Thames Water is the UK’s largest water and wastewater services company serving over 13.6 million customers in London and the Thames Valley, supplying an average of 2,600 million litres of drinking water and treating around 2,800 million litres of sewage every day.

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## Contents

**List of Tables** ............................................................................................................. iv
**List of Figures** ............................................................................................................. v
**Executive Summary** ................................................................................................. 1

1  Introduction ............................................................................................................... 8
   1.1  Purpose of this Statement of Response ...................................................... 8
   1.2  Overview of the public consultation .......................................................... 9
   1.3  Summary of responses ............................................................................. 10

2  Responses to the Consultation ............................................................................. 12
   2.1  Introduction and background information .................................................. 13
   2.2  Current Water Resources Programme, AMP4 (2005 - 2010) .................... 30
   2.3  Current and future demand for water ........................................................ 32
   2.4  Current and future water supply .............................................................. 60
   2.5  Allowing for risk and uncertainty – ‘Headroom’ ......................................... 80
   2.6  Baseline supply demand balance.............................................................. 96
   2.7  Appraisal of supply demand options ....................................................... 100
   2.8  Water Resources Options .................................................................... 104
   2.9  Preferred supply-demand programme ..................................................... 119
   2.10 Leakage................................................................................................... 121
   2.11 Metering and tariffs.................................................................................. 129
   2.12 Water efficiency....................................................................................... 138
   2.13 Programme appraisal............................................................................... 147
   2.14 Preferred supply demand programme ..................................................... 155
   2.15 Sensitivity testing..................................................................................... 158
   2.16 Summary of main elements of the preferred programme ......................... 160
   2.17 Strategic Environmental Assessment (SEA) Environmental Report ...... 161
   2.18 Upper Thames Reservoir ....................................................................... 168
   2.19 Other issues ............................................................................................ 185

3  Overview of revised plan ..................................................................................... 195
   3.1  Purpose of section ................................................................................... 195
   3.2  Material changes ..................................................................................... 196
   3.3  Revised Baseline Supply Demand Balances ............................................ 200
   3.4  Revised preferred programme – approach to selection ............................. 205
   3.5  Revised preferred programme – Results of programme appraisal .......... 209
   3.6  Components of Preferred Programme - Demand management strategy 222
   3.7  Summary of Preferred Programmes and comparison with original Plan. 235
   3.8  Concluding statement.............................................................................. 238

4  Next Steps ............................................................................................................ 240

Appendix 1:  List of statutory consultees ..................................................................... 241
Appendix 2:  Glossary ............................................................................................. 244
Appendix 3:  Schedule of Representations ............................................................. 249
Appendix 4:  Updated demand forecasts .................................................................. 250
Appendix 5:  Update of Strategic Environmental Assessment London and SWOX Water Resource Zones ............................................................................................................. 269
List of Tables

Table 1: London Water Resource Zone preferred programme .......................................................... 5
Table 2: Swindon & Oxfordshire Water Resource Zone preferred programme .................................. 6
Table 3: Total number of submissions received by response type .................................................. 10
Table 4: Total registrations and submissions from participants by sector ..................................... 20
Table 5: Comparison of groundwater source Deployable Output in WRP04, WRP06 and the draft Plan ................................................................. 25
Table 6: The impacts of demand reduction during a drought in regulatory reporting, Thames Valley and London ........................................................................ 26
Table 7: Assessment to demonstrate the impact on the Deployable Output for London and the Upper Thames ......................................................................................... 27
Table 8: Build-up of changes in the London demand forecast (1) .................................................. 36
Table 9: Thames Water household and population comparison (incl. economic downturn) ......... 37
Table 10: Property and population growth rate comparison (incl. economic downturn) ............. 38
Table 11: Build-up of changes in the London demand forecast (2) ................................................ 42
Table 12: 2007-08 volume per use in normal and power showers ................................................. 48
Table 13: Frequency and Volume per use assumptions for toilets ............................................... 49
Table 14: Rate of change in Per Capita Consumption ..................................................................... 50
Table 15: Build-up of changes in the London demand forecast (3) ............................................... 51
Table 16: Revised property Per Capita Consumptions .................................................................. 53
Table 17: Build-up of changes in the London demand forecast (4) ............................................... 53
Table 18: Build-up of changes in the London demand forecast (5) ............................................... 55
Table 19: Supply demand deficit resulting from scenario testing .................................................. 68
Table 20: Summary of the scenarios evaluated and their impact on Deployable Output ............ 71
Table 21: A list of the investigations required in AMP5 (2010-2015) provided by the Environment Agency .......................................................................................... 77
Table 22: Baseline Supply demand position in the draft Plan ......................................................... 97
Table 23: Baseline supply demand position in the revised draft Plan .......................................... 98
Table 24: Comparison of supply demand deficit/surplus between draft Plan and revised draft Plan .................................................................................................................. 98
Table 25: Feasible schemes in London Water Resource Zone ......................................................... 105
Table 26: Feasible schemes in Swindon & Oxfordshire Water Resource Zone ............................. 106
Table 27: Leakage reduction over the period 2005 – 2035 (litres/property/day) ......................... 123
Table 28: Household meter penetration by 2034/35 .................................................................. 131
Table 29: Modelled costs and benefits associated with different meter location choices ......... 133
Table 30: Manual or AMR .......................................................................................................... 133
Table 31: Overall AMR costs and benefits .................................................................................. 134
Table 32: Baseline water efficiency programme in revised draft Plan ........................................ 141
Table 33: Enhanced water efficiency programme in revised draft Plan ..................................... 142
Table 34: Assumptions linked to domestic water audits ............................................................... 143
Table 35: Contribution of demand management and water resource schemes to address the supply demand deficit ............................................................... 157
Table 36: AMP5 (2010-2015) Level of Service - Planned vs. Actual ........................................... 191
Table 37: Summary of demographic update in London WRZ ...................................................... 196
Table 38: Summary of the impact of the economic downturn in London WRZ ......................... 197
Table 39: Summary of household microcomponent review in London WRZ .............................. 198
Table 40: Summary of the impact of revised modelling of PCC in new build in London WRZ ................................................................. 198
Table 41: Summary of bounceback and other factors in London WRZ ....................................... 199
Table 42: Summary of changes to demand forecast for London WRZ ....................................... 199
Table 43: Summary of changes to WAFU .................................................................................. 199
Table 44: Baseline Supply demand position in the draft Plan ....................................................... 204
Table 45: Baseline supply demand position in the revised draft Plan ........................................ 204
Table 46: Comparison of supply demand deficit/surplus between draft Plan and revised draft Plan .................................................................................................................. 205
Table 47: SWOX supply side schemes – preferred programme .............................................. 210
Table 48: Longer term deficits from sustainability reduction and bulk supply scenarios ..... 213
Table 49: Revised leakage programme London – total savings ........................................ 224
Table 50: Table of leakage targets for London (Table 10b equivalent) (MI/d) .......................... 224
Table 51: Table of leakage targets for London (Table 10b equivalent) (l/prop/day) ................. 225
Table 52: Revised leakage programme SWOX – total savings ........................................ 225
Table 53: Table of leakage targets for SWOX (Table 10b equivalent) (MI/d) ......................... 226
Table 54: Table of leakage targets for SWOX (Table 10b equivalent) (l/prop/day) ................. 226
Table 55: Baseline water efficiency programme in revised draft Plan .................................. 233
Table 56: Enhanced water efficiency programme in revised draft Plan ............................... 234
Table 57: Components of the final planning scenario - London ........................................ 235
Table 58: Components of the final planning scenario - SWOX ........................................... 236

List of Figures

Figure 1 London Water Resource Zone Final Supply Demand Balance............................... 5
Figure 2 Swindon and Oxfordshire Water Resource Zone Final Supply Demand Balance..... 6
Figure 3: Population projections for the Thames Water supply area .................................. 37
Figure 4: Household projections for the Thames Water supply area .................................. 37
Figure 5: Economic downturn factors – households and population .................................. 40
Figure 6: Initial assessment of economic downturn – non-households .............................. 41
Figure 7: Revised assessment of economic downturn – non-households .......................... 42
Figure 8: Possible knowledge integrated community ....................................................... 46
Figure 9: Flowchart of the micro-component review process ........................................... 46
Figure 10: Draft Plan typical Per Capita Consumption split ............................................ 50
Figure 11: Revised Draft Plan typical Per Capita Consumption split .................................. 50
Figure 12: Demand Uncertainty Model (DUN) as used in the draft plan ............................. 83
Figure 13: Revised Uncertainty Model ........................................................................... 85
Figure 14: Relationship between leakage reduction and the cost of mains replacement .... 122
Figure 15: Changes in overall target headroom – London and SWOX ............................... 200
Figure 16 Baseline supply demand balance – London DYAA .......................................... 201
Figure 17: Baseline supply demand balance – SWOX Average (DYAA) and Peak (ADPW) .. 201
Figure 18: Baseline supply demand balance – Kennet Valley Average (DYAA) and Peak (ADPW) ........................................................................................................... 202
Figure 19: Baseline supply demand balance – SWA Average (DYAA) and Peak (ADPW) .... 202
Figure 20: Baseline supply demand balance – Guildford Average (DYAA) and Peak (ADPW) ........................................................................................................... 202
Figure 21: Baseline supply demand balance – Henley Average (DYAA) and Peak (ADPW) .. 203
Figure 22: Longer term planning problem in London ...................................................... 211
Figure 23: Four ‘future scenarios’ up to 2050 ..................................................................... 220
Figure 24: Comparison of target leakage levels - London ................................................ 224
Figure 25: Comparison of target leakage levels - SWOX .................................................. 226
Figure 26: Comparison of the predicted Optant meter installations per annum .................. 227
Figure 27: Comparison of the predicted Selective meter installations per annum ............... 228
Figure 28: Breakdown of the household Meter Penetration alongside Mains Replacement 229
Figure 29: Comparison of selective metering - London .................................................... 231
Figure 30: Comparison of selective metering - SWOX .................................................... 232
Figure 31: Revised final planning scenario – London ....................................................... 235
Figure 32: Revised final planning scenario – SWOX ....................................................... 236
Figure 33: Comparison of normal year average PCC vs Defra aspiration ........................ 237
Executive Summary

Along with all other water companies in England and Wales we have a legal duty to provide a secure supply of safe and clean water to our customers and every five years we are required to produce a Water Resources Management Plan (WRMP). This sets out how we intend to maintain the balance between supply and demand for water over the next 25 years and on 14 March 2008 we submitted our draft Plan to Defra, covering the 25 year period from 2010 to 2035. In May 2008, we published our draft Plan and the public was invited to comment on the draft Plan, in a 16-week consultation period from 7 May to 27 August 2008.

In total, we received 315 representations to the public consultation. We have prepared this Statement of Response to respond to the representations received and to comply with regulation 4 of the Water Resources Management Plan Regulations 2007. The statement summarises the points made by our consultees and describes our response to them. It also updates other aspects of the draft Plan where more up-to-date information that has become available since submission of the draft.

The main areas of interest raised by our consultees were:

- the approach used to forecast future demand for water
- the method used to take uncertainty into account, in particular climate change
- the opportunities for demand management
- the appraisal of new water resource schemes, and
- the methodology used in developing the preferred water resources programme.

A schedule of representations is provided in Appendix 3. This is a comprehensive list of all of the representations submitted to the public consultation and clearly signposts where each one has been addressed in this statement.

The structure of the statement is as follows:

Section 1 provides an introduction to the statement and an overview of the public consultation.

Section 2 explains the consideration we have given to the representations received, the changes made to the draft Plan as a result of the consideration of the representations and the reasons for those changes, and an explanation to describe why changes either have, or have not, been made to the draft Plan.

Section 3 draws together the material changes we have made to the draft Plan as a result of the consideration of the representations received and those arising from more recent information, and explains what these changes mean for a revised draft Plan.

**Summary of the main changes to the draft Water Resources Management Plan**

**Demand**

The forecast demand for water has reduced significantly across our supply area. This reduction in the demand forecast has been driven by several factors, including the economic downturn, revised population and household forecasts, a review of the
components of household water use (called micro-components) and a review of the assumptions used for water use in new build properties. The normal year Per Capita Consumption is now reduced from 163 litres per head per day (l/h/d) to 157 l/h/d by 2035. Taking into account regional variations in water use, this brings our Per Capita Consumption in line with Defra’s aspirational target of 130 l/h/d by 2030.

Despite the significant reduction in the forecast demand, without further intervention there still remains a substantial supply demand deficit throughout the planning period in both the London and Swindon & Oxfordshire Water Resource Zones, albeit with a more gentle deficit profile. In the London Water Resource Zone, the revised supply demand deficit rises to 323 Ml/d in 2034/35. In Swindon & Oxfordshire Water Resource Zone, the supply demand deficit rises to 53 Ml/d in 2034/35. These equate to reductions of around 30 to 40 per cent compared to the original forecasts included in the draft Plan but are still substantial deficits, which need to be addressed to ensure security of supply to our customers.

For the remaining four Thames Valley water resource zones the initial results indicate a greater surplus than in the draft Plan following the changes to the demand forecast.

Supply

The amount of water available for use for water supply has not changed significantly since the draft Plan. However, in response to the representations received, we have also undertaken additional detailed appraisal of new water supply schemes, including additional transfer schemes, reuse schemes, desalination options and reservoir options, including the costs, and the environmental and social impacts.

Further, in January 2009, the Environment Agency (EA) provided indicative information on sustainability reductions arising from the Water Framework Directive of 600 Ml/d (plus or minus 20 per cent) in the London Water Resource Zone, and 18 Ml/d in the Swindon & Oxfordshire Water Resource Zone. This would mean that we may have to reduce existing abstractions which could damage the environment, and look for new resources. We have used these indicative sustainability reductions in sensitivity analysis in our revised draft Plan.

Climate Change

Ofwat has also challenged the continued use of the UKCIP02 climate change scenarios, given that UKCIP will be publishing revised scenarios in Spring 2009. It has suggested that climate change impacts should be excluded from the Plan until the revised scenarios are available. In our view, it would be erroneous to exclude climate change impacts altogether since this would be contrary to government guidance. We have therefore continued to base our plan on the UKCIP02 scenarios. However, in recognition of Ofwat’s position, our Strategic Business Plan (April 2009) will only seek funding for the first two years of the Plan. Subsequent funding will be sought once the implications of the new UKCP09 scenarios have been assessed. Hence the leakage reduction forecasts and meter penetration numbers in our revised draft WRMP will not align with those in our Strategic Business Plan.

Revised preferred programmes

In determining the revised preferred programmes in London and Swindon & Oxfordshire Water Resource Zones, we have considered:

- the supply demand deficit
- customers’ preferences
- cost effectiveness
- sustainability
- resilience to uncertainty
- contribution to future carbon reduction requirements
- our aspirations as set out in our 25-year plan (Strategic Direction Statement)¹
  and
- the objectives set out in the Government’s water strategy `Future Water”².

The impact on bills is a particularly important consideration, due to the current economic recession and heightened affordability issues.

The preferred planning solution for the London Water Resource Zone remains strongly centred around demand management and the combined approach integrating our mains replacement work, progressive targeted metering and enhanced water efficiency from 2010 to 2020 (AMP periods 5 and 6). We call this approach integrated Demand Management.

The leakage programme is planned to achieve sustainable levels of leakage, taking into account customers’ willingness to pay for a higher level of leakage reduction activity. Overall, our policy is now to reduce leakage to sustainable levels and then maintain leakage levels across all Water Resource Zones and prevent leakage from increasing during the planning period until 2035.

Metering remains our preferred method of charging for water. However, the smaller supply demand deficit reduces the amount of metering that can be justified on a cost benefit basis compared to the draft Plan, particularly in London. For the London Water Resource Zone, we now propose to implement our metering programme over a longer period. We intend to achieve 77 per cent meter penetration within 15 years, rather than 80% over the ten years proposed in the draft Plan. We plan to trial a range of innovative tariffs from 2010, for example charging customers on a seasonal basis with the aim of implementing such tariffs from 2017 when the level of meter penetration will be sufficiently high to facilitate the change in the billing mechanism.

From AMP7 (2020-2025), demand management alone cannot maintain the supply demand balance and further water resources are required. Although the predicted deficit is relatively small and rises only slowly, we are acutely aware of a number of uncertainties, resolution of which could drive a step change in the scale of the deficit. These uncertainties include:

- the severity and duration of the current economic downtown
- the new climate change scenarios (UKCP09)
- the savings delivered by our AMP5 (2010-2015) demand management programme
- the magnitude of sustainability reductions that will be required throughout the South East of England as a result of the Water Framework Directive; and
- the requirement for bulk supplies to other companies in the South East.

Given that these considerable uncertainties lie outside the approach used to account for risks and uncertainties in the planning process, called headroom, we have concluded that it would be imprudent at this stage, to plan simply to meet the

¹ Strategic Direction Statement, Thames Water, 2008
predicted deficit. We have adopted a planning assumption that the capacity to deliver an additional 100ML/d plus should be planned for within the life of the Plan.

We have reviewed a range of water resource options to determine the preferred combination to maintain the balance between supply and demand. A strict monetary least cost plan would be based around desalination and reuse options, but our analysis indicates that this would unacceptably compromise our ability to deliver expected future carbon reduction targets and these options have therefore been rejected. Furthermore, if all carbon costs could be accounted for over the long term these would not remain least cost options. Therefore, our preferred option for a major additional water resource remains the proposed Upper Thames Reservoir.

However, we expect at least some of the uncertainties listed above to be resolved within the next five years. It would therefore be premature to continue to develop this scheme at a level of activity sufficient to ensure its delivery in 2019/20. We have adopted a pragmatic approach and are proposing reducing activity to maintain engagement in the wider planning process, to keep studies up-to-date and to defer delivery of the scheme for up to five years.

An inevitable consequence of the deferral of the Upper Thames Reservoir scheme is that we will not be able to accommodate any substantial changes to supply or demand in the intervening period. This is particularly relevant to sustainability reductions likely to be required by the Environment Agency, arising from the Water Framework Directive, these could only be implemented after 2026.

The deferral of the scheme and reduction in activity also defers the need to be definitive about the most appropriate reservoir size, since this will also depend on the resolution of the above uncertainties. However for the purposes of fulfilling the requirements of the Water Resources Planning Guideline we have undertaken further analysis into future uncertainties, including the consideration of possible demand scenarios beyond the planning horizon of 2035, up to 2050. This indicated a reservoir of 100 Mm$^3$ to be the preferred size at this stage because it provides the most sustainable option, particularly with regard to carbon, and is low-risk, providing a higher degree of resilience to climate change and future sustainability reductions. This size of reservoir was also supported by the Environment Agency as part of the preferred best regional solution arising out of the work to date by the Water Resources in the South East Group. It would provide sufficient reserve to cope with growth both in the Thames Water catchment and also other water company requirements.

Although not strictly necessary at this stage, since none of our resource options have sufficiently long lead times to require them to be developed during the next AMP period, we have also considered what an alternative plan might contain if it proved impossible to promote the reservoir successfully through the planning process. Returning to our long list of options indicates that a combination of options is likely to be required, probably including further expensive mains replacement work and more challenging tariff initiatives.

The final supply demand balance for the London Water Resource Zone is provided in Figure 1.
Figure 1 London Water Resource Zone Final Supply Demand Balance
This forecast is the Dry Year Annual Average (DYAA)

The key elements of the preferred programme for London Water Resource Zone are provided in Table 1.

<table>
<thead>
<tr>
<th>Leakage Programme</th>
<th>Programme aims to achieve a sustainable level of leakage, which is in line with industry average leakage levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP5 (2010-2015)</td>
<td>1,870km mains replacement (includes maintenance to manage asset deterioration) with 82 Ml/d savings</td>
</tr>
<tr>
<td>AMP6 (2015-2020)</td>
<td>2,200 km mains replacement (includes maintenance to manage asset deterioration) with 57 Ml/d savings</td>
</tr>
<tr>
<td>We will deliver this in combination with active leakage control consisting of pressure management, ‘find and fix’ activity and zonal reconfiguration.</td>
<td></td>
</tr>
</tbody>
</table>

| Metering Programme | Fifteen-year programme achieving 41 per cent meter penetration by 2015, 60 per cent by 2020 and 77 per cent by 2025. |

<table>
<thead>
<tr>
<th>Water Efficiency Programme</th>
<th>Baseline programme to provide 3.45 Ml/d savings in AMP5 (across the supply area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced programme delivers more cost effective savings</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply Schemes Programme</th>
<th>AMP7 (2020-2025) Groundwater schemes and Artificial Recharge scheme 23Ml/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP8 100Mm³ Proposed Upper Thames Reservoir from 2026 with a yield of 178 Ml/d</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: London Water Resource Zone preferred programme

In the Swindon & Oxfordshire Water Resource Zone, we plan to control leakage at current levels combined with a more intensive ten-year targeted metering programme and a strong water efficiency programme. We will introduce a number of small network constraint relief options, for example the removal of a constriction in the
network to increase water available, and groundwater schemes during AMP5 (2010-2015) with the requirement for additional new resources from AMP7 (2020-2025). Security of supply will be restored in this water resource zone by 2012/13.

The final supply demand balance for the Swindon & Oxfordshire Water Resource Zone is provided in Figure 2.

![Figure 2 Swindon and Oxfordshire Water Resource Zone Final Supply Demand Balance](image)

The forecast is the Average Day Peak Week (ADPW)

The key elements of the preferred programme for the Swindon & Oxfordshire Water Resource Zone are provided in Table 2.

<table>
<thead>
<tr>
<th>Leakage</th>
<th>Programme aims to maintain the level of leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AMP5 (2010-2015): 4.5 Ml/d savings</td>
</tr>
<tr>
<td></td>
<td>AMP6 (2015-2020): 1.3 Ml/d savings</td>
</tr>
<tr>
<td>Metering</td>
<td>10-year programme, achieving 70 per cent meter penetration by 2015, and 89 per cent by 2020</td>
</tr>
<tr>
<td>Water Efficiency</td>
<td>Baseline programme to provide 3.45 Ml/d savings in AMP5 (across the supply area)</td>
</tr>
<tr>
<td></td>
<td>Enhanced programme delivers more cost effective savings</td>
</tr>
<tr>
<td></td>
<td>AMP8 Proposed Upper Thames Reservoir 100 Mm³ from 2025: yield 24 Ml/d</td>
</tr>
</tbody>
</table>

Table 2: Swindon & Oxfordshire Water Resource Zone preferred programme
Next steps

This statement is being submitted to the Secretary of State today (27 February 2009). This statement is on our website and we will send it to all consultees who submitted a representation to the public consultation. The Secretary of State will review this statement and in the light of advice from technical experts, and with consideration of the responses to the public consultation, will decide to approve the Plan or direct changes to the Plan. The Plan will then be published and implemented from April 2010, unless it is determined that further scrutiny of the Plan is necessary.
1 Introduction

1.1 Purpose of this Statement of Response

1.1.1 Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how we intend to maintain the balance between supply and demand for water over the next 25 years. Water companies are also required to undertake a public consultation on their draft Plan. This is a new statutory requirement introduced in 2007.

1.1.2 In May 2008, we published our draft Plan covering the 25-year period from 2010 to 2035. The public consultation on the draft Plan began on 7 May 2008 and ran for a 16-week period to 27 August 2008.

1.1.3 We have produced this Statement of Response to comply with regulation 4 of the Water Resources Management Plan Regulations 2007. The statement identifies and explains:

a the consideration we have given to the representations received as part of the public consultation on the draft Plan

b the changes made to the draft Plan as a result of the consideration of the representations and the reasons for the changes

c where we have not made any changes to the draft Plan as a result of Thames Water consideration of the representations, why no change has been made.

1.1.4 The original statutory timetable for publication of the Statement of Response was within 26 weeks of the date of publication of the draft Plan. However, to allow water companies sufficient time to produce a comprehensive and meaningful Statement of Response, Defra issued a Direction3, granting an extension to all water companies in England of 13 weeks (ie up to 39 weeks from the publication date of the draft Plan) for publication of the statement. We were required to publish our Statement of Response on 4 February 2009. Due to the significant changes in the economy and the impact on the business, further changes were required to the statement, and consequently we delayed publishing our statement until 27 February 2009. We have sent copies of the statement to all consultees who made representations.

1.1.5 The statement is available on our website, at www.thameswater.co.uk

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1.2 Overview of the public consultation

1.2.1 The public consultation was undertaken on the complete draft Plan that comprised six volumes:

- **Volume 1** Summary Overview
- **Volume 2** Main Report
- **Volume 3** Appendices
- **Volume 4** Tables
- **Volume 5** Best Practicable Environmental Programme (BPEP): Assessment of alternative schemes
- **Volume 6** Strategic Environmental Assessment (SEA): Environmental Report

1.2.2 The full draft Plan was published on our website [www.thameswater.co.uk](http://www.thameswater.co.uk) and our consultation website [www.thameswaterconsult.co.uk](http://www.thameswaterconsult.co.uk). It was sent to 128 statutory consultees (Appendix 1). Organisations and individuals could also request copies of the draft Plan on CD or as a paper copy.

1.2.3 The draft Plan was also made available at the offices of Thames Water, the Consumer Council for Water, the Vale of White Horse District Council and Abingdon and Wantage libraries and local service points.

1.2.4 The public consultation was widely promoted by several means. Information was included with our customers’ bill statements and those of Three Valleys Water (one of the neighbouring water companies), in regional press and via external partners’ websites. We sent letters to local residents in the area of the proposed Upper Thames Reservoir, a newsletter was also sent to 36,000 addresses in the locality, and notifications were sent to parish magazines. We also emailed an invitation to participate in the consultation to over 1,600 organisations and individuals. During the 16-week consultation period, we continued to communicate directly with consultees via email and periodically reminded participants who had registered for the consultation to make their submission before the closing date.

1.2.5 We held two meetings for consultees in May 2008 to launch the public consultation and held a series of exhibitions in Oxfordshire, close to the site of the proposed Upper Thames Reservoir.

1.2.6 The consultation was run online, facilitated by an independent organisation, Dialogue by Design. People who wanted to participate in the consultation could register on the consultation website and complete an online response form. People who did not want, or were unable, to participate online were able to request a paper feedback form which replicated the questions on the website. Other written comments by letter and email were also accepted.

1.2.7 All submissions to the draft Plan consultation via the online consultation website were sent to the Secretary of State at Defra on a daily basis. Respondents who submitted a freeform written response were advised to send it direct to Defra.
1.3 Summary of responses

1.3.1 In total we received 315 responses to the public consultation. The total number of submissions received online, by using a feedback form or sending a letter or email, is shown in Table 3 below.

<table>
<thead>
<tr>
<th>Response type</th>
<th>Number received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>161</td>
</tr>
<tr>
<td>Feedback form</td>
<td>25</td>
</tr>
<tr>
<td>Email</td>
<td>46</td>
</tr>
<tr>
<td>Letter</td>
<td>83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>315</strong></td>
</tr>
</tbody>
</table>

Table 3: Total number of submissions received by response type

1.3.2 Defra directed us to accept two responses after the formal closing date of 27 August 2008.

1.3.3 In total, 91 responses were received from organisations and 127 from individuals, while 97 of respondents did not select a sector category. Table 4 shows the breakdown of respondents by sector.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Participants registered</th>
<th>Participants submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local or regional government</td>
<td>136</td>
<td>50</td>
</tr>
<tr>
<td>National or European Government</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Government agency or sponsored body</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>Voluntary or environmental organisation</td>
<td>50</td>
<td>22</td>
</tr>
<tr>
<td>Thames Water business customer</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Other business</td>
<td>46</td>
<td>8</td>
</tr>
<tr>
<td>Thames Water domestic customer</td>
<td>280</td>
<td>116</td>
</tr>
<tr>
<td>Thames Water employee or employee’s family</td>
<td>75</td>
<td>11</td>
</tr>
<tr>
<td>Other*</td>
<td>176</td>
<td>97</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>794</strong></td>
<td><strong>315</strong></td>
</tr>
</tbody>
</table>

* Respondents who did not select sector category
1.3.4 All representations received have been collated in the Schedule of Representations provided in Appendix 3. The purpose of the schedule is to provide a complete listing of all the representations submitted to the public consultation via the online consultation website, feedback forms and by letter/email, and to clearly signpost where these representations have been addressed in this statement. The schedule enables consultees, using their unique ID number, to locate their representation and to identify which section in the statement addresses their representation. The structure of the schedule is as follows:

- User ID number – this is the unique ID number allocated to a consultee.

- Consultee representation – representations that covered more than one technical point in a paragraph have been separated into individual technical points, to aid clarity. All offline representations - ie those received via feedback forms or letter - have been transcribed and included in the schedule.

- Section in the Statement of Response – the relevant section in the Statement of Response where the representation has been addressed is signposted. Representations which cover the same issue or technical point have been grouped together in the Statement of Response to avoid repetition.

1.3.5 Dialogue by Design have produced a report on the consultation which provides further detail on the consultation process and an overview of the results of the consultation. This is available to download from www.thameswaterconsult.co.uk.

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5 Report of consultation responses to Thames Water’s draft WRMP, Dialogue by Design, October 2008
2 Responses to the Consultation

This section of the statement covers the issues raised in the representations to our draft Plan. Each sub-section starts with a summary table highlighting the main issues raised in the representations. Then for each main issue, the following points are covered:

- the main points raised in the consultee representations
- Thames Water consideration of the representations
- changes made to the draft Plan as a result of consideration of the representations and the reasons for making the changes
- where we have made no changes to the draft Plan as a result of the considerations given to the representation, an explanation is given.

The changes made fall into two categories:

- those which add further detail or help to clarify the original text
- those which, as a result of revised or new information becoming available, have been made as adjustments.

Where no changes have been made, this has generally been either because:

- the issues raised in the representation have been fully covered in the draft Plan and there is no justification to change it, or
- because there has been insufficient time to gather the necessary information and/or complete additional work for a meaningful change to be made at this time. Where this is the case, an indication is given of when any additional work is likely to be completed and whether a change to the draft Plan is likely as a result of the work.

Further details of the representations received are provided in Appendix 3: Schedule of Representations and can be viewed online at [www.thameswaterconsult.co.uk](http://www.thameswaterconsult.co.uk).

A number of respondents have made comments on, or statements of opposition to, the proposed Upper Thames Reservoir when making their representations on other issues. An example is a challenge to the current and future demand for water, which in the view of the respondent, means that the proposed Upper Thames Reservoir is unnecessary. Reservoir-specific representations, including those made as part of another representation, are considered in section 2.18. Where statements of support or opposition have been made without further explanation or specific reference to technical issues, no changes to the draft Plan have been made.
2.1 Introduction and background information

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consultation information and process</td>
</tr>
<tr>
<td>2. Levels of service</td>
</tr>
<tr>
<td>3. Levels of service – timings of demand management actions</td>
</tr>
<tr>
<td>4. Lower Thames Operating Agreement (LTOA) – impact on Deployable Output</td>
</tr>
<tr>
<td>5. Lower Thames Operating Agreement – impact on development of proposed reservoir scheme</td>
</tr>
<tr>
<td>6. Lower Thames Operating Agreement – ecological impacts of Lower Thames abstractions</td>
</tr>
<tr>
<td>7. Tideway Tunnel – impact on Teddington Target Flows</td>
</tr>
<tr>
<td>8. Lower Thames Operating Agreement – timing of review</td>
</tr>
<tr>
<td>9. London Deployable Output</td>
</tr>
<tr>
<td>10. Drought Plan – review of water savings</td>
</tr>
<tr>
<td>11. Confirmation of scheme deployable output</td>
</tr>
</tbody>
</table>

2.1.1 Consultation information and process

2.1.1.i Consultee representations

A number of consultees stated that the consultation documentation was too technical to allow consultees to adequately understand the draft Plan and provide comments on it, and that the online approach was difficult to use.

Other consultees commended our approach to the consultation, specifically the use of customer research, the variety of customer forums and methods of consultee engagement. Publication of all six volumes of the full draft Plan, was generally welcomed, as it provided a high level of transparency.

2.1.1.ii Thames Water consideration

We are committed to best-practice consultation and take account of the expectations and preferences of consultees in developing long-term strategic plans. The public consultation on the draft Plan was designed to ensure a fair, open and transparent process. We undertook a wide range of activities to generate a high level of consultee awareness, and to encourage participation in the consultation. While we recognise that the draft Plan is a necessarily complex and detailed technical document, and some consultees clearly found it lengthy and difficult to fully understand, we believe that it was important to provide complete information for consideration by consultees. Further simplification of the draft Plan was not possible without losing important information which would have compromised its transparency and completeness.

2.1.1.iii Changes to the Plan made as a result of consultee representations

No changes.
2.1.1.iv  *Reasons for changes/no changes to the Plan*

Sub-section 2.1.1.ii explains the technical and complex nature of the document and why it is neither appropriate nor possible to try to simplify it. Therefore, no changes to the draft Plan are required.

2.1.2  *Levels of Service*

2.1.2.i  *Consultee representations*

Overall, consultees expressed support for Thames Water’s current Levels of Service. Consultees requested that Thames Water show clearly in the final Plan how the actual and planned Levels of Service to customers will vary over the planning period in light of the existing deficit in London and Swindon & Oxfordshire Water Resource Zones.

Consultees requested that Thames Water should show how the changes in the actual Levels of Service will affect the frequency and extent of implementation of its Drought Plan in these water resource zones and its potential applications for drought orders and permits for additional abstraction. Consultees stated that Thames Water should finish its Drought Plan in order that it is consistent with its Water Resources Management Plan.

2.1.2.ii  *Thames Water consideration*

The revised draft Plan includes revisions to the demand forecasts. The impact on actual and planned Levels of Service has been assessed and is discussed in sub-section 2.19.9.

We will complete the Drought Plan in order that it is consistent with our WRMP. Work is ongoing to address the revised requirements for earlier implementation of drought measures in the Drought Plan. For the actual Levels of Service, please refer to sub-section 2.19.9.

2.1.2.iii  *Changes to the Plan made as a result of consultee representations*

The revised draft Plan includes information on the stated Levels of Service and when these levels are attained in each of the water resource zones. This is presented in sub-section 2.19.9.iii

2.1.2.iv  *Reasons for changes/no changes to the Plan*

In response to consultee representations, the revised draft Plan has been amended to clearly state the impact of the revised demand forecasts on the stated Levels of Service in each water resource zone over the planning period.

2.1.3  *Levels of Service – timings of demand management actions*

2.1.3.i  *Consultee representations*

Several points were raised by consultees related to the timings of demand management measures, as follows:

a.  How the timings of demand management actions were determined.
b. Whether the distinction between public hosepipe bans and non-essential use bans can be made more explicit, with consideration of the Levels of Service for each, more in line with neighbouring water companies.

c. Whether a lower Level of Service for hosepipe bans would result in more Deployable Output once new resources such as the desalination plant are available, and the consequences of such a change for subsequent resource development needs.

d. Suggestion to reduce the mains pressures during very dry periods.

2.1.3.ii Thames Water consideration

a. As explained in Volume 2, Section 1.5 of the draft Plan, in planning future water resources we are working to agreed Levels of Service for our customers. The Levels of Service state the frequency with which we can impose different types of water use restrictions during periods of water shortage and are agreed with Ofwat and the Environment Agency. We have also conducted customer research to understand customer preferences in relation to Levels of Service. In practice, Levels of Service are enacted during a drought in accordance with our Drought Plan. Historically, decisions on introducing demand management measures (water use restriction measures) have been based on the total London reservoir storage intersecting Level 1 to 4 control curves on the Lower Thames Control Diagram (LTCD) - see draft Plan Volume 2, sub-section 1.6.1. However, our final Drought Plan (currently being agreed with the Environment Agency) has a new protocol in which, should the potential drought severity warrant it, Level 2 sprinkler bans and Level 3 hosepipe bans are introduced several weeks earlier than would otherwise be the case under the old protocol based solely on total reservoir storage. Under the new protocol, the status of groundwater storage levels throughout the Thames catchment is used in conjunction with river flows and reservoir storage to determine at an early stage in a drought event the potential risk to security of supply.

b. Research with our customers has shown that they are satisfied with the existing stated Levels of Service which relate to the escalating severity of drought events. We have service levels based around drought severities of one in five years (Level 1), one in ten years (Level 2), one in 20 years (Level 3) and never (effectively an extreme drought event of a worse severity than the most severe droughts experienced over the last 86 years). Increasing the frequency of hosepipe bans from Level 3 to Level 2 would represent a reduced level of service. As described above, our Drought Plan acknowledges that, when the severity of a drought warrants the introduction of hosepipe bans (Level 3 measure), this measure will be introduced together with sprinkler bans (Level 2 measure) at a time within the drought that will maximise its effectiveness in reducing demand. This will generally be several weeks in advance of a non-essential use ban. In this way, we can largely achieve our Levels of Service and become more effective in reducing demand when necessary during a prolonged drought.

c. For the London Water Resource Zone we estimate the benefit to deployable output of reducing Levels of Service by introducing hosepipe bans during a lesser

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6 Thames Water Strategic Direction Statement, December 2007

7 Thames Water Drought Plan, October 2008 (draft)
severity drought (one in ten years compared to one in 20 years) is about 2 Ml/d. This would not have a material impact on the Plan. The introduction of our desalination plant will mean that we can be more confident of achieving our stated Levels of Service. Currently there is a greater risk of failing our stated Levels of Service due to a significant supply demand gap, see 2.1.2 above.

d. We must maintain a minimum pressure at all times as a requirement of our regulatory obligations. Network pressures are optimised in relation to this pressure requirement and to minimise the occurrence of leakage from the system. If pressures were to be reduced in summer periods to below the minimum requirement, it is likely that properties that were at the extreme ends of the distribution network would experience unacceptable reductions in their domestic supply pressure. Our Drought Plan considers the option of reducing mains pressure within its Level 4 package of restrictions. It is an extreme measure and one we would only consider taking when security of supply is being seriously threatened during a prolonged and extreme drought. Reduction of pressure below the minimum required by regulation would require the issue of a Drought Order by the Secretary of State, implemented after other less severe restrictions.

2.1.3.iii Changes to the Plan made as a result of consultee representations

a. To add further clarity in response to these representations and to points b and c made above, we have included in our revised draft WRMP Volume 2 a new sub-section such that section, ‘1.5 Levels of Service’ is renamed ‘1.5 Levels of Service and Drought Plan’; and the existing text under 1.5 becomes sub-section 1.5.1 and the new sub-section 1.5.2 is as follows:

“Drought Plan

In practice, Levels of Service are enacted through our Drought Plan, which is a description of how we will manage our water resources and introduce water use restrictions during escalating drought conditions. Drought planning, like water resources planning, is now subject to a statutory process involving public consultation. After public consultation on our draft Drought Plan in 2006, we are now in the final stages of agreeing our final Drought Plan with the Environment Agency. The main change to the Drought Plan is the early introduction of water use restrictions, see Figure 5. In the Drought Plan should the potential drought severity warrant it, Level 2 sprinkler bans and Level 3 hosepipe bans are introduced several weeks earlier than would otherwise be the case under the old management procedure based solely on total reservoir storage and Level 1 to 4 control curves, see sub-section 1.6.1. Under the new management procedure, the status of groundwater storage levels throughout the Thames catchment is used in conjunction with river flows and reservoir storage to determine at an early stage in a drought event the potential risk to security of supply and therefore the need to introduce appropriate restrictions.

The new management procedure effectively draws a clear distinction between the control rules for the introduction of hosepipe bans on the one hand and non-essential use restrictions on the other, the latter having far more serious economic implications than the former and requiring several weeks of formal application process to secure an Order from the Secretary of State.”

b. No changes.
c. No changes.
d. No changes.

2.1.3.iv Reason for change/no changes to the Plan

In regard to a, further clarifying text has been added as set out in sub-section 2.1.3.iii.

In regard to b, the answer to a, provides sufficient and necessary explanation and requires no further changes to the original text.

In regard to c, Thames Water consideration given together with the existing draft Plan text provides the required explanation and no further changes to the text are justified.

In regard to d, the explanation provided is clear and no further changes to the original text are justified.

2.1.4 Lower Thames Operating Agreement (LTOA) – impact on Deployable Output

2.1.4.i Consultee representations

Consultees raised queries with respect to the LTOA and the impact on deployable output. One issue raised was that Thames Water has calculated that with the inclusion of the new demand savings (following the drought) the deployable output of London has been reduced by 117 Ml/d and by 28 Ml/d in the Swindon & Oxfordshire Water Resource Zone under dry year conditions, and a reduction of 10.5 Ml/d in the Swindon & Oxfordshire Water Resource Zone under critical period conditions. However, although Thames Water has included the new demand savings, it is not clear if these are applicable to the LTCD. Revision of the LTCD may result in an increase in deployable output, and this could mean that other options Thames Water has put forward may need to be re-appraised. Consultees stated that Thames Water should test changes to the LTCD in association with the Environment Agency and other interested parties as soon as possible.

2.1.4.ii Thames Water consideration

We have been working with the Environment Agency to review the LTOA and its associated issues since January 2007. Following the 2005/06 drought, we have used new data and have updated our assumptions on how much water is saved by introducing water use restrictions. In general, the Environment Agency agrees with these new figures.8

The calculation of London’s deployable output involves several inter-related factors:

a) the historic river flows over Teddington Weir
b) the performance of the water supply assets that constitute London's water resources system, of which about 80 per cent are based on the River Thames and Lee flows and their associated reservoir storage and 20 per cent are from groundwater abstraction in and around the chalk aquifer of the London Basin

8 ‘Thames Water presented its work on revising the demand savings that are in the LTOA in August 2007. The company had done a thorough analysis of the data from the recent drought and how its customers behaved. We are happy with the approach used in generating new demand savings for media campaigns and hosepipe bans.’ EA, 26 March 2008
c) the management rules and main assumptions within the LTCD, the principal ones being:

- target river flows over Teddington Weir
- Levels of Service - frequency of occurrence assumed for each level of water use restriction
- water use savings attributed to each level of restriction.

The WARMS model simulates the above functions (points a, b and c) in calculating London's deployable output.

The control rules associated with the LTOA are referred to as the Lower Thames Control Diagram (LTCD) - see Figure 6, Section 1.6.1, Volume 2 of the draft Plan and this comprises:

- environmental flow bands, referred to as Teddington Target Flow (TTF) bands
- four curves (Level 1 to Level 4) representing the escalating introduction of demand and supply side measures during drought.

These two factors are plotted against a total reservoir storage (y-axis) and time of year (x-axis).

We have been working with the Environment Agency to understand how we could improve deployable output by simply reconfiguring the LTCD control curves without making any major changes to the management assumptions, such as the Teddington Target Flows, increasing risk to security of supply or affecting our stated Levels of Service. This work shows that only a small increase in deployable output is possible if the Level 4 curve is moved downwards, but this is likely to be at the expense of an increased risk to security of supply. That is to say, without changing any of the existing fundamental assumptions in the preferred plan regarding Teddington Target Flows, Levels of Service or demand savings, it is not possible to significantly improve deployable output by reconfiguring the Level 1 to Level 4 curves.

We aim to keep all interested parties informed in the ongoing review of the LTOA and LTCD. The principal elements of the LTOA review are complete. The issue of assumed savings from drought demand restrictions has been addressed. The issue of timing and sequencing of restrictions has been addressed and will be included in the final Drought Plan. Further work is required to address the question of whether a change to the Level 4 curve could provide any benefit to deployable output and this requires recognised shortcomings with the Environment Agency water resource model to be addressed.

The remaining issue is the investigation into the impact of the Lower Thames abstraction on the environment of the Lower Thames and the Thames Tideway. This issue will be the subject of a major investigation in AMP5 (2010-2015) which is due to be completed in 2013.

2.1.4.iii Changes to the Plan made as a result of consultee representations

Additional text has been inserted in the revised draft Plan to further explain and clarify the complex calculation of London's deployable output. In Volume 2, section 1.6.1 the following text has been added:

WARMS – The Water Resources Management System (Thames Water model, described in section 4.1.1, Volume 2, draft Plan)
“The calculation of London’s deployable output involves several inter-related factors:

a) The historic river flows over Teddington Weir.
b) The performance of the water supply assets that constitute London's water resources system of which about 80 per cent are based on Thames and Lee riverflow and their associated reservoir storage and 20 per cent are from groundwater abstraction in and around the Chalk aquifer of the London Basin.
c) The management rules and key assumptions enshrined within the LTCD (Figure 6), the principal ones being:
   • target river flows over Teddington Weir
   • Levels of Service - frequency of occurrence assumed for each level of restriction, see Figure 5
   • water use savings attributed to each level of restriction.”

In order to acknowledge the progress made with the Environment Agency in understanding the evaluation of deployable output in respect of plausible changes to the LTCD, we have added the following paragraph, Volume 2, section 1.6.4:

“Subsequent to the publication of the draft Plan, ongoing modelling work with the Environment Agency has shown that London’s deployable output can be increased by up to about 20 Ml/d by a significant downward positioning of the Level 4 curve. However this downward positioning, which effectively acts to prolong the introduction of the last set of demand management measures during an extreme drought, would place London’s security of supply under an unacceptable risk.”

2.1.4. iv Reasons for changes/no changes to the Plan

Text as specified in section 2.1.4.iii has been inserted to further explain and clarify the complex calculation of London’s deployable output and to indicate the limited scope for increasing London’s deployable output by changes to the current LTCD.

2.1.5 Lower Thames Operating Agreement (LTOA) – Impact on development of proposed reservoir scheme

2.1.5. i Consultee representations

Consultees queried whether the proposed Upper Thames Reservoir option has taken account of any potential changes to the LTOA. Furthermore, while any changes are unlikely to affect the abstractions from the river it is likely that the probable changes to the minimum flows required at Teddington through the ongoing LTOA review will affect the releases that Thames Water needs to make to meet demands in the London Water Resource Zone. Thames Water should consider the impact of these changes on the development of this scheme.

2.1.5. ii Thames Water consideration

The changes that have already been made to the LTOA, namely the water use savings, have been taken into account in developing the preferred water resource options, including the proposed Upper Thames Reservoir. The actual operation and releases from the reservoir option to meet London’s demand can only be determined
when the LTOA review has been concluded in respect of Teddington Target Flows. However, a change in Teddington Target Flows is only likely to affect the timing of the release. For example, if the top Teddington Target Flow was to move from 800 to 1000 Ml/d, abstraction from the Lower Thames would be curtailed earlier, London’s reservoir storage would in turn decline more rapidly and this would trigger releases from a strategic resource earlier. Changes to the Teddington Target Flows will also have implications for the supply-demand balance and the ultimate deployable output required from the proposed Upper Thames Reservoir or indeed any other strategic scheme. Therefore, once triggered, the actual volume released from the reservoir, or any other strategic scheme, will ultimately depend upon the capacity of the scheme and this in turn will depend upon the supply-demand gap that the scheme or schemes are required to fill in terms of deployable output contribution to the respective water resource zone.

2.1.5.iii Changes to the Plan made as a result of consultee representations

The following additional paragraph has been added to sub-section 1.6.2 in Volume 2 of the draft Plan, following the last paragraph:

“The LTOA Review could, of course, have very significant implications for London’s longer term supply demand balance. For example, if the Teddington Target Flows were to be significantly increased then London’s deployable output would also decline significantly. This in turn is likely to necessitate additional water resource development. Therefore any long-term strategy should make reasonable allowance for this potentially major planning uncertainty.”

2.1.5.iv Reasons for changes/no changes to the Plan

The representation has highlighted a gap in the information provided on the LTOA Review given in the original draft Plan. Thames Water consideration, together with the changes to the draft described in 2.1.5.iii, provide a full response to the representation.

2.1.6 Lower Thames Operating Agreement (LTOA) – ecological impacts of Lower Thames abstractions

2.1.6.i Consultee representations

Consultees suggested that a review of the LTOA should also consider the ecological impact of abstractions from the Lower Thames. Thames Water has stated that there is no obvious evidence of detrimental impact from these water abstractions downstream in the upper reaches of the Thames Tideway, which may indicate that the Environment Agency could reduce target flows over Teddington Weir. This could mitigate the deployable output loss associated with the change in demand saving assumptions.

2.1.6.ii Thames Water consideration

The question of target flows over Teddington Weir needs to be agreed as part of the LTOA renegotiation. We have commissioned consultants to carry out a scoping study for investigations into the ecological impact of the Lower Thames abstractions. The AMP5 investigation is planned for completion in 2013. The investigation will need to be conducted over a period of several years because it will require a thorough review of all available information on the environmental condition of the lower Thames
followed by a monitoring programme to fill any gaps in existing information. The investigation is also likely to require the development of computer models to simulate the impact of different abstraction scenarios on the hydraulics and therefore the environmental receptors of the lower Thames and Tideway, and will conclude with a comprehensive report on the findings of the investigation.

The scoping study proposed in our draft Plan is aimed at understanding the possible impacts of our abstraction on both the freshwater Lower Thames and the Tideway downstream of Teddington Weir. While we do not want to pre-judge the results, we believe it is very unlikely that that the study will result in a significant change in the Teddington Target Flows to increase available water supply to the detriment of the environment. This view is based on our understanding that the Environment Agency believes the Lower Thames from Slough downstream to the freshwater limit at Teddington Weir is over-abstracted and not environmentally sustainable at low flows.10

2.1.6.iii Changes to the Plan made as a result of consultee representations

The following text has been inserted in Volume 2, sub-section 1.6.3, to provide further information and clarity on the ecological issues:

“However, the Environment Agency believe the lower part of the River Thames between Slough and the tidal limit is over abstracted, see also section 4.2.4.2. “

Also under 4.2.4.2 after the second sentence the following text has been inserted:

“In their view, the lower River Thames is not only over abstracted but also not environmentally sustainable at low flows.”

2.1.6.iv Reasons for changes/no changes to the Plan

Changes have been made to the revised draft Plan as outlined in section 2.1.6.iii to provide further information and clarity on the ecological impact of abstractions from the lower Thames.

2.1.7 Tideway Tunnel – impact on Teddington Target Flows

2.1.7.i Consultee representations

Consultees questioned whether the Thames Tideway Tunnel will improve the quality of water below Teddington Weir and therefore increase the scope for the Environment Agency to reduce target flows over Teddington Weir because pollutant concentrations at reduced flows will be lower and less harmful than previously assumed.

2.1.7.ii Thames Water consideration

The purpose of the Thames Tideway Tunnel is to reduce the frequency and impact of intermittent storm sewage discharges to the River Thames. This will help to resolve acute episodes of low dissolved oxygen concentrations. The reduction of intermittent storm discharges into the Tideway will not address the impact of prolonged periods of very low flows that are experienced in low flow summers and which are exacerbated by abstraction from the Lower Thames. It is the potential for these prolonged periods

10 Thames Corridor Abstraction Management Strategy - June 2004, Environment Agency
of low flows and the compounding impact of abstraction that will be addressed in the investigations proposed for AMP5 (2010-2015).

2.1.7.iii Changes to the Plan made as a result of consultee representations

Additional text has been added to the revised draft Plan, Volume 2, sub-section 1.6.3 under Target Flows prior to the final sentence in the paragraph which starts These are major, long-standing questions.............

“In regard to Tideway water quality, it should be noted that the purpose of the Thames Tideway Tunnel is to reduce the frequency and impact of intermittent storm sewage discharges to the River Thames. This will help to resolve acute episodes of low dissolved oxygen concentrations. The potential impact of the Tideway tunnel scheme will be one of the points covered with the Environment Agency as part of the LTOA review.”

2.1.7.iv Reasons for changes/no changes to the Plan

We have added additional text as described in sub-section 2.1.7.iii to the revised draft WRMP in order to clarify our views on the purpose and benefits of the Tideway Tunnel.

2.1.8 Lower Thames Operating Agreement (LTOA) – timing of review

2.1.8.i Consultee representations

Some consultees raised concerns that a number of aspects of the review of the LTOA will not be resolved until early in AMP5 (2010-2015). One aspect of this review – the impact of revised demand savings – has reached a conclusion, and shows a significant decrease in deployable output. This is a major driver of investment in the London and Swindon & Oxfordshire Water Resource Zones. However, it would be premature to commit to this investment when other elements of the review are likely to generate at least some offsetting increase in deployable output, deferring the need for at least some of the investment. Thames Water should resolve these issues with the Environment Agency as soon as possible.

2.1.8.ii Thames Water consideration

We accept that there are still some uncertainties to resolve, including the environmental impact of abstractions on the Lower Thames, but there will always be a degree of uncertainty in long-term planning of water resources. Further delay in major funding decisions could mean there are insufficient supplies available to meet long-term growth in water demand and maintain the supply demand balance. As described in section 2.1.6, it is unlikely the proposed study will result in significant reductions to Teddington Target Flows to increase deployable output and benefit water supplies.

2.1.8.iii Changes to the Plan made as a result of consultee representations

No changes.
2.1.8.iv Reasons for changes/no changes to the Plan

As set out in sub-section 2.1.8.iii, although there are still some uncertainties to resolve, the remaining aspects of the LTOA are considered unlikely to result in significant reductions to Teddington Target Flows. Therefore no changes to the draft Plan are justified.

2.1.9 London Deployable Output

2.1.9.i Consultee representations

a. Thames Water should ensure that its London deployable output in its final Plan is consistent with the sequencing and timing of restrictions in its final Drought Plan.

b. Thames Water needs to address the uncertainties and improve confidence in its current deployable output calculation for London.

2.1.9.ii Thames Water consideration

a. The draft Plan already acknowledges its interdependency with the Drought Plan, see Section 1.6.3, Volume 2, first paragraph. We will ensure that the final WRMP and final Drought Plan are consistent. Our revised Drought Plan takes into account the lessons learnt during the 2005/06 drought as well as the LTOA review to date. The revised drought management protocol is designed to introduce demand and supply side measures to maximise their effectiveness during the course of a drought consistent with Levels of Service.

b. We are working with the Environment Agency on the LTOA review. Through this work we have addressed the model discrepancy between the Environment Agency’s and Thames Water’s modelled deployable output. The Environment Agency wrote to Thames Water on 13 February and stated that ‘we consider your draft water resource management plan 2008 DO calculations are broadly within the expected range.’ This has demonstrated the robustness of our deployable output assessments. We will continue to work with the Environment Agency to increase their understanding of the deployable output calculations.

2.1.9.iii Changes to the Plan made as a result of consultee representations

No changes.

2.1.9.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.1.9.ii parts a) and b), we will ensure that London’s deployable output in the WRMP is consistent with the Drought Plan and we are confident in the assessment of deployable output. Therefore there is no justification for changes to the draft Plan.

2.1.10 Drought Plan – Review of water savings

2.1.10.i Consultee representations

Thames Water should do further work to investigate whether improved water savings may be achieved during a drought. While this is likely to be a long-term measure, it may be one route to reducing the need for new water supplies in the future.
2.1.10.ii  Thames Water consideration

We will continue to research and investigate ways in which improved water savings can be achieved during a drought without the stated Levels of Service being compromised. We expect that the introduction of metering linked with seasonal tariffs would provide a further mechanism for improving water savings during a drought—see draft Plan Volume 2, sub-section 7.3.3.3, Table 33, item 10. However, proper consideration of the affordability implications must be given. Additional savings associated with sophisticated water use tariffs have already been included in our draft Plan.

2.1.10.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.1.10.iv  Reasons for changes/no changes

As explained in sub-section 2.1.10.ii, we will continue to research and investigate ways in which improved water savings can be achieved. We anticipate that the introduction of metering linked with seasonal tariffs, will provide a further mechanism for improving water savings during a drought. This point is already included in the draft Plan. No further changes are required.

2.1.11  Confirmation of scheme deployable output

2.1.11.i  Consultee representations

a. Thames Water should clarify and provide a fuller explanation for the changes in the forecast deployable output for its desalination plant and some of its groundwater sources.

b. Thames Water should include supporting material to justify the change in deployable output at Farmoor Reservoir as a result of the change to the demand savings.

2.1.11.ii  Thames Water consideration

a. Desalination and other groundwater sources

The value of the deployable output from the desalination plant partly depends upon the operation mode during a drought. To date, we have obtained a deployable output range of between 140 and 150 Ml/d depending on the assumed mode of operation of the plant. This operation is subject to an operating agreement currently being drawn up with the Environment Agency and is linked to the abstraction licence. The agreement has not yet been finalised. Moreover, we have yet to commission and test the plant under realistic operational conditions. Therefore, in the revised draft Plan, we have assumed the lower value of deployable output (140 Ml/d), as it would be unacceptably risky from a security of supply viewpoint to over-estimate the plant’s contribution to London’s supply capability.

With regard to the deployable output of groundwater sources. Table 5 presents the deployable output presented in WRP04, WRP06 and the draft Plan and explains any changes in deployable output quoted.
<table>
<thead>
<tr>
<th>Groundwater Source</th>
<th>WRP04 (ML/d)</th>
<th>WRP06 (ML/d)</th>
<th>Draft Plan (ML/d)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Critical Period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guildford 2 (Guildford WRZ)</td>
<td>6.80</td>
<td>6.80</td>
<td>4.10 (6.80)</td>
<td>The licence is an aggregate licence combining 2 individual sources. The DO is the sum of these sources 4.1 + 2.7 (6.80)</td>
</tr>
<tr>
<td>Caversham East (Kennet Valley WRZ)</td>
<td>7.00</td>
<td>7.00</td>
<td>8.20</td>
<td>Increased following test pumping to assess output</td>
</tr>
<tr>
<td>Berkhamstead West (SWA WRZ)</td>
<td>9.10</td>
<td>6.00</td>
<td>7.40</td>
<td>Reduction in 2006 due to turbidity issues. Additional test pumping confirmed water quality issue can be managed and DO increased.</td>
</tr>
<tr>
<td>Goring Gap 1 (SWOX WRZ)</td>
<td>70.00</td>
<td>No value</td>
<td>85.50</td>
<td>Licence increase, via transfer and increase in treatment works capacity</td>
</tr>
<tr>
<td>Cleeve (SWOX WRZ)</td>
<td>7.30</td>
<td>No value</td>
<td>9.50</td>
<td>Increased following test pumping and installation of new pumps</td>
</tr>
<tr>
<td>Cleeve (SWOX WRZ)</td>
<td>4.30</td>
<td>No value</td>
<td>6.80</td>
<td>Increased following test pumping and installation of new pumps</td>
</tr>
<tr>
<td>Blockley (SWOX WRZ)</td>
<td>1.50</td>
<td>1.52</td>
<td>1.44</td>
<td>Decrease as a result of revised treatment works process losses</td>
</tr>
<tr>
<td>Fairford (SWOX WRZ)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.07</td>
<td>Re-assessment of available data</td>
</tr>
<tr>
<td>Latton (SWOX WRZ)</td>
<td>25.00</td>
<td>No value</td>
<td>20.00</td>
<td>Licence reduction</td>
</tr>
<tr>
<td><strong>Dry Year Annual Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guildford 2 (Guildford WRZ)</td>
<td>5.50</td>
<td>5.50</td>
<td>3.30 (5.50)</td>
<td>The licence is an aggregate licence combining 2 individual sources. The DO is the sum of these sources 3.30 + 2.20</td>
</tr>
<tr>
<td>Deptford (London WRZ)</td>
<td>26.0</td>
<td>No value</td>
<td>24.0</td>
<td>Reassessment based on operational test pumping</td>
</tr>
<tr>
<td>Darenth (London WRZ)</td>
<td>18.5</td>
<td>No value</td>
<td>20.30</td>
<td>Reassessment based on new operational data</td>
</tr>
<tr>
<td>Bell Green (London WRZ)</td>
<td>14.80</td>
<td>No value</td>
<td>15.60</td>
<td>Change in treatment works process losses</td>
</tr>
<tr>
<td>West Wycombe (London WRZ)</td>
<td>8.20</td>
<td>No value</td>
<td>9.60</td>
<td>Licence increase, via transfer</td>
</tr>
<tr>
<td>Horton Kirby (London WRZ)</td>
<td>12.0</td>
<td>No value</td>
<td>9.49</td>
<td>Licence reduction</td>
</tr>
<tr>
<td>North Orpington (London WRZ)</td>
<td>9.10</td>
<td>No value</td>
<td>8.18</td>
<td>Increase in treatment works process losses</td>
</tr>
<tr>
<td>Lullingstone (London WRZ)</td>
<td>4.10</td>
<td>No value</td>
<td>4.50</td>
<td>Reduction of Horton Kirby and Eynsford allows a maximum use of Lullingstone licence</td>
</tr>
<tr>
<td>Eynsford (London WRZ)</td>
<td>7.00</td>
<td>No value</td>
<td>3.00</td>
<td>Licence reduction</td>
</tr>
<tr>
<td>Westerham (London WRZ)</td>
<td>0.80</td>
<td>No value</td>
<td>0.85</td>
<td>Re-assessment based on new operational data.</td>
</tr>
<tr>
<td>Berkhamstead West (SWA WRZ)</td>
<td>8.23</td>
<td>6.00</td>
<td>7.40</td>
<td>Reduction in 2006 due to turbidity issues. Additional test pumping demonstrated water quality issue can be managed. DO increase.</td>
</tr>
<tr>
<td>Goring Gap 1 (SWOX WRZ)</td>
<td>70.0</td>
<td>No value</td>
<td>85.7 (85.5)</td>
<td>Licence increase, via transfer, and increase in treatment works capacity. DO should be 85.5 ML/d</td>
</tr>
<tr>
<td>Cleeve (SWOX WRZ)</td>
<td>7.30</td>
<td>No value</td>
<td>9.50</td>
<td>Increased following test pumping and installation of new pumps</td>
</tr>
<tr>
<td>Cleeve (SWOX WRZ)</td>
<td>4.30</td>
<td>No value</td>
<td>6.80</td>
<td>Increased following test pumping and installation of new pumps</td>
</tr>
<tr>
<td>Latton (SWOX WRZ)</td>
<td>25.0</td>
<td>No value</td>
<td>15.0</td>
<td>Licence reduction</td>
</tr>
<tr>
<td>Lambourne Down (SWOX WRZ)</td>
<td>2.70</td>
<td>No value</td>
<td>1.80</td>
<td>Pump capacity re-assessed from operational data</td>
</tr>
</tbody>
</table>
b. Farmoor Reservoir

We have undertaken a review of the impact of restrictions on customers’ demands in the Thames Valley. The savings observed in the Thames Valley differ from those achieved in London and are outlined in Table 6 below. The cumulative savings achieved up to and including Level 3 are greater (maximum 13.7 per cent in July) than those seen in London (maximum 11.1 per cent in July) but significantly less than those assumed in the regulatory reporting (max 28 per cent).

Table 6: The impacts of demand reduction during a drought in regulatory reporting, Thames Valley and London

<table>
<thead>
<tr>
<th>Regulatory Savings</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td>3%</td>
<td>2%</td>
<td>5%</td>
<td>8%</td>
<td>8%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>2%</td>
<td>3%</td>
<td>4%</td>
<td>7%</td>
<td>10%</td>
<td>13%</td>
<td>16%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-2</strong></td>
<td>5%</td>
<td>5%</td>
<td>7%</td>
<td>16%</td>
<td>19%</td>
<td>19%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>13%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Level 3a HP ban</strong></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Level 3b HP lift</strong></td>
<td>5%</td>
<td>5%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td>6%</td>
<td>5%</td>
<td>2%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-3</strong></td>
<td>10%</td>
<td>10%</td>
<td>12%</td>
<td>23%</td>
<td>29%</td>
<td>28%</td>
<td>26%</td>
<td>21%</td>
<td>11%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total Savings Levels 1-4</strong></td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Thames Valley

Revised estimates for the impacts of demand reduction in TV during a drought (based on 2006 observations recast given 1976 weather patterns)

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td>1.2%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.5%</td>
<td>1.7%</td>
<td>2.3%</td>
<td>2.9%</td>
<td>2.9%</td>
<td>2.9%</td>
<td>2.5%</td>
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<tr>
<td><strong>Level 2</strong></td>
<td>1.2%</td>
<td>1.3%</td>
<td>1.5%</td>
<td>2.3%</td>
<td>2.5%</td>
<td>6.5%</td>
<td>6.5%</td>
<td>6.7%</td>
<td>6.7%</td>
<td>1.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-2</strong></td>
<td>2.4%</td>
<td>2.6%</td>
<td>3.0%</td>
<td>4.2%</td>
<td>9.4%</td>
<td>9.6%</td>
<td>9.6%</td>
<td>9.6%</td>
<td>3.4%</td>
<td>3.0%</td>
<td>2.7%</td>
</tr>
<tr>
<td><strong>Level 3a HP ban</strong></td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>1.8%</td>
<td>1.9%</td>
<td>1.9%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Level 3b HP lift</strong></td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.6%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-3</strong></td>
<td>4.7%</td>
<td>4.7%</td>
<td>4.9%</td>
<td>6.2%</td>
<td>6.7%</td>
<td>13.2%</td>
<td>15.7%</td>
<td>15.7%</td>
<td>15.7%</td>
<td>6.7%</td>
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</tr>
<tr>
<td><strong>Total Savings Levels 1-4</strong></td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
</tr>
</tbody>
</table>

London

Revised estimates for the impacts of demand reduction in London during a drought (based on 2006 observations recast given 1976 weather patterns)

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<td><strong>Level 1</strong></td>
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<td>1.1%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
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<td>1.1%</td>
<td>1.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>1.1%</td>
<td>1.1%</td>
<td>1.1%</td>
<td>1.2%</td>
<td>1.2%</td>
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<td>1.2%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-2</strong></td>
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<td>2.2%</td>
<td>2.4%</td>
<td>2.5%</td>
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<tr>
<td><strong>Level 3a HP ban</strong></td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>0.5%</td>
<td>1.6%</td>
<td>1.7%</td>
<td>1.7%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Level 3b HP lift</strong></td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Cumulative Levels 1-3</strong></td>
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<td>4.4%</td>
<td>4.6%</td>
<td>4.8%</td>
<td>5.5%</td>
<td>7.0%</td>
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<td>7.7%</td>
<td>7.7%</td>
<td>7.7%</td>
</tr>
<tr>
<td><strong>Level 4</strong></td>
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<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
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<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
<td>18.0%</td>
</tr>
<tr>
<td><strong>Total Savings Levels 1-4</strong></td>
<td>22.2%</td>
<td>22.4%</td>
<td>22.6%</td>
<td>24.5%</td>
<td>24.7%</td>
<td>28.6%</td>
<td>29.4%</td>
<td>29.4%</td>
<td>29.4%</td>
<td>29.4%</td>
<td>22.2%</td>
</tr>
</tbody>
</table>

Note: Regulatory savings are the water use savings from restriction measures assumed historically and agreed with the Environment Agency and its predecessors.

We have undertaken an assessment to demonstrate the impact on the deployable output for London and the Upper Thames (consisting of the Swindon and the North Oxfordshire part of the Swindon & Oxfordshire Water Resource Zone). Table 7 shows the results of the analysis. The deployable output is first calculated for London then the demand is held at this level to determine the deployable output of the Upper Thames, with the timing of the restrictions determined by London.

Scenario Ref. 3 shown in Table 7 shows the impact of using the revised demand savings (i.e. less than the regulatory savings) for both London and the Thames Valley.

By applying the savings for London and Thames Valley independently, the deployable output under the current Level of Service becomes 233 Ml/d, equivalent to a reduction of 28 Ml/d.
Table 7: Assessment to demonstrate the impact on the Deployable Output for London and the Upper Thames

2.1.11.iii Changes to the Plan made as a result of consultee representations

The revised draft Plan has been changed in Section 1 to include the following text:

a. Desalination

The value of the Deployable Output from the desalination plant is partly dependent upon the operation mode during a drought. So far, we have obtained a deployable output range of between 140 and 150 Ml/d depending on the assumed mode of operation. This operation is subject to an operating agreement currently being drawn up with the Environment Agency and is linked to the abstraction licence. The agreement has not yet been finalised. Moreover, we have yet to commission and test the plant under realistic operational conditions. Therefore for the revised draft Plan we have assumed the lower value of Deployable Output (140 Ml/d), as it would be unacceptably risky from a security of supply viewpoint to over-estimate the plant's contribution to London's supply capability.

b. Farmoor Reservoir

We have undertaken a review of the impact of restrictions on customers on demands in the Thames Valley. The savings observed in the Thames Valley differ from those achieved in London and are outlined in table below. The cumulative saving achieved up to and including Level 3 are greater (maximum 13.7 per cent in July) than those seen in London (maximum 11.1 per cent in July) but significantly less than those assumed in the regulatory reporting (max 28 per cent).

<table>
<thead>
<tr>
<th>Ref</th>
<th>Demand Savings</th>
<th>London Savings</th>
<th>Thames Valley Savings</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>Farmoor Emergency Storage (Ml)</td>
<td>Reg</td>
</tr>
<tr>
<td>1</td>
<td>Base Run - WRP08 DO @Sep2007</td>
<td>4500</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>HP Ban @ Level 3</td>
<td>4500</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>HP Ban @ Level 3</td>
<td>4500</td>
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<tr>
<td>7</td>
<td>HP Ban @ Level 2</td>
<td>4500</td>
<td>x</td>
</tr>
</tbody>
</table>
Table: The impacts of demand reduction during a drought in regulatory reporting, Thames Valley and London

<table>
<thead>
<tr>
<th>Regulatory Savings</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>6%</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Level 2</td>
<td>3%</td>
<td>3%</td>
<td>4%</td>
<td>7%</td>
<td>10%</td>
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<td>9%</td>
<td>7%</td>
<td>4%</td>
<td>5%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Cumulative Levels 1-2</td>
<td>5%</td>
<td>5%</td>
<td>7%</td>
<td>15%</td>
<td>19%</td>
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<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Level 3a HP ban</td>
<td>8%</td>
<td>8%</td>
<td>9%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
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<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Level 3b NEU ban</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
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</tr>
<tr>
<td>Level 4</td>
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<td>10%</td>
<td>10%</td>
<td>10%</td>
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<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
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</tr>
<tr>
<td>Total Savings Levels 1-4</td>
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<td>28%</td>
<td>30%</td>
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<td>43%</td>
<td>46%</td>
<td>46%</td>
<td>46%</td>
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</tr>
</tbody>
</table>

**Thames Valley**

Revised estimates for the impacts of demand reduction in TV during a drought (based on 2006 observations recast given 1976 weather patterns)

<table>
<thead>
<tr>
<th>Thames Valley Levels</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
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<td>1.3%</td>
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<td>1.7%</td>
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<td>2.9%</td>
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<td>6.7%</td>
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<td>0.2%</td>
<td>0.3%</td>
<td>0.4%</td>
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<td>1.8%</td>
<td>1.9%</td>
<td>0.2%</td>
<td>0.1%</td>
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</tr>
<tr>
<td>Level 3b NEU ban</td>
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<td>2.0%</td>
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<tr>
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<td>4.7%</td>
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<tr>
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<td>10.0%</td>
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<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
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<tr>
<td>Total Savings Levels 1-4</td>
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<td>22.7%</td>
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</tr>
</tbody>
</table>

**London**

Revised estimates for the impacts of demand reduction in London during a drought (based on 2006 observations recast given 1976 weather patterns)

<table>
<thead>
<tr>
<th>London Levels</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1.1%</td>
<td>1.1%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>1.1%</td>
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<td>Cumulative Levels 1-2</td>
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<td>2.4%</td>
<td>3.2%</td>
<td>3.7%</td>
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<td>7.3%</td>
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<td>3.2%</td>
<td>2.6%</td>
<td>2.2%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Level 3a HP ban</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.3%</td>
<td>1.6%</td>
<td>1.7%</td>
<td>1.5%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
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</tr>
<tr>
<td>Level 3b NEU ban</td>
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<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
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<td>2.0%</td>
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<tr>
<td>Cumulative Levels 1-3</td>
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</tr>
<tr>
<td>Total Savings Levels 1-4</td>
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<td>22.5%</td>
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<td>25.0%</td>
<td>22.2%</td>
<td>22.2%</td>
<td>22.2%</td>
</tr>
</tbody>
</table>

Note: Regulatory savings are the water use savings from restriction measures assumed historically and agreed with the EA and its predecessors.

An assessment has been undertaken to demonstrate the impact on the Deployable Output for London and the Upper Thames, (consisting of the Swindon and the North Oxfordshire part of the Swindon & Oxfordshire Water Resource Zone). The table shows the results of the analysis. The Deployable Output is first calculated for London then the demand is held at this level to determine the Deployable Output of the Upper Thames, with the timing of the restrictions determined by London.

Scenario Ref. 3 shown in the Table below shows the impact of using the revised demand savings (ie less than the regulatory savings) for both London and the Thames Valley.
Table: Assessment to demonstrate the impact on the Deployable Output for London and the Upper Thames

<table>
<thead>
<tr>
<th>Ref</th>
<th>Demand Savings</th>
<th>Farmoor Emergency Storage (Ml)</th>
<th>London Savings</th>
<th>Thames Valley Savings</th>
<th>Change in DO from Base Run ie. Regulatory Demand Savings (Ml/d)</th>
<th>UT DO (Ml/d)</th>
<th>Change in DO from Base Run ie. Regulatory Demand Savings (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Base Run - WRP08 DO @ Sep2007</td>
<td>4500</td>
<td>x</td>
<td>x</td>
<td>2124</td>
<td>0</td>
<td>261</td>
</tr>
<tr>
<td>2</td>
<td>HP Ban @ Level 3</td>
<td>4500</td>
<td>x</td>
<td>x</td>
<td>2124</td>
<td>0</td>
<td>233</td>
</tr>
<tr>
<td>3</td>
<td>HP Ban @ Level 3</td>
<td>4500</td>
<td>x</td>
<td>x</td>
<td>2007</td>
<td>-117</td>
<td>233</td>
</tr>
<tr>
<td>4</td>
<td>HP Ban @ Level 3</td>
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<td>x</td>
<td>x</td>
<td>2015</td>
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<td>229</td>
</tr>
<tr>
<td>5</td>
<td>HP Ban @ Level 2</td>
<td>4500</td>
<td>x</td>
<td>x</td>
<td>2124</td>
<td>0</td>
<td>234</td>
</tr>
<tr>
<td>6</td>
<td>HP Ban @ Level 2</td>
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<td>x</td>
<td>x</td>
<td>2008</td>
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<td>234</td>
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<tr>
<td>7</td>
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<td>x</td>
<td>x</td>
<td>2017</td>
<td>-107</td>
<td>230</td>
</tr>
</tbody>
</table>

By applying the savings for London and Thames Valley independently, the Deployable Output under the current Level of Service becomes 233 Ml/d, equivalent to a reduction of 28 Ml/d.”

2.1.11.iv Reason for changes/no changes to the Plan

The draft Plan has been changed to provide a clear explanation of the reason for changes in its forecast Deployable Output for the desalination plant and to clarify the justification for the change in Deployable Output for Farmoor Reservoir arising from the changes in assumed savings.
2.2 Current Water Resources Programme, AMP4 (2005 - 2010)

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Leakage programme</td>
</tr>
</tbody>
</table>

2.2.1 Support for current programme AMP4 (2005-2010)

2.2.1.i Consultee representations

The majority of comments from consultees supported the current AMP4 (2005-2010) water resources programme.

2.2.1.ii Thames Water consideration

We are pleased that consultees expressed support for our AMP4 (2005-2010) water resources programme.

2.2.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.2.1.iv Reasons for changes/no changes

In light of the support expressed for the current AMP4 (2005-2010) programme, and in the absence of any objections in the representations submitted, no change to the draft Plan is proposed.

2.2.2 Leakage programme

2.2.2.i Consultee representations

Several consultees made positive comments about the scale and progress with the current leakage programme.

Others commented that the leakage reduction programme was not sufficiently demanding and questioned the number of leakage recurrences that arise from short-term repairs.

One consultee requested further data on the leakage rates from new pipes in London and queried the use of litres per hour when describing leaks from new pipework in contrast to litres per day.

2.2.2.ii Thames Water consideration

Reduction in leakage is one of our key priorities. Our current mains replacement programme and other leakage reduction measures will reduce leakage to 685 Ml/d by 2010 and replace over 10 per cent of water mains in London.

In response to the query on the number of recurrences which arise from short-term repairs, generally we do not find that the repair itself fails, but it is often the case that
a new leak occurs very close to the old leaks, due to the rest of the pipe being in poor condition. Comparison of data on burst rates across other companies in England and Wales indicates that the benefits of ‘find and fix’ activity are limited and that, in order to reduce leakage, the breakout of rates needs to be addressed in the short-term through pressure management and in the longer term through mains replacement. Given that we have already undertaken substantial pressure management activity to date, the preferred approach is for mains replacement. This involves replacing our oldest and worst performing mains with new plastic pipes.

Data on leakage rates from new pipes is referred to in Section 7.3.2.4 in the draft Plan. After mains replacement work, leakage levels are stated as 46 litres per property per day on our pipework and 69 litres per property per day on privately owned pipework. These are presented in l/prop/d, which is the industry standardised approach to reporting leakage rates.

2.2.2.iii Changes to the Plan made as a result of consultee representations

Data on leakage rates from new pipes has been reviewed and the following text change has been made in Section 7.3.2.4 of the revised draft Plan:

“Further research indicates leakage levels being achieved in VMR District Metered Areas (DMAs) where post construction benefits analysis has been completed of 35 l/prop/d on Thames-side and 25 l/prop/d on customer-side. In these VMR DMAs we do not replace all the pipework that is owned by our customers. Where there are new housing developments in our supply area, we assume that these new properties will result in an additional 46 l/prop/d of leakage.”

2.2.2. iv Reasons for changes/no changes

Volume 2, section 7.3.2.4 of the draft Plan provides data on leak recurrences and leakage from new pipes. Recent research has led us to update some of our assumptions and, as stated in 2.2.2.iii, changes have been made to the revised draft Plan.
2.3 Current and future demand for water

### Summary of main issues

<table>
<thead>
<tr>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approach to forecasting future demand for water</td>
</tr>
<tr>
<td>2. Property and population forecasts</td>
</tr>
<tr>
<td>3. The economic downturn</td>
</tr>
<tr>
<td>4. Current and planned regulations</td>
</tr>
<tr>
<td>5. Government’s aspirations for water use in existing properties</td>
</tr>
<tr>
<td>6. Government’s aspirations for water use in new developments</td>
</tr>
<tr>
<td>7. Bounceback of demand following drought restrictions</td>
</tr>
<tr>
<td>8. Non-household use</td>
</tr>
<tr>
<td>9. Flexibility in forecasts</td>
</tr>
<tr>
<td>10. Planning for peak events such as the Olympics</td>
</tr>
<tr>
<td>11. Tools to manage demand</td>
</tr>
</tbody>
</table>

#### 2.3.1 Approach to forecasting future demand for water

**2.3.1.i Consultee representations**

Consultees expressed differing views on Thames Water’s approach to forecasting future demand for water. Some stated that they thought Thames Water’s approach was acceptable, while others challenged the approach and also raised queries regarding the data and the accuracy of the forecasts.

Examples of specific challenges and queries are provided below, highlighting the breadth and detail of the responses:

- **a.** Thames Water have used a cautious approach, which has led to an overestimate of the predicted future water consumption.
- **b.** What is the basis for the exclusion of some information from a customer survey in Per Capita Consumption updates?
- **c.** Thames Water have over-forecast outdoor water use by 2035.
- **d.** Is there consistency in the forecasts used for water resources and wastewater planning?
- **e.** Is there consistency between water companies’ forecasts?
- **f.** What will be the effect of rising prices on water use?
- **g.** PCC is shown to rise to 300 l/head/d during critical periods in some zones. This is extremely high.

**2.3.1.ii Thames Water consideration**

With regard to the general comment on our approach to demand forecasting, we believe that the methodology adopted is fully in line with water industry best practice. However, we fully acknowledge that demand forecasting is an evolving discipline requiring regular and ongoing review of assumptions and data. In this section we describe in detail the latest work we have carried out largely, but not solely, in response to consultee representations. Notably, we now include an allowance for the impact on demand from the economic downturn.
In total, this work constitutes a comprehensive update of the demand forecasts originally included in the draft Plan. As will be seen, the revised forecasts are significantly lower and result in a significant change to the water resource zone supply-demand baseline balances and consequently the associated preferred programmes.

In order to both report on the work undertaken and at the same time provide the reader with an integrated and coherent view of the main changes to the original forecasts, we have collated all the elements of the work described in 2.3 into a new appendix to Volume 2 of the draft Plan (Appendix M) and have also appended it in this Statement (Appendix 4).

Addressing each of the above questions in turn:

a. Any forecasting is by its nature uncertain. Demand forecasting is no different and there are a number of aspects on which we are not certain and which could actually fall within a range of values. For some parameters, this range can be wide (eg. impact of demand management measures), for others we have a better idea of what may occur (eg. the number of people likely to opt for a meter each year). Where we have to make estimates, we do so weighing up the balance of available evidence and then select a reasonable value, in many cases using external experts to validate our assumption.

We consider that on balance our demand forecasts and the approach to their production are not overly cautious or risky. Uncertainty around the demand forecast is handled through a planning allowance known as ‘Headroom’ (subsection 2.5.3), which sets out the overall balance of risk we consider to be appropriate across all aspects of the supply and demand balance.

b. As explained in the draft Plan, we could not use all the output of the latest customer survey. This was primarily due to the timing of the survey unfortunately coinciding with drought water use restrictions. This led to spuriously low results for a number of components. We particularly mentioned outdoor use, where unsurprisingly respondents returned very little usage of hosepipes and sprinklers.

Following the consultation process and benchmarking against the wider industry, we identified further areas of concern where the survey results are questionable, particularly for toilets, shower use and internal tap use. These are discussed in section 2.3.5 below.

c. This query refers to the breakdown of micro-components of demand required within the Environment Agency’s water resources planning tables (Table WRP7, dWRMP Volume 4). Several consultees questioned the demand forecasts for outdoor water use.

We accept that this table was completed incorrectly and that the increase in outdoor usage portrayed in the table is an error. This will be updated within the tables produced for the revised Plan, see 2.3.7.

However, it is important to note that the dry year micro-component usage is a breakdown of the total Per Capita Consumption forecast. Therefore, in correcting the over-allocation of outdoor usage, the difference will be spread among usage in the other components and will not impact the overall investment plan.
While companies now have a good understanding of the building blocks of a micro-component forecast (ownership, frequency of use and volume per use), in a normal year, much less is known about how these components change during an extended dry year or peak week.

As such, although micro-components drive the underlying normal year demand forecast, dry year and peak week usage is forecast at the total water usage level and then subsequently broken down to micro-components for the purposes of the regulatory submission.

d. Every effort is made to ensure there is consistency between our water supply and wastewater planning. We use the same sources of population, housing and water use data to inform our respective forecasts. Our sewerage area is substantially larger than our water supply area. For areas where we do not supply water, we use information provided by the relevant water-only companies together with assumptions consistent with our water use assessments.

e. All water companies use the same Environment Agency Guidelines to produce their demand forecasts. The Guidelines do allow sufficient flexibility for companies to use different types of forecasting approaches and models to suit the unique needs of their own supply area.

Given that inter-company comparison is one of the key ways our regulators monitor our performance, they work to ensure that this comparability is maintained. Where there are differences between water companies, for example in forecasts of Per Capita Consumption, these can generally be explained by regional variations in socio-economic factors and demographics.

f. The relationship between prices and water use is a matter of conjecture. Water bills in the UK are relatively low when compared to those of our European neighbours such as Germany. Bills are also therefore a relatively small proportion of income, for most householders.

Intuitively, however, it would appear reasonable that if water were more expensive per unit, then it would encourage water efficiency and reduce wastage.

g. It is not unusual for a critical period (peak week) PCC to be somewhat higher than the average PCC over a normal year. However we concur that an average per capita consumption above 300 l/h/d is very unlikely.

We have examined our forecasts closely and there were only two, single year examples in Guildford and Henley WRZs where PCC jumped to this level. They coincided with the completion of the metering programmes in these zones and represent an artefact of the modelling process.

No investment is driven by this minor error and for the final plan we will adjust this to bring it back in line with the general trend.

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11 Leakage methodology review: variation in per capita consumption, Ofwat. 2007
2.3.1.iii Changes to the Plan made as a result of consultee representations

We have undertaken a comprehensive review of our demand forecasts, focussing on the following important areas:

- Updating of our demographic forecast, taking into account the latest Regional Spatial Strategies.
- Assessing the impact of the economic downturn.
- Reviewing our assumptions on micro-components of water use, including Defra’s goal to reduce water use in existing households to 130 l/h/d by 2030.
- Re-examining our water use assumptions in regard to new properties, including Defra’s aspiration to reduce consumption to 125 l/h/d.
- Considering the issue of ‘bounceback’ in demand from drought restrictions, ie whether demand will return to pre-drought levels following the 2006-07 water use restrictions and media campaigns.

These factors are discussed in further detail in sections 2.3.2 to 2.3.9 below. As noted at the beginning of this representation, we have collated all the main elements of the work described in section 2.3 into a new appendix to Volume 2 of our revised draft Plan (Appendix M) and have also appended it in this Statement for reference (Appendix 4).

2.3.1.iv Reasons for changes/no changes to the Plan

The full review of our demand forecasts has resulted in significant changes to our original Plan, which will be incorporated into the revised draft.

2.3.2 Property and population forecasts

2.3.2.i Consultee representations

Thames Water should take account of the latest housing forecasts contained in the South East, London and East of England regional spatial strategies.

2.3.2.ii Thames Water consideration

We anticipated within the draft Plan that we would need to update our demographic forecasts. These revised forecasts take into account updates to draft Regional Spatial Strategies (RSS), including the Secretary of State’s proposed changes to the RSS for the South East. They also use the latest (2006-based) Office of National Statistics sub-national population projections.

We have also subsequently included an allowance for the impact of the economic downturn (see section 2.3.3).

We instructed consultants, Experian, to update the household and demographic data as part of a group project for the water companies in South East England. The population and household projections comply with the Environment Agency Guidelines for forecasting the customer base. As per the draft Plan, three projections have been produced:

- policy-based
- trend-based
• Experian ‘most likely’.

The policy-based projections are based on the housing allocations contained within the latest available Regional Spatial Strategies combined with Communities and Local Government (CLG) household representative rates.

The trend-based households use the latest official Office of National Statistics population projections and CLG household representative rate projections.

Given that Regional Spatial Strategies are being revised to move population towards the trend at the national level, the ‘most likely’ scenario is designed to reconcile the difference between policy and trend. The projections necessarily cover a long time series and should be viewed as long-term projections.

Our demand forecasts are based on Experian’s policy forecasts for housing, and the ‘most likely’ scenario based on policy and trend based assessment of growth for population, in the same way as undertaken for the draft Plan.

We continue to add an estimate for clandestines (those not picked up in official figures) and short-term migrants to Experian’s figures as set out in the draft Plan.

Updating the demographic forecasts, before the application of an allowance for the economic downturn, resulted in increases in the growth rates for both properties and population forecasts.

Table 8 below shows the overall impact on demand from the demographic update. It can be seen that demand in London is forecast to increase by 11 Ml/d by 2015 and 51 Ml/d by 2035.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
<th>2007/08</th>
<th>2014/15</th>
<th>2034/35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic update</td>
<td></td>
<td>0</td>
<td>11</td>
<td>51</td>
</tr>
</tbody>
</table>

The charts presented below show the population Figure 3 and household Figure 4 projections for our water supply area in terms of revised and original ‘Most likely’ (population) and ‘Policy’ (households). Note that these graphs include an allowance for the economic downturn sub-section 2.3.3.
Figure 3: Population projections for the Thames Water supply area

Figure 4: Household projections for the Thames Water supply area

Table 9: Thames Water household and population comparison (incl. economic downturn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>London draft Plan</td>
<td>39,872</td>
<td>30,432</td>
<td>20,937</td>
<td>19,535</td>
</tr>
<tr>
<td>London revised</td>
<td>36,027</td>
<td>50,075</td>
<td>16,438</td>
<td>27,362</td>
</tr>
<tr>
<td>SWOX* draft Plan</td>
<td>4,871</td>
<td>4,402</td>
<td>3,855</td>
<td>3,340</td>
</tr>
<tr>
<td>SWOX revised</td>
<td>5,992</td>
<td>8,459</td>
<td>3,207</td>
<td>4,679</td>
</tr>
<tr>
<td>SWA** draft Plan</td>
<td>906</td>
<td>1,229</td>
<td>1,200</td>
<td>1,189</td>
</tr>
<tr>
<td>SWA revised</td>
<td>2,177</td>
<td>3,121</td>
<td>1,190</td>
<td>1,774</td>
</tr>
<tr>
<td>Kennet Valley draft Plan</td>
<td>1,373</td>
<td>1,212</td>
<td>1,274</td>
<td>1,061</td>
</tr>
<tr>
<td>Kennet Valley revised</td>
<td>1,876</td>
<td>2,486</td>
<td>1,600</td>
<td>1,401</td>
</tr>
<tr>
<td>Guildford draft Plan</td>
<td>468</td>
<td>574</td>
<td>408</td>
<td>423</td>
</tr>
<tr>
<td>Guildford revised</td>
<td>508</td>
<td>972</td>
<td>255</td>
<td>465</td>
</tr>
<tr>
<td>Henley draft Plan</td>
<td>67</td>
<td>94</td>
<td>64</td>
<td>71</td>
</tr>
<tr>
<td>Henley revised</td>
<td>169</td>
<td>271</td>
<td>52</td>
<td>135</td>
</tr>
</tbody>
</table>

*Swindon & Oxfordshire
**Slough, Wycombe & Aylesbury
Table 9 gives comparisons of the original and revised figures for property and population growth for all water resource zones and for 2010 to 2015 (AMP5 period) followed by 2015 to 2035 (AMP6 to AMP9 period). Table 10 provides the property and population growth rates for each water resource zone for each AMP period.

Table 10: Property and population growth rate comparison (incl. economic downturn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>London draft Plan</td>
<td>2.480</td>
<td>2.454</td>
<td>2.426</td>
<td>2.389</td>
<td>2.357</td>
<td>2.341</td>
</tr>
<tr>
<td>London revised</td>
<td>2.488</td>
<td>2.478</td>
<td>2.459</td>
<td>2.426</td>
<td>2.386</td>
<td>2.368</td>
</tr>
<tr>
<td>SWOX draft Plan</td>
<td>2.406</td>
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<td>2.292</td>
<td>2.247</td>
<td>2.217</td>
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<tr>
<td>SWOX revised</td>
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<td>2.354</td>
<td>2.322</td>
<td>2.301</td>
</tr>
<tr>
<td>SWA draft Plan</td>
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<td>2.396</td>
<td>2.343</td>
<td>2.294</td>
<td>2.264</td>
<td>2.241</td>
</tr>
<tr>
<td>SWA revised</td>
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<td>2.457</td>
<td>2.427</td>
<td>2.391</td>
<td>2.368</td>
</tr>
<tr>
<td>Kennet Valley draft Plan</td>
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<td>2.323</td>
<td>2.275</td>
<td>2.245</td>
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</tr>
<tr>
<td>Kennet Valley revised</td>
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<td>2.448</td>
<td>2.423</td>
<td>2.395</td>
<td>2.364</td>
<td>2.341</td>
</tr>
<tr>
<td>Guildford draft WRMP</td>
<td>2.415</td>
<td>2.360</td>
<td>2.317</td>
<td>2.282</td>
<td>2.262</td>
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</tr>
<tr>
<td>Guildford revised</td>
<td>2.417</td>
<td>2.408</td>
<td>2.408</td>
<td>2.401</td>
<td>2.382</td>
<td>2.361</td>
</tr>
<tr>
<td>Henley draft Plan</td>
<td>2.396</td>
<td>2.369</td>
<td>2.346</td>
<td>2.321</td>
<td>2.305</td>
<td>2.298</td>
</tr>
<tr>
<td>Henley revised</td>
<td>2.374</td>
<td>2.389</td>
<td>2.385</td>
<td>2.375</td>
<td>2.357</td>
<td>2.342</td>
</tr>
</tbody>
</table>

2.3.2.iii Changes to the Plan made as a result of consultee representations

As stated at the beginning of 2.3.1.ii, the above work and changes to the draft Plan have been incorporated into a new appendix to Volume 2 of the revised draft Plan (Appendix M) and also appended in this Statement, see Appendix 4

2.3.2.iv Reasons for changes/no changes to the Plan

The changes are required to ensure the latest demographic information is used to update the demand forecasts.

2.3.3 The economic downturn

2.3.3.i Consultee representations

Thames Water should also consider short to medium term factors such as the effect that the downturn in the economy may have on future housing development.

Forecast population growth will be lower than expected during current economic conditions. For its final plan, Thames Water should take account of the latest housing forecasts contained in the South East, London and East of England regional spatial strategies. As far as possible, we expect all companies to take into account the likely effect of the credit crunch on housing development in the short to medium term.

The recent change to the UK economic outlook will undoubtedly affect your assumptions for housing, growth and industrial usage.
2.3.3.ii Thames Water consideration

All the above representations relate to the latest national and global economic situation and its potential impact on domestic and industrial demand.

Household water use

In the light of the recent dramatic national and global economic downturn, Cambridge Econometrics were commissioned to undertake a study\(^\text{12}\) on three specific aspects: the prospects of economic growth; implications for population growth; and the interaction between the above and the impact on housing starts/completions.

Using their econometric models, they compared their most recent housing and population forecasts with forecasts run without the impact of the credit crunch to determine the level of adjustment required. This identified a series of annual reduction factors (Figure 3A) that could be applied to the Experian population and household forecasts to provide an adjustment to take into account the impact of the economic downturn on household projections.

We have mirrored these trends within the clandestine and short-term migrants estimates.

The results of the Cambridge Economics study showed a significant decline in both population and housing for the UK as a whole as well as the Thames Water region.

Importantly, however, the Cambridge Economics report does not show growth levels recovering back to previous policy levels. As such, the Government’s long-term targets for housing growth are not achieved in their assumptions.

We believe that policy measures will be taken to ensure eventual delivery of the Government growth targets in the longer term. This stance is supported by the forecasting requirements as set out in the Environment Agency water resources planning guidance.

We have therefore taken the view that growth levels will be reduced during the remainder of AMP4 (2005-2010), and AMP5 (2010-2015), with the overall number of properties and population being reduced below the Experian forecasts to 2016 as determined by the Cambridge Economics factors. In order that the growth levels in the policy plan are reflected in the forecasts, growth rates in our Plan have been set to increase between 2016 and 2021, so that total planned house completions and populations meet Experian’s planned levels. Beyond 2021, we have used the unadjusted Experian growth projections, which take account of RSS targets for the periods covered by each RSS and use trend projections beyond that.

These adjustments have resulted in the changes in our Plan since the draft (including the revision in the Experian forecasts to include the new trend-based data and Secretary of State requirements) shown in Figure 5, below.

---

Non-household water use

The Company’s assessment of non-household water use is usually based on an econometric model (developed and run by Experian). The model forecasts demand by Standard Industrial Classification (SIC) code, which are then amalgamated this into trends for service industry and non-service industry sectors.

To allow for the economic downturn, we re-ran our econometric model in October 2008. However, due to the recent acceleration in economic downturn, which has become increasingly evident since the completion of the Experian study, we have added an additional allowance.

Experian model forecasts

A comparison of the draft Plan (2007) and revised (2008) commercial water demand forecasts (ML/d) is provided in Figure 6 below. Breaking this out by sector, the non-service forecast is almost identical in both versions, the downward adjustments in the water demand forecast therefore reflecting the downturn’s direct impact on employment within the service industries.
Accelerated downturn

The economic impact experienced at the end of last year has deteriorated rapidly over the few months. In October we identified a number of key customers who were reducing capacity or closing. This has accelerated and more recent information shows that all our top 6 customers are either planning to close in 2009 or 2010 or reducing capacity significantly or considering closure for 2010.

Several of these have been well publicised. These include the temporary closures of the Honda car plant in Swindon, the BMW Mini Cowley works in Oxford and the brewery closures in Reading and Richmond.

The full year impact of these reductions and closure will not only be seen in 2009 but also in subsequent years. The spheres of influence of these companies are such that the impact of closure will have local impacts on smaller feeder or supply chain companies. It would be reasonable to assess that this will have an equal impact on commercial demand for water.

As an example when MG Rover closed in April 2005 there were circa 6,000 jobs immediately impacted, but a further 7,500 in the local economy of those companies supplying MG Rover.

Key customers identified who plan to close are on such a scale that they would not be easily or quickly replaced by other companies who would wish to locate in the Thames Valley, South East area of the UK.

The CBI February economic forecast confirms the changes we are now seeing:

“The global economic outlook has deteriorated rapidly in the months since our November forecast, as the real economy impact of the banking crisis intensification post-Lehmans revealed itself to be far reaching and intense. A significant slowdown was already evident in the advanced economies, but this is being accelerated by dramatic falls in international consumer and business confidence, and the lack of
available credit. Emerging market economies, which had previously shown a surprising degree of resilience, are now also suffering the effects of global financial crisis and the sharp downturn in demand. Industrial production has plummeted across many countries and world trade is falling rapidly too. Economic prospects also look considerably weaker here in the UK, where access to credit has deteriorated further. A deep and prolonged recession is now expected.”

These specific economic changes would not have been factored in the overall 25-year econometric trends on which the initial forecast was based. Consequently, we have made a further 5% reduction to non-household demand in all water resource zones, maintained over the planning horizon. See Figure 7, below.

![Figure 7: Revised assessment of economic downturn – non-households](image)

**The overall impact of economic downturn**

The combined impact of the economic downturn on the baseline demand forecast in London is -59 Ml/d by 2015 and -25 Ml/d by 2035, as shown in Table 11.

**Table 11: Build-up of changes in the London demand forecast (2)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
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<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
</tbody>
</table>
2.3.3.iii Changes to the Plan made as a result of consultee representations

As stated above at the beginning of 2.3.1.ii, the above work and changes to the original draft Plan have been incorporated into a new appendix to Volume 2 of the revised draft Plan (Appendix M) and also appended in this Statement, see Appendix 4.

1.1.3.iv Reasons for changes/no changes to the Plan

The impact of the economic downturn is significant and needs to be incorporated into the revised draft Plan together with the other factors noted above.

2.3.4 Current and planned regulations

2.3.4.i Consultee representations

With the increasing focus on developing the policy framework to drive down water use, consultees raised the importance of including all current and planned water efficiency regulations and opportunities arising from new technology.

2.3.4.ii Thames Water consideration

Our forecasts have already taken account of all current and planned legislation where we consider that it is robust and will achieve its stated objectives.

This topic is discussed further in the sections below with particular regard to the Government’s aspirations for water usage levels in existing and new homes as set down in ‘Future Water: The Government’s Water Strategy for England’13.

2.3.4.iii Changes to the Plan made as a result of consultee representations

Changes have been made to the demand forecast in response to this and other responses; see sections 2.3.5 and 2.3.6 below.

2.3.4.iv Reason for changes/no changes to the Plan

Current and future regulations will impact the demand forecasts and revisions have been made accordingly.

2.3.5 Government’s aspirations for water use in existing properties

2.3.5.i Consultee representations

a. Consultees questioned why Thames Water has a per capita consumption for London of 161 l/h/d, which is 12 l/h/d higher than the national average. A number of consultees suggested that this is untenable in an area designated to be an area of high water stress.

b. Many consultees also highlighted the Government’s aspirational target to achieve 130 l/h/d in existing households by 2030 and asked Thames Water to consider how Per Capita Consumption could be managed to achieve this.

2.3.5.ii Thames Water consideration

a. There is a high degree of variability in Per Capita Consumption across the country. This is evidenced within Ofwat's annual Security of Supply, Leakage and the Efficient Use of Water Reports, in which they publish reported water balance data from all water companies in England and Wales.

As stated in the draft Plan, the reason for the variability has been studied by Ofwat as a part of a suite of projects under the multi-agency Water Savings Group (WSG). This study concluded that Per Capita Consumption varied due to a number of factors, particularly climatic and socio-economic.

b. We have carried out a comprehensive review of our micro-component assumptions, which form the basis of projections of household demand. We have considered the representations, benchmarked our assumptions within the wider industry and validated our position with external experts.

The review has focused on two main areas and been carried out with the support of Artesia Consulting:

- An in-depth assessment of Defra’s 130 l/h/d aspirational target
- A technical review of micro-component assumptions.

As we set out in the draft Plan, we fully support Defra’s aspirational target to reduce household demand. This remains the case and the changes we explain below have brought us closer to the aspiration. However, we maintain our view that achieving the aspirational target cannot be achieved by water companies alone and will require concerted and targeted action by a wide range of stakeholders. We are committed to playing a full and active part in that process.

Artesia Consulting\(^{14}\) examined the basis of the Government’s 130 l/h/d aspiration and qualitatively assessed the risks and uncertainties associated with each of the Government’s identified areas for driving change as set out in Future Water. These include: changing household behaviour, metering and tariffs, new buildings, existing homes, and products and appliances.

In summary, the findings of the Artesia study were:

- There is no real scientific basis for selecting a value of 130 l/h/d. It has not been based on a bottom-up calculation of potential interventions. Rather it is a pragmatic figure based on benchmarking Per Capita Consumption across Europe.
- Defra makes it clear in Future Water that all stakeholders and individuals have shared responsibility to save water.
- A number of initiatives have been implemented to tackle some of Defra’s areas for change. However, it is clear that many of the initiatives required, and the evidence of their impacts, have yet to be realised.

\(^{14}\) Artesia Consulting: Defra’s vision for new and existing household per capita consumption: Study for Thames Water, December 2008
• The only stakeholders with enforceable actual numerical targets are the water companies, through Ofwat’s new water efficiency targets\(^{15}\).

• There is a need to measure progress and to decide how all stakeholders can be accountable for achieving the vision and delivering on their actions.

• Due to the large number of stakeholders that need to align themselves to achieving the reduction in Per Capita Consumption, the whole process needs to be owned and driven forward. The Water Savings Group was carrying out this function, but the group ceased to exist at the end of 2008. It is vital that this focus and leadership is strengthened and maintained, otherwise there is a significant risk that the various initiatives could falter and timescales slip further.

Artesia concluded that:

‘At this moment in time, Thames Water are justified in their statement that achieving the vision is particularly high risk for companies with a supply demand deficit. The vision should be aimed for, but there is considerable uncertainty in the outcomes and timescales of achieving this and therefore, planning on the basis of 130l/h/d is potentially high risk.’

On this basis, Thames Water consideration of the 130 l/h/d aspiration for existing properties remains unchanged. We will not specifically incorporate the achievement of this aspiration within our Plan, because at the current time this represents too high a risk. However, we support the need to reduce water use in existing households and we will play our part in making this happen through our programmes of demand management.

To keep from losing momentum, we believe that a Government-led ‘Knowledge Integration Community’ should be set up to build upon the work of the Water Savings Group.

This is ‘a group of end-to-end stakeholders (academics, industry, government and others) who craft, own and run an integrated programme of education, multidisciplinary research and outreach on a topic that goes to the heart of future UK prosperity’\(^{16}\).

The concept could provide a vehicle to drive knowledge exchange and research in a co-ordinated way, and to ensure widespread engagement to deliver common outcomes. Figure 8 illustrates how the range of stakeholders might integrate around a common vision to share knowledge and drive the process forward.

\(^{15}\) For more details of how our proposed water efficiency programme has been shaped by these targets please refer to Section 2.4.4.

\(^{16}\) The Opportunities Available Through Knowledge Sharing in the Water Sector, presented by Michael Kelly, Chief Scientific Advisor, CLG on 5 September 2007
Each of the stakeholders would need to be engaged and have action plans, goals and deliverables. This has already started in the Water Savings Group with the statement of overarching goals and the delivery of some of the early goals such as the water efficiency targets. The aim would be to exchange and impart knowledge on to each of the stakeholders.

The review of the micro-components followed the process as set out in Figure 9 below.

For the most part, the review supported the assumptions we used in the draft Plan. However, industry benchmarking identified three main areas for re-assessment:

- Showers – assumed volume per use
- Toilets – assumed frequency and volume per use
- Internal tap – categorisation and overall contribution to household use.
Key to the review of the micro-components has been the incorporation of data sources such as the metered datasets generated by the WRc plc Identiflow software\(^{17}\) and the forecasts of Defra’s Market Transformation Programme (MTP)\(^{18}\). These have replaced assumptions taken from our latest customer survey, which were compromised by the impact of drought water use restrictions (as discussed in 2.3.1).

Additionally, the Identiflow methodology carries a greater data confidence than the customer survey, as by measuring the flow to a property it removes inaccuracies in how customers reported their water consumption. Furthermore, the data taken from the customer survey needs several key assumptions to be applied to it such as toilet cistern size and shower flow rates. There is inevitably a degree of uncertainty surrounding these assumptions. The Identiflow studies however incorporate actual consumption figures for unmetered properties, providing a much higher quality of data.

The main Identiflow studies are:

- Thames Water/WRc plc, 2002: *Critical evaluation of customer water use components* (78 monitored households)

Our findings on the above three categories are as follows.

**Showers**

The volume of water used per shower for both normal and power showers were reviewed against industry assumptions, Identiflow flow monitoring studies and published data from other stakeholders. This indicated that the assumptions in the draft Plan were high.

Volume per use is derived from assumptions of normal and power shower flow rates and shower duration. Of the two, our flow rates appeared to be in line with published data, however while there is a relatively wide range of literature supporting various shower durations, we found that our draft Plan assumption was towards the high end of this range.

We have therefore reduced the assumed shower duration in the revised draft Plan, dropping from 8 minutes in 2007/08 to 5.2 minutes and then subsequently increasing over the planning horizon to 5.85 by 2035, based on the MTP\(^{19}\). This is summarised in Table 12 below, which is a review of Table 2 from Volume 3 Appendix B4.4.2 of the draft Plan.

\(^{17}\) http://www.wrcplc.co.uk/pdf/Identiflowflyer08.pdf

\(^{18}\) http://www.mtprog.com/

\(^{19}\) Actions to improve shower design and efficiency - Briefing note relating to policy scenario objectives in policy brief, MTP report BN DW Shower:
Table 12: 2007-08 volume per use in normal and power showers

<table>
<thead>
<tr>
<th>Shower Type</th>
<th>Plan</th>
<th>Unmetered customers</th>
<th>Metered customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal showers</td>
<td>draft Plan</td>
<td>64.68 litres</td>
<td>65.28 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td>36.4 litres</td>
<td></td>
</tr>
<tr>
<td>Power showers</td>
<td>draft Plan</td>
<td>120.12 litres</td>
<td>116.12 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td>67.6 litres</td>
<td></td>
</tr>
</tbody>
</table>

This change in shower consumption, bringing us more in line with the industry results, is a reduction in the proportion of base year Per Capita Consumption assigned to this component, from 30 per cent in the draft Plan to 17 per cent in the revised draft Plan.

Assumptions within the draft Plan on ownership, frequency of use and predicted growth and replacement rates were validated and accepted. Table 12 summarises our assumption changes.

Toilets

The review indicated that our assumptions on toilet use, particularly the frequency of use and average flush volumes, were relatively low. Assumptions within the draft Plan on ownership, predicted growth and replacement rates were validated and accepted for use in the revised draft Plan.

In the draft Plan we used a frequency of use of 4.1 flushes per day derived from the customer survey. This frequency of use is notably less than that recorded in two Identiflow datasets, 4.65 (Thames Water/WRc plc, 2002) and 5.05 (WRc plc, CP337).

We consider that this is another area where the customer survey could have been biased by the weather conditions at that time. Water use restrictions were in place and there were campaigns specifically aimed at reducing the number of flushes.

For the revised draft Plan we have changed our frequency of use to 4.65, at it was sourced from an Identiflow dataset specific to us.

Average flush volume has been calculated through proportionally allocating ownership of toilets across six different cistern generations. In the draft Plan, average flush volumes of 7.73 and 7.87 litres were used for unmetered and metered properties respectively.

Average flush volume is difficult to establish, as cistern size is not something customers are generally aware of. In our surveys, we use a proxy of toilet age, as there is often recollection of when a toilet was replaced and a size can then be reasonably inferred. For the revised draft Plan we used revised average flush volumes of 8.19 litres for unmetered and 8.05 litres for metered properties.
Table 13: Frequency and Volume per use assumptions for toilets

<table>
<thead>
<tr>
<th>Toilet use assumptions</th>
<th>Plan</th>
<th>Unmetered customers</th>
<th>Metered customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of use</td>
<td>Draft Plan</td>
<td>4.1 flushes per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td>4.65 flushes per day</td>
<td></td>
</tr>
<tr>
<td>Average flush volume</td>
<td>Draft Plan</td>
<td>7.73 litres</td>
<td>7.87 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td>8.19 litres</td>
<td>8.05 litres</td>
</tr>
</tbody>
</table>

The changes shown in Table 13 result in the proportion of base year Per Capita Consumption considered to be related to toilet use increasing from 20 per cent in the draft Plan to 24 per cent in the revised draft Plan.

The above changes result in the proportion of base year Per Capita Consumption considered to be related to toilet use increasing from 20 per cent in the draft Plan to 24 per cent in the revised draft Plan.

**Internal tap**

We have merged the ‘Sundry use’ and ‘Hand-dishes’ categories from the draft Plan into an ‘Internal tap’ use category. This is a more familiar component of water use, more in keeping with industry understanding, and is commonly derived by the WRc plc Identiflow sampling methodology.

In the draft Plan the inferred ‘tap use’ was noted as being low in comparison to previous studies. (CP187 and CP337) The available literature for internal tap use is fairly consistent, and the revised consumption figures for internal tap are consistent with the Thames Water WRc plc Identiflow study.

The proportion of Per Capita Consumption due to internal tap use was 13 per cent in the draft Plan. This has been increased in the revised draft Plan to 24 per cent.

No increase in internal tap use is forecast over the planning period, as most tap use is for basic hygiene purposes (e.g.. washing hands after toilet use and brushing teeth) and is therefore not discretionary use.

**Overall impact**

The draft Plan and revised micro-component breakdown is shown in Figure 10 and Figure 11.
The overall impact of the micro-component review is to reduce the average annual rate of change over the planning horizon from an increase of around 0.6 l/h/d per annum in the draft Plan to around 0.15 l/h/d per annum in the revised assessment. The detail is shown in Table 14.

Table 14: Rate of change in Per Capita Consumption

<table>
<thead>
<tr>
<th>Per Capita Consumption (l/h/d per annum)</th>
<th>draft WRMP</th>
<th>Revised draft WRMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmeasured household</td>
<td>0.59</td>
<td>0.11</td>
</tr>
<tr>
<td>Measured household</td>
<td>0.51</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Our assumptions on shower usage counterbalanced and surpassed the impact of all the demand reducing components ie. reducing cistern size in toilets and white goods becoming more efficient. This resulted in an increasing and positive rate of change over the planning horizon.

The above changes have served to reduce the influence of the shower assumptions in the revised draft Plan. This means the Per Capita Consumption rates of change are initially negative (ie underlying use is reducing) and it is not until later in the planning horizon that it begins to grow, when the increase in showering suppresses the reductions in demand from other components.

Table 15 below shows the impact of the micro-component review for London together with the other factors of demographic update and economic downturn. It can be seen that the review has resulted in a significant reduction in demand both by the end of AMP5 (2010-2015) and the 25-year planning period.

Table 15: Build-up of changes in the London demand forecast (3)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (ML/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Micro-component review</td>
<td>0</td>
</tr>
</tbody>
</table>

2.3.5.iii Changes to the Plan made as a result of consultee representations

As stated above at the beginning of 2.3.1.ii, the above work and changes to the draft Plan have been incorporated into a new appendix to Volume 2 (Appendix M) of the revised draft Plan and also appended in this Statement, see Appendix 4.

2.3.5.iv Reasons for changes/no changes to the Plan

A substantial piece of work has been undertaken in response to the representation resulting in significant changes to the original demand forecasts. The updated demand forecasts have been included in the revised draft Plan.

2.3.6 Government’s aspiration for water use in new developments

2.3.6.i Consultee representations

Some consultees welcomed the planning assumption used for new housing of 125 l/h/d but challenged Thames Water to be more ambitious in its long-term thinking on water use in new homes and to support activities to achieve a reduced water demand.

Furthermore, one consultee stated that much of the new planned development within the Swindon & Oxfordshire Water Resource Zone over the Plan period would need to achieve, as a minimum, Level 3 of the Code for Sustainable Homes, which stipulates a mandatory maximum Per Capita Consumption of 105 l/h/d, compared to the 125 l/h/d adopted in the draft Plan. They therefore considered that the forecast of demand over the Plan period was too pessimistic.
2.3.6.ii  Thames Water consideration

Since the draft Plan we have re-examined the Per Capita Consumption assumptions with regard to new properties. We have improved the way we model new property Per Capita Consumption so that it better reflects the latest Government aspirations for reduced water use.

There are two main elements to the modelling of new property Per Capita Consumption:

1. Assumed water usage on construction
2. How usage will change in the years after construction.

Assumed usage on construction

In the draft Plan we assumed that, in the base year, water use on construction would match the Government aspiration of 125 l/h/d. We stated that this assumption was potentially high risk, but that as the methods by which the aspiration could be achieved were clear, we felt it could be accommodated.

Additionally, we applied an annual rate of change to this value, eg if the rate of change was an increase of 0.5 l/h/d per annum, then new properties built in year 2 would have an assumed Per Capita Consumption of 125.5 l/h/d, year 3 would be 126, and so on.

After due consideration, we consider that if the Government successfully enacts its proposed legislative changes, for example the delivery of Part G of the Building Regulations, then houses built in future years could eventually achieve 125 l/h/d. However, this change will need a period of bedding in. Also, if changes are appropriately supported and policed, we need not apply the incremental rate of change, as properties would be built to the same standard in all years.

We have assumed that although new legislation will be introduced in 2010 defining the water use requirements of new properties, it will take up to five years before this becomes fully effective. Therefore the target of 125 l/h/d is not achieved until 2015. This is a trend that is consistent with the achievement of the Government’s historical water efficiency targets.

In the revised draft Plan we have assumed the following new property Per Capita Consumptions as set out in Table 16 below.
Table 16: Revised property Per Capita Consumptions

<table>
<thead>
<tr>
<th>Period</th>
<th>Per Capita Consumption on construction (l/h/d)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to March 2010</td>
<td>143</td>
<td>Current usage in new properties. This allows for any delays in the delivery of Part G.</td>
</tr>
<tr>
<td>From Apr 2010 to Mar 2015</td>
<td>143 to 125</td>
<td>A linear decrease in Per Capita Consumption to allow time for part G to be implemented and enforced.</td>
</tr>
<tr>
<td>From Apr 2015 to 2035</td>
<td>125</td>
<td>New properties built to achieve 125 l/h/d aspiration over the remainder of the planning horizon.</td>
</tr>
</tbody>
</table>

*Change in usage after construction*

Once built, the annual change in usage for new properties is assumed to follow that applied to the remainder of the metered housing stock, as discussed in the previous section.

These changes reduce the demand forecast. This impact increases over time as the cumulative number of new properties increases.

Table 17 adds the new property correction to the cumulative table of changes to demand for London. It can be seen that there is little impact in AMP5 (2010-2015) but a significant reduction in demand of 82 Ml/d by the end of the planning period.

Table 17: Build-up of changes in the London demand forecast (4)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Micro-component review</td>
<td>0</td>
</tr>
<tr>
<td>New property Per Capita Consumption</td>
<td>0</td>
</tr>
</tbody>
</table>

2.3.6.iii Changes to the Plan made as a result of consultee representations

As stated above at the beginning of 2.3.1.ii, the above work and changes to the draft Plan have been incorporated into a new appendix to Volume 2 of the revised draft Plan (Appendix M) and also appended in this Statement, see Appendix 4.

2.3.6.iv Reasons for changes/no changes to the Plan

An important change has been made to the assessment of the impact on demand from new properties, which has been incorporated in the demand forecasts in the revised draft Plan.
2.3.7 ‘Bounceback’ in demand following drought restrictions

There is an additional factor that is not directly attributable to a specific consultee representation, but which nevertheless represents an impact primarily on our demand projections in London. The water resource zones in the Thames Valley see minimal impact.

Since the drought of 2006 and subsequent ‘dull, wet weather’ years (2007/08 and 2008/09), underlying Per Capita Consumption in unmetered properties has been significantly lower than predicted in the draft Plan.

The explanation for the continuing low demand in 2007/08 and 2008/09 is probably the prolonged dull and exceptionally wet weather, as reported in June Return 2008. For the London Water Resource Zone, the dip in customer demand has amounted to some 40 Ml/d, a significant decline. Such dips in demand following drought or prolonged dull and wet weather have occurred in the past and have been followed by a subsequent ‘bounceback’ to the underlying longer-term trend.

Despite monthly modelling using our weather-related demand models, it has not been possible to conclude whether the continued low demands since the drought restrictions are purely due to the extended period of dull weather or whether this actually represents a longer-term step change in water usage behaviour.

It is likely that until we encounter a dry summer or a short period of hot weather we will not be able to see the likely longer-term trend.

For the revised draft Plan we have assumed that the recent trend in lower customer demand will continue, i.e. we have not assumed that demand will return to the draft Plan trend. This results in a step change in the demand forecast in London of approximately 40 Ml/d when compared to the draft Plan.

However, this so called ‘bounceback’ phenomenon is an important planning uncertainty and so we have included an allowance in ‘target headroom’ to cover the strong possibility of a partial degree of ‘bounceback’ over the planning period.

Other factors

In addition to the ‘bounceback’ factor, there are two other changes to the baseline demand forecast that have been included in our revised draft Plan but are not in response to a consultee representation. These relate to:

- changes in baseline demand management assumptions
- changes due to rolling the base year forward one year, from 2006/07 to 2007/08.

With regard to baseline demand management, we have brought our baseline water efficiency figures into line with the Ofwat targets and revised the meter optant forecast.

In the draft Plan we explained that there had been a significant increase in optants’ take-up of meters in the past couple of years and we surpassed the five-year forecast from the previous Business Plan within three years. We suggest that this was down to a combination of drought restrictions and bill increases, meaning customers were taking a closer interest in opportunities to save money.
We have still not seen a slowdown in requests for meters, perhaps due to the current economic situation, and therefore, in the revised draft Plan, we have increased the forecast of optant take-up from approximately 14,000 per annum to 24,000 per annum.

Optant forecasts are discussed further in Section 3 with regard to how we have considered the take-up rate will be affected by the selective metering plans.

With regard to base year changes, the impacts are generally minor and would be expected given that we have actual figures to replace previous forecasts. However, one point of note is the leakage level in London. However, in 2007/08 we outperformed our leakage target in London. Therefore the Distribution Input in the revised draft Plan is markedly lower.

Table 18 shows the build up of changes to the demand forecast for London Water Resource Zone.

Table 18: Build-up of changes in the London demand forecast (5)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td></td>
</tr>
<tr>
<td>Economic downturn</td>
<td></td>
</tr>
<tr>
<td>Micro-component review</td>
<td></td>
</tr>
<tr>
<td>New property Per Capita Consumption</td>
<td></td>
</tr>
<tr>
<td>Other (including ‘bounceback’, demand management programmes and base year movement)</td>
<td>-82</td>
</tr>
<tr>
<td><strong>Net Movement</strong></td>
<td><strong>-82</strong></td>
</tr>
</tbody>
</table>

2.3.8 Non-household water use

2.3.8.i Consultee representations

a. Consultees raised a number of comments relating to current and forecast non-household water use. Some highlighted plans for new industrial and commercial developments, which will drive a potential increase in demand for water, while other consultees cited possible closures of industrial sites, which could result in reductions in water use.

b. In addition, consultees questioned why Thames Water had not considered the use of other sources of water such as untreated groundwater or reuse in industrial operations.

2.3.8.ii Thames Water consideration

a. Our forecasting of industrial and commercial water consumption is carried out at a water resource zone level. In general, the introduction or closure of individual industrial or commercial properties would not have a significant impact on demand at the water resource zone level.

However, the impact of the economic downturn puts this issue in a new light. How we have reassessed our non-household forecasts in the revised plan was set out in section 2.3.3.
b. With regard to other sources of water for industrial operations, we have looked at the possibility of acquiring unused groundwater licences to add to the water resource options. They are shown in the licence transfer/commercial opportunities category within the generic and unconstrained options lists. We continue to seek further opportunities in this area.

With regard to the use of untreated groundwater, commercial customers can request a non-potable supply. We do not currently provides any non-potable water, as customers who require it often have their own licensed supplies, which are contingent on returning most of the water to the environment.

Commercial customers are increasingly looking at re-use or other water treatment in order to recycle their water. This will help to reduce commercial demand and is something we encourage.

2.3.8.iii Changes to the Plan made as a result of consultee representations

No changes.

2.3.8.iv Reasons for changes/no changes to the Plan

We have already included substantial changes to the non-household forecasts within the demand forecasts in the revised draft Plan other than the changes made to the non-household demand forecast in relation to the economic downturn, as discussed earlier in section 2.3.3.ii. No further changes are required.

2.3.9 Flexibility in forecasts

2.3.9.i Consultee representations

Several consultees raised concerns around the nature of long-term forecasting and how risk is incorporated into forecasts to take account of possible changes to base assumptions, such as revised housing profiles or increases in population. Consultees requested clarification on how Thames Water builds flexibility into the forecasts.

2.3.9.ii Thames Water consideration

The questions of risk, uncertainty and flexibility are, of course, crucially important for the delivery of a long-term plan, such as the Water Resources Management Plan. We deal with risk and uncertainty through the use of ‘target headroom’, which is explained in the Section 5, Volume 2 of the draft Plan.

Within target headroom there is an allowance for the likely range of uncertainty from changes in population and housing forecasts. However, we update the forecasts whenever new data become available, as it has recently with revisions in some of the Regional Spatial Strategies described in section 2.3.2.

The information going into the revised draft Plan is updated every year (via the Annual Water Resources Management Plan Review) and submitted to the Environment Agency and Ofwat. In this way, a degree of flexibility is built into the forecasts and into the draft Plan itself.
2.3.9.iii Changes to the Plan made as a result of consultee representations

No changes.

2.3.9.iv Reason for changes/ no changes to the Plan

No changes are required. Handling flexibility is explained within the Headroom and Sensitivity/‘what if’ sections of the draft Plan.

2.3.10 Planning for peak events such as the Olympics

2.3.10.i Consultee representations

Comments were received that sought reassurance that important peak events, such as the Olympics, were covered in the draft plan.

2.3.10.ii Thames Water consideration

Due to London’s large amount of reservoir storage there is generally more than sufficient water resources to cope with peak demands in London. Consequently, individual periods of peak demands per se, do not affect London’s supply demand balance, which is based on a dry year annual average demand. Individual peaks associated with a dry year will be implicitly incorporated into the annual average.

The ability of the London Water Resource Zone to cope with peaks is determined by water treatment, transmission and service reservoir storage capacities. Insofar as these elements do not constrain Deployable Output, they are not considered in water resources management planning. However, they are part of asset management planning which is handled within the Business Plan submission to Ofwat.

However, we agree that the Olympics represent an exceptional event; consequently, we have been in close liaison with the Olympic Delivery Authority. Based on modelling and experience from previous Olympic host cities, coupled with the fact that the Games will be held at the end of July/early August, the Olympic Deliver Authority expects utilities’ demand to be no greater than a ‘normal’ summer period.

They predict that about 25 per cent of London’s population will be away during this period, so the influx of visitors, competitors, media, officials, etc, will only bring demand back to a level normally experienced in a typical summer month outside the main holiday period (e.g. June). They also predict, that, on a daily basis, the majority of the major events will take place in the late afternoon/evening to maximise TV audiences. This will be when most commuters will have left London. This should reduce demand from the commercial sector, which will compensate for any potential increased demand in and around the Olympic venues.

For the Olympic Park itself, we have been given detailed peak demand information for each of the venues and have modelled our ability to provide adequate supplies from the mains, service reservoirs and local networks.

2.3.10.iii Changes to the Plan made as a result of consultee representations

We accept that the Olympics is an important event which should be considered in our water resources management planning. The following new sub-section has therefore been added to Volume 2 of the revised draft plan.
New sub-section inserted in section 1.8 of the draft Plan as follows:

**Olympics 2012**

The Olympics represent an exceptional event and we have been in close liaison with the Olympic Delivery Authority. Based on modelling and experience from previous Olympic host cities, coupled with the fact that the Games will be held at the end of July/early August, the Olympic Delivery Authority expect utilities' demand to be no greater than a "normal" summer period.

They predict that about 25 per cent of London's population will be away during this period, so the influx of visitors, competitors, media, officials, etc will only bring demand back to a level normally experienced in a typical summer month outside the main holiday period (eg June). They also predict, that, on a daily basis, the majority of the major events will take place in the late afternoon/evening to maximise TV audiences, and this will be when most commuters will have left London reducing demand from commercial sector, which will compensate for any potential increased demand in and around the Olympic venues.

For the Olympic Park itself, we have been given detailed peak demand information for each of the venues and we have modelled our ability to provide adequate supplies from the mains, service reservoirs and local networks.’

2.3.10.iv Reasons for changes/no changes to the Plan

The draft Plan made no mention of the Olympics 2012 event, and we agree with the representation that this should be considered.

2.3.11 Tools to manage demand

2.3.11.i Consultee representations

Several comments were received stating that Thames Water should consider all opportunities to reduce demand. These would help to reduce forecast increases in demand for water and negate the need for additional water resources. Suggested opportunities included:

a. extended leakage activity  
b. further metering  
c. use of tariffs  
d. enhanced water efficiency programme  
e. use of rainwater and greywater and treatment of water appropriate to the end use.

2.3.11.ii Thames Water consideration

As a general comment, we recognise the importance of actions to help manage demand for water. To this end demand management forms by far the major part of
our programme up to 2020/21. More specifically in regard to items a., b., c. and d. above, we would contend that these already comprise substantial elements in the draft Plan and, moreover, still form vital roles in the revised Plan, (see Section 3).

In regard to c, we have included the development of tariffs as a main strand of our draft Plan and we have proposed to undertake trials of a number of alternative tariffs which, if successful, could be rolled out in AMP6 (2015-2020). We have also included in the forecast an estimate of what these tariff changes could deliver in terms of demand savings. Such changes would be on the entire metered customer base, not only new properties.

In regard to d, we are committed to the education and promotion of the efficient use of water. In our draft Plan we have proposed an enhanced water efficiency programme. As part of the development of the enhanced programme, we consulted our stakeholder water efficiency forum, which is attended by external stakeholders with a professional interest in delivering water conservation. We also undertook research on successful initiatives both in the UK and internationally to inform our proposals.

In regard to e, our water efficiency programme includes actions to promote rainwater harvesting at individual domestic properties. We have also proposed a research project in our draft Business Plan to explore the technical and customer-related issues of the provision of a potable and non-potable water supply to households. This research project is proposed as part of the Olympic development and is dependent on the support of the Olympic Development Agency and Ofwat.

2.3.11.iii Changes to the Plan made as a result of consultee representations

We have reviewed all demand management programmes in the revised draft Plan. These are discussed in Section 3 of this Statement.

2.3.11.iv Reasons for changes/no changes to the Plan

As explained in section 2.3.11.ii, we recognise the importance of demand management activities to reduce the demand for water. The revised programme of demand management activities included in the revised draft Plan is presented in Section 3 of this Statement.
2.4 Current and future water supply

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approach to forecasting future supply of water and future reductions in abstractions</td>
</tr>
<tr>
<td>2. Resource zone integrity</td>
</tr>
<tr>
<td>3. Outage – temporary reduction in Deployable Output</td>
</tr>
<tr>
<td>4. Agreement on bulk transfers between water companies</td>
</tr>
<tr>
<td>5. Sustainability Reductions – statutory and non-statutory schemes</td>
</tr>
<tr>
<td>6. Sustainability Reductions – impact on Deployable Output</td>
</tr>
<tr>
<td>8. Habitats Regulation Assessment</td>
</tr>
<tr>
<td>9. Shared regional resource and work of WRSE Group</td>
</tr>
<tr>
<td>10. Changes to the Axford abstraction</td>
</tr>
<tr>
<td>11. Upper Thames resource utilisation</td>
</tr>
</tbody>
</table>

2.4.1 Approach to forecasting future supply of water and future reductions in abstractions

2.4.1.i Consultee representations

The majority of consultees stated that they thought Thames Water’s approach to assessing the amount of water available to use now and in the future was acceptable. Some consultees questioned the approach, the accuracy of data and information.

a. Some consultees questioned the rationale in the Environment Agency Water Resource Planning Guideline directing water companies to exclude allowances for the reduction in the amount of water that may be abstracted in the future even though such reductions are expected.

b. The Environment Agency stated that allowance for the potential loss of time-limited licences should be removed from ‘target headroom’.

2.4.1.ii Thames Water consideration

a. We have included sustainability reductions in the draft Plan where the requirement for them is certain and we have clear information on locations and volumes for the required reductions. The reductions, for which the requirement is certain, are all required in the period 2010/15. The inclusion of these sustainability reductions is described in detail in section 2.4.5 below.

Where there are further potential sustainability reductions after 2010/15, arising from, for example, the Water Framework Directive, we have followed the Environment Agency Water Resources Planning Guideline, which states that no potential sustainability reductions should be included where the requirement for these reductions remains uncertain. Therefore the revised draft Plan does not include allowances for such reductions. We have looked at the potential impact of future SRs that might arise from the WFD through a series of ‘what-if’ scenarios and these are discussed in more detail in sub-section 2.4.5 below.
b. We have a number of licences with time limits to either all or part of the licence volume. We will apply to renew these time-limited licences at the appropriate point before the time limit is reached. It is assumed that these licences will be renewed on application, but there is uncertainty as to whether the renewal of the licences can be guaranteed in every case. We have therefore included an allowance for the uncertainty associated with the potential for certain licences not to be renewed in the draft Plan. The Environment Agency has directed us to remove this allowance from the draft Plan, which we have done.

2.4.1.iii Changes to the Plan made as a result of consultee representations

a. No changes.

b. In view of the requirement that no allowance for the risk of non-renewal of time-limited licences should be included, to comply with the Environment Agency recommendation in their representation, in Volume 2, Section 5.1.2 of the revised draft Plan the following sentence has been amended as follows:

“The EA Guideline state that uncertainty around Time Limited licences (S3) should not be included. There are two licences (Bexley and Deptford) in London, which are considered particularly sensitive and are at risk over the planning period, however the allowances made for Bexley and Deptford have not been included in S3 in accordance with the Guideline”

2.4.1.iv Reasons for changes/no changes

As explained in section 2.4.1.ii, we have complied with the Environment Agency Water Resources Planning Guideline. Apart from the point of clarification described in section 2.4.1.iii, no further changes to the draft Plan are justified.

2.4.2 Resource zone integrity

2.4.2.i Consultee representations

a. Consultees supported the improvements Thames Water is making to remove infrastructure constraints, however Thames Water has still identified some constraints relating to critical periods and should justify why these constraints have not been addressed.

b. Consultees also asked Thames Water to include network constraints within Deployable Output as outlined in the Environment Agency Water Resources Planning Guideline.

2.4.2.ii Thames Water consideration

a. We have included additional options in the feasible options list (Tables 25 and 26) to modify the network to overcome the identified constraints. While some are not economically viable and so will not be considered for the preferred programme, some are economically viable, and these now feature in the feasible options list, see sub-section 2.8.1.

b. In our latest assessment for the revised draft Plan, we now consider network constraints as a separate factor to a reduction to Deployable Output, rather than within Deployable Output itself, as per the draft Plan. The network constraint is
identified in the tables as a separate line and the Water Available for Use is reduced accordingly.

2.4.2.iii Changes to the Plan made as a result of consultee representations

a. No change other than those described in sub-section 2.8.1.iii.

b. In order to reflect the change of approach, we have inserted the following sentence into Volume 2 of the revised draft Plan, at the end of section 4.1.2:

“In the revised draft Plan, network constraints are deducted from the appropriate Deployable Output value and not included as an integral part of the Deployable Output assessment technique, as adopted in the draft Plan”

2.4.2.iv Reason for changes/no changes to the Plan

a. The consideration explained in 2.4.2.ii a together with the additional changes made to the revised draft Plan under 2.8.1, in our view, provides an adequate explanation and so no further changes to the draft Plan are justified.

b. To comply with the Environment Agency Water Resource Planning Guideline, network constraints have been deducted from the Deployable Output, as stated in 2.4.2.iii b.

2.4.3 Outage

2.4.3.i Consultee representations

a. Consultees noted that outage allowances have been provided by water resource zone for dry year annual averages and asked for confirmation as to whether the same outage levels are used for peak week.

b. Consultees noted that outage estimations based on historic projections are likely to be erroneous if the supply becomes dependent on a large water resource scheme such as a reservoir due to potential issues such as dam failure, pollution by cyanobacteria, cryptosporidium, terrorist activity or accidental spillages, and pump breakdowns.

2.4.3.ii Thames Water consideration

a. As stated in the second paragraph of section 4.1.3, Volume 2 of the draft Plan, the same outage is used for the annual average and peak demand conditions. However, it is worth noting that, as it is not relevant to the supply demand balance, we do not report on the peak supply demand balance for the London Water Resource Zone. The method to calculate outage does not distinguish between average and peak outages and uses examples of historic legitimate outages as a basis for the analysis. These can occur in any month and the modelling assesses the outage over a year by applying a probability distribution function to the magnitude, the frequency and the duration of an event. The magnitude will depend on the sort of event and the time of the year it occurs. If the event lasts six months over the summer then the range may accommodate the peak and a reduced impact on output. It also assigns a ‘most likely value’ depending on the nature of the outage and the probability distribution function assigned. The duration of the event looks at how long similar events have occurred for and applies a range based on historic events. The frequency applies
a probability to the type of event happening also based on historic records. All the issues are then combined using Monte Carlo simulation techniques to give an overall uncertainty. Outage events are then summed to determine the overall outage uncertainty for the water resource zone. The outage is then presented for the selected level of risk, which we have determined at 5 per cent.

b. Our method for determining outage allowances looks at historic events and does not look at outage risk around new resources. Outages may change over a planning horizon if there are steps being taken to mitigate against certain outage events. In the draft Plan, the same outage allowance has been applied across the planning period within each zone. It should be pointed out, however, that we have a relatively low level of outage allowance due to the flexibility in our resource system and the relatively short record of outage data.

Outage is defined as a temporary loss of Deployable Output normally recoverable within three months, and is based upon information on the down-time of assets, which includes the 26 large raw water storage reservoirs already in operation. It should be noted that no dam failures have been experienced and some of these reservoirs are over 100 years old, which, while not a reason for complacency, indicates the robustness of our reservoirs. They are regularly inspected by specialist engineers acting for the Environment Agency as the responsible authority for dam safety. Enforcement action can be taken if repairs are not undertaken. Therefore such extreme events as dam failure or terrorist activity with a very low probability do not fall within the scope of the outage methodology.

The proposed Upper Thames Reservoir, like all our existing reservoirs, will be pumped storage with no natural inflow from the adjacent catchment, which means that spillway failures, such as that at Ulley Reservoir in Yorkshire, cannot happen. Water quality management within reservoirs is critical to their utilisation and has a high priority. Although the proposed Upper Thames Reservoir is large, its output will represent less than 15 per cent of available resources, and this risk has been assessed as acceptable.

2.4.3.iii Changes to the Plan made as a result of consultee representations:

a. In order to add further clarity on our approach, we have added the following paragraph to section 4.1.3, second paragraph of Volume 2 of the revised Plan;

“As it is not relevant to its supply demand balance, we do not report on the peak supply demand balance for the London Water Resource Zone.”

b. No changes.

2.4.3.iv Changes to the Plan part a and reason for no changes – part b only

a. For further clarification additional text as stated in sub-section 2.4.3.iii has been included in the revised draft Plan.

b. For the reasons set out in section 2.4.3 ii b above, no change is justified to the draft Plan as we believe we have provided further explanation of our approach, which is already included in the draft Plan.
2.4.4 Agreement on bulk transfers between water companies

2.4.4.i Consultee representations

Consultees noted that Thames Water’s bulk export assumptions are inconsistent with Essex & Suffolk Water’s bulk import assumptions and requested that Thames Water address the inconsistencies and confirm consistent values for bulk transfers with neighbouring water companies.

Also consultees asked Thames Water to identify other potential opportunities for increasing bulk supply from neighbouring water companies.

2.4.4.ii Thames Water consideration

We have liaised with our neighbouring water companies, including Essex & Suffolk Water, Sutton and East Surrey Water and Three Valleys Water, in order to confirm existing and potential future bulk supplies.

Essex and Suffolk Water have included a 20 Ml/d bulk import option from 2026/27 from Thames Water in their draft Plan on the basis of the resource surplus arising from the proposed Upper Thames Reservoir. They have since confirmed that they will not now require an increase in provision of bulk supply from us within the planning period and so the option will not feature in their final WRMP.

Three Valleys Water have not included the Iver bulk supply in their draft Plan. We have included the Iver supply at 10Ml/d in our draft Plan on the basis that this is the strict legal interpretation of the obligation within the bulk supply agreement. We have discussed this position with Three Valleys Water and they do not propose to amend their position on the Iver bulk supply within their Plan. We have set out, in correspondence with Three Valleys Water, the reasons why we cannot change our draft Plan. This mismatch still needs resolution and we will continue dialogue with Three Valleys Water to seek agreement. This resolution may require revision of the bulk supply agreement.

2.4.4.iii Changes to the Plan made as a result of consultee representations

No changes.

2.4.4.iv Reason for no changes

No change has been made to the draft Plan in response to the assumption included within Essex & Suffolk Water’s draft Plan as, they no longer need the resource. Therefore their Plan is now consistent with our draft Plan.

No change has been made to our draft Plan in response to the assumption included within Three Valleys Water’s draft WRMP, as we have confirmed the legal requirement to retain the bulk supply provision in our draft Plan. It would be incorrect to include an allowance in our draft Plan which ultimately would be allocated to another company to use.
2.4.5 Sustainability Reductions – statutory and non-statutory schemes

2.4.5.i Consultee representations

Consultees requested that consideration should be given to any changes in abstraction licences in the future. The assessment of future water availability should take into account reductions in abstraction as identified in the Environment Agency’s Catchment Abstraction Management Strategies as well as the potential variability of supply as a result of climate change. Such considerations are likely to be of increasing importance with future consent reviews and Thames Water should adopt a proactive stance.

The Water Framework Directive and Habitats Directive provide important constraints on what water is available and what water should be available for water company use. Thames Water has not included the potential reductions to their abstraction licences as a result of the Habitats Directive or other environmental Directives. Sustainability reductions are likely in the Kennet Valley Zone to safeguard the Kennet & Lambourn Floodplain Special Area of Conservation.

The environmental impact of a number of Thames Water abstractions affecting non-statutory watercourses is currently under investigation in AMP4 (2005-2010). Results of these investigations were not available for preparation of the draft Plan. However these may have a significant impact on the draft Plan.

2.4.5.ii Thames Water consideration

Thames Water is required to follow the prescribed EA Water Resource Planning Guideline in the approach to potential future licence reductions and changes that may arise from climate change. We have followed the Guideline and in relation to potential future reductions in abstraction licences our approach is to follow the direction given by the Environment Agency in the National Environment Programme (NEP). The NEP covers all requirements for licence reductions arising from the Habitats Directive, Catchment Abstraction Management Strategies (CAMS), AMP4 (2005-2010) investigations and other drivers on the Environment Agency’s Restoring Sustainable Abstractions Programme (RSAP).

For sites with statutory designation under the EU Habitats Directive, a number of ‘Appropriate assessments’ have been undertaken by the Environment Agency as part of their Review of Consents as required by the Directive. These investigations have been undertaken to a fixed timetable and include a review of Thames Water’s abstractions in order to assess whether they have an adverse impact on the sites.

For sites that are not designated under the Habitats Directive, we are working closely with the Environment Agency to complete the investigations required in AMP4 (2005-2010) but they will not be complete in time for the results to be included in the revised draft Plan.

The Environment Agency has informed us that we are not required to implement any solutions in relation to North Meadow and Clattinger Farm, the Oxford Meadows, and the Lee Valleys Waterbodies Special Areas of Conservation.

We have included all the requirements for reductions identified by the Environment Agency in the National Environment Programme received in November 2008. This has resulted in requirements for licence reductions at Speen and Axford as well as
an augmentation solution for the Thatcham Reedbeds Site of Special Scientific Interest.

The Environment Agency has also confirmed its requirements in relation to the West Berkshire Groundwater Scheme and we have included allowance for this solution in our final plan. The solution required does not have an impact on Deployable Output but requires the implementation of an augmentation scheme for potential use to maintain water levels in the Thatcham Reedbeds Special Area of Conservation in the event of prolonged use of the West Berkshire Groundwater Scheme during a drought. We have not yet been provided with definitive guidance in relation to the River Lambourn Special Area of Conservation but the Environment Agency has indicated that there may be the requirement for an alteration to the West Berkshire Groundwater Scheme Operating Agreement in respect to the scheme. However, they have indicated that this is unlikely to have an impact on Deployable Output.

**Scenario testing**

From AMP7, two uncertainties in particular become of great significance to the plan. These are the sustainability reduction requirements resulting from the Water Framework Directive and the potential requirement of other water companies in the South East, for which a strategic resource in the Thames catchment would be the optimal planning solution.

These uncertainties are discussed in further detail below.

**Sustainability reductions beyond AMP6**

We sought further guidance from the EA on the potential location and magnitude of any sustainability reductions that might arise as a result of the Water Framework Directive.

The Environment Agency advised Thames Water on 12th January 2009 of the following volumes to be used as the basis for scenarios to demonstrate the impact of potential sustainability reductions. These volumes have been used to undertake sensitivity testing of the impact of sustainability reductions that might arise from the WFD:

- SWOX: 18 Ml/d
- SWA: 7 Ml/d
- London: 600 Ml/d

For the proposed scenario for London the potential resource reduction is clearly of huge significance in relation to the supply demand balance for the London Water resource Zone (around 30% reduction in supply). The large volume of the potential sustainability reduction means that the scenario will show that it is not possible to ensure a positive supply/demand balance with the resource options available.

It is important to understand that this abstraction reduction scenario is only indicative, and that the investigations proposed for AMP5 into the impact of abstraction on the Lower Thames and Thames Tideway will inform the requirement for actual reductions in the future. However, given the magnitude of flows in the lower Thames it is clear that if investigations confirm that there is a requirement for reduction in abstraction, then the volume of reduction will need to be significant in relation to the flow range that is experienced at Teddington weir during a summer drought period. That is to say, the reduction required will have to be within the range of low summer residual
Teddington flows which are currently specified on the Lower Thames Control Diagram between 800ML/d to 200ML/d. This will mean that a potential resource requirement to enable this change will be more likely to be in the scale of 100ML/d or greater, rather than in the range 10-50ML/d for example. We have assessed a range of sustainability reduction scenarios up to the maximum volume of 600 ML/d, as required by the Environment Agency.

This range of scenarios of different sustainability reductions has been combined with scenarios of different potential bulk supplies that may be required by neighbouring water companies as a result of the resource that is made available from the development of the UTR.

It should be added that from an operational perspective it will be important to know whether the sustainability reductions will require a strategic scheme to be used only during drought or as a base load source. The latter would necessitate much higher operational costs.

In summary, it cannot be emphasised strongly enough that the Company is dependent upon the Environment Agency to clarify the position on future sustainability reductions. The paramount need for long-term planning is to be able to put reliable estimates of sustainability reductions within the central forecast assumptions relating to water available for use (WAFU).

**Bulk Supply potential arising from the UTRMD**

The results of the Water Resources in the South East (WRSE) modelling indicated that a potential bulk supply to SE Water of 20 ML/d formed part of the least cost regional solution and so this option has been used for the scenario analysis. For the purposes of the analysis a further potential bulk supply option of 30 ML/d has been assumed to reflect a higher bulk supply requirement that might arise if the WFD were to result in significant sustainability reductions for other water companies in the south east. Therefore, bulk supply options of zero ML/d, 20 ML/d and 50 ML/d have been included in the analysis.

**Results of scenario testing**

Table 19 below shows the results of the scenario testing, giving the deficits in 2020 (beginning of AMP6) and 2035 (end of planning period). It is clear that for only the most conservative sustainability reduction scenario, would a small programme of resource development be a pragmatic solution. Further, given the potential regional resource requirements a large strategic resource becomes the optimal solution, being least cost per unit of water supplied.
The results of the scenario testing indicate that the preferred planning solution must include for significant step changes in supply and demand. These step changes could not be accommodated through an incremental least cost solution and thus a strategic resource is required. This resource is the least cost solution when the full range of scenarios is taken into account and would provide for the optimal solution to the needs of the South East as a whole.

For further detail on the long term planning solution see section 3.

2.4.5.iii Changes to the Plan made as a result of consultee representations

The revised draft Plan has not been changed in respect of the Axford sustainability reduction, as this is already included in the draft Plan.

The revised draft Plan has been changed by the addition of a section following section 4.2.4.1 of Volume 2 of the revised draft Plan as follows:

“The Environment Agency has undertaken an investigation, known as an ‘Appropriate Assessment’, into the impact of abstraction at Speen on the Kennet and Lambourn Floodplain Special Area of Conservation as part of the Review of Consents required under the Habitats Directive. The investigation concluded that the impact of the abstraction on the local groundwater regime has the potential to adversely affect the integrity of the Special Area of Conservation site.

In the light of this conclusion, the Environment Agency has confirmed that it wishes the licence at Speen to be reduced to a peak of 5 Ml/d and an average of 4 Ml/d. In view of the supply demand balance for the Kennet Valley Water
Resource Zone, this reduction can be accommodated without the need for any new resource development. However network modifications will be required to ensure that the zones fed by the Speen source can be fed by alternative sources. The solution will be implemented from 2013/14”

We have also changed Volume 2 the draft Plan under section 9.3.3 to add the following:

“The plan includes a sustainability reduction at Speen of 5 Ml/d peak and 4 Ml/d average from 2013/14 onwards”.

We have also added a section following section 4.2.4.1 as follows:

“The Environment Agency has undertaken an investigation, known as an Appropriate Assessment, into the impact of abstraction from the West Berkshire Groundwater Scheme (WBGWS) on the Thatcham Reedbeds Site of Special Scientific Interest which is a component part of the Kennet and Lambourn Floodplain Special Area of Conservation as part of the Review of Consents required under the Habitats Directive. The investigation concluded that the abstraction has the potential to have an impact on the local groundwater regime such that the integrity of the Special Area of Conservation site could be adversely affected.

In the light of this conclusion the Environment Agency has confirmed that they wish an augmentation solution to be implemented for potential use in the event of prolonged use of the WBGWS during a drought. This solution will be implemented in 2012/13.”

The draft Plan has not been changed to include allowance for potential reductions that might arise from the implementation of licence reductions following investigations being conducted in AMP4 (2005-2010), as these investigations have not yet been reported yet.

The analysis of the sensitivity testing of the sustainability reductions is presented in section 3.

2.4.5.iv Reason for changes/no changes to the Plan

The draft Plan has been changed because the Environment Agency has confirmed further definite sustainability reductions since the preparation of the draft plan. These sustainability reductions require a licence reduction in the case of the Speen solution, which affects the Deployable Output of the source. In the case of the WBGWS, the solution does not affect the Deployable Output but requires an environmental augmentation scheme to be implemented. These schemes are included in the revised draft Plan.

As set out in sub-section 2.4.5.ii, we have assessed a wide range of potential sustainability reductions through scenario modelling to understand the possible impact and potential risk of future sustainability reductions. This work is in progress and we expect it to be completed in Spring 2009. Our preferred plan, however, does not include a significant reduction in deployable output linked to the WFD.
2.4.6 Sustainability Reductions – impact on Deployable Output

2.4.6.i Consultee representations

a. Consultees noted that Thames Water has included sustainability reductions provided by the Environment Agency in its draft Plan however the draft Plan does not clearly outline how it has calculated the reduction in Deployable Output and without this, it is not possible to ascertain if Thames Water has planned for the correct reductions which may lead to not providing the necessary environmental protection.

b. One consultee queried whether approximately 15 Ml/d should be included from the Kennet Valley as regulated Deployable Output to the London Water Resource Zone.

2.4.6.ii Thames Water consideration

a. The change in Deployable Output for the Swindon & Oxfordshire Water Resource Zone as a whole is different to the change in Deployable Output from the Axford source arising from the change to the Axford licence. The Swindon & Oxfordshire Deployable Output is calculated by modelling using WARMS, our water resources management model, of the whole water resource zone, taking into account the strategic storage provided by Farmoor reservoir. The assessment considers two options for an increase in the flow constraint, from 90 Ml/d to 100 Ml/d and 90 Ml/d to 166 Ml/d. For the option where the flow constraint is set at 100 Ml/d, the licence at Axford set at 6 Ml/d for peak and average conditions and, for the scenario with the flow constraint set at 166 Ml/d two options for the peak and average licence are considered; 6 Ml/d and 3 Ml/d.

The scenarios evaluated are shown in Table 20 below. The table also shows a scenario with the licence volume prior to the reduction in the Axford licence to demonstrate its impact.
Table 20: Summary of the scenarios evaluated and their impact on Deployable Output

<table>
<thead>
<tr>
<th>Licence Scenario</th>
<th>Peak with flow constraint in force (Ml/d)</th>
<th>Flow Constraint (Ml/d)</th>
<th>Average DO (Ml/d)</th>
<th>Change from Average Base Run (Ml/d)</th>
<th>Peak DO (Ml/d)</th>
<th>Change from Peak Base Run (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Licence</td>
<td>13.1</td>
<td>90</td>
<td>233</td>
<td></td>
<td>277.3</td>
<td></td>
</tr>
<tr>
<td>New licence 6Ml/d</td>
<td>6</td>
<td>100</td>
<td>230</td>
<td>-3</td>
<td>273.7</td>
<td>-3.6</td>
</tr>
<tr>
<td>New licence 6Ml/d</td>
<td>6</td>
<td>166</td>
<td>230</td>
<td>-3</td>
<td>273.7</td>
<td>-3.6</td>
</tr>
<tr>
<td>New licence 3Ml/d</td>
<td>3</td>
<td>166</td>
<td>227</td>
<td>-6</td>
<td>270.1</td>
<td>-7.2</td>
</tr>
</tbody>
</table>

a Kennet@Knighton

Any reduction in abstraction at Axford requires the provision of supply from an alternative source. This would mean that more water would have to be transferred from Farmoor Reservoir. While there is a reduction in Deployable Output of the Upper Thames from a reduction in licensed abstraction at Axford, there is also a marginal benefit to the London Deployable Output because of the re-circulation of water upstream from Farmoor Reservoir. The benefit, however, is small, as there is only limited available water. An increase in flow constraint will also reduce the total volume of abstraction, as the constraint would come into effect earlier. The net result is that with a decrease in licence to 6 Ml/d there would be a reduction of 3 Ml/d average and 3.6 Ml/d peak in Deployable Output for the Swindon & Oxfordshire Water Resource Zone. However, because abstraction is reduced in the Kennet catchment there is a benefit to the River Kennet and therefore the Lower Thames as flows increase, allowing more water to be abstracted for London, therefore for this scenario there is a 4 Ml/d benefit to the Deployable Output for London.

The change in the flow constraint from 100 Ml/d to 166 Ml/d does not alter the Deployable Output of the Upper Thames. The reason for this is that in the critical drought period of 1975/76 (which drives Deployable Output in the Upper Thames) flows decline at such a rapid rate that (in around 15 days from 166 Ml/d to 100 Ml/d) the impact on the overall system is limited.

A further reduction in licence down to 3 Ml/d reduces Deployable Output in the Upper Thames by another 3 Ml/d to 227 Ml/d, while increasing the Deployable Output in London by 3 Ml/d. This anomaly reflects the resolution of the modelling.

The draft Plan already includes the allowance for the required licence reduction at Axford and the associated reduction in Deployable Output for the Swindon & Oxfordshire Water Resource Zone.

b. We do not agree that 15 Ml/d should be added to the regulated Deployable Output for London, because this is determined by modelling based on the water resource system in the upstream catchments, including the Kennet catchment,
and therefore the Kennet Water Resource Zone. The surplus in the Kennet Water Resource Zone arises from flows in the river which could be abstracted within existing licence limits but which are not needed in the Kennet Water Resource Zone because there is not sufficient demand. The water flows downstream to London and is therefore already included in the Deployable Output for London. If the surplus in the Kennet Water Resource Zone was to be fully utilized, the effluent returns would still be returned to the river system. This would contribute to the Deployable Output for London, albeit with an appropriate allowance for any consumptive element of the use for public water supply.

2.4.6.iii Changes to the Plan made as a result of consultee representations

a. The following text has been included in Volume 2 at the end of section 4.2.4.1 in the revised draft Plan:

“Our analysis indicates that the change in Deployable Output as a result of the sustainability reduction at Axford for the Swindon & Oxfordshire Water Resource Zone as a whole is different to the change in Deployable Output from the Axford source arising from the change to the Axford licence. The Swindon & Oxfordshire Deployable Output is calculated by modelling of the whole water resource zone taking into account the strategic storage provided by Farmoor Reservoir.

The assessment considers two options for an increase in the flow constraint; from 90 Ml/d to 100 Ml/d and 90 Ml/d to 166 Ml/d. For the option where the flow constraint is set at 100 Ml/d the licence at Axford is set at 6 Ml/d for peak and average and for the scenario with the flow constraint at 166 Ml/d two options for the peak and average licence are considered; 6 Ml/d and 3 Ml/d.

The scenarios evaluated are shown in Table below. The table also shows a scenario with the licence volume prior to the reduction in the Axford licence to demonstrate the impact of the licence reduction.

Table: Summary of scenarios evaluated and their impact on Deployable Output

<table>
<thead>
<tr>
<th>Licence Scenario</th>
<th>Output from Upper Thames Water Resources Model (WARMS)</th>
<th>Peak with flow constraint in force</th>
<th>Flow Constraint (Ml/d)</th>
<th>Average DO (Ml/d)</th>
<th>Change from Average Base Run (Ml/d)</th>
<th>Peak DO (Ml/d)</th>
<th>Change from Peak Base Run (Ml/d)</th>
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<tr>
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<td>227</td>
<td>-6</td>
<td>270.1</td>
<td>-7.2</td>
</tr>
</tbody>
</table>

*a Kennet@Knighton
Any reduction in abstraction at Axford requires the provision of supply from an alternative source. This would mean that more water would have to be transferred from Farmoor Reservoir. While there is a reduction in Deployable Output of the Upper Thames from a reduction in licensed abstraction at Axford there is also a marginal benefit to the London Deployable Output because of the re-circulation of water upstream from Farmoor Reservoir. The benefit however is small as there is only limited water available. An increase in Flow Constraint will also reduce the total volume of abstraction as the constraint would come into effect earlier. The net result is that with a decrease in licence to 6 Ml/d there would be a reduction of 3 Ml/d average and 3.6 Ml/d peak in Deployable Output for the Swindon & Oxfordshire Water Resource Zone. However because abstraction is reduced in the Kennet catchment there is a benefit to the River Kennet and therefore the Lower Thames as flows increase allowing more water to be abstracted for London, therefore for this scenario there is a 4 Ml/d benefit to the Deployable Output for London.

The change in the flow constraint from 100 Ml/d to 166 Ml/d does not alter the Deployable Output of the Upper Thames. The reason for this is that in the critical drought period of 1975/76 (which drives Deployable Output in the UT) flows decline at such a rapid rate (around 15 days from 166 Ml/d to 100 Ml/d) that the impact on the overall system is limited.

A further reduction in licence down to 3 Ml/d reduces Deployable Output in the Upper Thames by another 3 Ml/d to 227 Ml/d whilst increasing the Deployable Output in London by 3 Ml/d. This anomaly reflects the resolution of the modelling.

2.4.6.iv Reason for changes/no changes to the Plan

a. No changes.

b. As explained in sub-section 2.4.6.ii b, we do not agree that 15 Ml/d should be added to the regulated Deployable Output for London. No further change to the draft Plan is justified.

2.4.7 Sustainability Reductions – investigations in AMP5 (2010-2015)

2.4.7.i Consultee representations

Consultees raised the issue that the Environment Agency advised water companies not to include sustainability reductions within their forecasts, but Thames Water have included current investigations, and have also assumed reductions of 20 per cent as a result of the Water Framework Directive, consistent with the assumption used by the Water Resources for the South East Group. It is not clear why Thames Water have taken this approach, Thames Water should not include these in its supply demand balance as customers may have to fund sustainability reductions that may not ultimately be needed.

In addition, one consultee queried whether the Lower Thames Operating Agreement will improve the situation for the Site of Special Scientific interest at Richmond.
2.4.7.ii Thames Water consideration

The Environment Agency advised companies to only include those sustainability reductions in the draft Plan for which the requirement is certain. We have followed this advice by including in our supply and demand balance the sustainability reductions identified for Axford and will include the reduction for Speen in our Plan (this is described in more detail in section 2.4.5). The assumption of a reduction of 20% for the WFD was not included in our supply and demand balance but was used as the basis for a ‘what-if’ scenario to determine the potential of such an impact if it were to come about. We have updated this work on scenarios to assess the potential of further sustainability reductions following receipt of more recent information from the Agency. This is described in more detail in section 2.4.5.

In relation to the Lower Thames Operating Agreement review and the potential to improve the SSSI at Richmond, the investigation into the impact of abstraction on the Lower Thames and Thames Tideway will take place in AMP5 and will address all receptors that have the potential to be affected. It is not possible to say whether this will improve the SSSI until the investigation has been completed.

2.4.7.iii Changes to the Plan made as a result of consultee representations

No changes.

2.4.7.iv Reason for no changes

We have complied with the Environment Agency Guideline and clarified the approach taken with respect to scenario testing. No changes to the draft Plan are justified.

2.4.8 Habitats Regulation Assessment

2.4.8.i Consultee representations

Consultees raised queries around a Habitats Regulation Assessment (HRA). The water company, as a competent authority, will have to ensure that its plan meets the requirements of the Habitats Regulations (Conservation Natural Habitats Regulations 1994) before implementation. Water Resources Management Plans are strategic level plans which, whilst themselves are not subject to permission, are influential in the decision-making process. Consequently a high level Habitats Regulations Assessment on effects on European sites should be completed and the Water Resources Management Plan should not be passing down plans or projects that might fail Habitats Regulations Assessment at the next more detailed level (ie: the Habitats Regulations Assessment decision should not be deferred to the Environment Agency’s licence/consent changing stage or planning application stage). Therefore a Habitats Regulations Assessment should accompany the Water Resources Management Plan, and the outcomes of these tests should clearly be used to inform the decisions made in the final Water Resources Management Plan.

2.4.8.ii Thames Water consideration

We do not consider that the draft Plan requires the production of a Habitats Regulation Assessment because the regulations do not apply to Water Resources Management Plans. In addition, we do not consider that the draft Plan will have a significant effect on European sites and so will not require an Appropriate Assessment.
However, despite the fact that we are not required to do so, we will undertake a high-level Habitats Regulation Assessment, as requested by Natural England. The Habitats Regulations Assessment will not materially affect the draft Plan but will add value to the document as supporting information outlining the consideration of potential impacts of the plan on designated sites.

2.4.8.iii Changes to the Plan made as a result of consultee representations

No changes have been made to the draft Plan. However we will complete a high level Habitats Regulations Assessment as an addendum to the revised draft Plan.

2.4.8.iv Reasons for changes/no changes to the Plan

As is explained in sub-section 2.4.8.ii, no further change to the draft Plan is justified.

2.4.9 Shared regional resource and work of Water Resources in the South East Group

2.4.9.i Consultee representations

a. Consultees raised the work of the Water Resources in the South East Group to determine an optimal regional solution, and suggested that Thames Water should take account of this work and work together with neighbouring companies to develop a shared water resources strategy for the south-east of England. Shared resources will mean benefits to customers, the environment and improved resilience. Thames Water recognises that the Water Resources in the South East Group’s work was not sufficiently developed in time to be included in the draft Plan, but we expect Thames Water to take account of the proposals in its final Plan.

b. In Section 9, Volume 2 of the draft Plan Thames Water states that the proposed Upper Thames Reservoir is intended to provide resilience against future uncertainties and provides for a possible strategic resource for the South East. It is our view that any major resource development should only be considered on the basis that it will provide a main component to a regional water resources strategy. The case for proposed Upper Thames Reservoir made by Thames Water is persuasive, but would be more so if the potential benefits of joint development and funding were explored and the additional security of supply was to benefit customers throughout the region.

c. Other consultees highlighted the importance that all water companies who are potentially involved in a shared resource scheme need to demonstrate effective management of existing resources, as this has implications for sustainability in the Thames Water area - and for the need for a reservoir.

2.4.9.ii Thames Water consideration

a. We are fully committed to the work of the Water Resources in the South East Group and will continue to work with regulators and neighbouring companies to identify opportunities across the region. We recognise the potential benefits of a regional resource for the wider South-East.

The WRSE modelling work provided conclusions in November 2008. This identified the need for development of a reservoir near Abingdon in many of the
scenarios. The latest model runs also identify a transfer to South East Water (at Bray) in the preferred options set and have also previously chosen a link to Sutton and East Surrey Water (Merton) and Southern Water (Honor Oak).

Since November 2008, water companies have published their Statements of Response which in some cases have changed draft Plans. The WRSE modelling needs to be updated based on the conclusions of the Statement of Responses.

b. We welcome discussions with any company that identifies a need for a transfer and we have approached neighbouring water companies. Several companies have expressed an interest in water from the proposed Upper Thames Reservoir, particularly in the face of ongoing uncertainty around the extent of future sustainability reductions. Both Essex & Suffolk and Three Valleys Water include reference to the proposed Upper Thames Reservoir in their draft Plans.

We have an open mind on how any transfer would be financed, whether via a traditional bulk supply agreement or joint promotion and ownership.

In liaison with other water companies involved with the Water Resources in the South East Group, we have included the latest conclusions of the Water Resources in the South East modelling in our revised draft Plan.

c. Regarding the effective management of existing resources schemes, we consider that all existing resources are properly utilised; our current Deployable Output is based on this assumption.

2.4.9.iii Changes to the Plan made as a result of consultee representations

In order to ensure the revised draft Plan is consistent with the latest modelling results from the Water Resources in the South East Group, Volume 2, sub-section 4.3.2 has been changed to state;

‘The Water Resources in the South East regional modelling conclusions based on companies’ draft Plans recommended one transfer option from Thames Water supply area to South East Water, through an increase in abstraction of 20 Ml/d based on the increased flow that would be available through the development of an Upper Thames Reservoir. We have included in scenario analysis an allowance for the increased abstraction at Bray, by South East Water, of 20 Ml/d to assess the wider regional benefits that may be provided by the proposed Upper Thames Reservoir.’

2.4.9.iv Reason for changes/no changes to the Plan

We have changed the draft Plan to reflect the results of the Water Resources in the South East Group modelling that were not available at the time of production of the draft Plan. The potential for a resource option to be developed by South East Water based on the resource provided by the proposed Upper Thames Reservoir needs to be included in our revised draft Plan, as it reflects the benefit of the scheme to the wider south east as required by the Environment Agency.

2.4.10 Changes to the Axford abstraction

2.4.10.i Consultee representations

One consultee raised the following queries linked to the Axford abstraction:
a. The Environment Agency is said to have confirmed that the Axford abstraction must be reduced to 6 ML/d average and peak. The current licence (following the early 2008 licence revision) is 11.1 ML/d average and 13.1 ML/d peak. Reaching the Environment Agency’s target of 6 ML/d implies a reduction of 5.1 ML/d on average and 7.1 ML/d for the peak. This is not consistent with the 3.6 ML/d reduction at Axford stated on page 29 of the draft Plan. The reduction to 6 ML/d is said to be dependent on an unspecified 100 ML/d trigger. Please clarify.

b. The consultee would like the Axford abstraction to be reduced to 6 ML/d average and peak, as soon as the Goring Gap boreholes are available for meeting Swindon & Oxfordshire demands.

c. In the draft Plan there is a reference to a provisional sustainability list being provided by the Environment Agency, but no details are given. One consultee proposed that full details of the provisional list should be provided in the draft Plan, including likely River Og outcomes, alongside possible options for their delivery.

2.4.10.ii Thames Water consideration

a. The Environment Agency has confirmed that it requires the Axford licence to be reduced to 6 ML/d average and peak, with a flow constraint set at 100 ML/d. This means the source Deployable Output for Axford is reduced by 5.1 ML/d average and 7.1 ML/d peak. This reduction results in the Deployable Output for the Swindon & Oxfordshire Water Resource Zone being reduced by 3 ML/d average and 3.6 ML/d peak. The reason for this difference between the source Deployable Output and the Swindon & Oxfordshire Deployable Output is explained in section 2.4.6 of this Statement.

b. The draft Plan (page 193) states that: ‘The final Plan includes a sustainability reduction at Axford of 3.6 ML/d peak and 3 ML/d average from 2014/15 onwards’. The Axford reduction can take place by this time because the Goring Gap 2 & 3 options will be implemented in 2014/15.

c. The reference to a provisional sustainability list being provided by the Environment Agency is in the draft Plan under section 4.2.4.2 - ‘Potential requirement for investigations in AMP5’. The provisional list of investigations required in AMP5 (2010-2015) provided by the Environment Agency is set out in Table 21 below:

<table>
<thead>
<tr>
<th>Source</th>
<th>Watercourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Thames Intakes</td>
<td>River Thames</td>
</tr>
<tr>
<td>Manor Road</td>
<td>Letcombe Brook</td>
</tr>
<tr>
<td>Waddon</td>
<td>Waddon Ponds</td>
</tr>
<tr>
<td>Pann Mill</td>
<td>River Wye</td>
</tr>
<tr>
<td>Dorney</td>
<td>Roundmoor Ditch</td>
</tr>
<tr>
<td>Mousehill &amp; Rodborough</td>
<td>Royal Brook</td>
</tr>
</tbody>
</table>

The investigation of the impact of the Ogbourne source on the River Og is a requirement within the AMP4 (2005-2010) period and is currently being investigated and is due to be completed by 31 December 2009.
2.4.10.iii  Changes to the Plan made as a result of consultee representations

a. No changes.

b. No changes.

c. The revised draft Plan has been changed under section 4.2.4.2 to add:

'The provisional list of investigations required in AMP5 (2010-2015) provided by the Environment Agency is set out below:

Table: Revised list of the investigations required in AMP5 (2010-2015) provided by the Environment Agency

<table>
<thead>
<tr>
<th>Source</th>
<th>Watercourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Thames intakes</td>
<td>River Thames</td>
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<td>Manor Road</td>
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<td>Dorney</td>
<td>Roundmoor Ditch</td>
</tr>
<tr>
<td>Mousehill &amp; Rodborough</td>
<td>Royal Brook</td>
</tr>
</tbody>
</table>

The investigation of the impact of the Ogbourne source on the River Og is a requirement within the AMP4 (2005-2010) period and is currently being undertaken and is due to be completed by 31 December 2009.'

2.4.10.iv  Reasons for changes/no changes/changes to the plan

a. Further explanation is provided in section 2.4.6.ii; no further change to the draft Plan is justified.

b. The point regarding implementation of the Axford reduction is already addressed in section 9.3.2 on p193 of the draft Plan.

c. The draft Plan has been changed to clarify the provisional list of investigations required in AMP5 (2010-2015) by the Environment Agency and to confirm the status of the investigation into the impact of the Ogbourne source on the River Og.

2.4.11  Upper Thames resource utilisation

2.4.11.i  Consultee representations

One consultee queried why Meysey Hampton and neighbouring groundwater sources were mothballed rather than utilised when groundwater levels are above average.

One consultee queried whether the Upper Thames surface water resources were closed in recent years.

2.4.11.ii  Thames Water consideration

The Meysey Hampton source has historically consisted of two licensed abstractions, one for use in summer periods and the other for winter periods. The control over which is used is provided by means of a flow constraint included on each of the two
abstraction licences. This constraint determines which source is used depending on the flow in the River Colne at Bibury. The summer licence at Meysey Hampton was revoked by the Environment Agency several years ago in order to improve flows in local watercourses. Other sources in the area have also been the subject of sustainability reductions rather than being mothballed. The winter high flow licence at Meysey Hampton is currently off-line because of poor water quality. The impact of the reduction in abstraction at Meysey Hampton is minimal in relation to the large flows experienced during flood events and so is insignificant in terms of impact on flood frequency.

The Buscot and Worsham intakes on the Upper Thames have indeed been closed in recent years. The abstraction licence volumes for both these sources have been transferred to Farmoor and so there has been no net reduction in licensed volume. The Culham abstraction licence has been retained and the Culham source remains a potential water resource option for the future.

2.4.11.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.4.11.iv  Reason for no changes

Further explanation is provided in section 2.4.11.ii. No changes to the draft Plan are justified.
2.5 Allowing for risk and uncertainty – 'Headroom'

Summary of main issues

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Assessing risk and uncertainty</td>
</tr>
<tr>
<td>2.</td>
<td>Components of uncertainty</td>
</tr>
<tr>
<td>3.</td>
<td>Uncertainty linked to demand</td>
</tr>
<tr>
<td>4.</td>
<td>Climate change</td>
</tr>
<tr>
<td>5.</td>
<td>Climate change – higher resolution assessments</td>
</tr>
<tr>
<td>6.</td>
<td>Climate change – groundwater</td>
</tr>
<tr>
<td>7.</td>
<td>Climate change – ongoing monitoring</td>
</tr>
<tr>
<td>8.</td>
<td>Climate change – impact on preferred options</td>
</tr>
<tr>
<td>9.</td>
<td>Climate change – doubts as to whether it is occurring</td>
</tr>
<tr>
<td>10.</td>
<td>Climate change – supply, demand estimates</td>
</tr>
<tr>
<td>11.</td>
<td>Supply side uncertainties</td>
</tr>
<tr>
<td>12.</td>
<td>Uncertainty – proposed reservoir</td>
</tr>
<tr>
<td>13.</td>
<td>Groundwater - regional analysis</td>
</tr>
<tr>
<td>14.</td>
<td>‘Target headroom’ and risk profile</td>
</tr>
</tbody>
</table>

2.5.1 Assessing risk and uncertainty

2.5.1.i Consultee representations

The majority of consultees stated that they thought Thames Water’s approach to assessing risk and uncertainty was reasonable, accepting that uncertainties by their nature are difficult to assess and quantify. However, one consultee queried the applicability of the methodology used, in particular the use of Monte Carlo techniques.

A number of consultees emphasised the need to build in sufficient uncertainty to accommodate inaccuracies in data and information, for example data on immigration. Other consultees commented that Thames Water has been over-cautious in adding an excessive safety margin.

2.5.1.ii Thames Water consideration

Our approach to assessing risk and uncertainty follows the Environment Agency Water Resource Planning Guideline. The principal mechanism for dealing with risk and uncertainty is through ‘target headroom’, which is essentially a safety margin between forecast demand and supply capability.

In deriving the Target Headroom profile over the planning period we have applied an escalating risk allowance starting with 5 per cent in AMP4 (2005-2010) and stepping up by increments of 5 per cent for each AMP period ending with 30 per cent risk by AMP9 (2030-2035). This means that we accept a level of confidence of 95 per cent in AMP4 (2005-2010), 90 per cent in AMP5 (2010-2015) and 85 per cent in AMP6 (2015-2020) ending with a 70 per cent confidence by AMP9 (2030-2035). In discussing this risk profile with other water companies, we are in line with other companies and therefore cannot be fairly described as being over-cautious in adding an excessive safety margin.
2.5.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.1.iv Reason for no changes

In assessing risk and uncertainty, we have followed the regulatory guideline. We have accepted a level for risk which we believe is appropriate in terms of security of water supply for London, the economic heart of the UK, and all our customers. The need for additional resilience in London in comparison with other areas has been previously recognised by Ofwat\(^{20}\). As explained in sub-section 2.5.1.ii, no change to the draft Plan is justified.

2.5.2 Components of uncertainty

2.5.2.i Consultee representations

a. Some consultees requested a comprehensive explanation of the components of uncertainty at water resource zone level. For example, has the consumer's attitude to reducing demand (permanently rather than in times of reduced supply) by changing their habits through managed expectation been factored into this ‘uncertainty’ factor.

b. Some consultees questioned the rationale for excluding leakage control when the improvements available from leakage control are much larger than the uncertainties caused from gradual pollution and supply side figures.

c. Some consultees noted that effort needed to be directed to reducing the levels of uncertainty linked to the stated main components of supply and demand where possible, and solutions found to facilitate more effective planning.

2.5.2.ii Thames Water consideration

a. An example of the breakdown of components of uncertainty is provided graphically for London in the draft Plan, Volume 2, Section 5, Figure 22 (also Figure 40 in Appendix G). Appendix G also contains details of our approach to climate change, which is the most significant component in most water resource zones.

b. Although leakage uncertainty is evaluated using a similar methodology as other demand components it is not considered within headroom. Given the importance of leakage control to Thames Water’s supply demand strategy, we have developed a detailed leakage risk assessment methodology to inform our leakage reduction policy. We believe that the consequences of missing leakage targets in any year are significant, particularly if that coincides with a period of restrictions, as occurred in 2006/07.

A number of factors warrant its separate treatment outside of the overall headroom methodology:

- The importance of the leakage issue and the scale of the proposed leakage reductions require that it is evaluated, and progress is separately monitored, to track delivery.

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\(^{20}\) Ofwat Response to WRP06
• The magnitude of the uncertainty can be altered by revising the mix of leakage control options.

• The risk of the leakage programme failing to deliver can be proactively managed (unlike that of the customer demand management programme which mostly depends on the customer response).

• The huge uncertainty around the leakage reductions would distort the overall headroom calculation.

This is explained in the draft Plan in Section 7.3.2.6.

c. We agree that future uncertainty is an important issue and we do invest to improve our understanding of the range of uncertainties and ways to reduce them over the planning horizon and in some cases beyond. For the larger elements of uncertainty, such as climate change, we have a proactive approach ensuring that we use the latest scenarios and assess their impacts at a catchment-scale. For demand-side uncertainty, one of the main ways we can reduce uncertainty is through metering.

The Environment Agency has recently released a set of potential future demand scenarios to the 2050s\textsuperscript{21}, based upon governance style and consumer consumption patterns. These are covered in Section 3 of this statement and are important as they reinforce the large range in potential demands and the difficulties associated with long-term planning.

2.5.2.iii Changes to the Plan made as a result of consultee representations

a. No changes.

b. No changes.

c. No changes.

2.5.2.iv Reason for changes/no changes to the Plan

a. Detailed information on the components of headroom is provided in the draft Plan, Section 5 of Volume 2.

b. Handling of leakage uncertainty outside of headroom is a pragmatic solution to the specific issues we face in London given the condition of the infrastructure network. This is discussed in Volume 2 of the draft Plan in section 7.3.2.6 and Appendix C4.

c. The draft Plan discusses risk and uncertainty in detail. No further changes to the draft Plan are therefore considered appropriate given the explanation articulated in section 2.5.2.ii.

\textsuperscript{21} Demand for water in the 2050s, Environment Agency, January 2009
2.5.3 Uncertainty linked to demand

2.5.3.i Consultee representations

Consultees proposed that given the basis of the demographic projections and the relatively high Per Capita Consumption figure adopted for planning purposes, the target headroom is too high.

2.5.3.ii Thames Water consideration

We consider that the level of headroom related to the accuracy of demand side components is relatively small when the potential range of uncertainties is considered. Our relatively high Per Capita Consumption is consistent with our location in the south east of England and our demographic projections follow agreed methodologies.

We have reviewed our demand-side headroom analysis since the draft Plan. This has involved a restructure of our demand uncertainty model, carried out with the support of consultants, Mott MacDonald.

2.5.3.iii Changes to the Plan made as a result of consultee representations

As a result, the following text has been added to Section 5.2 of Volume 2 of the revised draft Plan:

'We have reviewed and enhanced our existing Demand Uncertainty Model (DUN) Model.'

Figure 12: Demand Uncertainty Model (DUN) as used in the draft plan
The DUN Model, which previously used inputs from three separate models (Per Capita Consumption @RISK Model, Peaks @RISK Model and Metering @RISK Model) as illustrated in the figure above, has now been consolidated and includes input from one external @Risk model – a stochastic Per Capita Consumption model. This thereby reduces the errors associated with managing several models. The integrated model produces deterministic and stochastic pcc values for unmetered and metered households. The uncertainty modelling is performed on an extended range of micro components (toilet, bath, showers, jacuzzi, washing machine, washer dryer, dish washer, internal tap for hand wash and sundry use, swimming pool, garden watering, and other outdoor activities, such as the use of pressure washers and hosepipes for car washing). The output from the stochastic Per Capita Consumption model is then exported into the DUN model. In addition, the DUN model uses the following baseline component forecast as its additional input parameters; population change, change in metered and unmetered household Per Capita Consumption including the impact of climate change, change in metered non-household water use, change in unmetered non-household water use, demand management measures (AMP4) and peaking factors. Demand bounce back and Per Capita Consumption of new properties are newly introduced parameters.

Additional input built into the final planning demand uncertainty model is the demand management measures (AMP5 and beyond). This includes domestic water efficiency schemes, commercial water audits, selective metering policy (change of occupancy metering) and optants metering policy.

The model also considers the uncertainties around each component for the base year and carries this uncertainty into the forecast years along with the uncertainties relating to the rate of change of the components.

The DUN Model uses Monte Carlo simulation procedures which provide a simple, but powerful, analytical technique through which models are solved repeatedly with uncertain input variables randomly chosen from their defined probability distributions. It is a way of assessing the overall uncertainty associated with a variable, which is derived from a complex interrelationship between other variables, which are also uncertain. It provides a direct method of translating the variations in the input parameters into variations in the output parameters. Each of the uncertain input variables is defined as a statistical distribution with defined parameters, and the interrelationship between them, which gives rise to the output variable, is modelled in Excel. The model is then ‘run’ many times (i.e. some thousands of times) using Palisade's @RISK software. On each run, a value for each of the uncertain input variables is selected randomly by the software, according to the distribution and parameters by which it is defined.

Each demand component is assigned a probability distribution according to the information available. Most of the uncertainty ranges around these components have been estimated based on expert judgement or opinion. Where the assigned distribution is taken from a study the source is indicated.

The base year uncertainty distributions are taken from the water balance maximum likelihood estimation (MLE) confidence levels for each component. The demand component forecasts and probability distributions are considered as input variables and the distribution input forecast is generated as an output. An initial iteration is done to assess the uncertainties around the baseline demand forecasts with demand management measures only until the end of
AMP4 (2005-2010). A second iteration considers the uncertainties around the preferred plan demand forecasts.

![Revised Uncertainty Model Diagram]

**Figure 13: Revised Uncertainty Model**

*Revised Demand Uncertainty Model*

Results from the baseline model run are used as input into the headroom model to form an initial view of target headroom, which is fed into the economics of balancing supply and demand (EBSD) model. Final planning forecasts and the associated uncertainties are used to generate a final view of target headroom.

2.5.3.iv *Reason for changes/no changes to the Plan*

As set out in section 2.5.3.ii the demand-side headroom analysis has been reviewed since the draft Plan. This has involved a restructure of our demand uncertainty model, carried out with the support of consultants, Mott MacDonald. Amended text has been included in the revised draft Plan.

2.5.4 *Climate change*

2.5.4.i *Consultee representations*

Consultees raised various comments on climate change with some consultees disagreeing with the predictions and the need to account for climate change in water resources planning.

2.5.4.ii *Thames Water consideration*

We have used the methodology specified by the Environment Agency, using the outputs from six global climate models. Basic research into climate change is beyond the technical and financial abilities of any company, and in common with all organisations, companies and regulators, we rely on the outputs from the
international climate change community interpreted for us by specialist consultants. The United Kingdom Climate Impacts Programme (UKCIP) announced on 30 September 2008 that the new UKCIP08 scenarios due for release at the end of November would not now be available until the spring of 2009. United Kingdom Water Industry Research (UKWIR), on behalf of the water industry, had briefed consultants to interpret the new scenarios with the intention of testing sensitivities in time for the final Plan. Given the delay by UKCIP, it is now unlikely that any interpretation of the new scenarios will be available in time. These scenarios have now been named the UKCP09 scenarios. The work by UKWIR will take place as soon as possible after release of the scenarios by UKCP and we will use this information to test and report on sensitivities once it is available.

2.5.4.iii Changes to the Plan made as a result of consultee representations

Appendix E, Section E1 Introduction, second paragraph of the draft Plan has been updated as follows;

‘Note

At the time of writing the draft Plan, the United Kingdom Climate Impacts Programme (UKCIP) were due to issue the next upgrade of their scenarios in the autumn of 2008. The latest position is UKCIP announced on 30 September 2008 that the new UKCIP08 scenarios due for release at the end of November would not now be available until the spring of 2009 and will be called the UKCP09 scenarios. The work by United Kingdom Water Industry Research (UKWIR), outlined in 2.5.4.ii, will take place as soon as possible after release of the scenarios by UKCIP and we will use this information to test and report on sensitivities once it is available.’ However, it is unlikely that results will be available until the late summer of 2009 and whether it will be possible to incorporate these changes will depend on the timetable set by DEFRA for the final Plan.’

2.5.4.iv Reasons for changes/no changes to the Plan

The changes set out above have been made to the revised draft Plan section 5.2 Volume 2 in light of the latest information available on the new UKCIP08 scenarios.

2.5.5 Climate change – higher resolution assessments

2.5.5.i Consultee representations

Consultees questioned the evaluation undertaken in view of the Environment Agency Guideline which are only appropriate for strategic-level assessments of the potential implications of climate change and suggested that full resolution of the company’s questions on the treatment of the impact of climate change cannot be achieved until further work is carried out to evaluate its current approach.

Climate change is a significant driver of investment throughout the planning period in the London Water Resource Zone. It reduces Deployable Output at a rate of 5 Ml/d per annum from 2007/08 onwards and represents more than 50 per cent of target headroom by 2021. We therefore expect that the company should carry out further work into the impact of climate change to support the preliminary conclusions set out in its draft Plan and to justify its proposed investments throughout the planning period and especially investment in the medium term, which includes development of a reservoir in the upper Thames.
2.5.5.ii Thames Water consideration

In response to the representations given above, we have used the best information available, incorporated in the jointly developed methodologies, and in line with the guidance from the Environment Agency.

The standard methodology for the evaluation of water resources systems is by the use of behavioural analysis (simulation) models. These models use long periods of historic hydrological data and current (or future) demands to assess the response of the system and the reliability of the sources that are represented in the model given a repeat of the hydrological input data. We have adopted this approach through the WARMS model used in water resources planning. This model uses a number of rainfall and evaporation data sets as inputs to simulate system responses and generate river flow and aquifer recharge and does not use flow data directly. It has been subject to regulatory audit on a number of occasions. It has been agreed that it is fit for purpose through the audit process.

Data from the UKCIP02 scenarios as interpreted by UKWIR for the water industry and the Environment Agency has been used to derive a series of factors that are used to perturb the historic hydrological data sets as a proxy for future hydrologies in a world subject to climate change. These factors were derived from a range of climate models to produce a range of future hydrologies and the Environment Agency Guideline defined how they wished to see these used. There is no prospect that direct forecasts of weather suitable for developing future hydrologies will be available from climate change models in the foreseeable future. It is therefore inevitable that perturbation of historic sequences will continue to be used to evaluate climate change in water resource systems.

In our view it is not the change in climate at the site of the source that is important, it is the change over the catchments that drive that source. In the case of surface water this means the impact of climate change upstream of the point of abstraction. For unconfined groundwater sources, it is the groundwater catchment feeding the source.

The WARMS model uses geographically specific data sets of rainfall and evaporation to drive the simulations. Each catchment and aquifer unit is modelled using rainfall runoff and aquifer recharge models, each of which is associated with the geographically correct rainfall and evaporation datasets and the sources which are in these catchments. The sources are in turn assigned to the demand centre(s) within specific water resource zones. This means that the analysis looks at Deployable Output specific to the demand centre and therefore, by definition, if climate change factors are applied the impacts are assessed on a demand centre and hence a water resource zone basis.

For surface water sources, flow sequences are simulated upstream of the source so by definition the analysis is on a source-by-source basis. For groundwater sources, WARMS looks at recharge and the impact on groundwater storage in the aquifer unit concerned and hence on the source. If there is a physical constraint that prevents a source from producing its licensed output it is modelled explicitly. The fact that WARMS validation runs can reproduce river flows, including the groundwater component of flow, to a reasonable degree of accuracy shows this assessment to be reasonable. The UKWIR06 groundwater methodology looks at individual sources. The calculated impacts are small in comparison with the sources of other companies and this has lead to a challenge by the Reporters. This has been investigated further and it has been found that the majority of our groundwater sources are located in
areas where the abstraction intercepts groundwater flow that would otherwise have gone to river, rather than drawing on groundwater storage. This explains the robust nature of many of our groundwater sources.

The UKCP09 scenarios are now expected this spring. As soon as they are available UKWIR will repeat the work done in the UKWIR06 methodology to produce factors from UKCP09 data. They will be probabilistic based on ensemble runs of the Hadley Centre model and eleven other climate models (rather than the Hadley Centre plus five models used for UKWIR06). Preliminary indications from UKCIP are that it is expected that the range of values used in the draft Plan will be within the range indicated by UKCP09.

We have taken the best advice available from Government based research organisations. Sensitivity testing will be carried out as soon as the UKCP09 data are available. Beyond this, we believe we have taken the assessment of climate change impacts on water resources availability as far as reasonably possible given the current level of data and knowledge on climate change.

With regard to impacts on demand, there is limited good research. We have used the work recommended by the Environment Agency and currently used by Government. If better peer reviewed, and Government approved, research becomes available it will be incorporated in future assessments. The area of climate change impacts on Deployable Output and demand is kept under review and any new information that becomes available, if approved by our Regulators, will be incorporated as our plans are updated.

In summary, we have taken our climate change assessment as far as possible given the current level of data and knowledge available to water companies. The evaluation has been carried out at a catchment and aquifer unit level, which is the only meaningful level at which to evaluate the impacts of climate change on our water resources. This evaluation properly supports the specific and significant investment decisions and goes beyond the strategic-level assessment referred to in the representation. The UKCP09 scenarios expected this spring will be used to update the current climate change impact assessments.

2.5.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.5.iv Reason for changes/no changes to the Plan

The information discussed above is already incorporated in the draft Plan (subsection 5.1.1 in Volume 2 and Appendix E in Volume 3) and the updated text noted above under 2.5.4.

2.5.6 Climate Change - groundwater

2.5.6.i Consultee representations

Consultees recommended that Thames Water justifies the magnitude of impact of climate change on groundwater Deployable Output. The impact appears low when compared to Thames Water’s previous plan and other water companies.

2.5.6.ii Thames Water consideration
The differences identified in data for this draft Plan (WRMP08) and our previous plan (WRP06) are due to changes in the methodology used. The climate change impacts calculated for the draft Plan (WRP08) follow the approach set out in the UKWIR Report Ref. No. 07/CL/04/9. This methodology uses perturbed historic time series, and proposes three approaches of increasing complexity for the assessment of climate change impact. The most complex approach involves the use of an existing calibrated regional groundwater model, and it is this approach that we have used to assess the potential climate change impact.

With regard to the magnitude of the climate change impact on groundwater, it is significant that few of our groundwater sources in the Thames Valley have a Deployable Output dependent on groundwater levels. Often the constraint is the abstraction licence and not a hydrogeologically defined deepest advisable pumping water level. This means that the impact of lower rest water levels and additional drawdown can be absorbed to a certain extent before the Deployable Output is impacted, thus indicating a degree of robustness in the source Deployable Output, with the licences having been authorised at hydrologically sustainable limits. This position, as might be expected, is supported by the large natural water storage volumes provided in aquifers, which provide a buffer against recharge reductions predicted by some climate change scenarios.

More specifically, many of the Thames Valley groundwater sources are located along the rivers Thames or Kennet, which are usually groundwater discharge locations that experience smaller fluctuations in groundwater levels. As a result, abstraction sources in these locations would expect to experience smaller declines in groundwater levels as a result of potential future climate scenarios. Although this hydrological control can be influenced by abstraction well construction and local geological controls, such as natural fracturing, the analysis of Thames Valley sources supports the view that abstractions along the major river valleys are, in general, less affected by potential climate change impacts on groundwater levels. Groundwater abstraction sources located in interfluves between river valleys or close to the headwaters of smaller rivers may experience a greater impact on groundwater levels and potentially source output, but these sources are much fewer in number.

2.5.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.6.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.5.6.ii above, no change to the draft Plan is justified.

2.5.7 Climate Change – ongoing monitoring

2.5.7.i Consultee representations

Some consultees expected Thames Water to outline how it will assess and monitor the impacts of climate change on all sources while keeping its models up to date.

2.5.7.ii Thames Water consideration

We will continue to monitor the outputs from all our sources as we are required to do for making returns on abstraction to the Environment Agency. As we have done during dry periods in the past, we will be particularly interested in the response of our sources under such conditions. If there is a change in the expected response,
whether as the result of a climate change signal or not, we will modify the input to our models accordingly.

However, the provision of advice on the evidence for climate change and its likely impact will remain the responsibility of Government, through the Hadley Centre, and other national bodies. When outputs from these studies are published, peer reviewed and approved by recognised climate change experts, we will continue to be involved, generally through UKWIR, in updating the tools needed to implement these assessments. It is expected that the impacts on the supply demand balance will be reported through the regular, formal reviews and Regulatory reports.

2.5.7.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.7.iv Reasons for changes/no changes to the Plan

Sub-section 2.5.7.ii above, the draft Plan provides clear and adequate information, no change is justified.

2.5.8 Climate Change – impact on preferred options

2.5.8.i Consultee representations

Consultees expected Thames Water to investigate how climate change could impact its preferred options and outline those that are most resilient and adaptable to climate change. Some consultees also questioned if experiences from other countries with water deficit avoidance programmes have not been examined.

2.5.8.ii Thames Water consideration

We have investigated how climate change could impact on our preferred options using the agreed methodologies and guideline. The guideline is collated with regard to best practice and are adhered to by the UK water industry. We are satisfied that our preferred options are robust against expected climate change. Through the BPEP\textsuperscript{22} process, we have looked at the impacts on carbon, greenhouse gas emissions and energy of all the options evaluated and have favoured those options which have a lower impact in terms of carbon. We have also used this information as a key performance indicator in the selection of our preferred programme.

2.5.8.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.8.iv Reason for changes/no changes to the Plan

We have fully considered the robustness of our preferred options as described in Chapters 5 and 7 of Volume 2 and in Volume 5 of the draft Plan. No further work is necessary with the current level of knowledge on climate change.

\textsuperscript{22} draft WRMP Volume 5
2.5.9 Climate Change – doubts as to whether it is occurring

2.5.9.i Consultee representations

There are representations relating to the magnitude of climate change and even views expressed that the case for climate change has not been established at all. Some challenge the UKCIP view that summers will be hotter and drier with warmer wetter winters. Some comments suggest that Thames Water has selected model outputs that are favourable to the perceived objectives of the Plan and that they are unduly pessimistic. Some have suggested that the recent wet summers and flood events are evidence that the climate is not changing.

2.5.9.ii Thames Water consideration

The overwhelming evidence from the scientific community, supported by Government is that climate change is real and that long-term plans should take the impacts of climate change into account. UKCIP is the government-sponsored organisation that disseminates scenarios recommended for use in looking at the mitigation of, and adaptation to, climate change. The current scenarios, UKCIP02, are due to be replaced by the new UKCP09 scenarios later this year. It is not expected that there will be a significant change to the overall signals on climate change in UKCP09, although they will be probabilistic in nature and therefore facilitate an improved treatment of uncertainty. It is agreed that there will remain a great deal of uncertainty about the timing and magnitude of change. This is currently taken into account as far as possible by including uncertainty explicitly in Headroom. The way in which we are to consider climate change, and the methodologies to be used, have been prescribed by our regulators and we have followed their guidance. There has been no attempt to take any view as to whether the results are optimistic or pessimistic.

There will always be natural variability, such as the summer rainfall events in 2007 and this will continue, but the clear advice from the experts is to look to the long-term expected change.

2.5.9.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.9.iv Reason for changes/no changes to the Plan

Sub-section 2.5.4.ii explains that the delay to the release of the UKCP09 scenarios means that the necessary work in order to decide if a change is appropriate and, if so, what it should be has not been possible. No change to the draft Plan is therefore justified at this time.

2.5.10 Climate Change – supply, demand estimates

2.5.10.i Consultee representations

Consultee representations relate to the impact of climate change on both the supply side in terms of the yield of resources and the potential impact on demand on choices made by customers as a response to climate change and therefore on Levels of Service.
2.5.10.ii Thames Water consideration

Information from UKCIP is that as the climate changes we should expect warmer, wetter, winters together with hotter, drier, summers and more extremes of weather (both floods and droughts). The effects of the changes to winters, summers and droughts have been built into the Plan through models of the water resources system.

In determining the impact of climate change we have followed the Environment Agency Guideline. We do not agree that we have overstated the impact on Deployable Output and in particular that we have overstated the impact of climate change by a factor of two as has been suggested. These scenarios are used to perturb historic time series data to assess the impact of the longer and more extreme droughts that are likely in the future. There are no forecasts of the extent or nature of future droughts so we have to use perturbed versions of past events.

A report has been produced for Defra called ‘Climate Change and the Demand for Water’ 23 which has been used to inform our forecasts of long-term demand.

With regard to the magnitude of the climate change impact on groundwater, it is significant that few of our groundwater sources in the Thames Valley have a Deployable Output dependent on groundwater levels. Often the constraint is the abstraction licence and not the hydrogeology. This means that the impact of lower rest water levels and additional drawdown can be absorbed to a certain extent before the output is impacted, indicating a degree of robustness in the source. This position, as might be expected, is supported by the large natural water storage volumes provided in aquifers, which provide a buffer against recharge reductions predicted by some climate change scenarios.

We agree that one of the expected impacts of climate change will be a change in the frequency of rare events such as droughts and floods. We have used the best available information and models agreed with our regulators to assess these impacts in relation to our level of service. Our customers have confirmed through recent research that they wish to retain this level of service.

2.5.10.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.10.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.5.10.ii above, no change to the draft Plan is justified.

2.5.11 Supply side uncertainties

2.5.11.1 Consultee representations

a. Thames Water has included an allowance for the uncertainty of two time-limited licences in London (Bexley and Deptford) in its target headroom calculation. This is contrary to the Environment Agency Water Resources Planning Guideline and Thames Water should remove them from its final Plan.

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23 CCDeW: Climate change and the demand for water, Atkins et al, February 2003
b. Thames Water states that the risk of losing groundwater sources through gradual pollution is very small however this is not consistent with the situation at the Ogbourne borehole, where nitrates are a concern. The prospect of worsening nitrate pollution should be a justification for continued reduction in abstraction from all the boreholes in the Upper Kennet Valley. This should be taken into account in resource assessment, rather than headroom.

2.5.11.ii Thames Water consideration

a. The Environment Agency Guideline state that uncertainty around time limited licences should not be included. We did include an allowance for the uncertainty linked to these two licences to highlight that they are considered to be particularly sensitive and at risk over the planning period. We have amended the draft Plan according to Environment Agency Guideline, see also sub-section 2.4.1

b. Increasing or elevated nitrate concentrations in groundwater can be managed by blending of water or additional treatment, both approaches are used by us and other water companies to ensure compliance with drinking water quality standards. The concentrations of nitrate at Ogbourne are elevated but they are not increasing. In order to maintain compliance with drinking water standards we blend the water with water abstracted from Axford where the water has relatively low concentrations of nitrate. The availability of such sources are an important part of our assessment, planning and management of water resources.

2.5.11.iii Changes to the Plan made as a result of consultee representations

a. In order to reflect our latest approach to adhering to Environment Agency Guideline, the following amendment has been made to Volume 2: Under 5.1.2, after the second sentence of the first paragraph;

“Note that in order to comply with Environment Agency Guideline, the approach taken in the revised draft Plan has been to remove the allowances made for Bexley and Deptford in Time Limited licences (S3)”

b. No changes.

2.5.11.iv Reason for changes/no changes to the Plan

a. Changes have been made to the revised draft Plan as set out in sub-section 2.5.11.iii to remove time limited licences as required under the EA WRP Guideline.

b. As set out in sub-section 2.5.11.ii b above, we are not concerned about increasing nitrate levels at this water source and no changes to the draft Plan are justified.

2.5.12 Uncertainty – proposed reservoir

2.5.12.i Consultee representations

Thames Water has not included an allowance for the uncertainty of the output of the proposed Upper Thames Reservoir scheme within its target headroom calculation. Thames Water should include all appropriate uncertainties in the target headroom allowance in its final Plan.
2.5.12.ii Thames Water consideration

We deliberately excluded the proposed new Upper Thames Reservoir scheme from the headroom analysis. The headroom calculation primarily manages uncertainty around the yield that a scheme will deliver, enabling alternative options to be developed in anticipation of any shortfall in supply against demand. This methodology provides a useful approach to managing uncertainty around the smaller resource schemes, but for large schemes a more pragmatic approach is required. This is because large schemes generate a significant planning surplus and thus the additional headroom would not invoke the need for an additional resource for several years. Over this time there would be opportunity to identify a shortfall against anticipated yield and to take remedial action. The target headroom therefore offers little additional benefit to managing uncertainty around the yield from the reservoir, whereas the step up in the headroom profile (around 70 Ml/d) would look very unusual on the supply demand planning graph.

To counter the uncertainty surrounding the timing of delivery of this (and other) scheme(s), a contingency approach has been taken. Using this approach we will continue with the investigation stages of some ‘back up’ schemes so that if required, they can be developed quickly. Given that there is a long lead in time to the reservoir, we feel that this approach is the most sensible way to manage uncertainty around this option.

We discussed the proposed approach with the external Auditors, acting on behalf of Ofwat who agreed that this is a sensible approach. We do not therefore expect to change this approach for the final Plan.

2.5.12.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.12.iv Reasons for changes/no changes to the Plan

In sub-section 2.5.13.ii it is explained why an allowance for the uncertainty of the output of the proposed new Upper Thames Reservoir scheme has not been included within its target headroom calculation. No change to the draft Plan is justified.

2.5.13 Groundwater - Regional analysis

2.5.13.i Consultee representations

Consultees recommended that Thames Water should work with neighbouring companies, particularly where aquifers supply more than one company, to undertake a joint regional analysis.

2.5.13.ii Thames Water consideration

From a groundwater perspective, a joint regional analysis of aquifers common to more than one water company could be promoted through the use of accepted groundwater numerical models. We would therefore expect this to be facilitated by the Environment Agency through its continuing programme of regional groundwater model development, with the full involvement of water companies as main consultees.
2.5.13.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.13.iv Reasons for changes/no changes to the Plan

No change to the draft Plan is justified. The Environment Agency has the statutory authority to undertake regional groundwater analysis and model development and may be relied upon to do so.

2.5.14 Target Headroom and Risk profile

2.5.14.i Consultee representations

Thames Water has chosen a target headroom allowance that equates to an estimated 5 per cent chance that the target headroom will prove to be too low. Some consultees commented that this is much more conservative than other water companies and questioned the justification for this overly cautious approach.

One consultee recommended that Thames Water should consider assuming the target headroom associated with greater levels of risk, say 10 per cent, which would be in line with the rest of the industry. This would reduce the supply demand imbalance, and potentially defer some of the investment required during the AMP5 (2010-2015) period, while exposing Thames Water’s customers to levels of risk relating to target headroom that are more typical in the industry. Again, if Thames Water is to maintain its apparently risk averse approach, then it must demonstrate that its customers are willing to pay for such high levels of certainty.

However, other consultees encourage Thames Water to adopt a lower level of risk arguing that we should not take risks with the water supply.

2.5.14.ii Thames Water consideration

As discussed in sub-section 2.5.1, the target headroom allowance (risk profile) starts in AMP4 (2005-2010) as 5 per cent, but then increases in steps of 5 per cent thereafter for each successive AMP to the end of the planning period; AMP5 (2010-2015) has a risk level of 10 per cent. We believe this level of risk to be mid-range for the water industry and represents a reasonable balance of risk over the planning period.

2.5.14.iii Changes to the Plan made as a result of consultee representations

No changes.

2.5.14.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.5.1 and 2.5.15.ii the level of risk represents a reasonable balance of risk over the planning period and is appropriate in terms of security of supply of water to the capital city and our customers. Ofwat have previously supported this view. No change to the draft Plan is justified.
2.6 Baseline supply demand balance

Summary table of main issues

<table>
<thead>
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<th>Summary of main issues</th>
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<tbody>
<tr>
<td>1. Accuracy of forecasts and seasonal variation</td>
</tr>
<tr>
<td>2. Scale of deficits in London and Swindon &amp; Oxfordshire Water Resource Zones</td>
</tr>
</tbody>
</table>

### 2.6.1 Accuracy of forecasts and seasonal variation

#### 2.6.1.i Consultee representations

Some consultees raised queries around the baseline supply demand forecasts specifically regarding the robustness of the data and the importance of seasonal variations. The calculations appear to assume a more or less constant level of supply and demand over the year without any clear seasonal variations.

#### 2.6.1.ii Thames Water consideration

As discussed in the draft Plan, Volume 2, Section 3.1, there are three types of demand forecast produced to cover the required planning scenarios, namely Annual Average Normal Year (NYAA), Annual Average Dry Year (DYAA) and Critical Period Average Day Peak Week (ADPW). Based on historic demand data and demand forecasts, these three demand forecasts cover the requirements for long term planning at the water resource zone level. Therefore, seasonal variations from historic demand information are already built into these forecasts.

For London, because of its large reservoir storage facility, only DYAA is needed to assess the maximum likely stress on the system over a typical dry year twelve month period. For all the other water resource zones, both the DYAA and ADPW are required to assess the maximum stress on the supply systems over the twelve month period or the so called Critical Period, which is taken as the average demand over the highest peak week period of the year (ADPW).

#### 2.6.1.iii Changes to the Plan made as a result of consultee representations

No changes.

#### 2.6.1.iv Reasons for changes/no changes to the Plan

Sub-section 2.6.1.ii explains how seasonal variation is taken into consideration in demand forecasts. No change to the draft Plan is justified.

### 2.6.2 Scale of deficits in London and Swindon & Oxfordshire Water Resource Zones

#### 2.6.2.i Consultee representations

Some consultees expressed concern regarding the significant deficits in supply demand balance in London (approximately 300 Ml/d) and Swindon & Oxfordshire peak (50 Ml/d).
2.6.2.ii  Thames Water consideration

Based on the revised demand forecast (Section 2.3) and supply availability (Section 2.4) the baseline supply demand balance has been recalculated in the revised draft Plan.

Table 22 shows the summary zonal baseline supply demand balances over the planning horizon from the draft Plan. Table 23 shows the balances in the revised draft Plan. Table 24 compares the balances.

The deficits in London and Swindon & Oxfordshire Water Resource Zones have been significantly reduced. Over the planning period, the deficit reduces by 168 Ml/d in London and by 39 Ml/d in Swindon & Oxfordshire.

The other water resource zones remain in surplus throughout the planning period and other than in Guildford, the surpluses have increased.

The peak week surplus in the Guildford zone has reduced. The demand pattern in Guildford was particularly unusual in 2006-07, the poor summer resulting in a lower than expected peak demand. By moving the base year of the forecast forward one year to 2007-08, in order to align with the forthcoming Business Plan, we have been able to reduce the impact of the unusual demand pattern. The forecast peak demands are now in line with those reported in both 2004 and 2006.

### Table 22: Baseline Supply demand position in the draft Plan

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### Table 23: Baseline supply demand position in the revised draft Plan

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### Table 24: Comparison of supply demand deficit/surplus between draft Plan and revised draft Plan

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2.6.2.iii Changes to the Plan made as a result of consultee representations

The revised baseline supply demand forecasts are included in Appendix M of the revised draft Plan, and which are also appended to this document as Appendix 4.

2.6.2.iv Reason for changes/no changes to the Plan

As explained in sub-section 2.6.2.iii there have been significant changes to the demand forecast which has driven changes to the baseline supply demand balances in the water resource zones across our supply area. Consequently the baseline supply demand balances have been revised and the updated information has been included in the revised draft Plan. In view of the extensive changes made to the original demand forecasts, baselines and preferred plan, a new appendix detailing these changes has been added to the revised draft Plan (Appendix M), which is also appended to this document as Appendix 4.
2.7 Appraisal of supply demand options

Summary of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Options appraisal methodology</td>
</tr>
<tr>
<td>2. Balance of demand management and new resources</td>
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<tr>
<td>3. Scheme costs – accuracy</td>
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<td>4. Scheme costs – components</td>
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<tr>
<td>5. Best practicable environmental programme (BPEP)</td>
</tr>
<tr>
<td>6. Scheme mitigation proposals</td>
</tr>
</tbody>
</table>

2.7.1 Options appraisal methodology

2.7.1.i Consultee representations

Some consultees supported the options appraisal methodology adopted by Thames Water and stated that it was a comprehensive appraisal. Whilst other consultees, requested further clarification on the options selection process and the appraisal methodology.

2.7.1.ii Thames Water consideration

A full and detailed explanation of the options appraisal methodology is provided in Volume 2, Section 7.1 of the draft Plan. Following representations from consultees we reviewed the methodology. The review concluded that the process used in the identification and selection of the schemes was comprehensive and complied with the Environment Agency’s Water Resources Planning Guideline. The Guideline is used by all water companies and provides a comprehensive framework for water companies to follow in order to produce a WRMP. In following the Guideline, a water company is ensuring that the methods employed are inline with the Water Industry Act 1991.

2.7.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.7.1.iv Reason for changes/no changes to the Plan

As explained in sub-section 2.7.1.i we have followed the methodology set down within the Environment Agency Water Resource Planning Guideline. No changes to the draft Plan are justified.

2.7.2 Balance of demand management and new resources

2.7.2.i Consultee representations

Generally consultees stated a preference for resources to be focussed on tackling leakage and demand management, in preference to development of new resource schemes. However, once all practicable measures to reduce demand and leakage have been used, consultees then supported the development of new water resource schemes.
2.7.2.ii Thames Water consideration

Our priority is to provide a secure long-term water supply to our customers. We believe a robust WRMP is a balance of demand management and water resource development. Our plan follows the twin track approach, with a strong focus on demand management in combination with water resource schemes. Demand management measures have significantly higher risks in terms of certainty of output than water resource schemes and our supply demand balances have shown that demand management alone is not enough to balance supply and demand in zones of deficit. In our WRP04 plan, we included the Beckton desalination plant as a short-term measure to mitigate the significant risk to water supply provision in London. We have demonstrated that the desalination plant was needed, in addition to demand management. It is important to plan new resources in parallel with the demand management measures due to the time lag for the scheme to become operational.

2.7.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.7.2.iv Reason for no changes

Information is provided in sub-section 2.7.2.ii above, to explain the importance of balancing demand management measures alongside water resource measures. No change to the draft Plan is justified.

2.7.3 Scheme costs - accuracy

2.7.3.i Consultee representations

Some consultees raised the variance in the accuracy of some schemes operating and capital costs of +/- 50 to 100 per cent, whilst for others the variance is -10 to +30 per cent. We expect Thames Water to reduce the excessive cost variance of some schemes for its final Plan. Furthermore there are significant variations in scheme costs presented in WRP04, Stage1 BPEP, September 2006, WRP06 and draft WRMP08.

2.7.3.ii Thames Water consideration

We have a staged approach to scheme costing as clearly it would be an unnecessary expense to cost in detail all identified schemes. The 50 to 100 per cent accuracy reflects schemes costed to Stage 1 level (all feasible schemes), 10 to 30 per cent reflects schemes costed to Stage 2 level. Stage 2 costing is currently being carried out for all schemes shown as preferred in the draft Plan and those identified as contingency options. In the draft Plan the proposed Upper Thames Reservoir costs were already at Stage 2 due to the funding received at PR04 to investigate the scheme. We do not consider it appropriate to reduce the accuracy of these costs for planning purposes.

2.7.3.iii Changes to the Plan made as a result of consultee representations

As set out in sub-section 2.7.3.ii Stage 2 costing has been undertaken for all schemes identified as preferred in the draft Plan. This additional costing information has been used in the programme appraisal. Full details of the costs will not be disclosed due to commercial confidentiality.
2.7.3.iv  Reason for changes

As explained in sub-section 2.7.3.ii we have a staged approach to costing. Stage 2 costing has been undertaken for all schemes shown as preferred in the draft Plan and the revised draft Plan has been updated to reflect this work. These costs are presented in Tables 25 and 26.

2.7.4  Scheme costs – components

2.7.4.i  Consultee representations

Consultees requested a full breakdown of opex and capex costs for each option as required in the Environment Agency Water Resources Planning Guideline to enable full and fair scheme comparison. These costs should also include a full explanation of environmental and social impacts, for example, the impact of digging up roads on traffic flows in Central London. Also the costs should include the costs of infrastructure improvements that are required to utilise any extra water from resource developments, it is not clear if this has been done with regard to the proposed new reservoir.

2.7.4.ii  Thames Water consideration

The BPEP (Volume 5) and Environmental Report (Volume 6) of the draft Plan include a summary of all feasible options and detailed information on environmental and social costs for each scheme. We have not reported full opex and capex costs for each scheme due to commercial confidentiality in the draft Plan, but these costs were made available to Ofwat through the reporting process and further information has been provided to the Environment Agency as part of the WRSE modelling process.

Costs associated with infrastructure improvement required to utilise the output of a new resource are included in the cost of the scheme including the reservoir options.

2.7.4.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.7.4.iv  Reason for no changes

Sub-section 2.7.4.ii above addresses the availability of cost information of the schemes available in the draft Plan. No change to the draft Plan is justified.

2.7.5  Best practicable environmental assessment (BPEP)

2.7.5.i  Consultee representations

One consultee questioned the approach used to assign a monetary value to assessed impacts and the equal weight ascribed to each of the impacts.

2.7.5.ii  Thames Water consideration

An explanation of the methodology used to assess the environmental and social impacts of site-specific water resource schemes and demand management schemes is provided in section 7.1.2.1 in Volume 2 and Volume 5 of the draft Plan. The methodology explains that where impacts are monetised, an established approach using a technique called “benefits transfer” has been used. This is an industry
accepted methodology. In previous assessments, we also used a supplementary tool, based on Multi-Criterion Analysis (MCA) to capture a wider range of impacts and benefits however the use of subjective weighting and scoring was not universally accepted hence this was not repeated. Instead, the Strategic Environmental Assessment (SEA) was used to help to consider a wider range of impacts and benefits aiding decision making. The scheme assessments (BPEP) and the SEA are written up in Volumes 5 and 6 of the draft Plan respectively.

2.7.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.7.5.iv Reason for no changes

A detailed explanation of the assessment approach is provided in section 7.1.2, Volume 2 and in Volume 5 of the draft Plan. Changes to the draft Plan are not justified.

2.7.6 Scheme mitigation proposals

2.7.6.i Consultee representations

One consultee queried why mitigation proposals had not been put forward for cultural heritage as part of individual scheme proposals.

2.7.6.ii Thames Water consideration

The Best Practicable Environmental Assessment (BPEP) is a tool to assess the environmental and social impacts of site-specific water resource schemes and demand management schemes. The output is used in decision making to define the preferred suite of schemes which make up the programme. Once a scheme is taken forward, a detailed scheme level assessment is undertaken, it is at this stage that aspects such as cultural heritage will be investigated in detail and mitigation proposals identified where these are appropriate. These scheme level assessments will be undertaken in consultation with the relevant bodies.

2.7.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.7.6.iv Reason for no changes

The WRMP is a strategic plan and the assessments undertaken to support the development of the plan are strategic level assessments. Detailed scheme specific assessments are undertaken when an individual scheme is taken forward. No change to the draft Plan is justified.
2.8 Water Resources Options

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transfer schemes</td>
</tr>
<tr>
<td>2. Desalination</td>
</tr>
<tr>
<td>3. Effluent reuse</td>
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<tr>
<td>4. Water grid</td>
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<tr>
<td>5. Marsh Gibbon reservoir</td>
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<tr>
<td>6. WRB Lambourne scheme</td>
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<tr>
<td>7. London Artificial Recharge scheme</td>
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<td>8. Didcot power station</td>
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<td>9. Longdon Marsh</td>
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<tr>
<td>10. Transfer of water between water resource zones</td>
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<tr>
<td>11. Rising groundwater in London</td>
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<tr>
<td>12. Greater utilisation of aquifers</td>
</tr>
<tr>
<td>13. Aquifer storage and recovery</td>
</tr>
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</table>

As a result of representations received and the ongoing process of option identification and assessment, the revised draft Plan now contains a number of new resource development options within our updated feasible options list. These are highlighted in yellow in Tables 25 and 26 and include:

- Additional transfer schemes such as the Northern region transfer and additional transfers from the River Severn (including a reservoir at Longdon Marsh)
- Additional desalination options in London
- Additional effluent re-use options in London and the Thames Valley.

We have also re-assessed all existing options within the feasible options list to ensure comparability and to keep them up-to-date with latest market movements, for example in energy costs. The full feasible list for schemes in London and Swindon and Oxfordshire Water Resource Zones is provided in Tables 25 and Table 26.

These have been included in section 7.2, Volume 2 of the revised draft Plan.

Thames Water consideration of representations on schemes and changes to the draft Plan as a result of the representations is provided in the remainder of this section.
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Table 26: Feasible schemes in Swindon & Oxfordshire Water Resource Zone

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<th>Name</th>
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<th>Date available</th>
<th>ADPW AISC (£/Ml)</th>
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<td>SWOX NC2</td>
<td>4.5</td>
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<td>231</td>
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<td>Development of groundwater resources</td>
<td>Goring Gap 5</td>
<td>10.0</td>
<td>2012</td>
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<td>New</td>
<td>Development of groundwater resources</td>
<td>Goring Gap 3</td>
<td>10.0</td>
<td>2012</td>
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<td>Release of network/treatment constraints</td>
<td>SWOX NC5</td>
<td>0.3</td>
<td>2011</td>
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<td>Development of groundwater resources</td>
<td>Shaibourne (option B)</td>
<td>7.1</td>
<td>2012</td>
<td>285</td>
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<td>PR09 SWOX 04</td>
<td>Development of groundwater resources</td>
<td>Lambourn Down ASR - Cricklade Option 1 (Blunsdon)</td>
<td>0.9</td>
<td>2011</td>
<td>288</td>
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<td>PR09 SWOX 05</td>
<td>Aquifer storage and recovery (ASR)</td>
<td>ASR - Cricklade Option 2 (Latton)</td>
<td>9.5</td>
<td>2017</td>
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<td>PR09 SWOX 03</td>
<td>Aquifer storage and recovery (ASR)</td>
<td>ASR - Cricklade Option 2 (Latton)</td>
<td>9.5</td>
<td>2017</td>
<td>391</td>
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<td>Release of network/treatment constraints</td>
<td>SWOX NC6</td>
<td>2.1</td>
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<td>PR09 SWOX 09</td>
<td>Development of groundwater resources</td>
<td>Goring Gap 4</td>
<td>10.0</td>
<td>2013</td>
<td>422</td>
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<td>PR09 SWOX 08</td>
<td>Development of surface water resources</td>
<td>Culham (raw water transfer to Farmoor)</td>
<td>4.0</td>
<td>2012</td>
<td>462</td>
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<td>New</td>
<td>Release of network/treatment constraints</td>
<td>SWOX NC7</td>
<td>0.3</td>
<td>2011</td>
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<td>New</td>
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<td>8.0</td>
<td>2014</td>
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<td>SWA - SWOX transfer - Option 2</td>
<td>10.0</td>
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<td>606</td>
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<td>New</td>
<td>Inter-zonal transfer</td>
<td>SWA - SWOX transfer - Option 3</td>
<td>10.0</td>
<td>2014</td>
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<td>PR09 SWOX 11</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon 150Mm3 (3 zones SWOX)</td>
<td>48.0</td>
<td>2021</td>
<td>745</td>
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<td>PR09 SWOX 10</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon Phased (75Mm3 + 75Mm3) (P2S)</td>
<td>24.0</td>
<td>2024</td>
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<td>PR09 SWOX 18</td>
<td>Oxford Canal Transfer (Grimsbury)</td>
<td>Oxford Canal Transfer (Grimsbury)</td>
<td>15.0</td>
<td>2016</td>
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<td>PR09 SWOX 13</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon 75Mm3 (SWOX)</td>
<td>24.0</td>
<td>2020</td>
<td>804</td>
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<td>PR09 SWOX 12</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon 150Mm3 (SWOX)</td>
<td>48.0</td>
<td>2021</td>
<td>823</td>
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<td>New</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon 100Mm3 (SWOX)</td>
<td>24.0</td>
<td>2019</td>
<td>896</td>
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<td>Raw water transfer</td>
<td>Severn-Thames Transfer - Longdon Marsh (SWOX)</td>
<td>48.0</td>
<td>2020</td>
<td>938</td>
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<td>PR09 SWOX 14</td>
<td>River regulation and direct supply reservoir</td>
<td>Reservoir - Abingdon Phased (75Mm3 + 75Mm3) (P1S)</td>
<td>24.0</td>
<td>2020</td>
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<td>New</td>
<td>Planned indirect reuse</td>
<td>Oxford Re-use 25Mld</td>
<td>25.0</td>
<td>2013</td>
<td>984</td>
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<td>PR09 SWOX 15</td>
<td>Direct supply reservoir</td>
<td>Reservoir – Longworth 30Mm3</td>
<td>69.0</td>
<td>2021</td>
<td>988</td>
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<td>PR09 SWOX 20</td>
<td>Development of surface water resources</td>
<td>Culham (+ treatment 4.5Ml/d) Northern Region Transfer - Option 2 (SWOX)</td>
<td>4.0</td>
<td>2012</td>
<td>992</td>
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<td>PR09 SWOX 22</td>
<td>Raw water transfer</td>
<td>Reservoir - Abingdon 30Mm3</td>
<td>48.0</td>
<td>2020</td>
<td>1029</td>
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<td>PR09 SWOX 17</td>
<td>Direct supply reservoir</td>
<td>Reservoir - Abingdon 30Mm3</td>
<td>69.0</td>
<td>2019</td>
<td>1068</td>
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</table>
2.8.1 Transfer schemes

2.8.1.i Consultee representations

Some consultees questioned why there was not more cross regional transfer of water. The most commonly mentioned were transfers of water into the region from the River Severn and the transfer of water from South Wales, referred to as the Columbus transfer. Some consultees also commented that they did not think that sufficient detail was provided to enable direct comparison of schemes particularly with regard to costs.

2.8.1.ii Thames Water consideration

The large scale transfer of water across regions, from areas of surplus to deficit, is appealing and has been subject of studies for a number of decades. However, there are a number of significant engineering, water quality and cost implications. Unlike electricity and gas, water is heavy and therefore expensive to pump.

In the draft Plan, we examined a number of regional transfers as part of our work on reservoir alternatives. In 2003, we published our reservoir site selection study\textsuperscript{24}, a comprehensive assessment of potential reservoir sites. This was expanded to other types of resource development within the BPEP reports\textsuperscript{25} accompanying our Business Plan 2004 (PR04) and Water Resources Plan 2006 (WRP06) and as provided in Volume 5 of draft Plan submission. This ongoing process of identification and assessment of schemes is continuing and we have noted potential schemes put forward in representations.

With regard to the level of cost provision within the draft Plan document, long-term capital, operating and environmental & social costs are provided with Volume 4 of the draft Plan and combined in the overall unit of scheme comparison known as Average Incremental Social Cost (pence/m$^3$), as required by the Environment Agency Water Resources Planning Guideline. We cannot publish detailed cost information for reasons of commercial confidentiality. However, full cost breakdowns have been made available to our Ofwat Reporters and details have been shared with the Environment Agency as part of the Water Resources in the South East regional modelling exercise.

A full range of alternative schemes have been considered, including transfers from the River Severn and the Northern England Transfer.

A Severn-Thames transfer would involve a new or enlarged reservoir in mid-Wales to store winter rainfall and a major pipeline and other infrastructure to transport the water. We have re-evaluated this option and this shows that it is both more expensive and has a greater environmental impact, including energy and therefore carbon footprint, than the proposed Upper Thames Reservoir.

In addition, in the Severn Corridor Catchment Abstraction Management Strategy produced by the Environment Agency for the River Severn, the Environment Agency point out that they are required to consider the impacts of consents they authorise (waste, water abstraction and water discharge) upstream of a Habitats Directive site; in this case with the Severn Estuary being such a site, this potentially covers the whole of the River Severn catchment. This Catchment Abstraction Management

\textsuperscript{24} Reservoir Site Selection Study Report, Thames Water, September 2006
\textsuperscript{25} Best Practicable Environmental Programme, Thames Water, 2004 and 2006
Strategy designates the River Severn downstream of the Worfe confluence (to the north west of Birmingham) as having “No water available”. This means that there is “no water available for further licensing at low flows although water may be available at higher flows with appropriate restrictions”. To provide a resource that would benefit security of supply abstraction would be required during the summer low flow periods, particularly during droughts. The option of a supply to the Thames from the River Severn without reservoir storage is therefore not viable.

We have also looked at transferring water from the north of England and importing it from Scotland and Norway. The transfer options investigated to date are more expensive than the proposed reservoir and also use much more energy than a reservoir in the Upper Thames with a consequent increase in carbon footprint.

2.8.1.iii Changes to the Plan as a result of consultee representations

As a result of the consultation representations and the ongoing process of option identification and assessment, the revised draft Plan now contains a number of new resource development options within our updated feasible options list. These include additional transfers from the North of England and transfers from the River Severn (including a reservoir at Longdon Marsh). These are included in revised versions of Tables 26 and 27 in Section 7.2 of Volume 2 of the revised draft Plan.

2.8.1.iv Reason for changes/no changes to the Plan

As a result of the consultation representations and the ongoing process of option identification and assessment, the revised draft Plan now contains a number of new resource development options within our updated feasible options list in section 7.2 of the revised draft Plan.

2.8.2 Desalination

2.8.2.i Consultee representations

Some consultees raised several points related to the Beckton desalination plant, as follows:

a. Thames Water should only operate the desalination plant when absolutely necessary to provide security of water supply.

b. Desalination plants have negative environmental impacts and significant greenhouse gas emissions.

c. Thames Water should ensure that any biofuels used to power the plant meet strict sustainability standards, to minimise carbon emissions and avoid the potential social impacts of diverting food crops to fuel.

d. In 2006, costs for the desalination plant were quoted to be around £200m for a yield of 140 Ml/d, ie about £1.4 M/ Ml/d. However, the estuary south desalination scheme is quoted in draft WRP08 Volume 3 Table WRP2 as 50 Ml/d for a cost of £140m, a ratio of about 2.8, double what it was for a similar scheme less than two years previously. The dramatic change in capital cost does not appear to be justified and is therefore not robust.
2.8.2.ii Thames Water consideration

a. We are currently developing an operating agreement for the desalination plant at Beckton with the Environment Agency.

b. We recognise that the desalination plant uses more energy than a normal water treatment works. However we are providing a new source of water for customers from estuarine water. We intend to generate all the energy used by the desalination plant from a renewable energy source, as such this plant will not have significant adverse environmental impacts or greenhouse gas emissions.

c. We are reviewing the availability of biofuel sources and the whole carbon lifecycle. The intention is to use waste products such as used cooking oil or tallows where possible. Every effort is being made to ensure food crops are not diverted for use in our fuel. We will not be using biodiesel derived from palm oil.

d. There are two factors that contribute to the differential between the costs for desalination quoted in 2006 and those given in the draft Plan for the Thames estuary south desalination scheme. Firstly, a comparative cost for the current desalination scheme in today’s prices would be closer to £250 million than the £200 million previously quoted. Secondly, it would be erroneous to assume that the costs of all desalination plants can be pro-rataed based on volume since site-specific circumstances will always influence the costs of individual schemes. In this particular instance the estuary south scheme is more distant from the river and has a longer and more difficult pipeline route, does not have the benefit of existing structures that can be reused for the scheme and is likely to require more onerous building works. Further the costs of pre-treatment per megalitre of water produced reduce with increasing plant throughput. This makes smaller schemes comparatively more expensive.

2.8.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.2.iv Reason for no changes

Further explanation is provided in section 2.8.2.ii. No change to the draft Plan is justified.

2.8.3 Effluent reuse

2.8.3.i Consultee representations

Several consultees raised effluent reuse as an option and requested more detailed evaluation by Thames Water of effluent reuse options with particular concern around public perception. Some consultees questioned whether reuse could be achieved using an alternative, cheaper, less energy intensive treatment process, citing Essex & Suffolk Water’s Langford scheme as an example. Other reuse schemes raised by consultees as options for consideration included Oxford (Sandford STW) reuse scheme, Hoddesdon reuse Sewerage Scheme and Deephams reuse Scheme.
2.8.3.ii Thames Water consideration

In the draft Plan, a number of options for potential reuse sites were identified. These were considered as part of the options review. The economic and environmental assessment concluded that effluent reuse (termed 'indirect potable reuse'), in an industrialised catchment such as London is a high energy, high carbon option, and although it is a good potential contingency option, there are currently better, more cost effective and sustainable alternatives. Consequently, as a result of the assessment, Deephams was the only option taken forward into the feasible list of resource options. One of the reasons being that Deephams had significantly better effluent quality than the other East London works of Beckton and Crossness.

We currently have an indirect potable reuse pilot plant operating for research purposes at Deephams Wastewater Treatment Works in London to help to understand the numerous important technical, quality, health, environmental and perception issues associated with indirect potable effluent reuse. We plan to operate this pilot plant for a minimum of two years alongside other wider research streams as set out in our draft Plan.

Based on research undertaken to date, the industrialised nature of the Deephams catchment raises a suite of risks that would not necessarily apply to the Langford plant. The ‘Langford’ process would not be sufficient to treat the more challenging effluent quality of the relatively heavily industrialised catchments of London. All traders who discharge to our sewers are subject to trade effluent consents. While we seek to ensure that we are aware of the quality of discharges made to our sewers, we cannot be completely confident that illegal or accidental discharges are not being made or that traders are comprehensive and completely up-to-date in the composition of their effluent. These risks have to be taken into account when considering planned effluent reuse from the Sewage Treatment Works and will be addressed using the "Water Safety Plan" approach. This is a new Drinking Water Inspectorate approach, which has been introduced subsequent to the Langford scheme. The pilot plant study is designed to test the level of treatment required and to provide robust evidence to our regulators and our customers. We need to reassure the Drinking Water Inspectorate that adequate safeguards are in place and all risks have been mitigated to ensure water quality standards will not be compromised. Currently, we strongly believe that Reverse Osmosis treatment will be required; this is a high energy, carbon intensive option.

Effluent discharges are an important component of the flow in many rivers, particularly under low flow conditions. These discharges are available for abstraction downstream and this unplanned indirect potable reuse is already widely practised in the Thames catchment. This is why we have concentrated our efforts on investigating the gain to resources of the reuse of effluents that would otherwise be lost to the freshwater catchment. I.e. those which discharge into the Thames Tideway.

We are also investigating planned indirect potable reuse in the freshwater catchment, including Oxford (Sandford Sewage Treatment Works). Preliminary water resources analysis indicates that a reuse plant at Sandford would be a benefit to the Swindon & Oxfordshire Water Resource Zone but it would result in a loss of resources in London. This is because not all water supplied to customers is returned to sewer as effluent (eg water used in gardening, washing cars, etc). The additional treatment that is required for reuse also uses water in the production process. It is likely that the concentrated effluent stream that would be produced from the reuse process may be unsuitable for return to the sewage works and would need to be tankered off-site. Additionally, to produce a resource benefit to Swindon & Oxfordshire the water from
the reuse plant would need to be reintroduced into supply in Swindon & Oxfordshire. There is therefore, the risk of forming a closed loop, in which undesirable contaminants become increasingly concentrated, which international research suggests should be avoided.

On a few occasions it may be possible to transfer flows between catchments. This is only possible if the stream downstream of the effluent outfall can be managed in such a way as to maintain water quality and flow objectives set by the Environment Agency. The Hoddesdon transfer is such a scheme where the effluent is transferred into the Lee catchment for abstraction into reservoir storage.

2.8.3.iii Changes to the Plan made as a result of consultee representations

We have expanded the number of potential reuse options included in the feasible options list to include alternative sites, see Tables 26 and 27 above. We have also begun an assessment into potential reuse sites across the Thames catchment, following the principles used in our reservoir site selection study. This will consider every sewage treatment works as a potential reuse site and use screening criteria, such as resource availability, effluent quality and impact on flow to identify the most promising locations relative to our need.

2.8.3.iv Reason for changes/no changes to the Plan

As set out in sub-section 2.8.3.ii, we have reviewed potential reuse options and have updated section 7.2 in the revised draft Plan accordingly.

2.8.4 Water grid

2.8.4.i Consultee representations

Several consultees raised the option of a national water grid and suggested that this would provide choice, efficiency and redress any regions with a water deficit.

2.8.4.ii Thames Water consideration

It is technically feasible to build a network of large pipelines to move water around the country and the additional reservoir storage that would be required to support such a grid. This has been suggested as an option for many years. In their 2006 publication the Environment Agency have reviewed the option and they concluded that a grid would only be worthwhile if the demand exceeded the supply in south east England and there are no better, cheaper options available locally. Their investigations indicated that the development of a reservoir supported grid would cost at least four times as much and be more environmentally damaging than developing resources local to the demand for water.

Our investigations have confirmed this view, which is also shared by the Institution of Civil Engineers. We have included in our unconstrained list of options transfers of water from the north of England using pipes, river regulation and canals in combination and pipelines alone. These long distance transfers are analogous to a water grid. We have similarly evaluated transfers from Wales. Our assessments have

26 Reservoir Site Selection Study Report, Thames Water, September 2006

27 Do we need large scale transfers for south east England?, Environment Agency, September 2006
shown that both environmental and economic costs are higher than our preferred local options. Further, we believe that a water grid is not sustainable because of the much higher carbon footprint, both in terms of embedded carbon and energy use in operation, when compared with local solutions.

2.8.4.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.4.iv Reasons for changes/no changes to the Plan

For the reasons set out in sub-section 2.8.4.ii above, a national water grid is not viewed to be a feasible option and no change to the draft Plan is justified.

2.8.5 Marsh Gibbon reservoir

2.8.5.i Consultee representations

The Marsh Gibbon option has caused considerable local concern specifically in view of the potential location and impacts and the insufficient consultation with the local Authority. The Buckinghamshire County Archaeologist has advised that the possible location in the parish of Ludgershall around the River Ray valley has one of the highest concentrations of ridge and furrow in the country. As such, their historic and natural environment value is of national importance.

2.8.5.ii Thames Water consideration

The methodology developed to identify potential reservoir sites was consulted on widely. Both English Heritage and Buckinghamshire County Council were invited to comment on the methodology. The process was based upon negative screening using published information and included a number of ‘absolute constraints’ one of which was for designated archaeological sites. As can be seen from the Site Selection study28, which is available on our website, the site at Marsh Gibbon was flagged as having an absolute constraint because of the archaeology present. However, it was possible to produce an outline design for a medium sized reservoir of 75 Mm$^3$ capacity which avoided the designated sites and this was taken forward for more detailed assessment. The more detailed assessment showed that the site of the proposed Upper Thames Reservoir near Abingdon was preferred over Marsh Gibbon for a reservoir of 75Mm$^3$ for a wide variety of reasons including floodplain encroachment (more than four times that at the Abingdon site), less visual and landscape character sensitivity, a greater opportunity for on-site mitigation and the lower number of local residents potentially impacted by construction. As Marsh Gibbon was not the preferred site no site-specific consultation was initiated with local stakeholders.

2.8.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.5.iv Reasons for changes/no changes to the Plan

28 Reservoir Site Selection Study Report, Thames Water, September 2006
For the reasons set out in sub-section 2.8.5.ii above no change to the draft Plan is justified.

2.8.6 WRB Lambourn scheme

2.8.6.i Consultee representations

One consultee questioned why the former Water Resources Board Lambourn Scheme is not included in the feasible water resources options list.

2.8.6.ii Thames Water consideration

The Lambourn scheme suggested in the Water Resource Board reports in the 1960s was developed and was completed for use in late 1976 known as the West Berkshire Groundwater Scheme. This scheme currently forms part of our water resource base and its yield is included in the Deployable Output for London. The scheme is a strategic drought scheme consisting of a large number of boreholes in West Berkshire including a wellfield in the Lambourn valley. The licences are held by the Environment Agency and use of the scheme is guided by the Lower Thames Operating Agreement. The scheme would be used 1 in every 20 years on average.

2.8.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.6.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.8.6.ii above, the Lambourn Scheme has been constructed and already forms part of the existing baseline resources available for London therefore no change to the draft WMRP is justified.

2.8.7 London artificial recharge

2.8.7.i Consultee representations

One consultee queried the Deployable Output of the London artificial recharge scheme given as 27 Ml/d in WRP04 and the Stage 1 BPEP, but reduced to 19 Ml/d in the draft Plan. Thames Water was requested to provide further explanation as to why the Deployable Output for the scheme has been reduced.

2.8.7.ii Thames Water consideration

This representation refers to the South London Artificial Recharge Scheme. The most likely resource benefit from the scheme was reduced from 27 Ml/d in WRP04 to 19 Ml/d for the draft Plan because of groundwater investigations undertaken in AMP4 (2005-2010). The gain estimated at WRP04 was based on estimates prior to drilling and testing of boreholes that will form part of the scheme. During AMP4 (2005-2010) work has progressed on the drilling and testing of such boreholes and this investigation programme has enabled a more accurate view of the scheme resource benefit to be produced.

2.8.7.iii Changes to the Plan made as a result of consultee representations

No changes.
2.8.7.iv Reasons for changes/no changes to the Plan

As explained in section 2.8.7.ii the Deployable Output of the scheme was revised after WRP04 for the reasons given above, the revised value is already incorporated in the original draft Plan and therefore a change to the draft Plan is not justified.

2.8.8 Didcot power station

2.8.8.i Consultee representations

Several consultees raised the amount of water used at Didcot power station and cited the potential future closure of Didcot as an opportunity for additional available water resources.

2.8.8.ii Thames Water consideration

The owners of Didcot power station, nPower, hold a licence to abstract water. We take licences held by other abstractors into account in the modelling and WRMP assessments. We are aware that the A (coal fired) station will close by 2015. However, in their response to our WRMP, nPower have confirmed that they require the same volume of water that is currently utilised and they have stated that they will oppose any proposal that prevents them from abstracting their full licensed quantity at Didcot. They have confirmed that they regard the site as being of national importance for the supply of power to the UK and of strategic importance to them and that the maintenance of their abstraction licence is central to their future plans.

2.8.8.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.8.iv Reasons for changes/no changes to the Plan

For the reasons set out in section 2.8.8.ii above no change to the draft Plan is justified.

2.8.9 Longdon Marsh

2.8.9.i Consultee representations

Several consultees raised the option of a smaller reservoir at Longdon Marsh, linked to the Severn Thames transfer scheme, and requested that this option should be properly assessed and costed.

2.8.9.ii Thames Water consideration

We were aware that Longdon Marsh had been identified in the early 1970s by the Central Water Planning Unit (CWPU) as an alternative for comparison with other reservoir options then identified. It is within Severn Trent Water’s supply area and appears in both their current draft Plan list of options and in former plans. Since the publication of the draft Plan, we have carried out an appraisal of the Longdon Marsh scheme suggested as an alternative to the proposed Upper Thames Reservoir by some consultees. The scheme does not pass the tests in our site selection process\textsuperscript{29}, the methodology for which we consulted on widely. The main reasons are as follows:

\textsuperscript{29} Reservoir Site Selection Study Report, Thames Water, September 2006
- It is located in a functional floodplain of the River Severn (it is immediately upstream of Tewkesbury) and would be rejected on this basis by the Environment Agency.
- There is no land available in the Severn valley near Longdon Marsh to develop flood compensation storage on the level for level basis that would be required by the Environment Agency.
- The carbon footprint would be greater than for a Thames catchment option because of the need to pump water over the Cotswolds for discharge into the Thames.

2.8.9.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.9.iv Reasons for changes/no changes to the Plan

For the reasons set out in section 2.8.9.ii above, no change to the draft Plan is justified.

2.8.10 Transfer of water between water resource zones

2.8.10.i Consultee representations

Consultees questioned whether the surplus in Slough, Wycombe & Aylesbury, Kennet Valley, Guildford and Henley Water Resource Zones could be used to supplement the London and Swindon & Oxfordshire Water Resource Zones identified to be in deficit.

2.8.10.ii Thames Water consideration

Transfers between water resource zones, known as inter-zonal transfers, were considered in the draft Plan and identified in the generic list of options. Specific options were not taken forward to the unconstrained and feasible lists on the basis of:

a. Geographical constraints – Guildford Water Resource Zone is geographically separate from our other water resource zones and significant development of the distribution network would be required to utilise the available surplus.

b. Potential sustainability reductions – Kennet Valley Water Resource Zone has a number of environmental investigations that may lead to reductions in licensed abstraction, precluding the long-term viability of any transfer.

c. Materiality – we have reviewed possibilities to transfer water from Henley Water Resource Zone, however there is surplus water in Kennet and Slough, Wycombe & Aylesbury Water Resource Zone, the neighbouring water resource zones, and the main demand centres in Swindon & Oxfordshire Water Resource Zone are a long distance from Henley Water Resource Zone hence it is not a cost effective solution and has not been taken forward.

d. Transfers downstream – it is not good practice to transfer water downstream, and this would not be supported by the Environment Agency.

2.8.10.iii Changes to the Plan made as a result of consultee representations
In response to consultee representations in the revised draft Plan we have given fuller consideration to, and included, three options for the transfer of water from Slough, Wycombe & Aylesbury to the Swindon & Oxfordshire Water Resource Zones. These all involve the transfer of water in the north west of Slough, Wycombe & Aylesbury Water Resource Zone towards Oxford and incorporate new distribution mains and capacity upgrades to existing infrastructure. These have been carried forward into the unconstrained and feasible options lists in Section 7.2 of the revised draft Plan.

2.8.10.iv  Reason for changes/no changes to the Plan

Following a review of inter-zonal transfers based on consultee representations, three options to transfer water from Slough, Wycombe & Aylesbury to Swindon & Oxfordshire Water Resource Zones have been brought forward into the feasible list of schemes.

2.8.11 Rising groundwater in London

2.8.11.i Consultee representations

Some consultees raised the option of utilising the rising groundwater in London as a water resource option.

2.8.11.ii Thames Water consideration

We have been working with external partners to explore opportunities linked to rising groundwater in London for several years. In recent years we have extended existing sources and developed a number of new sources to exploit rising groundwater under London thereby benefiting from the resource available. Groundwater levels in the chalk aquifer beneath London have now broadly stabilised and beneath some parts of London groundwater levels have fallen. In future, the development of new groundwater abstraction schemes from the chalk aquifer beneath London will require support from artificial recharge. This would follow the principles of our North London Artificial Recharge Scheme, and we are currently exploring the potential of similar schemes in South London.

2.8.11.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.11.iv  Reasons for changes/no changes to the Plan

As explained in section 2.8.11.ii there are currently no further opportunities from rising groundwater in London. No changes to the draft Plan are justified.

2.8.12 Utilisation of local aquifers in the Thames Valley

2.8.12.i Consultee representations

Consultees have raised the question of whether increased abstraction from local aquifers in the Thames Valley is possible.
2.8.12.ii Thames Water consideration

The Thames catchment is one of the most extensively exploited in the country and all the major aquifers within the Thames Water supply area have been developed, to some extent, for water supply abstraction, many to their full potential. In recent years, it has become apparent that this level of abstraction has been unsustainable in a number of catchments, consequently there has been a requirement for abstraction to be reduced in some areas, notably the Cotswolds, the Chilterns and in the Darent Valley in south east London. This history of intense usage of available aquifer storage for water supply has meant that there is very little remaining potential for further new conventional groundwater abstraction. This position has been largely reinforced as a result of the Environment Agency’s development of Catchment Abstraction Management Strategies. The assessments carried out as part of the Catchment Abstraction Management Strategies processes have identified very few groundwater units where there is water available for use. In those areas where there is the potential for future development of groundwater then the volumes available tend to be relatively small.

The one area where there is the potential for significant further groundwater development is in the area of the middle Thames catchment adjacent to the River Thames, for example in the Goring Gap. We have identified the potential for increased groundwater abstraction in this area and have included these options in our plan. Any further groundwater abstraction in this area would need to be used to meet demand further up the catchment so that the returned effluent enters the river system upstream of the point of abstraction. This upstream use ensures that there is insignificant net consumptive abstraction thereby ensuring no adverse environmental impact.

2.8.12.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.12.iv Reasons for changes/no changes to the Plan

As explained in section 2.8.12.iii the major aquifers within the Thames Water supply area have been developed, to some extent, for water supply abstraction, there is very little remaining potential for further new conventional groundwater abstraction. This position has been largely reinforced as a result of the Environment Agency’s development of Catchment Abstraction Management Strategies. The one area where there is potential for significant new groundwater development is in the middle Thames catchment and these schemes are already identified in Section 7.2 of Volume 2 of the revised draft Plan. No changes to the draft Plan are justified.

2.8.13 Aquifer Storage and Recovery

2.8.13.i Consultee representations

Several consultees raised the option of Aquifer Storage and Recovery.

2.8.13.ii Thames Water consideration

We have carried out preliminary investigations into the potential sites where Aquifer Storage and Recovery could be developed in the Thames Valley. A number of potential sites have been identified and are included in the list of potential resource
options, however there are a limited number of sites where the potential to develop Aquifer Storage and Recovery exists.

2.8.13.iii Changes to the Plan made as a result of consultee representations

No changes.

2.8.13.iv Reasons for changes/no changes to the Plan

As explained in section 2.8.13.ii investigations have been undertaken into ASR options in Thames Valley and these are included in the draft Plan. No changes to the draft Plan are justified.
2.9 Preferred supply-demand programme

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Support for demand management</td>
</tr>
<tr>
<td>2. Demand management contribution to the supply demand balance</td>
</tr>
<tr>
<td>3. Profile of Baseline Water Available for Use (WAFU)</td>
</tr>
</tbody>
</table>

2.9.1 Support for demand management

2.9.1.i Consultee representations

Several consultees expressed support for the strong focus on demand management and its importance in achieving a sustainable reduction in water use. Consultees also endorsed the dovetailing of the mains replacement and metering programmes with the proposed enhanced water efficiency strategy to support customers in delivering savings and tackling customer pipe leakage.

2.9.1.ii Thames Water consideration

We welcome support for the demand management programme. We believe that demand management is an important component of a sustainable water resources strategy, however there are more risks to demand management than supply side schemes and it is important to have a balanced approach with an appropriate level of risk.

We also welcome support for the Integrated Demand Management approach, which we believe that it is the most sustainable and cost effective way to undertake significant programmes of demand management activity.

2.9.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.9.1.iv Reason for changes/no changes to the Plan

The support expressed for our approach to demand management programmes and the integrated delivery approach is welcomed. There were no objections made to the approach in the representations submitted. No changes to the draft Plan are justified.

2.9.2 Demand management contribution to the supply demand balance

2.9.2.i Consultee representations

Several consultees queried elements of the demand management programmes and questioned whether Thames Water’s plan was sufficiently ambitious with respect to demand management whilst other consultees questioned whether demand management could realistically deliver the attributed savings.

In addition, one consultee highlighted that with the proposed Upper Thames Reservoir recognised as being the preferred long-term solution to water resources in the Swindon & Oxfordshire area, focus should be maintained on reducing water demand in case of delays in its commissioning.
2.9.2.ii  Thames Water consideration

As we explained in the draft Plan, in line with our Strategic Direction Statement and customer’s preferences we have included a robust programme of demand management in our draft Plan. However the business case for demand management can only be driven by the need to balance supply and demand and the customer’s willingness to pay for going beyond a least-cost solution. The original demand management programme is based on this economic framework and so is the revised programme discussed herein. The savings attributed to demand management activities are based on best available knowledge but there is a higher risk associated with demand management measures than water resources schemes.

With regard to the focus being maintained on demand management in Swindon & Oxfordshire Water Resource Zone, we would agree with this point, and within the allowed economic framework, we believe we have achieved this both in the original and revised draft Plan.

2.9.2.iii  Changes to the Plan made as a result of consultee representations

No changes.

The economic approach is discussed in Volume 2, section 8 of the draft Plan. However, the changes to the demand management programme are presented in section 3 of this Statement.

2.9.2.iv  Reason for changes/no changes to the Plan

Section 3 sets out the material changes that have arisen from consideration of representations to the public consultation and the resultant changes to the draft Plan. Section 3 has been included as a new Appendix to the revised draft Plan.

2.9.3  Profile of Baseline Water Available For Use (WAFU)

2.9.3.i  Consultee representations

One consultee queried what factors led to the sharp reduction in Baseline Water Available For Use (WAFU) and the Final supply demand planning demand profiles after 2014/15 and could identification of these factors encourage similar reductions in later periods.

2.9.3.ii  Thames Water consideration

There are no sharp reductions in Baseline WAFU. The changes in Baseline WAFU are related to climate change. In the Final Supply Demand profile there is a step change in demand around 2014/15, this is linked to the introduction of tariffs. The impact of tariffs on demand is continued throughout the planning period.

2.9.3.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.9.3.iv  Reason for no changes

Sub-section 2.9.3.ii explains the factor driving the step change in the Final supply demand planning profiles. No changes to the draft Plan are justified.
2.10 Leakage

Summary table of main issues

<table>
<thead>
<tr>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leakage – forecast increase over planning period</td>
</tr>
<tr>
<td>2. Sustainable level of leakage – application to all water resource zones</td>
</tr>
<tr>
<td>3. Sustainable level of leakage – the economic justification</td>
</tr>
<tr>
<td>4. Sustainable level of leakage – accounting for the wider sustainability benefits</td>
</tr>
<tr>
<td>5. Customer side leakage</td>
</tr>
<tr>
<td>6. Leakage and water efficiency</td>
</tr>
<tr>
<td>7. Comparative leakage information</td>
</tr>
</tbody>
</table>

2.10.1 Leakage – forecast increase over planning period

2.10.1.i Consultee representations

a. Thames Water has a long history of high leakage in London and consultees welcomed the significant reduction in leakage achieved over recent years. However consultees were concerned that Thames Water is planning for increases in the baseline leakage forecast (although small) during the planning period and questioned whether the high leakage rates represented an accurate economic level of leakage.

b. Furthermore consultees specifically expressed concern with the statement that:

"Beyond 2021 there is no supply demand driver for further mains replacement..." when read with the later statement that "....at 2021, we will still expect to have the highest rate of burst mains in England and Wales due to the number of old cast iron mains that will still be in situ in London..."

Consultees did not view this to be satisfactory and stated that customers could reasonably expect that once current street works are completed, London will have a water supply system that meets the very best international standards and should not still be faced with "the highest rate of burst mains in England and Wales" and "old cast iron mains that will still be in situ".

Thames Water should investigate what further reductions to leakage could be made during the 2020s and include it in future options taking into account the expertise that would have been built up in this field. Furthermore Thames Water should conform to Government policy and not plan to allow leakage to rise at any time during its planning period.

2.10.1.ii Thames Water consideration

The representations are primarily concerned with the level of leakage and the planned reduction in leakage over time, particularly the post 2020 leakage programme.
We welcome the support of consultees for our efforts to significantly reduce leakage. With regard to the slowdown in the forecast leakage reduction past 2021, prior to this date leakage levels are forecast to reduce markedly. Beyond this period, leakage reduction as a potential scheme to manage the supply demand balance becomes an extremely expensive option because the amount of leakage saved per kilometre of mains replaced reduces significantly given that the mains in our supply area in poor condition with high levels of leakage and bursts will have largely been renewed. The leakage remaining in the network is likely to be the result of a number of small ‘background’ leaks over a wide geographical area. These leaks are difficult to detect because of their size and the leakage saving per length of main replaced would be small. Thus there is no longer a strong cost benefit justification to undertake mains replacement in comparison to other options to manage the supply demand balance. This relationship is illustrated in Figure 14 where the cost to achieve leakage reduction through mains replacement over time from 2010 to 2035 is shown against the projected savings that would be achieved. It can be seen that in the first 5 years the forecast mains replacement expenditure per Ml/d of water saved is approximately £6 million. In the five-year period 2020-2025 the forecast mains replacement expenditure per Ml/d of water saved has more than doubled to approximately £13 million.

![Figure 14: Relationship between leakage reduction and the cost of mains replacement](image.png)

As part of the extensive customer research that we undertook to understand our customers' priorities to help inform our 25 year Strategic Direction Statement (SDS) and our 2009 Business Plan, we asked customers about their willingness to pay for ongoing leakage reduction over and above that which would form part of a strict economic least cost plan to balance supply and demand. This work showed that leakage reduction is a key priority for our customers and we have included their willingness to pay for additional leakage control activity in London in our draft Water Resources Management Plan as part of our justification for the levels of activity proposed. Nevertheless, even when this extra expenditure is taken into account it does not support a mains replacement programme of the size that would be necessary to manage the supply demand balance in the period after 2020.
Customers’ willingness to pay for leakage reduction activity is discussed in further detail in section 2.10.3.ii.

Funding to facilitate ongoing mains replacement activity after 2020 to ensure that leakage levels and associated burst mains continue to be maintained is justified through our capital maintenance programme. By this time our leakage levels will be in line with the industry average but, given the adverse conditions associated with the corrosive London clay and the difficulties of working in a large congested urban area, we are still likely to have the highest leakage detection and repair levels of any other company serving the London area, or indeed in the United Kingdom. Our programme of activity proposed over the period 2010 - 2020 is designed to balance reducing leakage, the cost of undertaking this activity, maintaining the network and minimising traffic disruption in order to bring us in line with the industry average. Table 27 shows metrics for leakage performance over the planning period in our revised draft Plan.

Table 27: Leakage reduction over the period 2005 – 2035 (litres/property/day)

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<td>160</td>
<td>132</td>
<td>122</td>
<td>117</td>
<td>113</td>
</tr>
<tr>
<td>London WRZ</td>
<td>204</td>
<td>168</td>
<td>133</td>
<td>123</td>
<td>118</td>
<td>114</td>
</tr>
<tr>
<td>Thames Valley WRZ</td>
<td>146</td>
<td>135</td>
<td>127</td>
<td>119</td>
<td>114</td>
<td>110</td>
</tr>
</tbody>
</table>

Forecasts for leakage reduction included in our revised draft Plan have changed due to two factors. Firstly, the revised demand forecasts which have been previously discussed in section 2.3 and secondly, updated information related to greater savings associated with the repair of customer side leaks as part of the Victorian Mains Replacement work. These changes in leakage reduction forecasts were not related to the consultee representations detailed in section 2.10.1.i but were associated with addressing other representations.

2.10.1.iii Changes to the Plan made as a result of consultee representations

In line with the Environment Agency’s revised Water Resources Planning Guideline, we are not forecasting increasing leakage levels over time. Our revised draft Plan includes increased activity to offset any increase in leakage associated with the construction of new properties and the associated increase in water mains and fittings.

2.10.1.iv Reasons for changes/no changes to the Plan

In sub-section 2.10.1.ii it is explained why we do not consider that there is justification for a large ongoing mains replacement to manage the supply demand balance in the period after 2020. Therefore, no changes to the draft Plan are justified in relation to the relative magnitude of leakage reduction in the period after 2020.
2.10.2 Sustainable level of leakage – application to all water resource zones

2.10.2.i Consultee representations

Consultees generally support action beyond the economic level of leakage in the London Water Resource Zone, planning to a sustainable level of leakage. It was questioned why this approach should not be applied across all water resource zones.

2.10.2.ii Thames Water consideration

As stated in sub-section 2.10.1.ii customer surveys showed that people are willing to pay for leakage levels that exceed traditional least cost levels of leakage in London. This will bring the Company’s leakage levels broadly in line with the industry average by 2020. In Swindon & Oxfordshire Water Resource Zone, leakage reduction has been identified as a short-term measure in order to address the supply demand balance. The water resource zones of Kennet Valley, Guildford, Slough, Wycombe & Aylesbury and Henley are all in surplus, therefore there is no deficit to justify and drive investment beyond ‘least cost levels of leakage’ in these water resource zones. As a result these resource zones are already operating below their strict least cost level of leakage, therefore akin to the sustainable level of leakage.

2.10.2.iii Changes to the Plan

No changes.

2.10.2.iv Reason for no changes:

For the reasons set out in paragraph 2.10.2.ii above, no change to the draft Plan is justified.

2.10.3 Sustainable level of leakage – the economic justification

2.10.3.i Consultee representations

A number of consultees highlighted the need to define a sustainable level of leakage and explain how this is calculated.

Some consultees highlighted that the projected cost of this element exceeds other action by at least a factor of four and that the law of diminishing returns would suggest that there will be a point where the costs of this enhanced level of activity far outweigh the value of the water saved. Consultees asked that Thames Water provides robust evidence to support their assessment of customers' willingness to pay, and that its customers are willing to pay to reduce leakage even when leakage reduction is more expensive than other measures to balance supply and demand. Thames Water must make sure that its customers understand that this will make their bills permanently higher than they need to be. Consultees urged the regulators to ensure that Thames Water is not simply pursuing this course to satisfy public perceptions but it is supported by a strong business case.

2.10.3.ii Thames Water consideration

The sustainable level of leakage encompasses economic, environmental and social implications of providing an additional water supply instead of further reducing leakage. We have calculated the sustainable level of leakage using two complementary methodologies, which gave analogous results. The first examined the
average incremental social costs (AISC) of each of the new supply and demand schemes and compared these values against the AISC of leakage reduction. The average incremental cost calculation incorporates economic, environmental and social costs and customers' Willingness to Pay (WTP) for reducing leakage below traditional least cost levels of leakage. The second methodology used a full economic appraisal to weigh up alternative programmes of leakage reduction against customer willingness to pay. The sustainable level of leakage was that which gave the maximum leakage reduction whilst constraining the additional impact on customer bills to that which customers have stated they are willing to pay.

In Appendix J of the draft Plan, we provided an overview of the research conducted by Corr Willbourn on consumers' willingness to pay. Our research demonstrated that leakage reduction is a high priority for our customers and they are willing to pay for leakage reductions beyond traditional least cost economic levels. Ofwat, the economic regulator of the water industry, will only support this programme if customers are willing to pay for the additional cost of this activity above cheaper options such as the development of new water supplies. Therefore, we have also undertaken a stated preference study to evaluate our customers’ willingness to pay to reduce leakage for its own sake, without accounting for any additional benefits in terms of reduced incidence of hosepipe bans etc. Our approach sought to derive willingness to pay values using a variety of econometric techniques such as payment card and dichotomous choice techniques to ensure that both upper and lower bound values were determined. The overall level of leakage reduction included in our draft Plan is in line with the additional willingness to pay that our customers have indicated they are prepared to pay for the activity to go beyond a strict least cost level.

2.10.3.iii Changes to the Plan

Our revised draft Plan includes additional text to explain how our customers’ willingness to pay for additional leakage control activity has been determined. In section 7.3.2.8 the following text has been included and Appendix J has been updated.

“Customer's willingness to pay for leakage reduction

In 2008 we undertook a stated preference study to evaluate our customers' willingness to pay (WTP) to reduce leakage for its own sake, without accounting for any additional benefits in terms of reduced incidence of hosepipe bans etc. Our approach sought to derive WTP values through both payment card and dichotomous choice techniques to ensure that both upper and lower bound values were determined. A total of 500 households were sampled.

Interpretation of the results is not straightforward and there is low confidence in the value derived from the dichotomous choice results (the upper bound). Our consultants have conservatively recommended that these are amended in a way that brings the mean value close to that derived from the payment card. It is our view that the 'true' WTP probably lies somewhere between the payment card and unamended dichotomous choice value represented by the range £16.62 - £17.24 per household per year. This means that at the low end of the range the proposed programme has negative NPV, at the high end positive NPV. However, there will also be additional benefits arising from leakage reduction relating to its contribution to security of supply.”
2.10.3.iv Reason for changes/no changes to the Plan

In response to representations as set out in sub-section 2.10.3.i our revised draft Plan includes additional text to explain how our customers’ willingness to pay for additional leakage control activity has been determined.

2.10.4 Sustainable level of leakage – accounting for the wider sustainability benefits

2.10.4.i Consultee representations

Some consultees questioned whether the Economic Level of Leakage (ELL) takes adequate account of the wider sustainability benefits of reducing leakage in a highly water stressed area.

2.10.4.ii Thames Water consideration

We have followed guidance provided by Ofwat and accounted for wider sustainability through calculating sustainable levels of leakage. This method as stated in paragraph 2.10.3.ii seeks to incorporate all of the environmental and social implications of further reducing levels of leakage.

2.10.4.iii Changes to the Plan

No changes.

2.10.4.iv Reason for changes/no changes to the Plan

For the reasons set out in sub-section 2.10.4.ii the consultees representation has been accounted for in the methodology used for the draft Plan and no further changes are required.

2.10.5 Customer side leakage

2.10.5.i Consultee representations

Consultees questioned whether, with 26 per cent of all leakage occurring on customers’ premises, and metering helping to reduce this problem, the leakage targets are stated in the draft Plan achievable without much real effort on behalf of Thames Water.

2.10.5.ii Thames Water consideration

In determining the leakage reduction levels included in our draft Plan we recognised that achieving reductions in customer side leakage would require additional activity. Our plans to extensively implement household metering throughout our supply area will help identify leakage on customer supply pipes as the preferred location for the meters will be external to the property at the start of the customer supply pipe. The meter reading will therefore record any supply pipe leakage and as such there will be an incentive for the customer to have the leak repaired. Furthermore, we are intending to install intelligent meters as part of this activity. These will automatically identify the presence of ongoing continuous flows at a property and thus can quickly indicate the occurrence of customer side leakage. Our calculations used to derive the company leakage level assume leakage will be reduced by 75% following the installation of the meter, and subsequent repair of any leaks identified at that time.
However, it should be noted that there is considerable overlap of benefits from the metering programme and the VMR programme, under which meters are installed to target customer side leakage, and this is taken into account in our calculations.

2.10.5.iii Changes to the Plan

No changes.

2.10.5.iv Reason for changes/no changes to the Plan

The explanation set out in sub-section 2.10.5ii demonstrates that we have already given the matter of detecting customer side leakage full consideration in the draft Plan. No further changes are required.

2.10.6 Leakage and Water Efficiency Measures

2.10.6.i Consultee representations

Some consultees suggested that high leakage rates make it difficult to promote water efficiency to customers and additional techniques of dealing with leakage reduction need to be developed by Thames Water.

2.10.6.ii Thames Water consideration

We agree that it is difficult to effectively promote water efficiency with a backdrop of high leakage levels. However, in the last two years the Company has achieved and also surpassed the leakage targets that it has agreed with the water industry regulator Ofwat and over the last 4 years we have reduced total leakage by 25%. This has certainly helped to change customer perception to recognise that Thames Water is actively managing water supplies and helps to encourage customers to recognise the importance of water efficiency.

Furthermore, as discussed above in paragraph 2.10.3.ii the Company is promoting the concept of the sustainable level of leakage to help increase the level of leakage reduction activity above the strict least cost economic level. We have devised a number of techniques and promoted innovative programmes of activity to assist in the Company’s efforts to reduce leakage. These include the extensive mains replacement programme, the construction and subsequent deployment of ‘Leakfrogs’ to assist in identifying customer supply pipe leakage, the intention to roll out household metering throughout the supply area and install intelligent meters as part of this activity, and the current programme of water pump installation in high rise building in London to enable enhanced pressure management activity. As part of the strive for ongoing efficiency the Company will always be seeking innovative measures to help reduce leakage and improve customer Levels of Service.

2.10.6.iii Changes to the Plan

No changes.

2.10.6.iv Reason for changes/no changes to the Plan

The consideration provided in sub-section 2.10.6 ii is a justifiable approach and therefore no changes are required to the draft plan with respect to the techniques being used to reduce leakage.
2.10.7 Comparative leakage information

2.10.7.i Consultee representations

Several consultees asked how our leakage rates compared with other UK companies and other countries.

2.10.7.ii Thames Water consideration

It is not straightforward to compare leakage rates in other countries with those in the UK. The approaches and parameters used to measure and report leakage can vary significantly. The European Environment Agency recently published levels of leakage as a percentage of distribution input across Europe, this is available via the Ofwat website but Ofwat advise that these data need to be interpreted with a view to the data variabilities.

Ofwat publish details of England and Wales companies’ leakage performance\(^30\) and Ofwat use this data to compare companies’ performance taking into consideration variables unique to the characteristics of the supply area such as average system pressure and the nature of the catchment.

2.10.7.iii Changes to the Plan made as a result of consultee representations

No changes.

2.10.7.iv Reason for changes/no changes to the Plan

The information set out in sub-section 2.10.7.ii is intended to signpost further information to consultees on comparative leakage rates in the UK and in other countries. No further changes to the draft Plan are justified.

2.11 Metering and tariffs

Summary table of main issues

<table>
<thead>
<tr>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Support for compulsory metering strategy</td>
</tr>
<tr>
<td>2. Higher level of meter penetration</td>
</tr>
<tr>
<td>3. Information on costs associated with metering</td>
</tr>
<tr>
<td>4. Impact of metering on customers’ bills and revenue</td>
</tr>
<tr>
<td>5. Installation of meters on new properties</td>
</tr>
<tr>
<td>6. Ongoing tariff trials and exploration of the use of variable tariffs</td>
</tr>
<tr>
<td>7. Protection of vulnerable customers</td>
</tr>
</tbody>
</table>

2.11.1 Support for compulsory metering strategy

2.11.1.i Consultee representations

The majority of consultee representations relating to metering supported the proposed programme of compulsory metering and expressed a view that metering is the fairest way to pay for water and a vital part of managing demand.

However some consultees thought that more work should be done to assess the benefits and indicate whether metering is the most effective method of reducing consumption.

Some consultees also expressed preferences for the use of internal meters that can be readily read by householders and also read remotely by Thames Water.

2.11.1.ii Thames Water consideration

We welcome the support shown for the implementation of a compulsory metering programme as a component of the overall strategy to deliver security of water supply to our customers. We believe that metering is an important tool to help customers to identify the need and benefit of being water wise and to increase the effectiveness of other demand management initiatives. In particular increased meter penetration will enable us to detect leakage on customer supply pipes more effectively and account for water more precisely in the overall water balance. Metering will also provide us with a key enabler for more strategic tariffs to manage peak demands and help to control demand during drought.

We also understand that for some, compulsory metering is controversial and may result in higher bills for some customers. We believe that with adequate protection for vulnerable customers, please see sub-section 2.11.4, metering is the fairest way to pay for water, better reflecting levels of consumption.

We plan to continue to build our knowledge on metering as we rollout the programme, to monitor the costs and benefits of metering and also to undertake tariff trials.

Our preference is to install external meters: this is more cost-beneficial over the life of the meter due to the customer side leakage detection benefits that it provides. We
will fit internal meters in premises where this is more appropriate such as blocks of flats.

We will use Automated Meter Reads (AMR) technology for all new meter installations from AMP5 onwards. This development will aid the reading of internally located meters, supporting our levels of service under the Ofwat DG8\textsuperscript{31} measure. It will also provide improved meter reading productivity as the meter estate increases and supports the development of new tariffs to generate appropriate price signals to customers to manage demand.

2.11.1.iii Changes to the Plan made as a result of consultee representations

We continue to support metering however the revisions in the demand forecast as discussed in section 2.3, means that the driver to rapidly increase new meter installation activity from 2010 onwards is now not as strong and allows a more steady increase in activity over the next 15 years.

We also continue to look at ways in which we can deliver metering in tandem with other investment activities to reduce disruption and to minimise risk. The Company’s plan is to install and activate meters as part of our mains replacement programmes in London as advocated in our integrated demand management (IDM) approach. Our overall metering policy and review of installation figures are provided in sub-section 2.12.2.iii and section 3. This information will replace section 9.2.2 in Volume 2 of the draft Plan.

2.11.1.iv Reason for changes/no changes to the Plan

The review of our draft Plan has resulted in a lower future demand forecast than previously anticipated. This has reduced the amount of activity required to balance supply and demand in London and Swindon and Oxfordshire Water Resource Zones. As a result we have spread our metering proposals over a longer timescale in order to maximise cost effective implementation whilst delivering our strategic objectives.

The Company will continue to adopt an IDM approach to metering in London, capitalising on the fact that we are already undertaking activity in a locality and maximising complementary investment whilst we are in a geographical area. This coordination of investment activity helps to overcome some of the specific cost drivers that affect metering as a stand-alone activity in London (for example, congestion and Traffic Management Act permitting costs) and means we will be metering at the lowest possible cost to customers.

2.11.2 Higher level of meter penetration

2.11.2.1 Consultee representations

Some consultees challenged Thames Water on the target level of meter penetration and questioned why Thames Water is not seeking higher meter penetration rates through this process and aiming for 90 per cent by the end of the plan period.

\textsuperscript{31} Ofwat DG8 measure: Bills for metered customers
2.11.2.ii  Thames Water consideration

We have based our metering proposals on geographical trials undertaken in London together with operational experience of the installation of meters in domestic premises across our supply area since the early 1990s.

We maintain that achieving higher than 80 per cent penetration of meters on single properties will be very difficult and would need to allow for the separation of complex supplies, particularly in flats, resulting in excessive cost to customers.

Our metering proposals, along with other components of the draft WRMP, are scrutinised by our regulators to ensure they are appropriate in relation to our supply demand balance position, they are cost effective and contribute to a sustainable plan. We have developed a metering programme which appropriately balances operational risk with the benefits afforded to the supply demand balance to ensure we install meters in the most cost-effective way possible. Where it is not cost effective to meter individual properties, a bulk meter will be used with the aim of metering 100 per cent of connections from our mains. This will enable us to identify leakage on the joint supply, improving our network management data and may enable a review of assessed charges based on the bulk meter readings.

Our experience of the first 5-years of the compulsory metering programme will enable us to revise our estimates as necessary for AMP6 (2015-2020).

2.11.2.iii  Changes to the Plan made as a result of consultee representations

We remain committed to installing meters where economic to do so and thus increase individual household meter penetration. The reduced pace of meter installation proposed (as stated in sub-section 2.11.1.iii) in the revised draft Plan does not change our position in terms of reaching a potential overall penetration of around 80 per cent, however it does mean this will now be achieved by 2025, rather than 2020.

Table 28 below replaces Table 48, section 9.2.2, Volume 2 of the revised draft Plan.

Table 28: Household meter penetration by 2034/35

<table>
<thead>
<tr>
<th>Household Meter Penetration (%)</th>
<th>End AMP4</th>
<th>End AMP5</th>
<th>End AMP6</th>
<th>End AMP7</th>
<th>End AMP8</th>
<th>End AMP9</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>23%</td>
<td>41%</td>
<td>60%</td>
<td>77%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>Thames Valley</td>
<td>44%</td>
<td>57%</td>
<td>71%</td>
<td>89%</td>
<td>91%</td>
<td>92%</td>
</tr>
<tr>
<td>TWUL</td>
<td>28%</td>
<td>45%</td>
<td>63%</td>
<td>80%</td>
<td>82%</td>
<td>83%</td>
</tr>
</tbody>
</table>

Our overall metering policy and review of installation figures are provided in section 3. This will replace sub-section 9.2.2 in Volume 2 of the draft Plan.

2.11.2.iv  Reason for changes/no changes to the Plan

For the reasons set out in sub-section 2.11.2.ii, the proposed metering programme is appropriate in terms of the scale and the delivery timeframe and can be justified in terms of costs to our customers.
2.11.3 Information on costs associated with metering

2.11.3.i Consultee representation:

Some consultees argued that Thames Water should provide clear cost information relating to their metering strategy, including cost of baseline metering as well as proposals under the Final Planning scenario.

2.11.3.ii Thames Water consideration

We have undertaken a comprehensive analysis of metering costs and benefits since the draft Plan to set out the economic rationale for our metering strategy. We have used the model developed by WRc in collaboration with ten water companies to analyse the costs and benefits of different approaches to metering, to identify the most cost-effective policy and approach, taking account of different operating environments and external constraints arising from different policies.

The model takes into account the following costs:

- Meter installation costs – the largest component of cost. Unit costs of meter installation are applied to the number of meters expected to be installed and then converted to annual costs based on the meter asset life.
- Meter replacement costs – Taking account of wear with consumption, the replacement cost at the end of the meter asset life is included in the model and annualised.
- Social and environmental costs – allowance is made for carbon costs associated with meters.
- Operating costs – including costs of meter reading, customer contact and billing. This also takes account of opex savings associated with AMR technology via improved meter reading productivity.

Benefits associated with each metering approach are based on two key factors:

- a. Reductions in household consumption (m³/household/year)
- b. Reductions in supply pipe leakage (m³/household/year) but only applying to externally metered properties.

Costs and benefits are assessed over a 25-year period.

A number of scenarios are run through the model to test the following hypotheses, which are central to our metering policy for AMP5:

1. That it is more cost-beneficial to meter externally – i.e. that the additional cost of installation, largely due to excavation and reinstatement, is offset by the additional benefits associated with supply pipe leakage detection.
2. That it is more cost-beneficial to install AMR technology on all meters – i.e. that the additional benefits of reduced meter reading opex together with the benefits of improved data storage and communication (for example, assisting leakage detection, network management and tariffing), outweigh the additional up front capex cost of the AMR device.

Meter location

The table below compares the modelled costs and benefits associated with different meter location choices and ranks based on the overall ratio of benefits to cost.
Table 29: Modelled costs and benefits associated with different meter location choices

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Internal</th>
<th>External</th>
<th>Total costs £m</th>
<th>Total water savings Ml</th>
<th>Cost Benefit Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>100%</td>
<td>0%</td>
<td>566,806</td>
<td>595,546</td>
<td>3</td>
</tr>
<tr>
<td>External</td>
<td>0%</td>
<td>100%</td>
<td>640,937</td>
<td>2,580,106</td>
<td>1</td>
</tr>
<tr>
<td>Plan</td>
<td>25%</td>
<td>75%</td>
<td>622,405</td>
<td>2,068,966</td>
<td>2</td>
</tr>
</tbody>
</table>

This shows that external metering, although higher cost is overall more cost beneficial, due to the size of the benefit associated with supply pipe leakage detection. Our approach is to meter externally where possible, however the draft Plan recognises that this is constrained by type of property for example, blocks of flats.

**Manual or AMR**

Our analysis includes a full evaluation of the use of Automated Meter Reading (AMR) technology, quantifying the additional benefits that this will bring in terms of operating cost reductions and improved leakage targeting.

Table 30: Manual or AMR

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total costs £m</th>
<th>Total water savings Ml</th>
<th>Cost Benefit Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Read</td>
<td>737,142</td>
<td>1,897,512</td>
<td>2</td>
</tr>
<tr>
<td>AMR</td>
<td>622,405</td>
<td>2,068,966</td>
<td>1</td>
</tr>
</tbody>
</table>

This shows that whilst there is additional up front capex cost associated with AMR, the opex benefits (for example, meter reading productivity, additional data for improved network management) over a 25 year period, taking account of maintenance/replacement needs mean that the total NPV cost is less than for manually read meters. Overall AMR represents a more cost-beneficial approach.

With policy choices made on meter location and technology type, we are able to compare the overall costs and benefits of our preferred metering programme, compared to a baseline programme relying solely on meter optants.
Table 31: Overall AMR costs and benefits

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total costs £m</th>
<th>Total water savings £m</th>
<th>Cost Benefit Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Optant only)</td>
<td>583.144</td>
<td>334,462</td>
<td>3</td>
</tr>
<tr>
<td>Final Planning (Optant &amp; Selective)</td>
<td>737.142</td>
<td>1,897,512</td>
<td>2</td>
</tr>
<tr>
<td>Final Planning (AMR) (Optant &amp; Selective)</td>
<td>622.405</td>
<td>2,068,966</td>
<td>1</td>
</tr>
</tbody>
</table>

The overall ratio of benefits to cost is improved by 61% under our final planning programme and by up to 100% with the inclusion of AMR.

This modelling identifies the most cost-effective type of metering and informs our policy decisions. The results are then taken into the Economics of Balancing Supply and Demand (EBSD) modelling within the WRMP to compare the cost and benefits of our preferred metering programme with other options to deliver security of supply.

Here we are able to improve further on the metering cost benefit by twinning the deployment of metering with other investment activities such as mains replacement, within our Integrated Demand Management (IDM) approach.

This ensures that our final planning metering programme is cost effective in comparison to alternative options. Our revised metering programme is set out in section 3.

2.11.3.iii Changes to the Plan made as a result of consultee representations

The costs of the proposed metering strategy are discussed and presented in section 3. This will be added as Appendix N in Volume 3 of the revised draft Plan.

2.11.3.iv Reason for changes/no changes to the Plan

As set out in sub-section 2.11.3.ii, we have undertaken a comprehensive review of metering costs and have made changes to our revised draft Plan, these are presented in section 3.

2.11.4 Impact of metering on customers’ bills and revenue

2.11.4.i Consultee representations

a. Some consultees argued that the strategy may lead to significant tariff rebalancing if some of the previously high rateable value customers pay much less as a result of going onto a meter because they have comparatively low household consumption or choose to become more water efficient. The
b. Some consultees requested information on the distributional impacts of transferring customers to a meter and that this was modelled along with projections of the consequential impacts on revenue in order to allow us to fully understand the implications this will have for customers.

2.11.4.ii Thames Water consideration

a. Metering programmes, whether optant or selective, will inevitably result in some customers paying more and others paying less. The current inherent cross subsidy from those with high rateable values and low consumption to those with low rateable values and high consumption will unwind making bills more reflective of water use than under the current rateable value system. The safety nets, for the most vulnerable customers, that we are putting in place include our proposed social tariff and help from our proposed charitable trust fund. The current WaterSure scheme will also reduce bills for those customers that qualify.

b. Information on the distributional impacts of transferring customers to a meter and the projections of the impact on revenue is provided in Volume 4 of the draft Plan.

2.11.4.iii Changes to the Plan made as a result of consultee representations

No changes.

2.11.4.iv Reason for changes/no changes to the Plan

For the reasons set out in sub-section 2.11.1.ii, the metering programmes will inevitably result in some tariff rebalancing with some customers paying more and others paying less for water. The provisions noted above will ensure protection of the most vulnerable customers.

The information on the distributional impacts of transferring customers to a meter is already covered in the draft Plan.

2.11.5 Installation of meters on new properties

2.11.5.i Consultee responses:

Some consultees stated that meters should be installed on all new properties. This requirement should include flats and Thames Water should ensure all new dwellings are individually metered and that developers understand this requirement before new properties are built.

2.11.5.ii Thames Water consideration

It is standard practice to install meters on all new properties, including flats.

WaterSure – A scheme operated by Thames Water whereby customers may offered financial assistance with their metered bill if anyone in the household receives a specific state benefit, is a large family of three or more children or has a medical condition that requires the use of extra water.
2.11.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.11.5.iv Reason for changes/ no changes to the Plan

For the reasons set out in sub-section 2.11.5.ii, no changes to the draft Plan are justified.

2.11.6 Ongoing tariff trials and exploration of the use of variable tariffs

2.11.6.i Consultee representation:

Some consultees supported tariff trials with an expectation that Thames Water should consider all options for the use of variable tariffs and to use increased metering to reduce customer supply pipe losses.

2.11.6.ii Thames Water consideration

We welcome the support for the tariff trial programme in AMP5 (2010-2015). The Company is likely to need to undertake the metering trials in both London and Swindon & Oxfordshire Water Resource Zone in order to get a representative sample. We look forward to working with consultees in the design of the trials and to share the findings and extend our understanding of the issues and impacts.

We are proposing the use of automatic meter reading (AMR) units as standard, given the additional benefits for leakage detection on customer pipes and facilitating the use of innovative tariffs.

2.11.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.11.6.iv Reason for changes/no changes to the Plan

For the reasons set out in sub-section 2.11.6.ii above, we believe the trials will help us to assess the most effective tariff options and their impacts, with particular regard to further reductions in demand and water wastage, and affordability.

In light of the support expressed for our approach to tariff trials, and since no objection has been made to that approach in the representations submitted, no change to the draft Plan is proposed.

2.11.7 Protection of vulnerable customers

2.11.7.i Consultee representations

Some consultees observed that Thames Water will start its selective metering programme in areas with high discretionary water use, where water supplies are stretched and progress to areas where there is a comparatively high density of occupation, most likely in flats, with lower rateable values. These households are the most likely to see their bills increase as a result of going onto a meter and are least likely to be able to offset these increases by reducing their use of water without compromising health or hygiene. It is important that sufficient consideration is given
to developments in tariffs and/or government policy to help to minimise the financial impact on these households.

2.11.7.ii Thames Water consideration

We have proposed a targeted approach to compulsory metering, initially concentrating on water resource zones that are in a supply demand deficit. This is why metering in the London and Swindon & Oxfordshire Water Resource Zone will begin in AMP5 (2010-2015), with the other zones in AMP7 (2020-2025).

The implementation plan for each water resource zone will be derived at the District Metering Area (DMAs) level and factors such as high discretionary use and areas of low incomes will be taken into account, allowing us to focus on those DMAs containing the former and delaying those containing the latter. DMAs usually contain a wide socio-economic mix, but all efforts will be made to roll-out metering in a balanced way.

Importantly, to maximise the benefits of metering and minimise disruption to customers we plan to adopt an integrated approach to demand management which will result in leakage reduction, metering and water efficiency being delivered together.

We recognise the potential impacts on low income households and have proposed a package of measures aimed at financially vulnerable customers: water efficiency assistance through plumber assisted water audits targeted at lower-income households; introduction of a discounted social tariff targeted at customers least able to afford their charges; and funding for a charitable trust for customers experiencing financial hardship. Our innovative tariff proposals and trials will help inform this.

2.11.7.iii Changes to the Plan made as a result of consultee representations

No changes.

2.11.7.iv Reason for changes/no changes to the Plan

As is explained in sub-section 2.11.7.ii above, no change to the draft Plan is required. We have provided further information to explain the basis for the proposed implementation plan and the initiatives to protect vulnerable customers.
2.12 Water efficiency

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Support for water efficiency activity</td>
</tr>
<tr>
<td>2. Targeted activity to support low income customers</td>
</tr>
<tr>
<td>3. Targeted activity to encourage non-household customers</td>
</tr>
<tr>
<td>4. Water efficiency targets</td>
</tr>
<tr>
<td>5. Water neutrality</td>
</tr>
<tr>
<td>6. Greywater reuse and rainwater harvesting</td>
</tr>
<tr>
<td>7. Savings per Cistern Displacement Device</td>
</tr>
</tbody>
</table>

2.12.1 Support for water efficiency activity

2.12.1.i Consultee representations

Several consultees expressed support for a strong water efficiency programme. Specific comments related to educational activities, partnership working, recognition of the need to tackle growth areas such as Swindon, and the integrated approach to demand management.

2.12.1.ii Thames Water consideration

We welcome the support of consultees for the promotion of water efficiency and the integrated approach to demand management. We believe that water efficiency is an important component of a sustainable water resources management plan and proposed a strong baseline programme and an enhanced programme of activity in the draft Plan (Volume 2, sections 3.3.3 and 7.3.4.3).

2.12.1.iii Changes to the Plan made as a result of consultee representations

No changes.

There have been no changes in response to these specific representations, however there have been several changes made in response to other developments as detailed in sub-section 2.12.4.

2.12.1.iv Reasons for changes/no changes to the Plan

We welcome the support expressed for its programme of water efficiency from 2010. No change to the draft Plan is justified.

2.12.2 Targeted activity to support low income customers

2.12.2.i Consultee representations

Several consultees expressed support for the proposed education and audit programme targeting low-income households to help them to cope with the potential price impacts of metering.
2.12.2.ii Thames Water consideration

We welcome the support for our approach to target help towards low-income households. We recognise the need to support customers who may be financially disadvantaged by compulsory metering or physically unable to install water efficiency products themselves hence the proposal to offer an enhanced service to vulnerable customers as set out in the draft Plan Volume 2, section 7.3.4.3.

The enhanced programme has been affected by the restructured baseline, extended time span of Integrated Demand Management, and informed by responses received during the draft Water Resources Management Plan and Business Plan consultation.

In addition to the water efficiency plumber assisted audit programme to support low-income households, we are also proposing to reduce the bills of our poorest customers by introducing a social tariff (detailed in section C4.6.4.5 of the draft Business Plan).

2.12.2.iii Changes to the Plan made as a result of consultee representations

There have been no changes to the draft Plan in response to these specific representations, however there have been several changes made in response to other developments as detailed in sub-section 2.12.4.

The revised time plan for the Integrated Demand Management programme has been driven by the revised demand forecast (detailed in section 2.3). We now propose to offer water efficiency advice and devices to every household customer by 2025, after which we will revisit each DMA on a 10-year rolling basis.

As a result of the extended time plan for the Integrated Demand Management programme, we are assuming the continuation of cistern displacement device distribution at the current rate in proportion to the population in each water resource zone who will not be offered a water efficiency audit during each AMP.

The savings of all the domestic audits have been reviewed in light of the findings of our large-scale audit programmes. We have changed our assumptions to count 5 per cent of household savings as permanent, and to increase the uptake rate from 20 per cent in AMP5 (2010-2015) to 25 per cent in AMP6 (2015-2020) going forwards. Table 30 in sub-section 2.12.4 of this Statement details all assumptions linked to our proposed domestic water audit programme.

2.12.2.iv Reasons for changes/no changes to the Plan

Although there have been no changes made in response to these specific representations, there have been several changes made in response to other developments to the Water Efficiency baseline and final plan programmes as detailed in section 2.12.4.

2.12.3 Targeted activity to encourage non-household customers

2.12.3.i Consultee representations

Further information was requested on the details of the programme of water efficiency for non-household customers.
2.12.3.ii  Thames Water consideration

The baseline water efficiency programme targets both household and non-household customers. Further information on the baseline programme and the proposed enhanced programme is presented in the draft Plan, Volume 2, sections 3.3.3 and 7.3.4.

In summary, the non-household water efficiency programme comprises:
- self-audit packs, advice and resources provided via our website, Key Account Managers, at events and on request.
- advice on water use and available technologies during Water Regulations Inspections at commercial premises
- audit and retrofit programme targeting schools and public sector organisations. This will develop our experience and understanding of achievable savings, enabling us to provide case studies and more effective advice and support for our wider commercial customer base.
- activities in conjunction with external partners, for example sponsorship of Global Action Plan programme to target Small and Medium Enterprises (SMEs) in London and a project in conjunction with the London Borough of Croydon to target local businesses to encourage sustainable water use.

The non-household programme aims to save water and encourage sustainable use of water in the long-term.

2.12.3.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.12.3.iv  Reasons for changes/no changes to the Plan

Sub-section 2.12.3.ii above clearly summarises the programme of water efficiency activity targeted at non-household users which is set out in detail in the draft Plan. No change to the draft Plan is justified.

2.12.4  Water efficiency targets

2.12.4.i  Consultee representations

Several consultees highlighted the Ofwat consultation on mandatory water efficiency targets launched in July 2008 and the need to address these targets in the forecast per capita consumption values and the impact of base level water efficiency activity.

2.12.4.ii  Thames Water consideration

In November 2008, Ofwat confirmed the introduction of new regulatory targets for water efficiency for all water companies in England and Wales from 2010. We have been allocated an annual target of 3.45 Ml/d, to be measured as a three year rolling average. In light of the confirmation of the regulatory target, we have reviewed the baseline water efficiency programme and included additional activity to increase quantitative savings to achieve the regulatory target. We have extended the range of water efficient products to be promoted and distributed to household and non-household customers. The scale of this activity is 24,000 products with a calculated associated saving of 0.17 Ml/d per annum. This activity had previously been part of the enhanced water efficiency programme hence this programme has also been reconfigured in the revised draft Plan.
As Ofwat have yet to determine the attributable savings from specific water efficiency activities and the scope to offset this Ml/d target with educational activities it has not been possible to conclude the baseline activity which will fulfil this target requirement. To reflect this remaining uncertainty whilst at the same time confirming our commitment to achieving this target once the component data has been set, we have included an ‘Ofwat Target Addition’ component line within the baseline programme.

2.12.4.iii Changes to the Plan made as a result of consultee representations

As described in sub-section 2.12.4.ii the baseline and enhanced water efficiency programmes in the draft Plan have been reconfigured. In the revised draft Plan, Volume 2, section 7.3.4 the following text is to be added to paragraph 7 which starts “In August 2007…..;

“In November 2008 Ofwat confirmed that from 2010 we would be required to meet an annual water efficiency target of 3.45 Ml/d in addition to education and research. Driven by the need to increase quantitative savings to achieve the regulatory targets within the baseline, we have extended the range of water efficient products to be promoted and distributed to household and non-household customers.

As Ofwat have still to confirm activity uptake and savings assumptions, our baseline programme has been reconfigured using our best available assumptions and a compensatory ‘Ofwat Target Addition’ so we are modelling a reportable saving that meets the targets, despite not being able to model the actual activity.

The targets are based on new savings generated each year as reported in June Return Table 1 and so are not representative of the annual increase in rolling water efficiency savings within the Plan supply and demand modelling which takes into consideration the continued and declining savings of activities in previous years.”

The following tables and related text have also been included in the revised draft Plan.

Table 32 provides an overview of the revised baseline programme.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Baseline details AMP 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scale (K)</td>
</tr>
<tr>
<td>Domestic Self Audit Packs</td>
<td>15</td>
</tr>
<tr>
<td>Product Subsidy</td>
<td>120</td>
</tr>
<tr>
<td>Water Butts Distribution</td>
<td>50</td>
</tr>
<tr>
<td>Cistern Displacement Devices</td>
<td>500</td>
</tr>
<tr>
<td>Commercial Water Regulations Audits</td>
<td>26.85</td>
</tr>
<tr>
<td>Schools Audit Programme</td>
<td>0.15</td>
</tr>
<tr>
<td>Domestic SAQ</td>
<td>5000</td>
</tr>
<tr>
<td>Commercial SAQ</td>
<td>27.5</td>
</tr>
<tr>
<td>Project Programme</td>
<td>0</td>
</tr>
<tr>
<td>OFWAT TARGET ADDITION*</td>
<td>tbc</td>
</tr>
</tbody>
</table>
The activities to achieve this remains currently unconfirmed, but will be specified once Ofwat have determined the attributable savings from specific water efficiency activities and the scope to offset this Ml/d target with educational activities.

In light of the changes to the baseline programme, the enhanced water efficiency programme has also been revised, specifically the transfer of the promotion of subsidised water efficient devices from the enhanced programme to the baseline programme.

In addition, with the metering and VMR programmes extended over a longer time period, as discussed in section 3.4, the integrated water efficiency activity has been changed such that advice and devices will be offered to every household customer by 2025, after which we will revisit each DMA on a 10 year rolling basis. From AMP 8 onwards this continues to meet our statutory commitment to water efficiency and, as reflected in Table 31, leads to an increased level of domestic audit activity and reduced level of CDD distribution during AMP 8. As a result of this extended programme we are assuming the continuation of CDD distribution at the current rate in proportion to the population in each water resource zone who will not be offered a water efficiency audit during each AMP. The enhanced programme is presented in Table 33.

Table 33: Enhanced water efficiency programme in revised draft Plan

<table>
<thead>
<tr>
<th>AMP</th>
<th>Domestic Self Audit Packs</th>
<th>Plumber Assisted Audit</th>
<th>Public Sector Retrofit</th>
<th>Olympic Proposal - AMP 5 Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scale (K)</td>
<td>Saving (Ml/d)</td>
<td>Cost (£K)</td>
<td></td>
</tr>
<tr>
<td>AMP 5</td>
<td>226.51</td>
<td>2.97</td>
<td>8,124.94</td>
<td>2,717.00</td>
</tr>
<tr>
<td></td>
<td>27.68</td>
<td>85.76</td>
<td>4,254.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>978.00</td>
<td>3.33</td>
<td></td>
</tr>
<tr>
<td>AMP 6</td>
<td>203.64</td>
<td>2.67</td>
<td>7,304.73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.34</td>
<td>10,105.25</td>
<td>978.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>3.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP 7</td>
<td>339.27</td>
<td>4.44</td>
<td>12,169.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.88</td>
<td>8,631.05</td>
<td>978.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>3.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP 8</td>
<td>537.69</td>
<td>7.04</td>
<td>19,287.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.38</td>
<td>17,949.83</td>
<td>978.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>3.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMP 9</td>
<td>424.09</td>
<td>5.56</td>
<td>15,212.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.10</td>
<td>8,288.81</td>
<td>978.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>3.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The savings of all the domestic audits have been reviewed based on the findings of our large-scale audit programmes. In the updated assumptions 5 per cent of household savings are considered to be permanent, and the uptake rate has increased from 20 per cent in AMP5 (2010-2015) to 25 per cent in AMP6 (2015-2020) going forwards. Table 34 summarises the assumptions.
We have removed greywater and rainwater research proposals from the enhanced plan (please refer to the draft Water Resources Management Plan, Part 7.3.4.3) in response to Ofwat's indication that financial allowances will only be granted to least cost water efficiency programmes\(^{33}\) as they did not have an attributed saving.

### 2.12.4.iv Reason for changes/no changes to the Plan

As set out in sub-section 2.12.4.ii and 2.12.4.iii, the main changes to the water efficiency proposals are:

- We have a new regulatory obligation to deliver an annual saving of 3.45 Ml/d from water efficiency activity from 2010.
- Extension of the metering and VMR programmes over a longer time period, has led to a revision of the integrated water efficiency activity
- Savings assumptions have been revised based on improved data.

The revised draft Plan has been amended to reflect these changes.

---

\(^{33}\) Ofwat Appendix 1 November 2008
2.12.5 Water neutrality

2.12.5.i Consultee representations

Some consultees highlighted the need to consider the concept of water neutrality drawing on the Thames Gateway Water Neutrality study34. In planning future water resources Thames Water should consider the transferability of the concept to areas subject to growth over the planning period.

2.12.5.ii Thames Water consideration

We have supported action to achieve improved water efficiency within new homes and also run large-scale trials aiming to reduce the water consumption of existing homes. We have supported the increased water efficiency of new build and existing households within consultation responses to the Code for Sustainable Homes (CSH), Water Regulations and Building Regulations (Part G) and are currently working to engage Housing Associations, Local Authorities and housing developers to monitor the consumption of new homes built to the building regulations specification and homes built to Code for Sustainable Homes (CSH) standards. We supported the Environment Agency Water Neutrality study and are supportive of the innovative academic research designed to push forward the agenda. However application of water neutrality in future developments is still an academic concept and is outside the direct control of a water company and therefore we do not agree that it is a concept that we should build into long term water resource planning at this early stage. We do build in lower water consumption in new homes in line with the CSH and Building Regulations in the demand forecasts (section 2.3).

2.12.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.12.5.iv Reasons for changes/no changes to the Plan

For the reasons set out in sub-section 2.12.5ii above, no change to the draft Plan is justified.

2.12.6 Greywater reuse and rainwater harvesting

2.12.6.i Consultee representations

Several consultees expressed support for greywater reuse and rainwater harvesting and encouraged Thames Water to take the lead to make greywater reuse and rainwater harvesting more widespread in order to reduce the need for piped water and reduce surface water flooding.

2.12.6.ii Thames Water consideration

We continue to offer a subsidised rainwater butt offer to our customers and are also running a rainwater butt savings study which is open to all Thames Water employees. In addition we have undertaken a customer survey which will provide information about outdoor water use, levels of water butt ownership, attitudes to water butts and their contribution towards reducing the need for potable water.

We also continue to support large-scale water reuse projects. While the Millennium Dome is still regarded as an important and informative case study across the sector, we are also supporting the Olympic Development Authority (ODA) in their consideration of non-potable water use, working with BEDZed to install and evaluate Membrane Bio Reactor technology for recycling wastewater for toilet flushing at community scale and working in partnership with Langley Academy in Slough to install a rainwater harvesting system which will collect rainwater from the Academy’s roof and treat and recycle the water for toilet flushing within the building. All will provide vital data on the viability and effectiveness of these systems.

We are members of the British Standards Committee charged with producing standards and design guides relating to the reuse and recycling of water. We anticipate that the development of best practice guidance and revision of the Building Regulations will motivate development of the reclaimed water market in the UK.

We are keen to continue to develop our understanding of the financial, technical, environmental and customer implications of non-potable water supplies on a municipal scale. The ODA has been set a planning requirement that demands a reduction in potable water demand of 40 per cent for the Olympic Park. A reduction of 30 per cent is expected to be achieved by the use of water efficient plumbing and sanitary fittings. Rainwater harvesting has been considered and may be implemented at specific locations to supplement the 30 per cent reduction. It is understood that non-potable water supplies will be required to achieve the 40 per cent reduction. The ODA requirement for non-potable water has created an opportunity to develop a research and development project jointly with the ODA, London Development Agency (LDA), and Lee Valley Regional Park Authority (LVRPA) and in our draft Business Plan we included a proposal for a research project to design, build and operate an effluent reuse treatment plant and network to supply parts of the Olympic development for both the 2012 Games and Legacy periods. The research project will evaluate the technical and customer issues associated with non-potable water. This project is subject to the approval of the ODA and Ofwat funding the project as part of the Final Business Plan.

2.12.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.12.6.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.12.6.ii above, we support activities to promote rainwater and greywater harvesting. No change to the draft Plan is justified due to these representations although we have removed grey and rainwater research proposals from the enhanced water efficiency programme in response to Ofwat’s indication that financial allowances will only be granted to least cost water efficiency programmes.

2.12.7 Savings per cistern displacement device (CDD)

2.12.7.i Consultee representations

One consultee queried the effectiveness of cistern displacement devices and several consultees raised queries on the assumptions for cistern displacement devices and specifically why two differing assumptions of with “a flush rate of 5.2 flushes/person/day” and “a default value of 4.1 flushes/head/day” have been used in the draft Plan.
2.12.7.ii Thames Water consideration

Cistern devices are considered to be a good low cost technology and are widely promoted across the industry. We do offer advice on the types of cisterns for which CDDs are suitable and instructions on how to fit the CDDs.

The differing flush rates used in the water efficiency and demand planning calculations for the draft Plan was identified as an inconsistency. The assumed flush rate was benchmarked with those across the industry and informed by targeted research. The flush rate has subsequently been reviewed, along with the rest of our domestic micro-component demand assumptions by third party industry experts, Artesia Consulting.

2.12.7.iii Changes to the Plan made as a result of consultee representations

Based on this independent expert review of best available data, and industry experience, our flush rate has been revised to 4.65 flushes per head per day. This affects the saving assumption from CDD installation within our baseline programme detailed within the draft Water Resources Management Plan, Volume 2 sections 3.3.3.4.

2.12.7.iv Reason for changes/no changes to the Plan

As explained in sub-section 2.12.7.ii additional research was undertaken to revise the flush rate and this change has been made in the revised draft Plan.
2.13 Programme appraisal

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Option selection process</td>
</tr>
<tr>
<td>2. Fixing Demand Management in water resource zones with supply demand deficit</td>
</tr>
<tr>
<td>3. Fixing Demand Management in water resource zones with supply demand surplus</td>
</tr>
<tr>
<td>4. Weighting of carbon costs</td>
</tr>
<tr>
<td>5. Decision-making process</td>
</tr>
<tr>
<td>6. Accounting for flexibility</td>
</tr>
</tbody>
</table>

2.13.1 Option selection process

2.13.1.i Consultee representations

Some consultees asked for further explanation of the option selection process. Specific aspects highlighted for further clarification included the manual intervention and the use of the “optimiser” model.

2.13.1.ii Thames Water consideration

The approach to option selection and programme appraisal is described in sections 7.3.1 and 8.3, Volume 2 of the draft Plan. The modelling is essentially undertaken in two steps.

The first step is a manually operated model that ranks options in order of the Average Incremental Social Cost and selects programmes (combinations of options) that meet levels of service and are least-cost in order of selection. This procedure does not, however, guarantee that the overall programme is least cost compared to all the other possible programmes that could be selected from the full range of options provided and does not take account of other drivers such as corporate policy or political drivers which might necessitate selection of something other than the least cost solution. Also it cannot accommodate the interdependencies of different strategies for leakage reduction, metering and water efficiency promotion. For these reasons, our demand management policy is pre-determined through the application of our Integrated Demand Management approach as described in section 7.3.1 of volume 2 of the draft Plan. Through this method we calculate the Average Incremental Cost (AIC) rankings of different combinations of demand management options to allow the manual selection of the least cost combination that is consistent with broader corporate and regulatory drivers.

Having manually fixed the demand management approach, the second step is to put the options through a mathematical ‘optimiser’, which is able to systematically test all the possible option sets to derive the overall or global least-cost programme. The Average Incremental Social Cost ranked list of options is used as a starting condition for the optimiser tool, which is then used to identify the range of least cost solutions.

The application of these approaches is described in sections 8.6 to 8.9 of volume 2 of the draft Plan. This includes the manual evaluation of the performance of the
identified solutions against a number of different parameters and under several different scenarios.

2.13.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.13.1.iv Reasons for changes/no changes to the Plan

A summary of the approach to option selection is provided in sub-section 2.13.1.ii, no change to the draft Plan is justified.

2.13.2 Fixing Demand Management In water resource zones with supply demand deficit

2.13.2.i Consultee representations

Some consultees noted that in the two water resource zones with supply-demand deficits, London and Swindon & Oxfordshire Water Resource Zones, the company has fixed its metering and water efficiency programmes. It was argued that Thames Water should fully articulate why it considers its investment plan to be the optimum planning solution and should include detail of how willingness to pay analysis has informed this decision. The company should also ensure that its customers understand the permanent effect that investment in such measures will have on their bills.

2.13.2.ii Thames Water consideration

The method utilised to determine our leakage reduction, metering and water efficiency programmes is described in section 7.3.1 of volume 2 of the draft Plan. For each of our district metered areas, but initially focussing on those zones with the highest supply demand deficit, we have examined the combined cost-effectiveness of leakage reduction, metering and water efficiency to allow us to rank activity in different areas on the basis of Average Incremental Cost (AIC). This ensures that we are undertaking activity in the areas where it is most cost-effective to do so.

The need to pre-determine the demand management policy is explained in section 8.3.1 of volume 2 of the draft Plan. Our planning framework enables us to make informed and transparent decisions on which activities to include in our preferred plans. This framework takes into account the full range of cost and benefit considerations, including those that cannot readily be monetised such as non-monetisable environmental impacts. However, the inability to express all of the policy drivers and benefits of demand management in monetary values means that a judgement must be made by the decision maker in selecting the appropriate level of activity to adopt. These are described in sections 7.3.2.4 (for mains replacement), 7.3.3.2 (for metering) and 7.3.4.1 (for water efficiency) of volume 2 of the draft Plan.

We have received strong support for both our metering and water efficiency programmes in public consultation on our Strategic Direction Statement 35 and representations received to this consultation on our draft Plan.

Further, in recognition of the need to ensure that our customers support all elements of our business plan and to allow for the recognition of such non-monetisable

35 Strategic Direction Statement, Thames Water, 2008
benefits, we have also undertaken a contingent valuation willingness to pay study to evaluate the benefits our customers perceive from our full investment programme. This study was undertaken in June 2008 and the results were not available in time for publication of the draft Plan. The study demonstrated strong support for our business plan (which included all elements of our draft Plan) with customers willing to pay £68/h/yr for the enhancement elements of our proposed plan. This demonstrates that our customers not only understand but greatly appreciate the benefits from the proposed investment.

2.13.2.iii Changes to the Plan made as a result of consultee representations

A new section 9.4 has been included in the revised draft Plan “Customers’ willingness to pay” as set out below and Appendix J has been updated.

“Section 9.4 Customers’ Willingness to Pay

Benefits to domestic customers of maintaining the supply demand balance were investigated through a stated preference survey conducted by Cascade Consulting in July and August 2007. The questionnaire explained our current Levels of Service and how these would deteriorate without investment in measures to restore the balance between supply and demand. 513 customers were surveyed and they demonstrated a mean willingness to pay of approximately £25 per household per year.

Further in June 2008 we commissioned the consultants NERA to undertake a contingent valuation willingness to pay study to evaluate customers’ preferences for the investment proposals contained in its draft Business Plan. These proposals incorporated the draft Plan, along with proposals relating to other elements of the business. Customers expressed strong support for the proposed business plan and demonstrated a mean willingness to pay of £68/h/yr for the enhancement element of our proposed plan. This demonstrates that our customers not only understand, but greatly appreciate, the benefits from the proposed investment.”

The introduction to Appendix J at the end of the first paragraph has also been revised to state:

“….and Cascade Consulting in 2007 for the UTMRD study.

Additionally there have been three major strands of customer research conducted specifically for PR09:
- Deliberative research led by Corr Willburn
- Quantitative research led by ICF
- Contingent valuation led by NERA”

The final sentence of the introduction is deleted.

2.13.2.iv Reason for changes/no changes to the Plan

The NERA stated preference study was not available for inclusion at the time of the publication of the draft Plan. Since it has provided valuable evidence of customer support for our proposals it is now appropriate to include reference to it in our draft Plan.
2.13.3 Fixing Demand Management in water resource zones with supply demand surplus

2.13.3.i Consultee representations

Some consultees argued, as a result of aligning the draft Plan with its Strategic Direction Statement, that Thames Water has included programmes of metering and water efficiency in zones that have no baseline supply demand deficit. While it is for the Company to determine its overall strategic direction, it must be able to demonstrate that it has adopted the most economic solution to balancing supply and demand. If the company wishes to justify these enhanced metering and water efficiency programmes for reasons other than for balancing supply and demand, then it must provide compelling evidence that the benefits outweigh the costs, and that there is broad customer willingness to pay for them. If it cannot provide this evidence, then it should withdraw these programmes from its plan.

2.13.3.ii Thames Water consideration

Under a least-cost planning scenario, demand management would not be undertaken in zones with a supply demand surplus as there is no resource problem to resolve.

However, there are wider environmental and social benefits from demand management, which should be taken into account to ensure that our long-term plans are sustainable. As stated above in section 2.13.2.ii, these benefits cannot all be monetised and therefore the cost-benefit of these activities cannot be demonstrated in the numerical sense.

2.13.3.iii Changes to the Plan made as a result of consultee representations

No changes.

2.13.3.iv Reason for changes/no changes in the Plan

As explained in sub-section 2.13.3.ii no further changes are required other than those already indicated in section 2.13.2.iii.

2.13.4 Weighting of carbon costs

2.13.4.i Consultee representations

Some consultees argued that Thames Water has rejected a number of programmes of investment based on their carbon costs relative to the carbon costs of other programmes, even though the total cost (including capital, operating, environmental, social and carbon costs) of the rejected programme was lower than the preferred programmes. This leads to an inefficient solution. The company has not justified why it has given greater weight to carbon costs than to other costs.

2.13.4.ii Thames Water consideration

As stated in our Strategic Direction Statement, we have always sought to recognise our obligations with respect to climate change and tried to anticipate future requirements for reduction in carbon emissions in our planning processes. Our Strategic Environmental Assessment (SEA) methodology includes carbon cost as an important consideration which correctly influenced the selection of the preferred programme. Carbon cost was therefore one of the performance indicators used to
compare and select between alternative programmes. Programmes were only rejected based on carbon cost because overall, these programmes were less beneficial solutions than the alternatives.

Since the publication of the draft Plan the Climate Change Act 2008 has become law. This sets legally binding targets for the UK to reduce its greenhouse gas emissions by at least 80 per cent by 2050 against a 1990 baseline. There are two key elements of the Act that are of direct importance to developing new water resource options;

- To improve carbon management and help the transition towards a low carbon economy in the UK
- The introduction of powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make adaptation plans to address the risks associated with climate change.

This requires us to develop our business in a way that significantly reduces our greenhouse gas emissions and ensures we have taken the unavoidable impacts of climate change into account. In preparing our plans we have been mindful of the expectation that, as a company, we will become subject to emission reduction targets in the future and carefully assessed the carbon impacts of different choices both in terms of their immediate impact (due to construction ‘embedded’ carbon) and ongoing impact (operational carbon). Operational carbon emissions are of particular concern to us as high emissions will compromise our ability to meet reduction targets of the future and because future emissions will do more damage than current. This is because they will be in the atmosphere when global concentrations are higher and expected climate change impacts accelerate with higher concentrations.

We have not yet found an acceptable means of reflecting this issue within our economic analysis so it is simply represented as a qualitative additional cost. Inclusion of this impact in the decision making process has the appearance of giving carbon costs an additional weighting in the analysis. Further information is provided in Section 3.

2.13.4.iii Changes to the Plan made as a result of consultee representations

The following bullet point has been added to the second list in Volume 2, section 8.10.1 of the revised draft Plan:

- **Risk to achievement of future emission reduction targets**

The following text has been inserted into the final bullet point in the third list in Volume 2, section 8.10.1 of the revised draft Plan, before the final sentence,

“This includes the impact of the proposed programme on the Company’s ability to deliver its likely future emission reduction targets.”

The following text has been inserted to replace the final paragraph of section 9.4, volume 2 of the revised draft Plan.

“The Climate Change Act 2008 now sets legally binding targets for the UK to reduce its greenhouse gas emissions by at least 80 per cent by 2050 against a 1990 baseline. There are two key elements of the Act that are of direct importance to developing new water resource options;
o To improve carbon management and help the transition towards a low carbon economy in the UK
o The introduction of powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make adaptation plans to address the risks associated with climate change.

We have sought to recognise future requirements of the Act in developing our draft Plan, in the expectation that, as a company, we will become subject to emission reduction targets in the future. We have assessed the carbon impacts of different programmes both in terms of their immediate impact (due to construction ‘embodied’ carbon) and ongoing annual impact (operational carbon). Operational carbon emissions are of particular concern to us as high emissions will compromise our ability to meet reduction targets of the future and because future emissions will do more damage than current. This is because they will be in the atmosphere when global concentrations are higher and expected climate change impacts accelerate with higher concentrations.

The indicative carbon data for the construction and operation of the proposed reservoir versus the alternative of desalination/reuse show that although the reservoir is more carbon intensive to build it much less carbon intensive to operate. From a comparison of the combined delivery and operation of each solution it can be seen that the reservoir is almost nine times less carbon intensive than the alternate desalination/reuse. In this respect the development of a reservoir is more compatible with the drivers of the Climate Change Act 2008.

<table>
<thead>
<tr>
<th></th>
<th>Reservoir</th>
<th>Alternate option combination</th>
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</thead>
<tbody>
<tr>
<td>Tonnes of construction embodied carbon</td>
<td>293,753 Tonnes</td>
<td>62,712 Tonnes</td>
</tr>
<tr>
<td>Whole life operational carbon emissions @ 0.43 grid emission factor</td>
<td>387,430 Tonnes</td>
<td>6,040,370 Tonnes</td>
</tr>
</tbody>
</table>

We have not yet found an acceptable means of reflecting this issue within our economic analysis so it is simply represented as a qualitative additional cost. Inclusion of this impact in the decision making process has the appearance of giving carbon costs an additional weighting in the analysis. “

2.13.4.iv Reason for changes/no changes to the Plan

As explained in section 2.13.4.iii, text has been inserted to provide further clarification of the treatment of carbon costs.

2.13.5 Decision-making process

2.13.5.i Consultee representations

Some consultees stated their expectations that Thames Water should adopt the most cost beneficial set of interventions. If it does not, the company should set out clearly the basis on which it believes that an alternative less cost beneficial plan is justified.
2.13.5.ii Thames Water consideration

It is a common misconception that, for a set of interventions to be preferred, they must be the most cost beneficial according to a numerical analysis. A full and correct cost benefit analysis will include monetised, quantified and qualitative impacts to ensure full consideration of all costs and benefits. This necessarily means that the final decision becomes more subjective than simply choosing the set of interventions which shows the greatest excess of monetised benefits over costs since some judgement must be applied in comparing impacts that are not in common units.

We have undertaken a full examination of all of the impacts of our proposed Plan and are confident that our proposed set of interventions represents the most cost beneficial when all costs and benefits are taken into account.

2.13.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.13.5.iv Reason for changes/no changes in the Plan

As is explained in sub-section 2.13.5.ii, no change to the draft Plan is justified.

2.13.6 Accounting for flexibility

2.13.6.i Consultee representations

Where companies' investment plans are driven by factors that are subject to a high degree of uncertainty – including the effects of climate change and future trends in Per Capita Consumption – some consultees argued that it is prudent to consider options that offer a more flexible response to changes in the supply demand balance. Committing to large-scale schemes with sunk costs might result in significant over-capacity, at customers' expense. Some consultees suggested that Thames Water should take into account the value of flexibility when comparing options to balance supply and demand. It is not clear whether the company has done this in its draft Plan.

2.13.6.ii Thames Water consideration

In recognition of the uncertainty associated with many of assumptions made in the WRMP process, the preferred plan presented in the draft Plan was subjected to a series of sensitivity analyses as explained in section 10.2 of Volume 2 of the draft Plan. These included the rate of change of per capita consumption, metering assumptions in reducing consumption and assumed new property per capita consumption. The judgement made at this time was that the risk of over-capacity was out-weighed by the significant risk of a supply-demand deficit and being compelled to develop numerous small schemes with significant additional carbon burdens. Since publication of the draft Plan, the Environment Agency has published a briefing note describing demand scenarios to 2050 and helpfully provided us with the Thames region specific data. In addition, Thames region of the Environment Agency have also provided us with an estimate of the amount of reductions in abstraction that may be required to meet the needs of the Water Framework Directive to use in sensitivity testing. This has allowed us to expand our sensitivity analysis further and has reinforced the conclusion that the proposed plan offers the appropriate flexibility to

\[36\text{ Demand for Water in the 2050s, Environment Agency February 2009}\]
respond to future uncertainties. The new sensitivity analysis is described in detail in section 2.15.

2.13.6.iii **Changes to the Plan made as a result of consultee representations**

No changes.

2.13.6.iv **Reason for no changes**

No further changes are required other than those indicated in section 2.15.2.iii.
2.14 Preferred supply demand programme

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Time lag to address supply demand deficit in some water resource zones</td>
</tr>
<tr>
<td>2. Consequences of supply demand deficits for eco-town and accelerated growth proposals</td>
</tr>
<tr>
<td>3. Support for a balanced approach to selection of preferred programme</td>
</tr>
<tr>
<td>4. Contribution of individual schemes</td>
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</tbody>
</table>

2.14.1 Time lag to address supply demand deficit in some water resource zones

2.14.1.i Consultee representations

Several consultees expressed concern around the time lag to address the supply demand gap in London and Swindon & Oxfordshire Water Resource Zones

2.14.1.ii Thames Water consideration

In the draft Plan the deficit for London Water Resource Zone was overcome by 2013/14 and in Swindon & Oxfordshire Water Resource Zone by 2014/15. In the revised draft Plan the deficit for London Water Resource Zone is eradicated in 2009/10 and for Swindon & Oxfordshire Water Resource Zone in 2012/13. These deficits are a risk in terms of achieving our Levels of Service however it does not mean our customers will run out of water.

2.14.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.14.1.iv Reason for changes/no changes to the Plan

As explained in sub-section 2.14.ii we do have deficits in both London and Swindon & Oxfordshire Water Resource Zones, these deficits present a risk to our Levels of Service and we plan to close the deficits as rapidly as practicable. No changes to the draft Plan are justified.

2.14.2 Consequences of supply demand deficits for eco-town and accelerated growth proposals

2.14.2.i Consultee representations

Some consultees raised concerns around the implications of the supply demand deficits in some water resource zones for the Government's eco-town and accelerated growth proposals.

2.14.2.ii Thames Water consideration

In compiling our long-term demand forecasts we take account of Government population and housing projections (Section 2.3). We support the principle of eco-towns and the Government's aspiration to develop and demonstrate a sustainable
approach to housing provision. Eco-towns present an opportunity for water efficiency measures and reuse technologies to be incorporated at a development scale in a cost effective and sustainable manner. We take an active approach in reviewing and responding to Government proposals on housing growth and are trialing different domestic audit and retrofit programmes to assess the viability and long-term sustainability of improving the water efficiency of the existing housing stock.

2.14.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.14.2.iv Reason for no changes

As explained in sub-section 2.14.2.ii we take account of Government population and housing forecasts in developing our long-term demand forecast (Section 2.3). We also take account and contribute to relevant developments in policy such as the eco-town proposals. No changes to the draft Plan are justified.

2.14.3 Balanced approach to selection of preferred programme

2.14.3.i Consultee representations

Some consultees expressed support for the selection of a programme based on a balance of cost, environment, sustainability and carbon impacts.

2.14.3.ii Thames Water consideration

We welcome the support expressed by consultees. For water resource zones identified to have a supply-demand deficit, we develop a planning solution which restores and then maintains security of supply over the planning period, in developing the solution we consider a range of factors including cost, environmental and social impact, risk, alignment with the Company’s strategic direction and our customers’ preferences.

2.14.3.iii Changes to the Plan made as a result of consultee representations

No changes.

2.14.3.iv Reason for no changes

We welcome the support expressed. No change to the draft Plan is justified.

2.14.4 Contribution of individual schemes

2.14.4.i Consultee representations

Some consultees asked for further information to indicate the percentage of the deficit that each scheme might address and clear justification for all the schemes proposed.

2.14.4.ii Thames Water consideration

For both the draft Plan and the revised draft Plan (London and SWOX WRZ), the tables 35 below show the breakdown of the contributions from demand management
and water resource schemes to address the baseline deficit profile over the planning period.

The justification for any given scheme is based initially on strict least-cost monetary economics. However, our preferred options are also selected additionally on sustainability factors, including customer willingness to pay, cost-benefit and the Company’s Strategic Direction Statement.

Table 35: Contribution of demand management and water resource schemes to address the supply demand deficit

<table>
<thead>
<tr>
<th>Revised draft Plan - London WRZ (DYAA)</th>
<th>Volume (ML/d)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>AMP5</td>
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<tr>
<td>Demand Management Programmes</td>
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<td>Water Resource Development</td>
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<td>Demand Management Programmes</td>
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<td>Water Resource Development</td>
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<tr>
<th>Revised draft Plan - SWOX WRZ (ADPW)</th>
<th>Volume (ML/d)</th>
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<td>Demand Management Programmes</td>
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<td>Water Resource Development</td>
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<td>AMP5</td>
</tr>
<tr>
<td>Demand Management Programmes</td>
<td>24</td>
</tr>
<tr>
<td>Water Resource Development</td>
<td>25</td>
</tr>
</tbody>
</table>

2.14.4.iii Changes to the Plan made as a result of consultee representations

No changes.

2.14.4.iv Reason for no changes to the Plan

The information provided above already exists either in the draft Plan or has been adapted from the data herein; the later has been transferred to the revised draft Plan.
2.15 Sensitivity testing

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
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<tbody>
<tr>
<td>1. Sensitivity analysis for all water resource zones</td>
</tr>
<tr>
<td>2. Nature of sensitivity analysis</td>
</tr>
<tr>
<td>3. Approach to sensitivity testing</td>
</tr>
</tbody>
</table>

2.15.1 Sensitivity analysis for all water resource zones

2.15.1.i Consultee representations

Some consultees requested that Thames Water undertake sensitivity analysis for all water resource zones including those in surplus.

2.15.1.ii Thames Water consideration

We have undertaken sensitivity analysis for those water resource zones that are in supply demand deficit and this is presented in Section 10 of Volume 2 of the draft Plan. We have not undertaken sensitivity analysis for those water resource zones that are in surplus because the combination of the headroom allowance already incorporated in the forecast and the supply side surplus will convey a degree of robustness to the preferred programmes rendering them more insensitive to underlying assumptions than those water resource zones that are in deficit.

2.15.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.15.1.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.14.1.ii sensitivity analysis is not undertaken for water resource zones in surplus. No changes to the draft Plan are justified.

2.15.2 Nature of sensitivity analysis

2.15.2.i Consultee representations

Some consultees queried the type of sensitivity testing undertaken and the parameters chosen. For example is sensitivity testing undertaken with regard to long term rising costs of energy? Some consultees noted the importance of sensitivity testing with regard to demographics. One consultee recommended that Thames Water should include sensitivity analysis on higher population growth rates in combination with higher Per Capita Consumption levels and should look beyond the planning horizon.

2.15.2.ii Thames Water consideration

We have undertaken sensitivity analysis in relation to key components of the draft Plan including: domestic population, Per Capita Consumption rate of change, metering savings and Victorian Mains Renewal savings. Clearly there are many areas and combinations of components that could also be addressed in sensitivity
analysis and a pragmatic approach that identifies those issues that have the potential to materially affect the draft Plan, are necessary. We have not conducted sensitivity analysis in relation to the potential changes in costs in the long term. Changing assumptions on population and Per Capita Consumption generated the largest movements in distribution input.

2.15.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.15.2.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.15.2.ii sensitivity analysis has been undertaken for the key areas identified and is reported in Section 10 of the draft Plan. No changes to the draft Plan are justified, however we discuss some of the aspects further in section 3 with respect to demand in 2050 and the integration of contingency options.

2.15.3 Approach to sensitivity testing

2.15.3.i Consultee representations

Furthermore one consultee queried the significance of sensitivity testing compared to target headroom.

2.15.3.ii Thames Water consideration

Sensitivity testing is different from the application of target headroom to the supply demand balance going forward. Target headroom is used to account for the uncertainty of several components together and is then applied as a single expression of that uncertainty, whereas sensitivity testing allows certain specific parameters to be analysed individually to assess their impact on the demand supply balance.

2.15.3.iii Changes to the Plan made as a result of consultee representations

No changes.

2.15.3.iv Reasons for changes/no changes to the Plan

The difference between sensitivity analysis and target headroom has been explained in sub-section 2.15.3.ii. No changes to the draft Plan are required.
2.16 Summary of main elements of the preferred programme

There were no comments received on this specific section.

A summary of the main elements of the revised preferred programmes are presented in section 3.
2.17 Strategic Environmental Assessment (SEA) Environmental Report

Summary table of main issues

<table>
<thead>
<tr>
<th>Table of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strategic Environmental Assessment (SEA) methodology</td>
</tr>
<tr>
<td>2. Sufficient consideration of viable alternatives</td>
</tr>
<tr>
<td>3. Full consideration of environmental and social impacts and benefits</td>
</tr>
<tr>
<td>4. Assessment of carbon and the carbon footprint of the Plan</td>
</tr>
<tr>
<td>5. Identification and mitigation of cumulative impacts</td>
</tr>
<tr>
<td>6. Monitoring of environmental effects</td>
</tr>
</tbody>
</table>

2.17.1 Strategic Environmental Assessment (SEA) methodology

2.17.1.i Consultee representations

- Some consultees supported the use of an environmental assessment process in developing and evaluating options for water resource management. However one consultee queried the criteria selected and another consultee queried why the SEA preferred programme was not selected as the preferred programme.

2.17.1.ii Thames Water consideration

- The SEA process integrates the consideration of environmental and social criteria of relevance to our supply area into the water resources planning process. The SEA criteria were derived from the key topics specified in the SEA Directive\(^{37}\) and the impacts of the schemes and programmes included in the draft Plan were assessed against the SEA criteria. A detailed explanation is provided in Volume 6 of the draft Plan.

- In formulating the optimum planning solution for each water resource zone we take a range of factors into consideration including operating and capital costs, risk and environmental and social impacts and benefits. The optimum programme is selected based on the best overall cost benefit in terms of its ability to solve the planning problem, financial and environmental impacts and overall risk of delivery. The SEA is one of several tools used in the decision making process. Although the preferred final programmes for London and Swindon & Oxfordshire Water Resource Zone presented in the draft Plan were not the SEA preferred programmes (which were selected solely on the basis of lowest environmental and social impacts), the preferred programmes did contain the optimal combinations of schemes of low economic cost, low carbon cost, good environmental performance and acceptable levels of risk. This is set out in section 8.10, Volume 2 of the draft Plan.

\(^{37}\) European Directive 2001/42/EC “on the assessment of the effects of certain plans and programmes on the environment”
2.17.1.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.17.1.iv  Reasons for changes/no changes to the Plan

The SEA process is a valuable tool to integrate the consideration of environmental and social impacts in the water resource planning process and to aid decision-making. Given the consideration above in sub-section 2.17.1.ii and the coverage of the SEA process already included in the draft Plan, no changes are justified. We have continued to use the SEA process to inform the development of our preferred programmes in the revised draft Plan.

2.17.2 Sufficient consideration of viable alternative schemes

2.17.2.i  Consultee representation

Some consultees contended that the Environmental Report does not include reasonable alternative schemes. Some consultees suggested that the whole SEA is invalidated by the dismissal of the Severn-Thames Transfer scheme on the basis of impact on a Special Protected Area (SPA), when use of other sites (to enable transfer between the catchments) have not been adequately investigated.

2.17.2.ii  Thames Water consideration

As a result of the consultation representations and the ongoing process of option identification and assessment, the revised draft Plan now contains a number of new resource development options within our updated feasible options list. These are presented in Tables 27 and 28 for London and Swindon & Oxfordshire Water Resource Zones respectively in Section 2.8 of this Statement. An environmental and social assessment has been undertaken of each of these schemes. The output of these assessments has been used to inform the updated SEA assessment.

A summary of the main conclusions output from the SEA assessment on transfer schemes, particularly in comparison with reservoir schemes, are as follows;

- the assessment of the Severn-Thames transfer scheme based on Craig Goch reservoir in mid Wales (sub-section 2.8.1) showed it to be both more expensive and to have a greater environmental impact, including energy and hence carbon footprint, as well as impact on the SPA site, than a proposed Upper Thames Reservoir.

- the Longdon Marsh scheme, which involves transfer of water from the Severn catchment to the Thames catchment without impacting a European designated site and would involve building a reservoir at Longdon Marsh in Gloucestershire (sub-section 2.8.9), identified fewer significant operational environmental and social adverse impacts than the Severn Thames transfer based on Craig Goch reservoir, however, compared with the proposed Upper Thames Reservoir, the Longdon Marsh scheme had more significant adverse impacts on landscape and visual amenity and no beneficial impacts on water quality or aquatic biodiversity. This alternative transfer scheme was therefore not identified by the SEA as a preferable option to an Upper Thames Reservoir.
- other transfer schemes including the northern region transfer schemes were investigated and found to be more expensive and have a higher environmental impact with regard to energy and carbon footprint than an Upper Thames Reservoir.

2.17.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.17.2.iv Reasons for changes/no changes to the Plan

For the reasons set out in sub-section 2.17.2.ii above, no change to the draft Plan is justified.

SEA appraisal has informed the development of the revised preferred programmes in the revised draft Plan. The SEA appraisal will be written up in an addendum to the Environmental Report which will be published in Spring 2009.

2.17.3 Full consideration of environmental and social impacts and benefits

2.17.3.i Consultee representations

Some consultees questioned the environmental and social impacts which were considered as part of the environmental assessment and the methodology employed. Specific points raised included:

- why the only environmental and cultural factors taken into consideration were those that had statutory protection.

- why greater emphasis was placed on water related impacts, whereas the environmental and social impacts on land use, local infrastructure and transport, during both construction and operation and in the short and long term have not been taken into account sufficiently.

- why the SEA has not costed the environmental impact of change to the local environment and disturbance in and around the proposed Steventon reservoir site.

- whether some elements, specifically the risk and carbon elements, were given a greater 'weight' than the environmental and social impacts.

- whether the benefits of further demand management in terms of reducing energy costs and carbon emissions and reducing load to sewage works thus enabling lower treatment costs, reduced load on the environment and headroom provision for accommodating growth were considered.

2.17.3.ii Thames Water consideration

a The SEA has been based on a range of criteria which were derived from the key topics specified in the SEA Directive and were selected on the basis of a scoping and a consultation process. The SEA is a strategic level assessment and it is therefore often necessary to use broad categorisations, such as the level of designation of protected sites, to distinguish between alternatives. It does not preclude the need for project level assessments such as an Environmental Impact
Assessment which would enable more local and project specific impacts to be identified and wherever possible, mitigated.

b The methodology does consider water related impacts, to some extent this is inevitable when examining the impacts of water supply measures. However, more terrestrial impacts such as loss of high-grade agricultural land, change in visual amenity, land-take, transport and social infrastructure impacts were all included in the assessment, albeit at a strategic level. It would have been inappropriate to assess one of the schemes (ie the reservoir) at a more detailed, less strategic level for this exercise, and for this reason effects on Steventon were not examined in any more detail than were effects of other schemes on local areas.

c Each scheme has been assessed against a range of environmental and social criteria which includes climate change. The relative environmental and social impacts of each scheme were compared focusing on the frequency of significant adverse impacts during long-term operation of the scheme. No explicit weightings were used in formulating the plan. However, it is the case that SEA influences coincide with objectives from other sources, for example, it is a recommendation of the SEA that demand management and leakage reduction schemes should be maximised due to their having fewer environmental and social impacts than supply schemes. This recommendation also came out of the Strategic Direction Statement, which is in turn a reflection of our customer’s preferences. Likewise, carbon costs were included as a SEA criterion (Climate Change), but their minimisation was also seen as an individual objective of the Plan in accordance with instructions from Ofwat. The apparent weighting of carbon as a criterion is discussed further in sub-section 2.13.4.ii.

d Demand management schemes were recommended by the SEA as they were found to have relatively few potential impacts and various potential benefits, including reduced impacts on water resources through lower abstraction requirements, and reduced energy use in treatment.

e Following the SEA assessment, recommendations were made as to which schemes should be selected in preference to others and a set of alternative programmes were formulated for those water resource zones which showed supply demand deficit over the planning period. Programmes were then optimised to different drivers including least environmental and social cost, impact and carbon. These beneficial characteristics of demand management schemes were also attributed economic costs using accepted benefits transfer techniques, and as such were considered when we examined the environmental and social costs of schemes.

2.17.3.iii Changes to the Plan made as a result of consultee representations

No changes.
2.17.3.iv Reasons for changes/no changes to the Plan

Clarification has been provided to explain the detailed approach and methodology used in response to the representations. The SEA criteria were selected on the basis of a scoping and consultation process and therefore no changes to the draft Plan are required.

2.17.4 Assessment of carbon and the carbon footprint of the Plan

2.17.4.i Consultee representations

One consultee noted that the carbon footprint of the Plan predicts a small net reduction over the Plan which represents a significant saving compared with the baseline scenario and is achieved largely through demand management. Further reduction of per capita consumption would also have the effect of further reducing carbon emissions.

2.17.4.ii Thames Water consideration

Sub-sections 2.3.1 and 2.3.17 cover revisions to the demand forecast and per capita consumption. In line with the forecast reduced per capita consumption, we forecast a reduction in carbon emissions.

2.17.4.iii Changes to the Plan made as a result of consultee representations

No changes.

2.17.4.iv Reasons for changes/no changes to the Plan

This point is covered in sub-sections 2.3.1 and 2.3.17 of this statement.

2.17.5 Identification and mitigation of cumulative impacts

2.17.5.i Consultee representations

Some consultees recommended that Thames Water revise parts of its SEA surrounding mitigation of all cumulative impacts. Although Thames Water clearly outlines the effect of numerous schemes on the environment in its SEA, conclusions and mitigation of cumulative impacts do not seem to match.

The SEA states that Kidbrooke AR and proposed Upper Thames Reservoir A would both affect flow over Teddington Weir and therefore affect the Lower Thames Operating Agreement. This is a cumulative impact and needs to be mitigated if adverse. Similarly, it is stated that Goring Gap groundwater schemes are ‘potentially incompatible due to licence restrictions’. Consultees need to know how and when this impact will be addressed. Finally, the SEA states that the cumulative impacts of other WRMPs and RBMPs will be taken into account in the final WRMP – how and when this will be done.

2.17.5.ii Thames Water consideration

As stated in section 7.4.2 of the Environmental Report, Volume 6 of the draft Plan, schemes that potentially affect flow over Teddington Weir are not necessarily considered to be incompatible. It is likely that any potential adverse impacts on flows over Teddington Weir caused by both schemes could be mitigated by appropriate
timing of reservoir releases and abstractions (for both Kidbrooke AR and the proposed Upper Thames Reservoir A). The primary source of water for Kidbrooke AR will be surplus capacity in local supply mains and abstraction from the Thames or from other sources would only take place during the winter. This will be clarified in the addendum to the Environmental Report.

The issue of compatibility of Goring Gap groundwater schemes1 and 3 will be explored further to ascertain whether sufficient water is available during the early AMP5 (2010-2015) programme. This will be reported in the addendum to the Environment Report.

Draft river basin management plans (RBMPs) were released by the Environment Agency for consultation in December 2008. We will examine the relevant RBMPs and other companies draft WRMPs to identify any cumulative effects. These will be reported in the addendum to the Environmental Report which will be published in Spring 2009.

2.17.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.17.5.iv Reasons for changes/no changes to the Plan

Sub-section 2.17.5.ii provides further explanation on potential cumulative impacts and an addendum to the Environmental Report will be produced in Spring 2009 to provide further information on cumulative impacts arising form the RBMPs and other water companies WRMPs. No changes to the draft Plan are justified.

2.17.6 Monitoring of environmental effects

2.17.6.i Consultee representations

Some consultees recommend that Thames Water provide details on how it will set up a monitoring programme to identify any unforeseen significant environmental effects in order that appropriate remedial action can be taken. Chapter 10 of the SEA Environmental Report, Volume 6 of the draft Plan states that only the significant impacts of the WRMP will be monitored. However, the SEA Directive requires monitoring to be carried out to ensure that ‘unforeseen adverse effects’ are identified ‘at an early stage’.

2.17.6.ii Thames Water consideration

Regulation 17 of the SEA Regulations states ‘The responsible authority shall monitor the significant environmental effects of the implementation of each plan or programme with the purpose of identifying unforeseen adverse effects at an early stage and being able to take appropriate remedial action.’ In developing the monitoring programme, we therefore took as a starting point those effects that had been identified as significant. Of those receptors on which only perceptible impacts were identified, only impacts on Terrestrial Biodiversity, Landscape & Visual Amenity and Recreation & Navigation would not be encompassed by the monitoring parameters included in Table 10.1 of the Environmental Report. However, as in most cases these impacts would arise due to the reservoir, they would be included in a detailed monitoring programme to be laid out in the Environmental Management Plan required as a planning condition attached to a development consent for the reservoir.
The SEA monitoring programme will make use of existing datasets collated by ourselves or by others such as the Environment Agency. Data will be reviewed on an annual basis so that trends can be identified and effective mitigation measures implemented. More detailed information on the monitoring programme will be included in the SEA Post Adoption Statement to be published with the final WRMP.

2.17.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.17.6.iv Reasons for changes/no changes to the Plan

More detailed information on the monitoring programme will be included in the SEA Post Adoption Statement to be published with the final WRMP. No changes to the draft Plan are justified.
2.18 Upper Thames Reservoir

Summary table of main issues

<table>
<thead>
<tr>
<th>Table of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Statements of opposition and the legal process</td>
</tr>
<tr>
<td>2. Consideration of alternative schemes</td>
</tr>
<tr>
<td>3. Challenging the need for development</td>
</tr>
<tr>
<td>4. Challenging information provided on scheme costs</td>
</tr>
<tr>
<td>5. Impact on flooding</td>
</tr>
<tr>
<td>6. Construction impacts</td>
</tr>
<tr>
<td>7. Environmental impacts</td>
</tr>
<tr>
<td>8. Structure and reservoir safety</td>
</tr>
<tr>
<td>9. Location of reservoir in Oxfordshire</td>
</tr>
<tr>
<td>10. Bulk supplies, Water Resources in the South East and company profits</td>
</tr>
<tr>
<td>11. Alternative sites</td>
</tr>
<tr>
<td>12. Operational impacts</td>
</tr>
<tr>
<td>13. Challenging viability</td>
</tr>
<tr>
<td>14. Climate change, microclimate and evaporation</td>
</tr>
<tr>
<td>15. Assumed abstraction licence</td>
</tr>
<tr>
<td>16. Hydrological evidence</td>
</tr>
<tr>
<td>17. Build-up of use</td>
</tr>
<tr>
<td>18. Average Incremental Social Costs</td>
</tr>
<tr>
<td>19. Stage 1 report</td>
</tr>
</tbody>
</table>

2.18.1 Statements of opposition and the legal process

2.18.1.i Consultee representations

Consultees offered a wide range of views on the proposed Upper Thames Reservoir. Several consultees made statements in support of the reservoir, while other consultees made statements of opposition to the reservoir. Several consultees called for a Public Inquiry and some consultees requested mediation to enable the examination of the complex issues involved in the reservoir proposals. One consultee questioned whether the inclusion of the reservoir proposal in the draft Plan is prejudicial to the proper examination of the proposal under whatever consenting process is ultimately used.

Many of the representations are related to technical issues, these are discussed in the appropriate section of this Statement of Response.

2.18.1.ii Thames Water consideration

Representations related to technical issues such as the population forecasts, demand forecasts, uncertainty or option appraisal, have been covered in the relevant sections of this Statement.

The need for a reservoir is being considered through the appropriate statutory process, that is the Water Resources Management Plan process, in accordance with the statutory Water Resource Planning Guideline produced by the Environment Agency. This Statement of Response following the public consultation on the draft Plan will be carefully considered by the Secretary of State who will decide whether to
approve the draft Plan, direct us to amend the draft Plan or call for further public scrutiny of the Plan.

If the Secretary of State approves the draft Plan and the reservoir project proceeds, a planning application will be made under the Planning Act and considered by the Infrastructure Planning Commission. The Infrastructure Planning Commission, as part of its examination of the application, may call a public hearing to assist them in coming to a decision.

The Government is also committed to thorough and effective public consultation in the preparation of National Policy Statements which will include one on water infrastructure. It is intended that this consultation should include positive and proactive means of engaging citizens and communities. Where a National Policy Statement is location specific, the relevant local communities will be consulted on the proposals and the Government will consult the local authorities on how the NPS should be publicised in the local area. As well as effective and thorough public consultation National Policy Statements will be subject to parliamentary scrutiny. The Planning Act requires the Government to lay each draft National Policy Statement before Parliament and to respond to the recommendations of a committee of either house, or a resolution of either house, within a specified period. Where a committee recommends that a debate is held, the Government has said that it will make Parliamentary time available within six weeks. Before designating a National Policy Statement, the Government will consider representations made during the consultation including resolutions of Parliament, amending the National Policy Statement as appropriate. The new regime is intended to make decisions about major infrastructure in ways that are faster, fairer and more transparent.

We are content with the statutory processes and are prepared to represent our plans and projects at any statutory public hearings or inquiries. The processes being followed in respect of the draft Plan and any subsequent application for consent, will be statutory processes enacted by the Government. We will comply with the law, and will follow the rules laid down by Parliament - both in respect of the determination of the Water Resources Management Plan, and the planning/consent process that we are required to follow should we proceed with the application for consent for the proposed Upper Thames Reservoir.

2.18.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.1.iv Reasons for changes/no changes to the Plan

Where statements of support or opposition have been made with reference to technical issues, these have been considered in the appropriate sections of this Statement.

Further explanation to clarify the statutory process is given in sub-section 2.18.1.ii, no changes to the draft Plan are justified.

2.18.2 Consideration of alternative schemes

2.18.2.i Consultee representations

Consultees consider that Thames Water has not taken sufficient account of alternative schemes to the proposed Upper Thames reservoir. The most commonly
mentioned were transfers of water into the region from the River Severn which would themselves involve reservoir development but outside the Thames region, indirect planned reuse of effluent, desalination, the use of potentially unused licences, Didcot power station in particular, and the use of artificial recharge of groundwater.

2.18.2.ii Thames Water consideration

A full range of alternative schemes to the proposed Upper Thames reservoir have been considered, including transfers from the River Severn or the north of England together with imports from Scotland and Norway. As a result of representations received we have revisited some of the options and have commissioned additional investigations into the transfer option from a reservoir at Longdon Marsh in Gloucestershire, these are presented in section 2.8 of this Statement.

2.18.2.iii Changes to the Plan made as a result of consultee representations

Changes to the draft Plan which have been made in response to further investigation of water resource options are presented in Section 2.8.

2.18.2.iv Reasons for changes/no changes to the Plan

Changes to the draft Plan on specific schemes are detailed in section 2.8 of this Statement. No further changes are justified.

2.18.3 Challenging the need for development

2.18.3.i Consultee representations

The need for the reservoir has been challenged on a number of issues relating to the planning of future resources. This has included per capita consumption, population, job creation and household projections and demand forecasting. The adequacy of demand management activities, particularly leakage but also metering, water efficiency and other issues are included in the consultees’ rejection of the need for a reservoir. In addition consultees queried whether Thames Water had ignored the financial benefits of the delay to the reservoir construction. The treatment of uncertainty, and particularly headroom, has also been challenged.

2.18.3.ii Thames Water consideration

Consultees have challenged a number of the issues around the forecasting of demand and the assumptions that underpin the forecasts. There have been particular challenges around per capita consumption, population forecasts and the impacts of the economic downturn. As a result of the representations we have reviewed the demand for water as described in section 2.3 of this Statement.

These challenges have all been addressed in the following sections of this Statement.

2.3 Current and future demand for water
2.5 Allowing for risk and uncertainty
2.10 Leakage
2.11 Metering
2.12 Water Efficiency
The draft Plan included the proposed Upper Thames Reservoir as an integral part of our water resources strategy in order to secure supplies for both the Swindon and Oxfordshire and the London Water Resource Zones. However the severe economic downturn and the fact that people are currently using less water, potentially as a result of water savings achieved during the recent drought and continuing dull, wet weather in the following two summers, has caused the current demand for water to drop significantly. This has been reflected in the forecasts. Moreover, we have identified a number of significant uncertainties which have the potential to drive a step change in the supply demand deficit predictions and some of which are likely to be resolved within the AMP5 period. These include sustainability reductions to meet the requirements of the Water Framework Directive, improved and updated climate change predictions from the forthcoming UKCP09 scenarios, effectiveness of demand management measures, duration and severity of the economic downturn, change in weather patterns to a period of warmer, drier summers. As a result, we do not consider it prudent to continue at current activity levels on the Upper Thames Reservoir project and the scheme is delayed by up to 5 years. Early resolution of some of the uncertainties described above could drive the need for Upper Thames Reservoir and potentially bring the project forward again. As a result, the WRMP will be reviewed annually. In the meantime we will continue to engage with the planning process to ensure the reservoir scheme is recognised in plans for the area, and will keep our studies up to date.

2.18.3.iii Changes to the Plan made as a result of consultee representations

Following representations received on our draft Plan and changes in the economic climate we have revised our demand forecasts and have concluded that the proposed Upper Thames Reservoir is not required until 2026/7. We will review our Plan annually and, if any of the above uncertainties are resolved and materially impact the WRMP, the full plan will be reworked and this may bring the proposal forward again. Information on the preferred programme in our revised draft Plan is provided in sections 2.9 and 3 of this Statement.

2.18.3 iv Reasons for changes/no changes to the Plan

In view of the revised demand forecast and the revised supply-demand balance in London and Swindon & Oxfordshire Water Resource Zones, the preferred programmes were reviewed to ensure they were appropriate to the planning problem. The reservoir is still a key part of our long term plans and is included in our revised draft Plan from 2025.

2.18.4 Challenging information provided on scheme costs

2.18.4.i Consultee representations

Some consultees challenged the cost of the Upper Thames Reservoir compared with the costs of other water resources schemes with specific reference to reuse. Furthermore consultees suggested that the overall planned costs appear to be based on the reservoir being in full operation from the completion of construction with the view being expressed that it will not be utilised in full for many years and it is inherently less flexible and more expensive than other options.

2.18.4.ii Thames Water consideration

The challenge is in respect of the comparative costs between the proposed reservoir and other options, rather than on the costs of the reservoir itself. Reservoir costs
have been the subject of extensive investigations, funded in the current Asset Management Period, and are therefore much more robust than the cost estimates for most other options. The costs given in the draft Plan are correct as at the date of the publication. The main elements to the construction of the embankments, pipelines, treatment works and other structures, are well established in terms of quantity and these have been used with current contractor estimates in deriving the costs. Final costs will depend on the contract price at construction and additional items, for example conservation, access and amenity, which will be subject to public consultation.

In reviewing scheme costs, we undertake an economic comparison using Average Incremental Social Cost, which includes capital, operating and environmental and social costs. The Average Incremental Social Cost allows direct comparison as it is expressed on a p/m³ basis. Using this approach, reuse is around 55 per cent more expensive than a reservoir. Further information on comparative costs of options has been considered in sections 2.7, 2.13 and 2.14 of this Statement.

The issue around effluent reuse has been explained in section 2.8.3. With the information currently available to us, we do not agree that the simple tertiary treatment processes used by Essex & Suffolk Water at Langford on effluent derived from predominantly domestic sewage and advocated by a number of consultees is appropriate for use with effluents such as those in London with a heavily industrialised catchment. We have constructed a pilot plant at Deephams Sewage Treatment Works in London to evaluate the treatment processes that are required in more industrial catchments. When this research is complete, during AMP5 (2010-2015), we will be confident of the processes required to ensure indirect potable reuse can be developed in a way that is both safe and acceptable to the customers who live in the areas in which reuse will form part of the water supply.

It is inevitable that any large increase in available resources will be subject to a period during which it is not fully utilised, and full utilisation will not occur until supply and demand move closer together. This does, however, provide a significant benefit to the security of supply and will potentially allow for more extreme events than those currently envisaged to be withstood without adverse effects on customers. In terms of the consideration of water resources in the wider context of South East England, it will give the opportunity to provide water to other companies in the short to medium term after construction is completed. This will give the opportunity to offset some of the costs of development of the reservoir to the benefit of customers.

2.18.4.iii Changes to the Plan made as a result of consultee representation

Any changes that are being made to the Plan as a result of this challenge on the comparative cost of schemes are described in the following sections of this Statement:

- 2.7 Appraisal of supply demand options
- 2.7.1 Options appraisal methodology
- 2.7.2 Balance of demand management and new resources
- 2.7.3 Scheme costs – accuracy
- 2.7.4 Scheme costs – components
- 2.8.3 Effluent reuse
- 2.13.3 Weighting of carbon costs
- 2.13.5 Decision-making process
2.13.6 Accounting for flexibility

2.14.3 Balanced approach to selection of preferred programme
2.14.4 Contribution of individual schemes

2.18.4.iv Reasons for changes/no changes to the Plan

A full cost assessment is undertaken on all feasible schemes. Cost is a key parameter used in selecting a preferred programme. Changes have been made to the revised draft Plan in line with sub-section 2.18.4.iii.

2.18.5 Impact on flooding

2.18.5.i Consultee representations

Several consultees raised concerns in relation to local flooding. Abingdon and the villages of Steventon and East Hanney were all affected by the July 2007 flooding and other flood events. Consultees raised concerns that the proposed reservoir will impinge upon the floodplain, potentially impact on groundwater flooding and may induce more pluvial flooding (sometimes called flash flooding) in the area immediately surrounding the reservoir.

2.18.5.ii Thames Water consideration

We are acutely aware of these concerns which have been raised with us by local representatives at all levels, in person by members of the public at the local exhibitions and in technical correspondence.

The Environment Agency is the responsible authority for flood management and flood risk assessment. At the local exhibitions in the area of the proposed reservoir, we provided information on the flood compensation storage required to replace the area of floodplain of the River Ock and its tributaries that would be lost if the reservoir is constructed. This is in line with the Environment Agency’s requirement to provide compensation storage for a 1 in 100 year flood plus 20 per cent for climate change on a ‘level for level’ basis. We will continue to work with the Environment Agency to ensure that all its requirements are met.

Issues that are specific to the design and potential environmental impact of the reservoir including local flooding will be the subject of further consultation both by us and through the planning process if the reservoir project proceeds.

2.18.5.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.5.iv Reasons for changes/no changes to the Plan

Issues that are specific to the design and potential environmental impact of the reservoir do not form part of the draft Plan. They will be the subject of further consultation by us and through the planning process if the reservoir project proceeds at a later date.
2.18.6 Construction impacts

2.18.6.i Consultee representations

Some consultees expressed concern that the 8-10 year construction period would cause major local environmental damage, dust and disruption, especially to the area adjoining the A34 (already Britain’s busiest trunk road) around the villages of Steventon, Drayton and Marcham.

2.18.6.ii Thames Water consideration

As explained in sub-section 2.18.3.ii the proposed Upper Thames Reservoir has been delayed in our revised draft plan to 2026/27, funding linked to promotion and preliminary studies will not be included in our Business Plan in AMP5 (2010-2015).

If the reservoir project proceeds at a later date, the issues that are specific to the construction of the reservoir will be the subject of further consultation both by us and through the planning process. Any planning application will be accompanied by a full Environmental Statement. This will include a full assessment of construction impacts and those on traffic both during construction and when the reservoir is operational together with full plans for mitigation of such impacts. Planning applications made under the Planning Act will be considered by the Infrastructure Planning Commission (IPC) and, as part of its examination of the application issues such as construction impacts will be considered.

2.18.6.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.6.iv Reasons for changes/no changes to the Plan

Issues that are specific to the design and potential environmental impact of the reservoir do not form part of the draft Plan. They will be the subject of further consultation by us and through the planning process if the reservoir project proceeds at a later date.

2.18.7 Environmental impacts

2.18.7.i Consultee representations

Consultees made a wide range of comments relating to the environmental impact of the proposed reservoir. These range from concerns about the impact on flora and fauna, individual species and wildlife relocation should the project go ahead to wider concerns such as the impact on agriculture, archaeology, traffic, flooding, landscape, energy, recreation and local communities.

2.18.7.ii Thames Water consideration

As explained in sub-section 2.18.3.ii the proposed Upper Thames Reservoir has been delayed in our revised draft plan to 2026/27, funding linked to promotion and preliminary studies will not be included in our Business Plan in AMP5 (2010-2015).

If the reservoir project proceeds at a later date, the issues that are specific to the environmental impact of the reservoir will be the subject of further consultation both by us and through the planning process. Any planning application will be
accompanied by a full Environmental Statement and considered by the Infrastructure Planning Commission. The Infrastructure Planning Commission, as part of its examination of the application, will cover issues such as local environmental impact.

2.18.7.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.7.iv Reasons for changes/no changes to the Plan

Issues that are specific to the design and potential environmental impact of the reservoir do not form part of this draft Plan. They will be the subject of further consultation by us and assessed fully through the planning process if the draft Plan if the reservoir project proceeds.

2.18.8 Structure and reservoir safety

2.18.8.i Consultee representations

Some consultees questioned whether the site is suitable for reservoir construction, why the proposed reservoir needs to be within embankments and raised issues about design and safety.

One consultee questioned the exact location for the proposed reservoir.

2.18.8.ii Thames Water consideration

As explained in sub-section 2.18.3.ii the proposed reservoir has been delayed in our revised draft plan to 2026/27, funding linked to promotion and preliminary studies will not be included in our Business Plan in AMP5 (2010-2015).

Representations related to specific structure and safety issues have been responded to below.

There are no valley sites suitable for a reservoir in the Thames catchment so a fully embanked structure is the only option available. The construction of the embankments from materials from within the site not only increases the volume of water that can be stored but also means that no materials have to be transported away from the site to the detriment of the local transport networks.

Extensive ground investigations have already taken place to inform the engineering design of the embankments. If the project proceeds, there would be further investigations and a trial embankment would be built.

All reservoirs are subject to the statutory requirements contained within the Reservoirs Act 1975 and the enforcement authority, under the Act, is the Environment Agency. The design and construction of a reservoir would be supervised by what is known as a `nominated` Construction Engineer. The appointment of this nominated Engineer is administered by the Institution of Civil Engineers.

Reservoir safety is of great importance and within two years of completion and thereafter at least once every ten years, the reservoir would be inspected by an independent qualified Inspecting Engineer. Reservoir safety is supervised by the
Environment Agency which remains the responsible authority appointed by Government once a reservoir is operational.

The site of the proposed reservoir is to the south west of Abingdon in Oxfordshire. The site is between the villages of Steventon and Drayton to the east, Marcham to the north and East Hanney to the west. The south of the site is bounded by the main railway line between Paddington and Bristol. More detail is available on our website.

2.18.8.iii Changes to the Plan made as a result of consultee representations
No changes.

2.18.8.iv Reasons for changes/no changes to the Plan
Matters dealing with the construction and safety of the proposed reservoir are not issues that form part of the Plan. If the reservoir project proceeds at a later date these matters will be dealt with fully through the planning process before consents are granted for construction.

2.18.9 Location of the reservoir in Oxfordshire

2.18.9.i Consultee representations
Some consultees have commented on the location of the reservoir in Oxfordshire and remarked on the inequity of the loss of land and local disruption in the county of Oxfordshire when the perceived need for water is in London.

2.18.9.ii Thames Water consideration
As explained in sub-section 2.18.3.ii the proposed reservoir has been delayed in our revised draft plan to 2026/27, the supply demand planning indicates that the reservoir will be needed to provide water to both London and Swindon and Oxfordshire Water Resource Zones, albeit with the majority for London in the period immediately after commissioning.

We have undertaken detailed studies to investigate potential sites using a process on which we consulted widely. The site selection process showed that there were no suitable reservoir sites in or close to London. Application of the site selection methodology identified the site to the south west of Abingdon as the best available based on information as published in site selection Report.

2.18.9.iii Changes to the Plan made as a result of consultee representations
No changes.

2.18.9.iv Reasons for changes/no changes to the Plan
The proposed reservoir site is that identified as the best available based on information from the published site selection methodology on which we consulted widely. We will present this evidence in any application for consent should the project proceed.
2.18.10 Reservoir – bulk supplies, Water Resources in the South East and company profits

2.18.10.i Consultee representations

Some consultees have suggested that if existing bulk supplies from Thames Water to neighbouring companies were cancelled there would be no need for a reservoir.

Other consultees have suggested that taking bulk supplies from neighbouring companies would similarly remove the need for the reservoir.

Some consultees also resisted the suggestion from the work of the Water Resources in the South East Group that further bulk supplies could be supplied by the reservoir. Bulk supplies are viewed as means of generating profits for Thames Water and some consultees stated that the reservoir is only being suggested to meet the financial and commercial interests of the owners of Thames Water, resulting in bias in the Plan.

2.18.10.ii Thames Water consideration

We have a number of bulk supply agreements with neighbouring water companies in the London area. These are covered in section 4.1.4, Volume 2 of the draft Plan and sub-section 2.4.4 in this Statement.

The Environment Agency has overall responsibility to Government for water resources planning. They have been leading an investigation into the water resources situation in the south east of England through the Water Resources in the South East Group. Information to date indicates that the Group will recommend that companies share resources whenever possible. The short-term use of water from the reservoir if built, until it is fully taken up by our customers, is on their list of favoured options. This is not being used to justify the reservoir, which we believe is still needed in the long term to secure the long-term resources for our customers.

Currently, bulk supply agreements do not generate 'profits' for our shareholders. Typically they only recover costs. Should the reservoir be developed and be used as a regional resource, if only in the short to medium term, the charges to participating companies would be the subject of negotiation between the parties. If the companies cannot agree a price it would be determined by our regulators to protect the interests of all companies and their customers.

Investment in the proposed reservoir and in other options, such as the Victorian Mains Replacement programme to reduce leakage, would both be treated as additions to our infrastructure assets. Returns and cash flow from the proposed reservoir and from other options would be equally attractive to investors, since they are calculated on the same basis.

2.18.10.iii Changes to the Plan made as a result of consultee representations

Further information relating to bulk supplies and the reasons why no changes have been made relating to bulk supplies are discussed in section 2.4.4 and the reasons given in section 2.4.4.iv. Information relating to the Water Resources in the South East Group and changes made to the draft Plan are detailed in section 2.4.9.
2.18.10.iv Reasons for changes/no changes to the Plan

Sub-section 2.18.10.iii highlights sections of the Statement for further explanation and details of changes to the draft Plan related to these representations.

2.18.11 Alternative sites

2.18.11.i Consultee representations

Some consultees raised concerns about the other reservoir sites, in particular Quainton, identified in the Site Selection Study Report. Others asked why the development of a single large reservoir was preferred over a number of smaller reservoirs.

2.18.11.ii Thames Water consideration

During the site selection process a large number of reservoir sites were considered. This process was undertaken in consultation with stakeholders. The proposed site near Abingdon was identified as the preferred site for mid-range reservoir development and for the large, dual-purpose reservoir. Quainton was one of four sites identified which could be suitable for a smaller reservoir. There were a number of issues raised by the respondents on the site at Quainton that had already been identified in the Site Selection Study Report. It is not our intention to investigate the site at Quainton further unless we are unsuccessful in promoting our preferred site near Abingdon and we need to revisit the site selection process for a small reservoir.

The option of developing a number of smaller reservoirs or a staged development of the proposed reservoir has been investigated as part of the draft Plan. It is less expensive in economic and environmental terms to develop a single large reservoir than a number of smaller reservoirs. This is particularly true if there needs to be closely staged, and in some cases, overlapping developments at another site or sites.

2.18.11.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.11.iv Reasons for changes/no changes to the Plan

The preferred site for the proposed Upper Thames Reservoir was selected using information from the site selection methodology on which we have consulted widely. We have also looked at the option of a number of smaller reservoirs and both increase the environmental impact and costs.

As explained in sub-section 2.18.3.ii the proposed Upper Thames Reservoir has been delayed in our revised draft Plan to 2026/27. We will review the site selection study if the reservoir is promoted in the future. No change to the draft Plan is justified.

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38 Site Selection Report, Thames Water, 2006
2.18.12 Operational impacts

2.18.12.i Consultee representations

Some consultees have raised questions about how the reservoir would be filled and operated, including the implications for energy use and possible siltation of the reservoir. The future of the Wilts & Berks Canal has also been raised.

2.18.12.ii Thames Water consideration

The first filling of the reservoir would need to be done under controlled conditions with full monitoring of the structures. In operational use, our modelling has shown that the reservoir can be filled in a single winter.

Issues that are specific to the environmental impact of the reservoir will be the subject of further consultation both by us and through the planning process if the project proceeds. If a planning application is made it will be under the Planning Act and considered by the Infrastructure Planning Commission. The Infrastructure Planning Commission, as part of its examination of the application, will cover issues such as energy use.

In summary the reservoir will operate as follows. Water would be abstracted when it is available and used to refill the reservoir, predominantly in the winter. Water for London would be released back into the river and transferred to London under gravity. Water would then be abstracted for storage in the London reservoirs and treatment at the London treatment works.

The proposed reservoir, in common with most of our other reservoirs, would be pumped storage. This means that we can avoid abstracting water when there are high silt loads in the river. The reservoirs are therefore not susceptible to siltation in the way that a river impoundment may be. We have reservoirs in London that have been operational for many decades without significant siltation.

We are in discussions with the Wilts & Berks Canal Trust about how the canal might be integrated with the proposed reservoir.

2.18.12.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.12.iv Reasons for changes/no changes to the Plan

Issues that are specific to the design and potential environmental impact of the reservoir do not form part of the draft Plan. They will be the subject of further consultation by us and through the planning process if the reservoir project proceeds in the future. No change to the draft Plan is justified.

2.18.13 Challenging viability

2.18.13.i Consultee representations

Some consultees have challenged whether there is sufficient flow in the River Thames to fill and operate the proposed reservoir.
2.18.13.ii  Thames Water consideration

We have carefully evaluated the water available from the River Thames given the constraints that are likely to be imposed by the Environment Agency. We have used simulation modelling to calculate the abstraction and discharge regime for the proposed reservoir using over 80 years of historic daily data. The simulations have been done using our WARMS model, which has been subject to regular audit by our regulators. The historic data have been obtained from the Environment Agency. As explained in sub-section 2.18.15 below, we have tested against potential licence and flow constraints set by the Environment Agency as the responsible authority.

The modelling has shown that under normal operations the reservoir could be filled in a single winter. We have discussed this with the Environment Agency who have not challenged our results. The exception could be the first filling of the reservoir, which will be closely monitored and could take up to two years.

We have also used methodologies as prescribed by the Environment Agency to assess the impact of climate change and we have shown that the reservoir would be robust against currently available climate change scenarios.

2.18.13.iii  Changes to the Plan made as a result of consultee representations

No changes.

2.18.13.iv  Reasons for changes/no changes to the Plan

Issues that are specific to the design and potential environmental impact of the reservoir do not form part of the draft Plan. They will be the subject of further consultation by us and through the planning process if the project proceeds in the future.

2.18.14  Climate change, microclimate and evaporation

2.18.14.i  Consultee representations

Some consultees have expressed doubts as to whether the reservoir would still be viable when climate change has been taken into account. Consultees have challenged the volume of water that would be lost by evaporation and suggested that due to evaporation the reservoir is not viable. Consultees also raised points about the potential impact of the reservoir on the local microclimate.

2.18.14.ii  Thames Water consideration

We have used the scenarios produced by United Kingdom Climate Impacts Programme, incorporated within methodologies developed with, and approved by, the Environment Agency to assess the impacts of climate change. These scenarios are used to perturb long period rainfall and evaporation data to simulate the effect of climate change and thereby assess the impact of the longer and more extreme droughts that are likely in the future. There are currently no techniques available that allow proper forecasts as to the extent or nature of future droughts. We have, therefore had to use perturbed versions of past events to assess sensitivities. These perturbed time series are used in our simulation modelling. These have shown that the reservoir would be robust against the conditions suggested by the scenarios. If and when improved techniques become available they will be added to our assessments.
It is agreed that evaporation would occur from the reservoir, as it does from all surfaces that are wet, whether open water or vegetated surfaces, and this needs to be taken into account in any water balance. Evaporative losses from the reservoir have been included in our assessment of reservoir output calculated using the standard Met Office MORECS data which are derived from the Penman-Monteith equation. The Penman-Monteith equation is used world-wide to calculate evaporation. This assessment has shown that over a normal annual cycle, incoming precipitation exceeds evaporation. Assessments in dry and drought summers show that evaporation would, as expected, increase. It does not however, compromise the viability of the reservoir under current or expected climate change conditions.

Issues that are specific to the design and potential environmental impact of the proposed reservoir will be covered by further consultation and through the planning process if the project proceeds in the future. This will include the potential impacts on the local microclimate.

2.18.14.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.14.iv Reasons for changes/no changes to the Plan

The viability has been demonstrated through the use of best available modelling. Issues that are specific to the design and potential environmental impact of the reservoir do not form part of the draft Plan. They will be the subject of further consultation by us and through the planning process if the project proceeds in the future.

2.18.15 Assumed abstraction licence

2.18.15.i Consultee representations

Some consultees asked for clarification of the abstraction licence conditions on which we are basing our assumptions to make the reservoir viable.

2.18.15.ii Thames Water consideration

The Environment Agency is responsible for the granting of abstraction licences and they were consulted on the licence conditions they would expect to impose. They have stipulated that abstraction would not be permitted when flow in the Thames at Culham is less than the Q_{50} flow. This means that there can be no abstraction when flows are below the 50 percentile flow. At Culham this is 1450 Ml/d and this figure has been agreed with the Environment Agency for planning purposes. We proposed that the maximum permitted abstraction should be 1000 Ml in any one day, with an annual total of 366,000 Ml. This has also been agreed by the Environment Agency as a basis for planning. It is expected that this will also form the basis for the licence to abstract that will be needed from the Environment Agency if the project proceeds.

2.18.15.iii Changes to the Plan made as a result of consultee representations

No changes.
2.18.15.iv Reasons for changes/no changes to the Plan

As described in sub-section 2.18.15.ii, the licence assumptions for planning purposes have been agreed with the Environment Agency as the licensing authority, no change to the draft Plan is therefore required.

2.18.16 Reservoir – hydrological evidence

2.18.16.i Consultee representations

Consultees questioned whether Thames Water could provide good, independent hydrological evidence based on an independent survey that there is sufficient flow in the Thames to fill and service the proposed reservoir. Consultees also stated that this should include climate change conditions throughout the life of the reservoir.

2.18.16.ii Thames Water consideration

The assessment of the operation of the proposed reservoir, including drawdown and refill has been carried out using our WARMS model. This simulation model, using daily hydrometeorological data from 1920 to date, has been subject to independent technical audit by the reporters acting for our regulators on a number of occasions. It also has the capability to assess the impact of climate change on rainfall, runoff and aquifer recharge using the methodologies agreed with and required by the Environment Agency in the Water Resources Planning Guideline. The Environment Agency have used the output from the model in all discussions with us relating to the hydrology of the proposed reservoir and have not challenged the validity of the generated hydrologies. Climate change to date has been assessed to 2035 as required by the same Guideline using the UKCIP02 scenarios, although the methodologies could be used to look further ahead to 2070. When they are published in spring 2009, the UKCP09 scenarios are expected to provide information to 2100.

It is expected that the proposed reservoir will have an operational life of at least 100 years, in other words beyond 2120. Although sensitivities could be further tested when the UKCP09 scenarios are available, current information from UKCIP indicates that the UKCIP02 scenarios we have used will fall within the range of the UKCP09 scenarios. (see section 2.5.5).

2.18.16.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.16.iv Reasons for changes/no changes to the Plan

As described in sub-section 2.18.16.ii, the methods used have been subject to regulatory audit, prescribed by the Guideline or discussed with our regulators. Further, issues that are specific to the potential environmental impact of the reservoir do not form part of the Plan. They will be the subject of further consultation and will be available for public scrutiny as part of the water resources licensing process if the project proceeds in the future. No changes to the draft Plan are justified.
2.18.17 Build up of use

2.18.17.i Consultee representations

Some consultees expressed the view that the reservoir would not be needed or used until 2027/8 at the very earliest (even without other facilities being brought in to boost supply), and therefore there would be an initial ‘build-up’ of use.

2.18.17.ii Thames Water consideration

The draft Plan included the proposed Upper Thames Reservoir as an integral part of our water resources strategy and in order to secure supplies for both the Swindon & Oxfordshire and the London Water Resource Zones. However, the severe economic downturn and people using less water as a result of the recent drought and continuing dull, wet weather since then has caused the current demand for water to drop significantly and this has to be reflected in the forecasts. Due to these other uncertainties it would not be prudent to continue at current activity levels on the Upper Thames Reservoir in AMP5 (2010-2015) and the scheme is delayed by up to 5 years. The reservoir is still a key part of our long-term plans and is included in our revised draft Plan from 2026/7.

Bearing in mind the proposed reservoir is for river regulation as well as direct supply, use will depend upon the weather conditions immediately after commissioning. Obviously if this coincides with a drought, extensive use will be made of the river regulation capability as well as the direct supply element.

2.18.17.iii Changes to the Plan made as a result of consultee representations

Changes have been made to the draft Plan as a result of representations received and new information which has resulted in a revised planning solution with deferral of the proposed reservoir to 2026/27.

2.18.17.iv Reasons for changes/no changes to the Plan

For the reasons explained in sub-section 2.18.17.ii changes have been made to the planning solution in the draft Plan. These are described in full in Section 3.

2.18.18 Reservoir – Average Incremental Social Cost

2.18.18.i Consultee representations

Some consultees commented that Thames Water had assumed in its Average Incremental Social Cost figure that the reservoir operates at full output capacity from the date of commissioning which is not in line with the actual build-up pattern of use.

2.18.18.ii Thames Water consideration

The way in which costs are considered and used in the comparison of schemes is discussed in section 2.18.4. Any scheme that is developed and commissioned is, by definition, available for use at its design output from the date of commissioning. As explained in section 2.18.17, the degree to which any strategic resource is used in any particular year will depend on the weather conditions at the time. This applies equally to sources of this type, which have already been developed, such as the West Berkshire Groundwater Scheme, artificial recharge or desalination.
2.18.18.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.18.iv Reasons for changes/no changes to the Plan

For the reasons explained in sub-section 2.18.18.ii, no change to the draft Plan is justified.

2.18.19 References to Stage 1 Report

2.18.19.i Consultee representations

Some consultees stated that the actual use of the reservoir, based on the Stage 1 Needs case, builds up from 2022/3 to full use in 2034/5 and taking this into account the Average Incremental Social Cost will be about double that presented in the Stage 1 Report. Consultees asked for greater transparency to ensure fair cost comparisons.

2.18.19.ii Thames Water consideration

The analysis undertaken for the draft Plan supersedes the assessments carried out for the Stage 1 Report. This includes a reassessment of all the Average Incremental Social Cost values associated with the many options considered. Average Incremental Social Cost values have been carried out using common cost bases and methodologies and do provide a fair basis for comparison.

2.18.19.iii Changes to the Plan made as a result of consultee representations

No changes.

2.18.19.iv Reasons for changes/no changes to the Plan

As described in sub-section 2.18.19.ii, the information in the draft Plan supersedes that given in the Stage 1 Report so no change to the draft Plan is justified.
2.19 Other issues

There were several representations which are outside the chapters of the draft Plan, these are addressed in this section.

Summary table of main issues

<table>
<thead>
<tr>
<th>Summary of main issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Integration of the Business Plan, Water Resources Management Plan and</td>
</tr>
<tr>
<td>River Basin Management Plans</td>
</tr>
<tr>
<td>2. Commercial competition</td>
</tr>
<tr>
<td>3. Planning application and consideration of water availability</td>
</tr>
<tr>
<td>4. Ownership and profits</td>
</tr>
<tr>
<td>5. Water Framework Directive</td>
</tr>
<tr>
<td>7. Storage options</td>
</tr>
<tr>
<td>8. Asset resilience</td>
</tr>
<tr>
<td>9. Compliance with Directions related to the Water Resources Management Plan</td>
</tr>
</tbody>
</table>


2.19.1.i Consultee representations

Some consultees questioned whether the three current consultations; draft Business Plans, Water Resources Management Plans and River Basin Management Plans, add up to a coherent approach and can be implemented at the same time as a fundamental change in the way the majority of households pay for water.

2.19.1.ii Thames Water consideration:

Our draft Business Plan and draft Water Resources Management Plan are consistent and aligned in terms of proposed activities and the impact on customer bills. The Environment Agency published the draft Thames River Basin Management Plan in December 2008. We have been in discussion with the Environment Agency on the draft River Basin Management Plan prior to this, and have included proposed measures in our draft Business Plan. However, the River Basin Management Plan is a draft and it cannot be guaranteed that there will be full alignment between the River Basin Management Plan, and the Business Plan and Water Resources Management Plan, at this stage.

2.19.1.iii Changes to the Plan made as a result of consultee representations

No changes.

2.19.1.iv Reasons for changes/no changes to the Plan

As explained in section 2.19.1.ii above, the Business Plan and the Water Resources Management Plan are consistent. We have included proposed measures from the draft River Basin Management Plan in the draft Business Plan. No change to the draft Plan is justified.
2.19.2 Commercial competition

2.19.2.i Consultee representation

Several consultees expressed that Thames Water is a monopoly supplier within the Thames Water region and questioned why there is no commercial competition.

2.19.2.ii Thames Water consideration

In the UK, domestic customers and some commercial customers do not have a choice of water supplier and the water companies are therefore viewed as monopoly suppliers. However, a strict regulatory framework is in place to protect customers’ interests. The Water Services Regulation Authority (Ofwat) regulates the water and sewerage industry in England and Wales and determines how much individual water companies can charge their customers and the level of service that is provided to customers.

Opportunities to create new competition in supplying water to large commercial and industrial users were included in the Water Act 2003. This came into force on 1 December 2005 for customers that use in excess of 50 Ml of water per year.

2.19.2.iii Changes to the Plan made as a result of consultee representations

No changes.

2.19.2.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.19.2.ii above, there is a competitive marketplace for large commercial water users. Domestic and smaller commercial users cannot currently choose their water supplier, however the industry is tightly regulated to protect customer interests. No changes to the draft Plan are justified.

2.19.3 Planning application and consideration of water availability

2.19.3.i Consultee representations

One consultee questioned that if Thames Water estimates that the water supply in the Banbury area will run out in six years time, why this was not raised when Thames Water was consulted on a planning application for new housing estates in Bodicote/Banbury (eg 1000 houses on the Bodicote-Bankside site).

2.19.3.ii Thames Water consideration

We have provided comments on future development through the local development framework process and included comments which stated that future infrastructure upgrades would be required to meet proposed development levels outlined in the Cherwell District Council’s planning policy documents. We do comment on individual planning applications where appropriate, and on this aspect, we did submit a response in November 2005 in which it was stated that the existing water supply infrastructure has insufficient capacity to meet the additional demands for the proposed development and several conditions were recommended. Once planning permission has been granted, water companies are legally obliged to supply water to new developments.
The purpose of the 25-year water resources management plan is to understand the long-term demand in our supply area and develop a programme of demand management and resource schemes to ensure we can supply the water to meet that demand.

2.19.3.iii Changes to the Plan

No changes.

2.19.3.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.19.3.ii, we provided information on the local water supply position. No changes to the draft Plan are justified.

2.19.4 Ownership and profits

2.19.4.i Consultee representations

Some consultees noted that Thames Water provides water to other Macquarie-owned water companies, and questioned whether these are intentionally hidden, and Thames Water customers are paying to allow the company to profit from such water sales.

2.19.4.ii Thames Water consideration

Macquarie does not have investment interests in any other water companies in the UK. In Volume 2, section 4.1.4 of the draft Plan we provide information on all bulk supplies of either raw or treated water into or out of our supply area. No information on water transfers has been omitted from our draft Plan.

2.19.4.iii Changes to the Plan

No changes.

2.19.4.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.19.4.ii, all information relating to bulk supplies has been provided in the draft Plan, no further changes are required.

2.19.5 Water Framework Directive

2.19.5.i Consultee representations

Several consultees raised queries around the Water Framework Directive. Specific issues raised included costs and whether the extent of the eventual costs of the Water Framework Directive and other Directives requiring environmental mitigation investment, and the share of burden falling on the water industry resembles a tax rather than an ordinary utility cost – eg raising the proportion of storm overflows taken to treatment has little to do with the level of household consumption. One consultee asked whether it would serve to create complacency in the water industry.

2.19.5.ii Thames Water consideration

We have a statutory duty to provide water and wastewater services and are required to agree long-term business plans with regulatory bodies in terms of the programme
of work and costs to our customers. These business plans can include new obligations such as objectives arising from the Water Framework Directive, the costs are therefore included in the regulatory contract.

2.19.5.iii Changes to the Plan

No changes.

2.19.5.iv Reasons for changes/no changes to the Plan

As explained in sub-section 2.19.5.ii, regulators can introduce new obligations on the water industry arising from new legislation such as the Water Framework Directive. No changes to the draft Plan are justified.

2.19.6 Water Framework Directive – nitrate concentrations

2.19.6.i Consultee representations

Several consultees raised the problems of rising levels of nitrate in water sources and the opportunity to include catchment management schemes to address these.

2.19.6.ii Thames Water consideration

Management of nitrate concentrations in water resources is, we believe, best achieved through the control of nitrate inputs into the environment. The primary responsibility for this activity rests with the Environment Agency. We have worked closely with the Environment Agency over many years to identify areas at risk from nitrate contamination and have encouraged measures designed to control nitrate pollution at source. Until recently, nitrate vulnerable zones have been the main catchment management tool available to the Environment Agency and we welcome the recent changes announced by Defra that will impose further restrictions on the use of nitrate in agriculture. The central difficulty with nitrate vulnerable zone designation and the associated protection measures is that they may not be sufficient, in the short to medium term, to prevent nitrate concentrations exceeding the 50 mg/l standard.

The Water Framework Directive will require additional actions to ensure that drinking water sources are protected from pollution, including nitrate. We have provided the Environment Agency with extensive information to help them identify where our water sources are at particular risk from nitrates. This information will be used by the Environment Agency and other stakeholders to develop catchment management plans aimed at achieving the objectives of the Water Framework Directive. Our Plan recognises and anticipates that the Water Framework Directive will deliver improvements in raw water quality over the medium to long term.

As part of our draft Business Plan, we have included schemes to deal with increasing concentrations of nitrate at two of our treatment works. In both cases, we considered whether local catchment management schemes would be an effective alternative to specialist water treatment. Unfortunately, the concentration of nitrates in both sources was rising quickly and it was evident that catchment management activities (in addition to those already underway or planned) would not prevent future failures of the drinking water standard. In these circumstances we were obliged to select water treatment as the preferred option.
2.19.6.iii Changes to the Plan

No changes.

2.19.6.iv Reasons for changes/no changes to the Plan

Further information to address the representation is provided in sub-section 2.19.6.ii relating to management of nitrate and the Water Framework Directive. No changes to the draft Plan are justified.

2.19.7 Storage options

2.19.7.i Consultee representations

Some consultees noted that abstraction and storage of flood water should be considered for water resource management as high volumes of water are available in the Thames Valley at these times. A system providing locally based underground storage tanks for local floodwater and rainwater collection could be considered.

2.19.7.ii Thames Water consideration

A government policy review of surface water drainage has confirmed that the best way to deal with rainfall is to allow soakaway to ground, through Sustainable Urban Drainage (SUDs) and other integrated urban drainage approaches. These methods prevent rainwater being channelled into rivers reducing the risk of flooding, and also increase the amount of water which soaks away into ground. This water either recharges groundwater available for later use, or slowly drains to rivers creating a more natural flow pattern. Floodwater is often contaminated with sewage and chemicals and cleaning this polluted water to the required standard would be difficult. Many of our resource issues are in London where there may not be the space for provision of underground storage. Providing the large number of small schemes required would be very expensive and provide only a very local resource.

Rainwater harvesting does offer a supplementary resource for use at the local level, such as within sustainable housing developments, and has been incorporated in some modern new developments, however this method would not be cost effective for existing housing other than for small scale collection such as water butts. Storage to allow enough water to be stored to meet the requirements for water provision during a prolonged dry spell would be considerable and the local storage would not benefit our customers more widely.

As part of our water efficiency programme, we promote subsidised rainwater butts. We have been involved with a number of research projects to investigate the feasibility, costs and benefits of rainwater harvesting at varying scales. We also participate in policy development in this area such as BSI’s greywater and rainwater standards.

We intend to increase understanding and acceptability for water reuse, and will seek to work with local and regional planners to ensure new development is as water efficient as possible, which will include the use of local rainwater and wastewater reuse.

2.19.7.iii Changes to the Plan

No changes.
2.19.7.iv  Reasons for changes/no changes to the Plan

As set out in sub-section 2.19.7.ii, we recognise the contribution of rainwater to the water supply system and have addressed this in our draft Plan. No further change to the draft Plan is justified.

2.19.8  Asset resilience

2.19.8.i  Consultee representations

Consultees queried whether Thames Water had taken account of the potential impact of flood and other climate change related events on Levels of Service.

2.19.8.ii  Thames Water consideration

There is ongoing discussion and consultation regarding surface drainage and flooding. In the meantime, we are in discussion with Ofwat regarding the inclusion of climate change expenditure in our Business Plan.

2.19.8.iii  Changes to the Plan

No changes.

2.19.8.iv  Reasons for changes/no changes to the Plan

As explained in sub-section 2.19.7.ii the issue is not relevant to the draft Plan. No change to the draft Plan is justified.

2.19.9  Compliance with Directions related to the Plan

2.19.9.i  Consultee representation

a. Consultees requested that Thames Water demonstrate compliance with Defra’s Directions.

b. In addition, consultees queried whether the draft Plan was aligned with some important elements of Government and Environment Agency policies and objectives surrounding metering, leakage and consumption of water.

2.19.9.ii  Thames Water consideration

a. Defra’s Directions in regard to the draft Plan and water company requirements are as follows:

i. To provide evidence to show the required information on planned Levels of Service and information on actual Levels of Service.

Table 36 below provides the actual Levels of Service for the London Water Resource Zone associated with the preferred programmes for the original draft Plan and the revised draft Plan; the planned or stated Levels of Service (as given in sub-section 1.5 of Volume 2) are shown for comparison. It can be seen that in the revised draft, primarily due to the reduced demand forecasts, the stated Levels of Service is attained in the first year of AMP5 (2010-2015) compared to the third year for the draft Plan. The Levels of Service ratios are calculated by
running the WARMS model with the appropriate Deployable Output and demand information.

Table 36: AMP5 (2010-2015) Level of Service - Planned vs. Actual

AMP5 Level of Service - Planned versus Actual

<table>
<thead>
<tr>
<th></th>
<th>2010/11</th>
<th></th>
<th>2011/12</th>
<th></th>
<th>2012/13</th>
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<td>L3</td>
<td>L4</td>
<td>L1</td>
<td>L2</td>
</tr>
<tr>
<td>Planned</td>
<td>1 in 5</td>
<td>1 in 10</td>
<td>1 in 20</td>
<td>Never</td>
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<td>1 in 10</td>
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<tr>
<td>Revised</td>
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<td>1 in 17</td>
<td>1 in 20</td>
<td>Never</td>
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<table>
<thead>
<tr>
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<th>2013/14</th>
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<th>2014/15</th>
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<td>L1</td>
<td>L2</td>
<td>L3</td>
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<tr>
<td>Planned</td>
<td>1 in 5</td>
<td>1 in 10</td>
<td>1 in 20</td>
<td>Never</td>
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<tr>
<td>Original</td>
<td>1 in 7</td>
<td>1 in 17</td>
<td>1 in 20</td>
<td>Never</td>
</tr>
<tr>
<td>Revised</td>
<td>1 in 7</td>
<td>1 in 17</td>
<td>1 in 20</td>
<td>Never</td>
</tr>
</tbody>
</table>

ii. To appraise current options for water supply as well as future options. By doing this we can confirm whether it is using the optimum solution.

In the draft Plan Volume 2, section 7 detailed information is provided on the appraisal of supply-demand options and section 8 covers the programme appraisal which explains the decision making process undertaken to determine the optimum planning solution. In addition, in Volume 3, Appendix F provides a full listing of water resources option, all of which were considered in the process that lead up to the economic modelling that provide the basis for final option selection. We have since reviewed and updated this list, which we have presented in section 2.8 of this statement, in Tables 25 and 26.

iii. To provide clear cost information relating to metering strategy, including cost of baseline metering as well as proposals under the final planning scenario. This should be compared to the cost of compulsory metering.

The consideration given in section 2.11.3 provides the Company’s information on its metering strategy in term of costs and benefits and shows that our The overall ratio of benefits to cost is improved by 61% under our final planning programme and by up to 100% with the inclusion of AMR.

This modelling identifies the most cost-effective type of metering and informs our policy decisions. The results are then taken into the Economics of Balancing Supply and Demand (EBSD) modelling within the WRMP to compare the cost and benefits of our preferred metering programme with other options to deliver security of supply.

Here we are able to improve further on the metering cost benefit by twinning the deployment of metering with other investment activities such as mains replacement, within our Integrated Demand Management (IDM) approach.
In order to comply with Defra Directions a new section has been inserted in Volume 2 of the draft Plan ‘9.3.5 Defra Directions’ with the following text:

“The Defra Directions with which we are required to comply can be stated as follows:

a) To provide evidence to show the required information on planned Levels of Service and information on actual Levels of Service.

b) To appraise current options for water supply as well as future options.

c) To provide clear cost information relating to metering strategy, including cost of baseline metering as well as proposals under the final planning scenario. This should be compared to the cost of compulsory metering.

With regard to:

a) the table below provides the actual Levels of Service for the London Water Resource Zone associated with the preferred programmes for the draft Plan and the revised draft Plan; the planned or stated Levels of Service (as given in sub-section 1.5 of Volume 2) are shown for comparison. It can be seen that in the revised draft, primarily due to the reduced demand forecasts, the stated Levels of Service is attained in the first year of AMP5 (2010-2015) compared to the third year for the draft Plan. The Levels of Service ratios are calculated by running the WARMS model with the appropriate Deployable Output and demand information.

### AMP5 Level of Service - Planned versus Actual

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<tr>
<th></th>
<th>2010/11</th>
<th>2011/12</th>
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<td>L1</td>
<td>L2</td>
<td>L3</td>
</tr>
<tr>
<td>Planned</td>
<td>1 in 5</td>
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<tr>
<td>Original</td>
<td>1 in 5</td>
<td>1 in 17</td>
<td>1 in 17</td>
</tr>
<tr>
<td>Revised</td>
<td>1 in 7</td>
<td>1 in 17</td>
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<tr>
<td></td>
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<td>L2</td>
</tr>
<tr>
<td>Planned</td>
<td>1 in 5</td>
<td>1 in 10</td>
</tr>
<tr>
<td>Original</td>
<td>1 in 7</td>
<td>1 in 17</td>
</tr>
<tr>
<td>Revised</td>
<td>1 in 7</td>
<td>1 in 17</td>
</tr>
</tbody>
</table>

Table: AMP5 (2010-2015) Level of Service - Planned vs. Actual

a. in section 7 detailed information is provided on the appraisal of supply-demand options and section 8 covers the programme appraisal which explains the decision making process undertaken to determine the optimum planning solution. In addition, in Volume 3, Appendix F provides a full listing of water
resources option, all of which were considered in the process that lead up to the economic modelling that provide the basis for final option selection. The revised lists are given below.

2.19.9.iv Reason for changes/no changes to the Plan

In sub-section 2.19.9.ii. we have explained how we have complied with Defra’s Directions and the changes made to the draft Plan are shown in sub-section 2.19.9.iii.
We have endeavoured to address all consultee representations in the Statement of Response which are related to the draft Plan. If consultees have raised an issue which they do not feel has been addressed please contact consultations@thameswater.co.uk
3 Overview of revised plan

3.1 Purpose of section

This section sets out the details of the assessment that has led to the revised dWRMP. It draws out the material changes that have arisen from consideration of consultee representations, and new data and information that has become available since submission of the dWRMP in March 2008. It also explains how these changes have informed the revised dWRMP.

In order to provide a coherent summary of the revisions to the original draft Water Resources Management Plan (dWRMP), Section 3 has been added to Volume 3 of the original dWRMP as Appendix N.

Material changes to demand forecasts - section 3.2 describes in sequence the factors that have produced the main changes to the demand forecasts over the planning period.

Revised baseline balances - section 3.3 sets out the revised baseline supply-demand balances for each of the six Water Resources Zones (WRZs). The revised deficits and surpluses for each WRZ are presented and compared to those in the original dWRMP.

Revised preferred programme: approach to selection - section 3.4 builds on the baseline balances and describes the process used to identify the preferred supply demand programme.

Revised preferred programme: results of programme appraisal – section 3.5 describes the results of the programme appraisal process.

Components of the preferred plan – section 3.6 describes the preferred plan demand management elements of the programme in the London and SWOX water resource zones in more detail.

Summary of Preferred Programmes and comparison with original Plan – section 3.7 provides the revised supply demand balance charts showing the preferred programmes

Concluding statement - section 3.8 summary of revised draft Plan.

One of the most significant drivers for investment in our revised draft Plan is the forecast impact of climate change on both water available for use and the demand for water.

As discussed in section 2, we have used the UKCIP (UK Climate Impacts Programme) 2002 climate change scenarios to assess the potential impact on water available for use. Updated climate change scenarios will be available from UKCIP later in 2009 and, whilst we do not expect that these will be significantly different and materially impact on our plan, we do recognise that future investment should be determined using the most up to date information wherever possible and that the delay in UKCIP2009 data creates an element of uncertainty.

39 ‘material changes’ are those that are sufficiently significant to impact on the preferred programme
We therefore intend to update our plan using the UKCIP2009 scenarios as soon as pragmatically possible. To allow for any changes in the required investment, our final Business Plan (BP) submission to Ofwat in April 2009 will only include investment costs and outputs for the first two years of the planning period (2010/11 and 2011/12) where these are driven by climate change.

We intend to make an in period submission for the remainder of the AMP5 period using the UKCIP2009 climate change scenarios and have discussed our proposed approach with Ofwat. We believe that this is the most efficient way of dealing with this uncertainty, whilst also managing the security of supply risk for our customers. Consequently leakage reduction forecasts and household meter penetration numbers contained in our revised draft WRMP will align with those in our final BP, for the first two years of the period only.

In the unlikely event that the UKCIP2009 data does have a material impact on our plan, then the forecast leakage reduction and household meter penetration in our final BP will change.

In the London water resource zone the potential impact of climate change on water available for use is much more significant than in the SWOX zone, given that London’s water is predominantly derived from surface water sources. The overall magnitude of our AMP5 leakage reduction and household meter installation activities are closely linked to the size of the supply demand deficit for London. Any changes could therefore be significant. In SWOX, climate change comprises a much smaller driver for the resource development and household meter programmes.

### 3.2 Material changes

#### 3.2.1 Introduction

The most significant changes relate to the demand forecast and are as follows:

- Demographics - population and households
- Economic downturn
- Household water use – microcomponents of demand
- Water use in new build properties
- Bounceback

#### 3.2.2 Demographic movements – population and households

An independent review of our population and household forecasts has been undertaken. The changes arising from the review are discussed in sub-section 2.3.2, and are summarised in Table 37 for London. Over the planning period, the upward movement in demand associated with updated Office of National Statistics (ONS) population and Regional Spatial Strategies (RSS) household forecasts becomes increasingly significant with an increase in the forecast for water consumption from 11 Ml/d in 2014/15 to 51 Ml/d in 2034/35.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 37: Summary of demographic update in London WRZ
3.2.3 Economic downturn

As described in sub-section 2.3.3, an independent review\(^40\) of the impact of the economic downturn in terms of the demand forecast has also been undertaken. The results showed a significant reduction in both population and housing growth over the planning period. Based on econometric principles alone, the trend would be expected to continue indefinitely.

However, we are also required to following Environment Agency Water Resources Planning Guidelines which direct water companies to plan to policy forecasts ie. government housing policy. This is also in line with the forecasts used for the Regional Spatial Strategies and our continuing dialogue with the Regional Assemblies. Therefore we have made an assumption that in the medium to long-term government housing policy will influence the housing market resulting in an upward departure from the base econometric trend, back to policy levels.

The Company’s assessment of non-household demand is based on both an econometric model developed and run by Experian and an allowance for the recent acceleration in the economic demand downturn, which has become increasingly evident since the completion of the Experian study in October 2008.

Table 38 summarises the net impact of the economic downturn on households and non-household demand and shows the impacts to be significant in the short to medium term with a reduction in demand for water of around 59 Ml/d by 2014/15. The impact then progressively reduces to 25 Ml/d by 2034/35.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 38: Summary of the impact of the economic downturn in London WRZ

3.2.4 Household water use – microcomponents of demand

An independent review of household microcomponent water use has been undertaken as detailed in sub-section 2.3.5. The review has resulted in an improved understanding of Defra’s aspirational per capita consumption (PCC) target of 130 l/h/d by 2030 as well as a considerable change to the PCC profile with the rate of change over the planning period reducing from 0.6 l/h/d per annum to about 0.15 l/h/d per annum.

Table 39 provides a summary of the net effect of the microcomponent review which shows the effect of the revisions to be an increasingly significant factor in the longer term with the reduction in demand for water of 43 Ml/d in 2014/15 rising to 125 Ml/d in 2034/35.

Table 39: Summary of household microcomponent review in London WRZ

3.2.5 Water use in new build properties

As described in sub-section 2.3.6, we have improved modelling of PCC for new properties to reflect the government aspirations for reducing water use. The net effect of this change is to steadily reduce baseline demand in comparison to the original dWRMP trend over the planning period. The main impact is seen more in the longer term as shown in Table 40 below.

Table 40: Summary of the impact of revised modelling of PCC in new build in London WRZ

3.2.6 Bounceback

As set out in sub-section 2.3.7, water use restrictions were introduced in the drought year in 2006/07. This was followed by the very wet and ‘dull’ years of 2007/08 and 2008/09, which has resulted in a significant decline in demand in our supply area. We have continued to include this decline in the revised demand forecasts.

This results in a step change reduction in the demand forecast in London of approximately 40 Ml/d when compared to the dWRMP. At the same time, an extra factor of uncertainty has been added to Target Headroom to allow for the strong possibility that there will be a degree of bounceback towards the previous trend in demand in the dWRMP forecast.

3.2.7 Other impacts on the demand forecast

In addition to the bounceback factor there are other factors, which together have a significant impact on the demand forecast in the dWRMP, these are:

- Changes in baseline demand management assumptions;
- Changes due to rolling the base year forward a year, from 2006-07 to 2007-08.

Table 41 summarises the net change in the demand forecast as a result of the change in the bounce back assumption and other factors with respect to the original demand forecast for the London WRZ.
### Changes to original demand forecasts (Ml/d)

<table>
<thead>
<tr>
<th>Factor</th>
<th>2007/08</th>
<th>2014/15</th>
<th>2034/35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other (Bounceback, movements in demand management assumptions and base year)</td>
<td>-82</td>
<td>-41</td>
<td>-31</td>
</tr>
</tbody>
</table>

Table 41: Summary of bounceback and other factors in London WRZ

### Summary of changes to demand forecasts

Table 42 shows the changes to the components of the demand forecast as discussed above and the aggregated impact of the changes to the demand forecast for the London WRZ. The analysis shows a significant reduction in the demand forecast of around 131 Ml/d in 2014/5 to around 212 Ml/d in 2034/35.

<table>
<thead>
<tr>
<th>Factor</th>
<th>2007/08</th>
<th>2014/15</th>
<th>2034/35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic update</td>
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<td>Economic downturn</td>
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<td>-25</td>
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<tr>
<td>Microcomponent review</td>
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<td>-43</td>
<td>-125</td>
</tr>
<tr>
<td>New Property PCC</td>
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<td>1</td>
<td>-82</td>
</tr>
<tr>
<td>Other (Bounceback, movements in base year and demand management)</td>
<td>-82</td>
<td>-41</td>
<td>-31</td>
</tr>
<tr>
<td>Net Movement</td>
<td>-82</td>
<td>-131</td>
<td>-212</td>
</tr>
</tbody>
</table>

Table 42: Summary of changes to demand forecast for London WRZ

### Water Available for Use (WAFU)

The changes with respect to available water supply are relatively small and not in themselves considered material, but, need to be taken into account in the development of the revised Baseline supply demand balances.

Table 43 below shows WAFU in the original the revised Plans and the change over the planning period, for the investment driver Dry Year Annual Average (DYAA) or Average Day Peak Week (ADPW).

<table>
<thead>
<tr>
<th>WAFU (Ml/d)</th>
<th>London DYAA</th>
<th>SWOX ADPW</th>
<th>SWA ADPW</th>
<th>Guildford ADPW</th>
<th>Kennet Valley ADPW</th>
<th>Henley ADPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Plan</td>
<td>1979.3</td>
<td>346.4</td>
<td>210.1</td>
<td>74.0</td>
<td>175.4</td>
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<tr>
<td>Revised Plan</td>
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<td>210.1</td>
<td>74.0</td>
<td>175.9</td>
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<tr>
<td>Change (Ml/d)</td>
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<td>0</td>
<td>0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Table 43: Summary of changes to WAFU

### Target Headroom (TH)

As a result of the material changes to the components of the demand forecasts summarised in sub-section 3.2.8, there has been knock-on impact on the
contribution of the demand side components to overall TH. This increase is primarily due to the addition of an uncertainty allowance relating to demand bounceback. The impact of this is about 16% increase in overall TH for the London WRZ by 2034/35. The graphs in Figure 15 below indicate the degree of total movement in TH.

Figure 15: Changes in overall target headroom – London and SWOX

3.3 Revised Baseline Supply Demand Balances

The DYAA and ADPW supply demand balances have been revised in line with the updated demand and supply-side information. They are presented for all Water Resources Zones (WRZs) below.

3.3.1 London WRZ

Figure 16 shows the supply demand balance for the London WRZ (DYAA). The graph shows the revised demand forecast which has reduced significantly and the supply demand deficit, which has in turn significantly reduced throughout the whole planning period. Nevertheless, there still remains a substantial deficit to recover for most of the planning period.
3.3.2 Swindon and Oxfordshire (SWOX) WRZ

Figure 17: Baseline supply demand balance – SWOX Average (DYAA) and Peak (ADPW)

Figure 17 shows the supply demand balance for SWOX WRZ (DYAA and ADPW) in the dWRMP and the revised dWRMP.

Similar to London WRZ, the original supply demand deficit has been significantly reduced. The peak week scenario remains the driver for investment, as the deficit is more significant than for annual average. In the case of SWOX (DYAA), there is a surplus in the early years of the planning period, and in both scenarios the revised demand profiles are show more subdued growth than in the original plan.
3.3.3 Other WRZs- Kennet Valley, Slough/Wycombe/Aylesbury, Guildford and Henley

The figures below show the baseline supply demand balances for the remaining WRZs. All remain in surplus for the planning period.

Figure 18: Baseline supply demand balance – Kennet Valley Average (DYAA) and Peak (ADPW)

Figure 19: Baseline supply demand balance – SWA Average (DYAA) and Peak (ADPW)

Figure 20: Baseline supply demand balance – Guildford Average (DYAA) and Peak (ADPW)
3.3.4 Summary of Revised Supply Demand Surplus/Deficits

Based on the revised demand forecast (Section 2.3) and supply availability (Section 2.4) the baseline supply demand balance has been recalculated in the revised draft Plan.

Table 22 shows the summary zonal baseline supply demand balances over the planning horizon from the draft Plan.
Table 45 shows the balances in the revised draft Plan. Table 24 compares the balances.

The deficits in London and Swindon & Oxfordshire Water Resource Zones have been significantly reduced. Over the planning period, the deficit reduces by 168 Ml/d in London and by 39 Ml/d in Swindon & Oxfordshire.

The other water resource zones remain in surplus throughout the planning period and other than in Guildford, the surpluses have increased. The peak week surplus in the Guildford zone has reduced. The demand pattern in Guildford was particularly unusual in 2006-07, the poor summer resulting in a lower than expected peak demand. By moving the base year of the forecast forward one year to 2007-08, in order to align with the forthcoming Business Plan, we have been able to reduce the impact of the unusual demand pattern. The forecast peak demands are now in line with those reported in both 2004 and 2006.
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<tbody>
<tr>
<td>London (DYAA)</td>
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<td></td>
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<td>2364.6</td>
<td>2458.7</td>
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<td></td>
<td>Surplus/Deficit</td>
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**Table 44: Baseline Supply demand position in the draft Plan**

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**Table 45: Baseline supply demand position in the revised draft Plan**
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Table 46: Comparison of supply demand deficit/surplus between draft Plan and revised draft Plan

### 3.4 Revised preferred programme – approach to selection

#### 3.4.1 Overview

We have reviewed our preferred programmes in light of the revised supply demand balances and have found that less activity is required, particularly in the short term, to maintain security of supply. Our preferred programme still exhibits a strong preference for demand management in the short and medium term. In the longer term significant resource development continues to be required, although the volume required is smaller.

The revised preferred programme in the London WRZ remains strongly centred around the integrated demand management (IDM) approach of mains replacement, progressive targeted household metering and enhanced water efficiency in AMP5 and AMP6. From AMP7 to the end of the planning period, demand management alone cannot provide the necessary savings to ensure a robust supply demand surplus that will withstand the likely impacts of growth, climate change and longer-term sustainability reductions associated with the Water Framework Directive, hence a substantial water resources development programme is still required. This is despite a significant reduction in PCC predicted by 2034/35.

Normal year PCC is now reduced from 157 L/h/d to 135 L/h/d by 2034/35 and taking into account regional variations, is considered to be in line with the Defra aspiration of 130 L/h/d.
The remainder of this section provides an overview of the development of our revised preferred plan considering:

- Selection of the preferred programme
  - Rationale and approach
  - Taking uncertainties into account
  - Results of programme appraisal
- Optimum reservoir timing
- Optimum reservoir size

### 3.4.2 Selection of Preferred Programme

#### Rationale and approach

Given the change to the baseline supply demand balances for all WRZs, we have reviewed the preferred programmes presented in the original dWRMP to ensure that we continue to promote the optimum solution to alleviate predicted supply demand deficits. Unsurprisingly, given the reduced baseline deficits, we have found that less investment is required particularly in the short term, to maintain security of supply in both the London and SWOX WRZs. The remaining Thames Valley zones show a significantly greater surplus than in the original dWRMP.

Our approach to programme appraisal remains essentially the same as the dWRMP. We have continued to take a wide range of considerations into account to inform the selection of the best overall programme.

Our plan must deliver an appropriate balance between cost to the customer, risk to security of supply and negative environmental and social impacts. Our optimal overall plan is a sustainable least cost plan. Some of these planning considerations must be taken into account in a more qualitative manner, as they cannot be monetised and included within the economic appraisal. This makes the decision making process necessarily subjective for some criteria. It is our responsibility to ensure that all available information is taken into account when making this judgement and that the decision making process is clearly explained.

We have continued to take the following considerations into account when developing our plan:

- Affordability (impact on bills, ability to implement innovative tariffs)
- Environmental impact/adaptability (scale of impacts, ability to adapt to climate change, ability to meet future sustainability reductions)
- Leakage reduction (volume of reduction, levels achieved in comparison to industry)
- Efficient use of water (metering and water efficiency programmes, ability to meet Government PCC aspirations)
- Security of supply (risk associated with programme, ability to meet longer term demands)
Regional resource (ability to make bulk supplies available to other companies should they be required, alignment with Agency WRSE results)

Our goal is to identify a planning solution, which can meet our strategic objectives on each of these issues. Economic cost remains a central consideration, especially given the increasing cost of capital (which results in greater bill impacts for each pound invested) and heightened affordability issues linked to the current recession.

Taking into account uncertainties in planning assumptions

In accordance with the Environment Agency’s guidelines, the ‘optimum solution’ must be demonstrably robust and flexible taking account of the identified range of risks and uncertainties, of which the principal ones are:

a) Impact of economic downturn
b) Bounceback from 2006 drought and 2007 and 2008 wet summers
c) Potential impact of climate change to supply availability
d) Success of demand management activities
e) Regional bulk supply needs
f) Findings from Lower Thames Operating Agreement Review
g) Water Framework Directive requirements for sustainability reductions in Thames catchment and other South East companies

We would anticipate that the net result of factors a) to g), would constitute a substantial negative impact on supply demand balance. Therefore our preferred plan must consider both the risk around the sensitivity to our planning assumptions and the real possibility of a significant step change to the forecasts in the longer term.

We have achieved this in two ways. For uncertainties a) to d) an allowance has been made within our target headroom assessment for the potential range around the planning assumptions. As this headroom allowance cannot mitigate against the full range of potential outcomes, we have additionally used sensitivity testing to assess the robustness of our plan to the additional levels of risk.

We have used this testing to develop a contingency programme, which will ensure that this risk is acceptable. This contingency programme will allow us to quickly and flexibly respond to a deviation between forecast and actual supply demand balance, ensuring that security of supply is maintained.

For uncertainties e) to g) no allowance could be made within our central planning assumptions or within target headroom. In particular, we were not able to include the potential impact of the Water Framework Directive (WFD) requirements within our central forecasts, as no definitive information is available on the scale of impact. For these uncertainties we have therefore used scenario testing to inform the selection of our preferred programme.

We have undertaken sensitivity testing for the short and medium term (AMP5 and AMP6) and scenario testing for the longer term due to the potential timing and magnitude of the uncertainties.

Our programme appraisal can therefore be described as a two-stage process;
Step 1 - determine the preferred programme for AMPs 5 and 6 (2010-2020) based on the standard planning forecast, using sensitivity testing to identify contingency options to mitigate against additional uncertainties in our forecast.

Step 2 - with the preferred AMP5 and 6 programme, assess the remaining programme from AMP7 to AMP9 (2020-2035) based on a prudent planning forecast, which takes into account the range of potential scenarios in related to the uncertainties listed above.

These steps are undertaken within the framework of the programme appraisal process, which uses performance criteria outputs in combination with the SEA to develop a sustainable least cost planning solution.

The conclusions of this two-stage programme appraisal process are discussed below. Further details on the components of the preferred programme are given in Section 3.6.
3.5 Revised preferred programme – Results of programme appraisal

3.5.1 Step 1 - AMP5 and AMP6

**London WRZ**

The programme appraisal process found demand management activity to be the optimum least cost solution over AMP5 and AMP6. With the reduced supply demand deficit, this strategy can now be entirely based on demand management over this period.

The AMP5 programme is the economic least cost option when customers’ willingness to pay for leakage reduction is taken into account.

For the AMP6 programme, resource development may be a more cost effective option than further demand management. However, we have included demand management activity in preference to resource development in our AMP6 programme. This is for the following reasons:

1. Based on consultation to date, customers appear willing to support leakage reduction beyond levels achieved in 2015.

2. Metering, when combined with mains replacement is a cost effective option and one that is strongly supported by our stakeholders. Enhanced levels of water efficiency activity are cost effective when combined with metering. The achievement of Government PCC aspirations is only possible if we undertake further demand management activity over AMP6 and beyond.

3. The SEA strongly supports further demand management activity in preference to resource development.

We will have the flexibility to be able to review this strategy over the course of AMP5. Over this period we will also repeat our willingness to pay studies to confirm that customers are willing to pay over and above the least cost programme to achieve further leakage reduction.

**SWOX WRZ**

In SWOX, the programme appraisal identified demand management as a continued feature of the preferred solution, with leakage reduction, compulsory metering and enhanced water efficiency forming part of the least cost planning solution over AMP5.

Resource development is required in addition to offset the remaining deficit over AMP5. These schemes in the preferred programme are shown in Table 47. In total 28 Mi/d of small-scale groundwater development and release of infrastructure constraints (NC) are delivered.
Table 47: SWOX supply side schemes – preferred programme

In AMP6 the preferred programme is continued compulsory metering. No further water resource options are required.

Contingency options (AMP5 and AMP6)

A potential weakness of the AMP5 and 6 preferred programme is its heavy reliance on demand management (particularly in the London WRZ) and whilst we are very much more confident in our ability to reduce leakage and install meters than we were at the beginning of AMP4, there still remains the possibility that the proposed demand management programme will fall short of its intended savings (note that we do not have direct control over how much water will be saved by metering and water efficiency activity).

The effectiveness of the programme will be reviewed on an ongoing basis over AMPs 5 and 6 and if significant shortfalls become apparent, we may need to introduce small-scale water resources options. This set of options might also form part of the AMP6 programme, should the ongoing expenditure on demand management become non cost beneficial.

To ensure that these contingency schemes could be developed within the required timescales should they be needed, we will need to continue to progress their development.

We have used sensitivity around the key planning assumptions to develop the optimum set of contingency options.

3.5.2 Step 2 – preferred programme AMP7 to AMP9

London WRZ

Beyond AMP6 there is a relatively small deficit growing slowly over the remaining 15 years of the planning period. Figure 22 shows the preferred programme up to the start of AMP7 compared with the equivalent picture in the original draft. It can be seen that the updated demand forecasts have substantially changed the longer term planning problem in respect of the magnitude and growth of the deficit profile.
Despite the lower deficit profile, from 2020 onwards demand management alone will not satisfy the growing deficit in either London or SWOX. In particular, further leakage reduction is prohibitively expensive and high risk. Therefore, in addition to an ongoing programme of compulsory metering (AMP7), some water resource development is also required.

Given the standard planning forecast shown above, the least cost solution to satisfy the deficit over AMP7-9 is incremental, small-scale resource development, where supply is increased in line with demand as closely as possible. The option mix starts in the early years with small-scale groundwater schemes and thereafter brings in reuse and desalination schemes. Note that, AMP3 and 4 saw the bulk of London’s sustainable groundwater resource being committed and so there is now only a limited amount left for future development.

This solution is least cost in monetary terms as it is the most efficient solution in terms of minimising surplus in the programme and defers expenditure into the future. The least cost analysis does not take into account potential step changes in the forecast and is therefore based on a relatively small deficit, which grows slowly over time. This solution does not include the resources which are most cost effective per unit of water supplied as these resources tend to be large and therefore generate surplus in the planning period is a less economically efficient solution than a set of more expensive options which are spread out over time.

An alternative solution is the development of a large, strategic resource. This solution would necessarily be more expensive in monetary terms than the least cost programme as it will result in a surplus in supply for parts of the planning period. It would also provide for resource needs over timescales beyond those of the 25-year planning period. This benefit would not be taken into account in the least cost planning analysis.

Scenario testing is required to determine which solution on balance, is optimal given the full range of potential futures.
**Scenario testing**

From AMP7, two uncertainties in particular are of great significance to the plan. These are firstly sustainability reduction requirements resulting from the Water Framework Directive and secondly the potential regional supply requirements of other water companies in the South East, for which a strategic resource in the Thames catchment would be the optimal planning solution.

These uncertainties are discussed in further detail below.

*Sustainability reductions beyond AMP6*

We sought further guidance from the EA on the potential location and magnitude of any sustainability reductions that might arise as a result of the Water Framework Directive.

The Environment Agency advised us of the following volumes to be used as the basis for scenarios to demonstrate the impact of potential sustainability reductions. These volumes have been used to investigate different scenarios for sustainability reductions that might arise from the WFD:

- SWOX 18 Ml/d
- SWA 7 Ml/d
- London 600 Ml/d

For the proposed scenario for London the potential resource reduction is clearly significant in relation to the supply demand balance for the London WRZ (around 30% reduction in supply). This is unlikely to be achievable but indicates the potential significance of this uncertainty.

It is important to understand that this abstraction reduction scenario is only indicative, and that the investigations proposed for AMP5 into the impact of abstraction on the Lower Thames and Thames Tideway will inform the requirement for actual reductions in the future.

However, given the magnitude of flows in the lower Thames it is clear that if investigations confirm that there is a requirement for reduction in abstraction, then the volume of reduction will need to be significant in relation to the flow range that is experienced at Teddington weir during a summer drought period. We have assessed a range of sustainability reduction scenarios up to the maximum volume of 600 Ml/d, as required by the Environment Agency.

It should be added that from an operational perspective it will be important to know whether the sustainability reductions will require a strategic scheme to be used only during drought or as a base load source. The latter would necessitate much higher operational costs.

In summary, it cannot be emphasised strongly enough that the Company is dependent upon the Environment Agency to clarify the position on future sustainability reductions. The paramount need for long-term planning is to be able to put reliable estimates of sustainability reductions within the central forecast assumptions relating to water available for use (WAFU).
Clearly, as we have always maintained, the Company cannot accept any significant sustainability reductions until adequate water resource options have been put in place. Given the likely magnitude of these reductions, as indicated by the Environment Agency, a major resource would be required in order to enable their implementation. The timing of that resource being available will dictate the time at which sustainability reductions can be accommodated.

**Bulk Supply potential arising from the UTR**

The results of the Water Resources in the South East (WRSE) modelling indicated that a potential bulk supply to SE Water of 20 Ml/d formed part of the least cost regional solution and so this option has been used for the scenario analysis. For the purposes of the analysis a further potential bulk supply option of 30 Ml/d has been assumed to reflect a higher bulk supply requirement that might arise if the WFD were to result in significant sustainability reductions for other water companies in the south east. Therefore, bulk supply options of 0 Ml/d, 20 Ml/d and 50 Ml/d have been included in the analysis.

**Results of scenario testing**

Table 48 below gives results of the scenario testing, expressed simply as the deficits in 2020 (beginning of AMP6) and 2035 (end of planning period). It is evident in the majority of the scenarios the predicted deficit is increased by more than 100 Ml/d.

<table>
<thead>
<tr>
<th>Scenario (Mld)</th>
<th>Supply demand deficit (Ml/d)</th>
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<tbody>
<tr>
<td>Sustainability reduction</td>
<td>Bulk supply</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
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<td>50</td>
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<td>50</td>
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Table 48: Longer term deficits from sustainability reduction and bulk supply scenarios

There is a wide range of scenarios and clearly, we would question whether the achievement of those at the extreme end of the spectrum is possible. However, it is clear that even for the most conservative sustainability reduction scenario a programme of smaller resource developments would not be a pragmatic solution or cost effective solution, with a resource requirement of 130 Ml/d by the end of the planning period.
The results of the scenario testing indicate that the preferred planning solution must allow for significant step changes in supply and demand. These step changes could not be accommodated through an incremental least cost solution. Given the potential range of scenarios plus additional uncertainties around our supply and demand forecasts, it is clear that a large strategic resource is required. This resource will be the most cost effective solution per unit of water produced and will have the additional benefit of being able to supply the wider South-East region with a cost-effective and relatively risk free resource.

**Preferred long-term planning solution**

Having concluded that a strategic resource is required, the alternative options are a reservoir versus a combination of reuse and further desalination schemes.

The advantages of both reuse and desalination in comparison to the development of a reservoir is that they potentially have a shorter lead-time and can be sized to provide the required deployable output without incurring an unnecessary surplus.

However, the disadvantages are considerable, as discussed below.

i. Carbon implications (see Box 1)

A significant statutory development since publication of the draft WRMP was published is that the Climate Change Act 2008 has become law. The Act contains legally binding targets for the UK to reduce its greenhouse gas emissions by at least 80% by 2050 against a 1990 baseline. This is in effect a decarbonisation of the UK economy.

There are two key elements of direct importance to developing new water resource options contained in the Act:

- To improve carbon management and help the transition towards a low carbon economy in the UK i.e. to decarbonise the whole UK economy; and
- The introduction of powers for Government to require public bodies and statutory undertakers [e.g. Thames Water] to carry out their own risk assessment and make adaptation plans to address the risks associated with climate change.

In effect this means that Thames Water needs to develop its business in a way that significantly reduces its greenhouse gas emissions and ensures that it has taken into account the unavoidable impact of climate change. The specific concerns this obligation raises in connection with reuse and desalination can be listed as follows:

- Carbon emissions become increasingly more important in the longer term.
- Operational emissions given in the original draft will have to be uplifted thereby increasing the impact of this externality.
- Reuse and desalination have a much higher operational carbon footprint than reservoir operation; the latter has a much higher embedded carbon footprint.
- The Climate Change Act decarbonisation goals mean that higher cost associated with carbon use will have to be passed on to customers.
• An important contributing factor is potential WFD requirements on sustainability reductions, if replacement water resources options were used more or less continuously as base load sources they would greatly add to the option’s operational carbon footprint.

ii. Public perception

There is a serious customer perception issue with the reuse option. The amount of new water resources required would mean large reuse plants, which in turn could mean substantial public opposition to basing water supply derived from recycled sewage effluent.

iii. Regional need

Reuse and desalination options are unlikely to be of a direct regional benefit to the wider South East. With the potentially substantial WFD requirements for sustainability reductions the need for a sustainable water resource option that has wider regional benefit is likely to grow.
The concentration of carbon in the atmosphere is rising towards its long-run stabilisation level, and expected climate-change damages accelerate with higher concentrations. An extra unit of carbon will therefore do more damage at the margin the later it is emitted because, even with a plausible concentration goal, it will be in the atmosphere when concentrations are higher and higher concentrations mean larger climate change impacts at the margin (as damage is a function of the cumulated stock). Additionally, as incomes grow, the monetary value of damage is likely to grow, owing to an associated higher willingness to pay to avoid climate change damage. For example, the Shadow Price of Carbon (T/CO2) in 2007 prices will increase from £27.00 in 2010 to £59.60 in 2050. In terms of the operation of desalination and re-use this means that because their operational carbon emissions are significantly higher than those for operating a reservoir in the future they will cause a proportionately greater level of climate change damage than a reservoir.

The indicative carbon data for the construction and operation of the proposed reservoir versus the alternative of desalination/reuse show that although the reservoir is more carbon intensive to build it much less carbon intensive to operate. From a comparison of the combined delivery and operation of each solution the table below shows that the reservoir is almost six times less carbon intensive than the alternate desalination/reuse. In this respect the development of a reservoir is more compatible with the drivers of the Climate Change Act 2008.

<table>
<thead>
<tr>
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<th>Reservoir</th>
<th>Desalination/reuse</th>
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<tbody>
<tr>
<td>Tonnes of construction embodied carbon</td>
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<td>62,712 Tonnes</td>
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<tr>
<td>Whole life operational carbon emissions @ 0.43 grid emission factor</td>
<td>387,430 Tonnes</td>
<td>6,040,370 Tonnes</td>
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</table>

Although the Shadow Price of Carbon has been incorporated into our financial assessments for new water resources (to reflect the damage costs of climate change caused by each additional tonne of greenhouse gas emitted), our financial assessments do not include actual fiscal measures from Government such as the proposed Carbon Reduction Commitment (CRC) cap and trade scheme. The CRC scheme is effectively a charge imposed on organizations to buy permits for the CO2 they emit as a result of the use of electricity and other fossil fuels. This is particularly important with respect to water resource schemes, which have higher operational carbon emissions as the financial penalty of carbon emissions is anticipated to significantly increase as the UK decarbonises its economy. In addition, at draft WRMP no costs associated with mitigating either the embodied or operational carbon emissions were included in our financial assessments.

There is considerable uncertainty associated with respect to the future emission Grid Rolling Average factor value associated with the use of grid electricity. The value used for reporting historic emissions has been increasing over recent years as the energy mix of grid electricity has changed due to market pressures. In our draft WRMP we used an emissions factor of 0.43 but the figure we will use for 2008/09 regulatory reporting has risen to 0.537 due to the increase in the carbon intensity of the UK energy mix. On this basis, the operational emissions associated with the different water resource options will need to be uplifted by 20%.

Desalination and re-use options both have large operational footprints when compared to the operation of a reservoir. Gaining planning permission in urban areas where such plants are likely to operate will be very difficult as experienced during the development of the advanced water treatment plant at Beckton. There was significant opposition not only to the technology itself but also how and when it is to be used. There is still significant opposition to the actual operational regime of the facility both from the GLA and other stakeholders to ensure that it is only used at time of drought and not as a continuous resource.

The Stern Review concluded that the benefits of strong early action considerably outweigh the costs i.e. it will be cheaper for businesses and economies (and therefore customers) to invest early in mitigation solutions. Our proposed plan is intended to reduce the long-run carbon costs to the business, our customers and the environment by reducing the quantity of future carbon emissions to operate our preferred solutions.

In the context of the Climate Change Act 2008 and the 80% decarbonisation goal for the UK economy and the requirement to adapt to the impacts of climate change, the options of using either desalination or water re-use are incompatible with the Intention of the Act. As the UK moves towards its 2050 target there are likely to be higher costs associated with carbon use that would need to be passed through to customers. The greater the dependence on high-energy water resource solutions the higher the operational and carbon costs, which will impact on our ability to deliver our share of the UK decarbonisation target.

Another major consideration in respect of carbon emissions is whether reuse or desalination plants would be required to be used strategically during droughts or as base load sources, the latter consuming very much more energy than the former. A major factor here would be in the nature and location of future sustainability reductions. For example, if there is to be a large reduction to the M2 abstraction licence (main licence for abstracting water from the Lower Thames) then reuse and/or desalination plants would become base load and would have to be operated on a ‘24/7’ basis, unlike the Beckton advanced water treatment plant which will only be used to the full extent in periods of drought. Base load use would therefore greatly increase the carbon footprint of these options and add further risk to the company’s carbon commitment. Given the potential reductions in water abstraction that are likely to be associated with the WFD, it is increasingly likely that we may have to reduce the M2 licence.

Finally, London is an industrialised catchment and as such all reuse options would be high in energy and carbon use. Deephams was the only option taken forward into the feasible list of resource options because it was the least energy intensive of the reuse options. Basing London’s future water resources on reuse alone would very likely bring in the other sewage treatment works such as Beckton or Crossness, which would be higher energy options than Deephams.

BOX 1-Carbon reduction requirements

As described above, the Climate Change Act 2008 introduces the obligation to consider the carbon footprint of proposals both to build and to operate.

The concentration of carbon in the atmosphere is rising towards its long-run stabilisation level, and expected climate-change damages accelerate with higher concentrations. An extra unit of carbon will therefore do more damage at the margin the later it is emitted because, even with a plausible concentration goal, it will be in the atmosphere when concentrations are higher and higher concentrations mean larger climate change impacts at the margin (as damage is a function of the cumulated stock). Additionally, as incomes grow, the monetary value of damage is likely to grow, owing to an associated higher willingness to pay to avoid climate change damage. For example, the Shadow Price of Carbon (T/CO2) in 2007 prices will increase from £27.00 in 2010 to £59.60 in 2050. In terms of the operation of desalination and re-use this means that because their operational carbon emissions are significantly higher than those for operating a reservoir in the future they will cause a proportionately greater level of climate change damage than a reservoir.

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Another major consideration in respect of carbon emissions is whether reuse or desalination plants would be required to be used strategically during droughts or as base load sources, the latter consuming very much more energy than the former. A major factor here would be in the nature and location of future sustainability reductions. For example, if there is to be a large reduction to the M2 abstraction licence (main licence for abstracting water from the Lower Thames) then reuse and/or desalination plants would become base load and would have to be operated on a ‘24/7’ basis, unlike the Beckton advanced water treatment plant which will only be used to the full extent in periods of drought. Base load use would therefore greatly increase the carbon footprint of these options and add further risk to the company’s carbon commitment. Given the potential reductions in water abstraction that are likely to be associated with the WFD, it is increasingly likely that we may have to reduce the M2 licence.

Finally, London is an industrialised catchment and as such all reuse options would be high in energy and carbon use. Deephams was the only option taken forward into the feasible list of resource options because it was the least energy intensive of the reuse options. Basing London’s future water resources on reuse alone would very likely bring in the other sewage treatment works such as Beckton or Crossness, which would be higher energy options than Deephams.
Option selection – Preferred long term option

Customer research that informed Thames Water’s Strategic Direction Statement indicated that the public generally support reservoir development if demand management options are not sufficient to meet growth.

A reservoir provides a lower risk and more sustainable option in comparison to reuse and desalination. The reasons for this are as follows.

- Although a reservoir is more carbon intensive to build (embodied carbon) it has a lower operational carbon footprint some six times lower compared with the equivalent output using desalination and re-use options.

- It is expected in the future that winters will be predominantly wetter and warmer and summers will be drier and hotter compared to the present [UKCIP02]. In this context a reservoir would provide a significant beneficial adaptation response in that it can collect and store water in the limited time when it is available in the expected wetter winters, which can be made available to the environment in the drier and hotter summers.

- A reservoir will provide additional resource buffering capacity to allow the business to manage extended drought periods more effectively.

- Unlike either desalination or re-use a reservoir will additionally provide a climate change adaptation benefit to the wider South East at a regional level. With the likely substantial WFD requirements for sustainability reductions the need for a strategic scheme such as a reservoir that can help reduce the impacts of climate change on the aquatic environment is further increased.

The preferred programme therefore includes a reservoir in preference to reuse and desalination. Our site selection analysis concluded that Abingdon is the preferred site for reservoir development. The outstanding questions are then a) when is the optimum timing for the reservoir and b) what size should it be?

These questions are addressed in the two following sections below.

Optimum timing for reservoir

The planning analysis indicates that the optimum timing for a strategic resource is AMP6, around 2020. This would mean a significant bill impact as part of the current price review as we would need to be funded to develop this resource as soon as possible.

As discussed in section 3.4.2, there are several significant uncertainties which impact on our planning assumptions. Our decision on the preferred programme must balance the risk of underestimating the impact of these uncertainties, leading to a future resource shortfall against the risk that resources developed are not required as early as anticipated.

Over the course of AMP5 we will become better informed in relation to the majority of these uncertainties, as the latest information becomes available. Given the scope and magnitude of the uncertainties and the fact that we will be in a more informed position over the course of the next 2-5 years, we believe the sensible course of action is to gain further confidence in quantifying the major uncertainties before
deciding upon the timing and optimum size of reservoir. Consequently, the Company has decided to defer the construction of the reservoir until this information is available in AMP5.

Given that it will take 10 years to construct the reservoir, in order to address the deficit profile over AMP7 which results from a delay in the development of this strategic resource, a ‘bridging’ set of options consisting of further leakage reduction and small scale groundwater schemes is put forward as part of the preferred solution.

**Optimum size of reservoir**

Having established the need for a major resource to supply the London and SWOX WRZs and selected a reservoir as the preferred option, consideration should be given to the optimum size of reservoir. We will continue to review the most appropriate size for this resource over the course of AMP5, as more information around the key planning uncertainties becomes available.

This decision on optimum reservoir size needs to balance the needs of the future against the cost today. A phased development of the reservoir is no longer considered to be a realistic option (see Box 2). This means that once the reservoir is completed there will not be the opportunity to go back to the site and increase the size.

With a serviceable life of at least 100 years, a reservoir should be built with view to the longer term. The standard planning framework limits the period of analysis to 2035, around 10 years after the commissioning date of the reservoir in our preferred programme. It is not appropriate to limit the size of the reservoir to the yield required in 2035, when the reservoir would be able to operate for at least a further 90 years. Our analysis extends forecast demand to 2050 (the limit of available information) based on a range of scenarios.

The assessment of the most appropriate size of reservoir is not an exact science, rather a balanced decision based on the full range of available information, including ‘what if?’ scenarios to describe potential different futures for sustainability reductions, bulk supply requirements and levels of demand in the longer term.

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**Box 2 - Reason why phased reservoir development is not realistic**

The phased development of a reservoir is not a preferred option because it would both exacerbate the adverse impacts of reservoir construction and preclude the most efficient maximisation of the benefit from the site.

Development of a reservoir in two phases of 75 Mm3 each would mean that a greater overall footprint is required on the site than if a single reservoir of 150 Mm3 was constructed. This is because the development of the reservoir in two elements would require a bund around the whole development but with the addition of a separating bund down the middle, which would itself have a significant footprint making for a greater overall land requirement. Development of a single reservoir of 150 Mm3 volume would require a smaller footprint and would not need such high retaining embankments as the phased option and so would be less intrusive.

A two-phased development would have major adverse impacts on both the local community and the wider environment, when compared with a single-phased development. This is because the disturbance associated with the construction would be required twice. This disturbance factor is a significant issue as the construction period for a reservoir of this size is several years. In addition to the increased local disturbance, there would also be duplication of the carbon impact of the construction phase. This again is a very significant factor, because the carbon impact of the construction phase of the reservoir is relatively high compared to its operational carbon footprint, see Box 1.
The ‘least regrets’ approach dictates that it is better to develop a reservoir with some surplus resource than need to develop an additional resource at significant cost and environmental and social impact at a later date. In the event of excess surplus capacity being available, this would provide resilience to outage from existing resources\(^{41}\), or flexibility when deciding which resources to replace when they have reached the end of their serviceable life.

This would enable the highest impact sources to be taken off-line to be replaced by the reservoir with relatively low operational costs and impacts (including carbon). Of course the ‘least regrets’ approach must be balanced against the impact of potentially unnecessary bill increases to fund unutilised capacity, with today’s customer base effectively paying for security of supply for future generations.

Figure 23 below indicates the range of scenarios, which have been taken into account for the London WRZ during this analysis (showing sustainability reduction scenarios and longer-term demand scenarios to 2050). In this example a 100Mm\(^3\) reservoir is shown.

The future demand scenarios are derived from the Environment Agency’s recently published *Demand for water in the 2050s*\(^{42}\).

Clearly there is a wide range of scenarios for future supply and demand balance, with some far more extreme than others (for example the demand forecast based on the Market Forces projection). We would not seek to plan on the basis of extreme scenarios, but rather what we consider to be a more central view of the combination of supply and demand futures. With this in mind, the analysis compared the potential of three different sized reservoirs to meet possible futures to 2050.

These reservoirs are of volume 75Mm\(^3\), 100Mm\(^3\) and 150Mm\(^3\), with deployable outputs of 144, 198 and 307 Ml/d respectively. The 150Mm\(^3\) reservoir is the largest size that could be accommodated on the Abingdon site.

\(^{41}\) In the longer term post 2034/35 a major consideration will be the existing water resource base, which will be coming to the end of its asset life. The serviceability of London’s reservoirs is the main concern here. In practice, this aspect is likely to be reflected in the need to make increasingly higher allowances for source outage. A major new reservoir will help to ensure that security of supply is maintained.

Figure 23: Four ‘future scenarios’ up to 2050

A summary of the results from this analysis is given below.

i) 75Mm³

Given a central view of demand to 2050 (based on the revised dWRMP demand forecast, which includes our demand management programme), the UTR would be able to meet demand until 2050 with a spare capacity of around 15 Ml/d. Thus a bulk supply of up to 15 Ml/d could be provided as a regional resource until at least 2050 under this scenario. This reservoir would not be able to meet any of the sustainability reduction scenarios without requiring additional resource to meet demand at a later date. For instance, under the likely event that a sustainability reduction of 100 Ml/d is a obligation from the WFD and a bulk supply of 20 Ml/d is required, a further resource option would be required from 2025/26 to meet forecast demands.

ii) 100Mm³

A reservoir of volume 100 Mm³ would be able to meet either a bulk supply or sustainability reduction of 50 Ml/d to 2050. It would provide a surplus in the year 2035 under scenarios including a sustainability reduction of 100 Ml/d or sustainability reduction of 50 Ml/d and bulk supply up to 50 Ml/d. The analysis also shows that if a sustainability reduction of 100Ml/d together with a bulk supply of 20 Ml/d were required then further water resource development would be required in 2024/25.

Should demand follow the ‘innovation’ forecast between 2035 and 2050 then the reservoir would be able to support a sustainability reduction of 100 Ml/d plus a bulk supply of 20 Ml/d to 2050.
iii) 150Mm$^3$

A reservoir of volume 150 Mm$^3$ would clearly enable the greatest sustainability reduction in combination with provision of bulk supply although the maximum sustainability reduction that can be accommodated is 200 Ml/d based on a central view of demand. The size of this reduction could be increased by around 70 Ml/d should demand follow the ‘innovation forecast’.

The analysis demonstrates that the sustainability reduction of 600Ml/d cannot be accommodated under any of the reservoir options.

A reservoir of this size would be required to meet the ‘Market Forces’ demand forecast scenario beyond 2030.

Conclusions on reservoir size and the uncertainties

The analysis demonstrates that the 75Mm$^3$ option is not large enough to provide the likely level of sustainability reductions that are anticipated to be required for the WFD, even at the lower end of the spectrum, but could support the provision of a bulk supply. The analysis results support reservoir sizes of both 100 and 150 Mm$^3$, depending on the combination and magnitude of scenario.

We cannot be sure what the future holds, however on balance, given current information we believe that the 100 Mm$^3$ reservoir is the most sensible option, given central scenarios around demand and bulk supply requirements. If demand is lower than forecast then there would be greater potential for sustainability reductions, greater resilience in the system and the option to phase out our energy intensive sources when they reach the end of their asset life.

In conclusion, our current judgement is that a 100 Mm$^3$ reservoir provides flexibility to meet a range of future scenarios for both supply and demand whilst minimising impact on customer bills. We will review this decision as more information relating to the key planning uncertainties becomes available.

SWOX WRZ

In the SWOX WRZ, leakage levels are held constant from AMP7 onwards, with additional activity undertaken to offset leakage contributions from new properties. Together with the revised demand forecast, this gives a relatively flat demand profile in SWOX in the longer term.

Resource development is still required to meet demand, however the resource requirement is significantly reduced from the dWRMP. Taking into account the potential sustainability reductions in this zone, which are likely to be in the magnitude of 18 Ml/d plus the strong case for significant resource development in London, the optimum combined strategy is to make provision for supply from the reservoir to the SWOX zone. This will also provide resource to meet long-term growth in demand in this zone.
Long-term risk management

There is a requirement to develop a set of contingency options for the longer term should the reservoir option not be accepted. The Company has presented information to show why it is not prepared to base its long-term strategy on reuse and desalination.

Consequently, over the AMP5 period it will look at alternative options from the feasible list that it considers will provide a sustainable alternative to the reservoir. The alternative options are likely to be relatively smaller scale with a short-period lead-in time. Therefore, we consider that there will be sufficient time to research and investigate alternative options before they may be needed from AMP8 onwards.

3.6 Components of Preferred Programme - Demand management strategy

This section covers in more detail the demand management strategy for each WRZ sequentially in terms of leakage reduction, metering and water efficiency.

3.6.1 Leakage strategy

London WRZ

As presented in the dWRMP, in restoring the supply demand balance, we place highest priority on leakage reduction, which is in line with our customers’ preferences and our aspirations as set out in our Strategic Direction Statement. Consequently, programme selection is based on the sustainable economic level of leakage (SELL), as opposed to the traditional strict least cost monetary economic level of leakage (ELL).

It should be noted that significant ongoing detection and repair activity is required just to hold leakage at a constant rate, due to the poor condition of the network. To prevent further deterioration of the network, a capital maintenance programme is required to replace those mains in the worst condition (as determined by the number of bursts over a period of time). The amount of capital maintenance activity required to maintain asset performance and thus leakage levels is dependent on the size of the growth mains replacement programme employed to reduce leakage. This is because this growth programme will replace areas of network in the poorest condition and thus prevent further deterioration in the condition of these mains.

The leakage programme has been reviewed in light of the revised supply demand deficit. The latest data from the ongoing mains replacement programme has identified increased leakage savings per kilometer, these can in the majority be attributed to the successful application of Leakfrog technology to reduce residual customer side leakage. Assessments of the savings are evaluated as 0.08 Ml/d per km compared to 0.05 Ml/d per km assumed in the original dWRMP.

The revised AMP5 mains replacement growth programme is now 1000km, in comparison to 2000km in the original draft. The total amount of network that will be replaced in the future includes the capital maintenance programme. In response to the revised dWRMP, the capital maintenance mains replacement programme will now need to increase over AMP5 with 870km of mains replacement.
The mains replacement programme will be delivered in combination with enhanced Active Leakage Control (ALC) consisting of pressure management, zonal reconfiguration, increased find and fix; and additional enabling activity e.g., improvements to DMAs by installing additional meters to measure distribution leakage.

The AMP6 programme has been increased from 1500km of mains replacement to 2000km. Associated capital maintenance will be around 475km company-wide.

The total mains replacement programme for AMP5 and 6 is 3000km for mains replacement (compared to 3500km in dWRMP) and including capital maintenance is 4572km (compared to 4450km in dWRMP).

Given this mains replacement programme, we estimate that by the end of AMP6 the overall leakage savings will result in a leakage level of 406 Mil/d or 133 l/prop/day. This compares with 412 Mil/d and 134 l/prop/day given in the original dWRMP.

In line with the Water Resources Planning Guidelines the company’s leakage policy is not to allow leakage to increase in any WRZ. The leakage programme in London will therefore need to offset the 19 Mil/d additional leakage over the planning period attributed to the network associated with the addition of new properties. From AMP7 to AMP9, leakage reduction is no longer cost beneficial (other than when associated with metering) and only plays a small part in the preferred programme. Leakage levels are held constant in the longer term by a continued programme of enhanced ALC.

The overall leakage savings are given below in Table 48 in terms of the individual elements of the leakage strategy. In regard to the table (row 3), it should be noted that:

- Customer Side Leakage (CSL) currently accounts for around 25% of total leakage. Therefore activities that target CSL form a vital part of the overall leakage programme. These activities include enhanced levels of ALC, mains replacement and metering. Metering is essential to help identify leakage and to ensure that savings are maintained in the long term. Our calculations have assumed the use of an intelligent meter as a detection aid which speeds up finding leaks in-between billing cycles and identifies small leaks, which might otherwise be missed.

- The Application of Practical Leakage Economics (APLE) risk model was used to derive target leakage levels with 80% confidence of hitting the target in any one year. For PR09 further improvements have been made to the leakage uncertainty modelling. Leakage uncertainty is now considered at the beginning, rather than at the end of the process. Namely, leakage programmes are developed and then assessed for leakage uncertainty before being considered within the overall supply demand planning process. Confidence levels of 80% have been selected for the AMP5 period. This assessment takes account not only of the delivery of the leakage target within a single year, which can be impacted by immediate leakage control performance and weather, but also the fact that with further leakage reductions throughout the AMP5 period, failure to deliver the target in one year makes the next year’s target even more difficult to achieve. Furthermore, the maintenance of the supply demand balance in London over the AMP5 period is almost entirely driven by demand management, and in particular leakage reduction. This is a relatively higher risk strategy than an
approach including resource development but reflects the fact that our AMP5 customer consultation process has identified that customers consider leakage reduction a very important priority for Thames Water and as such it should be a major ongoing focus for investment. Failure to achieve leakage targets would therefore place security of supply in jeopardy and therefore warrants greater certainty in delivery of the leakage targets.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total saving (Mi/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AMP5</td>
</tr>
<tr>
<td>Mains replacement</td>
<td>74</td>
</tr>
<tr>
<td>Enhanced ALC</td>
<td>0</td>
</tr>
<tr>
<td>Metering (CSL)</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77.9</strong></td>
</tr>
<tr>
<td>Confidence level</td>
<td>80%</td>
</tr>
</tbody>
</table>

Table 49: Revised leakage programme London – total savings

The revised level of leakage in comparison with the original dWRMP profile is shown in Figure 24 and the breakdown given in Table 50 (Mi/d) and Table 51 (l/prop/day).

It can be seen that leakage levels under the revised leakage strategy are similar to those given in the original dWRMP over the course of the planning period but are higher during AMP5.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Original dWRMP</td>
<td>551</td>
<td>521</td>
<td>491</td>
<td>470</td>
<td>450</td>
<td>412</td>
<td>406</td>
<td>403</td>
<td>400</td>
</tr>
<tr>
<td>Revised dWRMP</td>
<td>550</td>
<td>539</td>
<td>521</td>
<td>501</td>
<td>481</td>
<td>406</td>
<td>394</td>
<td>394</td>
<td>394</td>
</tr>
</tbody>
</table>

Table 50: Table of leakage targets for London (Table 10b equivalent) (Mi/d)\(^{43}\)

\(^{43}\) Leakage reduction forecast based on UKCIP02 scenarios and may change as discussed in section 3.1
Table 51: Table of leakage targets for London (Table 10b equivalent) (l/prop/day)

<table>
<thead>
<tr>
<th>Activity</th>
<th>AMP5</th>
<th>AMP6</th>
<th>AMP7</th>
<th>AMP8</th>
<th>AMP9</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced ALC</td>
<td>3.3</td>
<td>0.1</td>
<td>1.2</td>
<td>1.1</td>
<td>1.0</td>
<td>6.7</td>
</tr>
<tr>
<td>Metering (CSL)</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.5</strong></td>
<td><strong>1.3</strong></td>
<td><strong>1.2</strong></td>
<td><strong>1.1</strong></td>
<td><strong>1.0</strong></td>
<td><strong>9.1</strong></td>
</tr>
<tr>
<td>Confidence level</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 52: Revised leakage programme SWOX – total savings

The revised level of leakage in comparison with the original dWRMP profile is shown in Figure 25 and the breakdown given in Table 50(Ml/d) and Table 51 (l/prop/day). An important point to note for SWOX is that baseline leakage levels are higher in the revised plan due to the redistribution of the company level target. Consequently, the revised leakage levels start off lower than the original dWRMP levels and gradually converge to the dWRMP level by 2034/35.
---|---|---|---|---|---|---|---|---|---
Original dWRMP  | 49 | 49 | 48 | 48 | 48 | 49 | 50 | 51 | 51
Revised dWRMP  | 53 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52

Table 53: Table of leakage targets for SWOX (Table 10b equivalent) (Ml/d)

---|---|---|---|---|---|---|---|---|---
Original dWRMP | 115 | 113 | 111 | 109 | 107 | 104 | 101 | 99 | 98
Revised dWRMP | 126 | 123 | 121 | 120 | 118 | 110 | 104 | 99 | 95

Table 54: Table of leakage targets for SWOX (Table 10b equivalent) (l/prop/day)

‘Surplus’ Zones - Kennet Valley, Slough/Wycombe/ Aylesbury, Guildford and Henley

Because of the improved supply demand balance, clearly the deficit driver does not exist for the ‘surplus’ zones. However, as noted above, in recognition of the Environment Agency water resource planning guidelines from consultee representations, we have now introduced a policy preventing leakage rising in any WRZ (requiring additional investment). Consequently, we have re-adjusted the leakage programme in each of the four WRZs in surplus to ensure leakage does not rise over the planning period.

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44 Leakage reduction forecast based on UKCIP02 scenarios and may change as discussed in section 3.1
3.6.2 Metering strategy

Our Strategic Direction Statement (Taking Care of Water, 2007) and the subsequent draft WRMP, made the case for a 10-year progressive and targeted metering programme, focusing on areas of greatest water stress (London and SWOX, but rolled out across all zones) and where water savings are most likely to be made, ie. where there is high discretionary water use.

Since the original dWRMP submission, we have been reviewing our metering proposals to take account of the latest demand forecasts and to identify the most cost effective means of delivery.

**Optant Metering**

We have reviewed and re-forecast the number of meters that it will install on request from customers over the planning horizon. This is in response to the higher number of meter requests received in AMP4 and the expectation that the economic downturn and the large proposed selective metering policy would keep the public interest in metering high. The profile gradually reduces as the selective programme is ramped up.

Figure 26 below shows the final planning forecast number of optant installations per annum in the draft and revised plans.

![Figure 26: Comparison of the predicted Optant meter installations per annum](image)

**Selective Metering**

In the revised plan we have chosen to extend the duration of the metering profile by 5 years to a total of 15 years (AMP5 to AMP7), primarily in response to the revised demand forecast and the subsequent improvement in supply demand position.

Figure 27 below displays the reforecast number of selective installations per annum.
To continue with the draft programme would not be cost-effective and would represent over-investment against the supply demand driver. As well as the impact of the revised supply demand balance, the recession has heightened affordability issues, giving a further argument for extending the duration of the programme and reducing the pressure on customers' bills in the short term.

The selective metering profile increases over time to take into account the complexities associated with metering different property types. In developing our metering case we have looked at ways in which we can exploit synergies that exist between various investment programmes to minimise disruption to customers and minimise costs. This approach of ‘Integrated Demand Management’ (IDM) will minimise the impact on customer’s bills by maximising synergies with the revised mains replacement programme.

Figure 28 shows a breakdown over the planning period of cumulative household metering installations in association with the mains replacement programme for total company area.
We are also assessing the most cost-effective metering technology and has carried out a number of trials on the use of Automated Meter Reading (AMR) technology. The trials have covered a wide range of aspects of AMR technology, including cost, installation, productivity and reliability. The trials have centred around comparing the strengths and weaknesses of the Walk-by AMR systems compared to the Fixed Network AMR systems.

Geographical metering trials have also been carried out to test the cost effectiveness of installing meters street-by-street. Four areas of 500 unmetered properties were chosen with the aim of covering a range of socio-economic groups in both rural and urban areas. The key findings of this trial were:

- Only a small efficiency gain was achieved in the densest urban area
  - Only 32.6% meter penetration achieved
- A significant efficiency gain was observed in other areas
  - 98.6% of fits were possible externally
  - 91.5% meter penetration was achieved
- Current IT systems (e.g. work planning tool) do not adequately support this strategy
- Surveys identified a high number of properties that were not being billed individually.

The findings of the geographical metering trial support the assumption that deploying meters street-by-street will be more efficient and therefore more cost-effective than change of occupier metering. However the trial also demonstrated that densely populated urban areas where many properties are flats will require additional measures to reach meter penetration targets.

The Company has also looked at trials carried out by other water companies in the UK. The key learning points from these trials are:
The range of AMR in a boundary box is relatively short, regardless of the type of system used. This is a result of the very low power outputs mandated by UK radio transmission regulations and the fact that the transmitter is mounted below ground level. However, this issue has been resolved by the use of repeaters and sophisticated Drive-By antennae so this should not be regarded as an insurmountable problem.

The experience of internal versus external meter installations has shown a longer life for an internal meter than for an external meter (often due to poor production values leading to water ingress). This is already improving and will improve further as the market develops.

Some companies have experimented with internal metering and have found that it will not support their leakage detection programs.

**London WRZ**

An IDM approach to metering is important in London, where the costs of metering as a standalone activity can be 20-25% greater than in the wider Thames Valley.

Such cost differentials include:

- Labour Costs
- Highways Authority Streetworks Charges
- Traffic Management
- Cost of Parking
- Weekend Working/ Nights
- Congestion Charging

There are also additional factors/areas of risk to be considered when working in London, they include:

- Traffic density and associated delays
- Other traffic factors
  - Red routes
  - More onerous Highway Authority requirements
- Increasing congestion during the Olympics limiting the amount of work that can be undertaken.

This will be compounded further by the introduction of the Traffic Management Act and the associated London Permitting Scheme.

As a part of the growth mains replacement activity throughout the AMP4 period (2005-10), meters have been routinely installed on all supply pipes. The vast majority of these installations are ‘sleeping’ in that they are not used for billing purposes.

This policy will continue into AMP5 but also be extended to the capital maintenance programme. Once installed however, the meters will be put directly into charge following proving activity.

For the zones where meters have been installed as part of mains replacement activity during AMP4, we will return to undertake the necessary proving activity to activate these meters and place into charge. During AMP5, this policy will focus on
‘simple’ supply connections, usually where there is a one-on-one property
relationship with the meter. More complex, shared supply arrangements, requiring
supply separation, will be addressed in AMP6 and beyond.

In terms of meter penetration, the revised programme achieves 41% in London by
2015 (original programme achieved 51% by 2015), 60% by 2020 (original
programme achieved 78% by 2020) and 80% by 2025 (original programme achieved
81% by 2025)45. At this time all connections will be metered.

Thus the original objectives of metering all connections and achieving the target
meter penetration on individual households will be achieved by 2025. Thus, we
achieve the original metering objective by 2025. This strategy has a more
acceptable impact on customer bills and will also provide a more realistic length of
time for developing effective tariffs to assist with mitigating affordability issues.

Figure 29 shows the revised metering programme for London in comparison with the
original dWRMP programme in terms of number of meters installed and level of
meter penetration.

![Figure 29: Comparison of selective metering - London](image)

**SWOX WRZ**

The metering programme for SWOX is more intensive than for London and is spread
over 10 years. The programme forms part of the sustainable least cost plan.

The proposed programme will achieve 70% meter penetration by 2015 and 89% by
2020. Figure 30 shows the revised numbers of selective meters installed and the
corresponding level of meter penetration compared with the original programme.

---

45 Meter installation programme linked to leakage reduction activity which is based on UKCIP02 scenarios and may
change, as discussed in Section 3.1.
Surplus zones

For the four remaining resource zones (Slough/Wycombe/Aylesbury, Kennet Valley, Guildford and Henley) we continue to propose that metering is carried out even though they are predicted to remain in surplus over the planning horizon.

The Company considers that it is important to maximise the scope for demand management across all zones and that the water efficiency message, for which metering is a key enabler, should be company-wide and irrespective of the prevailing supply demand position. This is the only way in which government aspirations on per capita consumption can be achieved.
3.6.3 Water efficiency strategy

Both the revised mains replacement and metering programmes and the new regulatory obligation on water efficiency have changed the shape of the water efficiency programme proposed in the dWRMP.

The baseline programme has been extended to include the promotion of subsidised water efficiency products. The scale of the programme is around 24,000 products per annum, with a calculated associated saving of 0.17 Ml/d per annum. This has been included to ensure we can achieve the new regulatory target of 3.45 Ml/d per annum. For the enhanced programme, domestic audits (household self audit and plumber assisted audit programmes) will run in tandem with the revised mains replacement/metering programme to maximize efficiencies.

The revised baseline programme is given in Table 55 below.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Baseline details AMP5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scale ('000')</td>
</tr>
<tr>
<td>Domestic Self Audit Packs</td>
<td>15</td>
</tr>
<tr>
<td>Product Subsidy</td>
<td>120</td>
</tr>
<tr>
<td>Water Butts Distribution</td>
<td>50</td>
</tr>
<tr>
<td>Cistern Displacement Devices</td>
<td>500</td>
</tr>
<tr>
<td>Commercial Water Regulations Audits</td>
<td>26.85</td>
</tr>
<tr>
<td>Schools Audit Programme</td>
<td>0.15</td>
</tr>
<tr>
<td>Domestic Self Audit Questionnaire</td>
<td>5,000</td>
</tr>
<tr>
<td>Commercial Self Audit Questionnaire</td>
<td>27.5</td>
</tr>
<tr>
<td>Project Programme</td>
<td>0</td>
</tr>
<tr>
<td>Ofwat target addition*</td>
<td>tbc</td>
</tr>
</tbody>
</table>

*The activities to achieve this remains currently unconfirmed, but will be specified once Ofwat have determined the attributable savings from specific water efficiency activities and the scope to offset this volumetric target with educational activities.

Table 55: Baseline water efficiency programme in revised draft Plan

In light of the changes to the baseline programme, the enhanced water efficiency programme has also been revised, specifically the transfer of the promotion of subsidised water efficient devices from the enhanced programme to the baseline programme.

In addition, with the metering and mains replacement programmes extended over a longer time period, the integrated water efficiency activity has been changed such that advice and devices will be offered to every household customer by 2025, after which we will revisit each DMA on a 10 year rolling basis. As a result of this extended programme we are assuming the continuation of CDD distribution at the current rate in proportion to the population in each water resource zone who will not be offered a water efficiency audit during each AMP.

The enhanced programme is presented in Table 56 below.
<table>
<thead>
<tr>
<th>Enhanced Programme</th>
<th>Domestic Self Audit Packs</th>
<th>Plumber Assisted Audit</th>
<th>Public Sector Retrofit</th>
<th>Olympic Proposal - AMP5 Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP5</td>
<td>Scale ('000') 227</td>
<td>28</td>
<td>0.60</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Saving (Ml/d) 2.97</td>
<td>0.56</td>
<td>3.33</td>
<td>-</td>
</tr>
<tr>
<td>AMP6</td>
<td>Scale ('000') 204</td>
<td>66</td>
<td>0.60</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Saving (Ml/d) 2.67</td>
<td>1.34</td>
<td>3.33</td>
<td>-</td>
</tr>
<tr>
<td>AMP7</td>
<td>Scale ('000') 339</td>
<td>43</td>
<td>0.60</td>
<td>-</td>
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<tr>
<td></td>
<td>Saving (Ml/d) 4.44</td>
<td>0.88</td>
<td>3.33</td>
<td>-</td>
</tr>
<tr>
<td>AMP8</td>
<td>Scale ('000') 538</td>
<td>117</td>
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<td>-</td>
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<td></td>
<td>Saving (Ml/d) 7.04</td>
<td>2.38</td>
<td>3.33</td>
<td>-</td>
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<td>AMP9</td>
<td>Scale ('000') 424</td>
<td>54</td>
<td>0.60</td>
<td>-</td>
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<td></td>
<td>Saving (Ml/d) 5.56</td>
<td>1.10</td>
<td>3.33</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 56: Enhanced water efficiency programme in revised draft Plan
3.7 Summary of Preferred Programmes and comparison with original Plan

3.7.1 London WRZ

Figure 31 shows the revised final programme. Because of the smaller deficit, security of supply is now restored by 2009/10 compared to 2013/14 in the original Plan.

Table 57 provides a summary of the revised programme compared to the original

<table>
<thead>
<tr>
<th>Components (cumulative contribution in Ml/d)</th>
<th>End of AMP 5</th>
<th>End of AMP 6</th>
<th>End of AMP 7</th>
<th>End of AMP 8</th>
<th>End of AMP 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage</td>
<td>Revised 73</td>
<td>154</td>
<td>170</td>
<td>174</td>
<td>177</td>
</tr>
<tr>
<td></td>
<td>Original 115</td>
<td>157</td>
<td>168</td>
<td>175</td>
<td>179</td>
</tr>
<tr>
<td>Metering, water efficiency and tariffs⁴⁶</td>
<td>Revised 19</td>
<td>70</td>
<td>104</td>
<td>101</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Original 44</td>
<td>127</td>
<td>133</td>
<td>127</td>
<td>122</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Revised 0</td>
<td>0</td>
<td>22</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Original 8</td>
<td>8</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

Figure 31: Revised final planning scenario – London

3.7.2 SWOX WRZ

Figure 32 shows the revised final programme. Because of the smaller deficit, moderately more leakage reduction and greater availability of early water resources options, security of supply is now restored in 2012/13 compared to 2014/15 as in the original draft. Table 58 provides a summary of the revised programme compared to the original.

⁴⁶Savings are lower in revised due to elongation of programme over 15 years and revised assumptions on savings per property
### Table 58: Components of the final planning scenario - SWOX

<table>
<thead>
<tr>
<th>Components</th>
<th>End of AMP 5</th>
<th>End of AMP 6</th>
<th>End of AMP 7</th>
<th>End of AMP 8</th>
<th>End of AMP 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage</td>
<td>Revised</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Original</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Metering, water efficiency and tariffs</td>
<td>Revised</td>
<td>5</td>
<td>21</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Original</td>
<td>19</td>
<td>33</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Water Resources</td>
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<tr>
<td></td>
<td>Original</td>
<td>25</td>
<td>25</td>
<td>73</td>
<td>73</td>
</tr>
</tbody>
</table>

#### 3.7.3 Surplus zones

The surplus zones exhibit greater surpluses than in the original draft and therefore continue to not require resource development over the planning period. Demand management is included in the programme to meet strategic direction on metering and to offset leakage increases over time, which result from new properties.

#### 3.7.4 Revised PCC profile

The revised average PCC profile over the planning period is shown in Figure 33 below. It can be seen that after applying a regional uplift of +12 l/head/day the revised trend falls below Defra’s target by 2023/24. Normal year PCC is now reduced from 157 l/h/d to 135. Given the known regional variability in PCC, we conclude that we are now in line with the Defra aspiration of 130 l/h/d by 2030.
3.7.5 SEA

The SEA appraisal has informed the development of the revised preferred programmes in the revised draft Plan. The SEA appraisal will be written up in an addendum to the Environmental Report, which will be published in Spring 2009. A summary of the update to our SEA completed for the revised draft plan is given in Appendix 5. This update found that in general the revised draft plan performed better than the draft plan due to the following factors:

The revised draft plan:

- retains a considerable contribution from demand management options which perform favourably against SEA criteria.
- has selected some smaller resource schemes with lower impacts than those included in the draft plan
- introduces a smaller reservoir (100Mm³) at a later stage. The impacts caused by the later introduction of the smaller reservoir are therefore comparatively less than in the draft WRMP programme.
3.8 Concluding statement

The comprehensive review of the demand forecasts following consultee representations, together with the latest acceleration in economic downturn and an associated reduction in water use, have resulted in a much reduced deficit profile over the planning period. This has led to a substantially changed set of preferred plans for the London and SWOX WRZs.

The Company believes the revised demand forecasts are now better aligned with most of the other companies in the South East and that the revised Per Capita Consumption profile over the planning period is now consistent with Defra’s aspirational target of 130 l/h/d by 2025.

For London AMP5 and 6 the preferred plan is based solely on demand management. For SWOX over this period the preferred plan is more strictly twin track with small-scale water resources schemes in AMP5 programme and demand management carrying through both AMP periods into AMP7.

From AMP7 and beyond the strategy is driven by the contrasts of a relatively small and slowly growing deficit profile on the one hand and a complexity of major planning uncertainties on the other. Of the latter, the severity and longevity of current the economic downturn and the threat to the existing water resource base from the LTOA Review and Water Framework Directive are of particular importance.

In deciding upon an option mix that best satisfies these criteria demand management alone will not accommodate the central forecast deficit. Water resources options are required even from the start of AMP7. Scenario analysis has shown there to be potentially a very large range of water resource requirement.

In satisfying the long-term planning problem the Company is therefore presented with the decision to base its future strategy on either reuse and desalination or a reservoir. Having regard to the risk of compromising future carbon obligations and the longer-term cumulative carbon impact of reuse and desalination, the Company believes that it is not sustainable to base a potentially major long-term strategy on these high-energy options and a reservoir is therefore the preferred long-term option.

The Upper Thames Reservoir (UTR) has a lowest unit cost in comparison to alternative options and is therefore the optimum in the long run over a 50 year planning horizon. It will be better able to satisfy any step-wise increase in demand or reduction in existing water resources base and is shown to be the most sustainable option in regard to:

- Strategic Environmental Assessment programme selection;
- meeting future carbon reduction obligations; and
- compatibility with the Company’s Strategic Direction Statement.

Because of the wide range of uncertainty associated with the economic downturn and associated reduction in demand and sustainability directions, the Company believes the prudent decision is to defer the planning phase of the UTR to AMP6 with the aim of completing the UTR by the beginning of AMP8 in 2026. Given the potential impact on bills over AMP5, we feel that on balance this represents the optimum strategy, which is in the best interests of our customers and the wider South East.
This also defers the date at which any significant sustainability reductions can be accommodated.

Given current information, at this stage, it would not be sensible to firm up on the optimum reservoir size given the lack of clarity on the longer-term uncertainties but we are currently planning on a reservoir size of 100 Mm$^3$, which would provide around 178 Ml/d of annual average supply to London and 20 Ml/d to SWOX (24 Ml/d peak supply).

In order to address the deficit profile over AMP7, a ‘bridging’ set of options consisting of further leakage reduction and small scale groundwater schemes is put forward as part of the preferred solution.

The need and timescale for the reservoir proposal will be considered as part of the annual review of our WRMP. It is essential to keep the reservoir option open because it is the best strategic water resource scheme available to the company. Therefore we will continue to:

- Work with the WRSE group to establish the optimum level of water resources for the south east of England
- Work with planning authorities to ensure that the reservoir proposal is accommodated in the appropriate local and regional plans
- Work with government departments to ensure that the National Policy Statement for water provides for the proposed Upper Thames Reservoir
- Complete current ecological baseline studies on the proposed reservoir site
- Maintain a dialogue with all key stakeholders

Overall, the Company believes the preferred programmes for all WRZs together represent the best economic balance that keeps bills to a minimum, satisfies consultee representations and provides longer term robustness and flexibility in a still very uncertain longer term future.

The annual review of the WRMP will be the best vehicle for updating the plan, clarifying and quantifying the major uncertainties. In this regard, the Company is crucially dependent upon the Environment Agency to (a) provide detailed clarification of the potential sustainability reductions that may be required as a result of the Water Framework Directive and (b) to quantify the implications for London’s water resources following the proposed ecological investigations associated with the LTOA Review.

As indicated earlier, significant sustainability reductions resulting from a) and b) could only be implemented after the proposed Upper Thames Reservoir has been completed.
4 Next Steps

This Statement was submitted to the Secretary of State on 4th February 2009. The Statement was sent to all consultees who submitted a representation. It was also published on our website www.thameswater.co.uk. The Secretary of State will review the Statement of Response and based on advice from technical experts, and with consideration of the responses to the public consultation, will decide to either approve the Plan, following which the Plan will be published as a Final Plan and implemented from April 2010 or the Secretary of State will decide that further scrutiny is required on our draft Plan.
Appendix 1: List of statutory consultees

Statutory consultees to whom we sent a copy of the published draft water resources management plan.

Anglian Water Services Ltd
Aylesbury Vale District Council
Basingstoke and Deane Borough Council
Basingstoke Canal Authority
Bedfordshire County Council
Borough of Broxbourne
Bournemouth & West Hampshire Water Plc
Bracknell Forest Borough Council
Brentwood Borough Council
British Waterways
Buckinghamshire County Council
Cherwell District Council
Chiltern District Council
City of London Corporation
City of Westminster
Cotswold District Council
Dacorum District Council
Dartford Borough Council
Daventry District Council
Dwr Cymru Welsh Water
East Hampshire District Council
East Hertfordshire District Council
East of England Development Agency (EEDA)
East of England Regional Assembly (EERA)
Elmbridge Borough Council
English Heritage (Historic Buildings and Monuments Commission of England)
Environment Agency
Epping Forest District Council
Epsom and Ewell Borough Council
Essex and Suffolk Water
Essex County Council
Folkestone and Dover Water
Gloucestershire County Council
Gravesend Borough Council
Greater London Authority
Guildford District Council
Hampshire County Council
Harlow Council
Hart District Council
Hertfordshire County Council
Hertsmere Borough Council
Horsham District Council
Kennet District Council
London Borough of Barking and Dagenham
London Borough of Barnet
London Borough of Bexley
London Borough of Brent
London Borough of Bromley
London Borough of Camden
London Borough of Croydon
London Borough of Ealing
London Borough of Enfield
London Borough of Greenwich
London Borough of Hackney
London Borough of Hammersmith & Fulham
London Borough of Haringey
London Borough of Harrow
London Borough of Havering
London Borough of Hillingdon
London Borough of Hounslow
London Borough of Islington
London Borough of Lambeth
London Borough of Lewisham
London Borough of Merton
London Borough of Newham
London Borough of Redbridge
London Borough of Richmond upon Thames
London Borough of Southwark
London Borough of Sutton
London Borough of Tower Hamlets
London Borough of Waltham Forest
London Borough of Wandsworth
London Borough of Wandsworth
London Councils
London Development Agency
Luton Borough Council
Mole Valley District Council
Natural England
North Hertfordshire District Council
North Wiltshire District Council
Northamptonshire County Council
Oxford City Council
Oxfordshire County Council
Port of London Authority
Portsmouth Water Ltd
Reading Borough Council
Reigate and Barnstead Borough Council
Royal Borough of Kensington and Chelsea
Royal Borough of Kingston Upon Thames
Royal Borough of Windsor & Maidenhead
Runnymede Borough Council
Rushmoor Borough Council
Sevenoaks District Council
Severn Trent Water
Slough Borough Council
South Bedfordshire District Council
South Buckinghamshire District Council
South Downs Joint Committee
South East England Development Agency (SEEDA)
South East England Regional Assembly (SEERA)
South East Water
South Northamptonshire Council
South Oxfordshire District Council
South West England Development Agency
South West England Regional Assembly
Southern Water Services Ltd
Spelthorne Borough Council
St Albans City and District Council
Stevenage Borough Council
Surrey County Council
Surrey Heath District Council
Sutton & East Surrey Water Plc
Swindon Borough Council
Tandridge District Council
The National Trust
Three Rivers District Council
Three Valleys Water
Uttlesford District Council
Vale of White Horse District Council
Watford Borough Council
Waverly Borough Council
Welwyn and Hatfield Borough Council
Wessex Water
West Berkshire Council
West Oxfordshire District Council
Wiltshire County Council
Woking Borough Council
Wokingham Borough Council
Wycombe District Council
### Appendix 2: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstraction</td>
<td>The removal of water from any source, either permanently or temporarily.</td>
</tr>
<tr>
<td>Abstraction licence</td>
<td>The authorisation granted by the Environment Agency to allow the removal of water from a source.</td>
</tr>
<tr>
<td>Allowable outage</td>
<td>The outage (calculated from legitimate unplanned and planned events) which affects the water available for use. An outage allowance may be made for such outages.</td>
</tr>
<tr>
<td>AMP</td>
<td>Asset Management Plan is the investment programme for a 5 year period agreed with Ofwat. AMP5 covers the period 2010-2015, AMP6 covers the period 2015-2020, AMP7 covers the period 2020 to 2025.</td>
</tr>
<tr>
<td>Annual average demand</td>
<td>The total demand in a year, divided by the number of days in the year.</td>
</tr>
<tr>
<td>Aquifer</td>
<td>A geological formation, group of formations, or part of a formation, that can store and transmit water in significant volumes.</td>
</tr>
<tr>
<td>Aquifer Storage and Recovery (ASR)</td>
<td>Water is injected into an aquifer through wells or by surface spreading and infiltration and then can be pumped out when needed. The aquifer essentially functions as a water bank.</td>
</tr>
<tr>
<td>Artificial recharge</td>
<td>The addition of surface water to a groundwater reservoir by human activity such as putting surface water into recharge basins.</td>
</tr>
<tr>
<td>Asset Management Period (AMP)</td>
<td>Five year period for which water companies are funded by Ofwat according to their Strategic Business Plans.</td>
</tr>
<tr>
<td>Available headroom</td>
<td>The difference (in Ml/d or percent) between water available for use (including imported water) and demand at any given point in time.</td>
</tr>
<tr>
<td>Average day demand in peak week (ADPW)</td>
<td>One seventh of total demand in the peak week in any 12 month accounting period (ADPW).</td>
</tr>
<tr>
<td>Average incremental social costs (AISC)</td>
<td>The ratio of present social costs over present net value of additional water delivered or reduced demand.</td>
</tr>
<tr>
<td>Baseline forecast</td>
<td>A demand forecast which reflects a company’s current demand management policy but which should assume the swiftest possible achievement of the current agreed target for leakage during the forecast duration, as well as implementation of our water efficiency plan, irrespective of any supply surplus.</td>
</tr>
<tr>
<td>Best Practicable Environmental programme (BPEP)</td>
<td>BPEP is a methodology to assess schemes in terms of environmental and social impacts as well as costs and uses “best practice” techniques.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Catchment Management Abstraction Strategies (CAMS) Consumption monitor</td>
<td>Strategies for management of water resources at a local level produced by the Environment Agency</td>
</tr>
<tr>
<td>Demand management</td>
<td>The implementation of policies or measures, which serve to control or influence the consumption or waste of water (this definition can be applied at any point along the chain of supply).</td>
</tr>
</tbody>
</table>
| Department for Environment, Food and Rural Affairs (DEFRA) Deployable output (DO) | The output of a commissioned source or group of sources or of bulk supply as constrained by:  
- Licence, if applicable  
- Pumping plant and/or well/aquifer properties  
- Raw water mains and/or aquifers  
- Transfer and/or output main  
- Treatment  
- Water quality |
<p>| Distribution input (DI) | The amount of water entering the distribution system at the point of production. |
| Distribution losses | Made up of losses on trunk mains, service reservoirs, distribution mains and communication pipes. Distribution losses are distribution input less water taken. |
| Drought Plan | Statutory plan containing management guidelines and protocols that will come into operation during periods of drought. |
| Drought Order | An authorisation granted by the Secretary of State under drought conditions, which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis. |
| Drought permit | An authorisation granted by the Environment Agency under drought conditions, which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis. |
| Dry year annual average unrestricted daily demand | The level of demand, which is just equal to the maximum annual average, which can be met at any time during the year without the introduction of demand restrictions. This should be based on a continuation of current demand management policies. The dry year demand should be expressed as the total demand in the year divided by the number of days in the year. |
| Economics of Balancing Supply | A method to assess the balance between a company’s available water resource and the demand for water by customers. Any |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>and Demand (EBSD)</td>
<td>Imbalance between supply and demand can be met either by demand management such as selective metering and leakage control, or by the provision of additional water resources.</td>
</tr>
<tr>
<td>Environment Agency (EA)</td>
<td>UK government agency whose principal aim is to protect and enhance the environment in England and Wales.</td>
</tr>
<tr>
<td>Final planning demand forecast</td>
<td>A demand forecast, which reflects a company’s preferred policy for managing demand and resources through the planning period, after taking account of all options through full economic analysis.</td>
</tr>
<tr>
<td>Final planning scenario</td>
<td>The scenario of water available for use and final planning demand forecast which constitute our best estimate for planning purposes, and which is consistent with information provided to Ofwat for the Periodic Review.</td>
</tr>
<tr>
<td>Forecast/plan horizon</td>
<td>The end date of demand forecast or water resources plan (for example, 2035).</td>
</tr>
<tr>
<td>June Return</td>
<td>An annual report made by water companies to Ofwat to advice on progress during the Asset Management Period.</td>
</tr>
<tr>
<td>Integrated Demand Management</td>
<td>Integration of demand management activities including mains replacement, metering and water efficiency to deliver a single, coherent demand management strategy.</td>
</tr>
<tr>
<td>Interfluves</td>
<td>High ground between two rivers or river valleys.</td>
</tr>
<tr>
<td>Least cost planning</td>
<td>An approach that minimises the net present value of all the costs of managing the supply demand balance over a long-term planning horizon.</td>
</tr>
<tr>
<td>Levels of Service</td>
<td>The frequency with which water companies can impose different types of water restrictions during water shortages (agreed with Ofwat and the Environment Agency).</td>
</tr>
<tr>
<td>Lower Thames Operating Agreement (LTOA)</td>
<td>An agreement between Thames Water and the Environment Agency on the amount of water that we can abstract from the Lower River Thames.</td>
</tr>
<tr>
<td>Lower Thames Control Diagram (LTCD)</td>
<td>The control rules for deciding on the appropriate environmental flows over Teddington Weir and therefore how much water can be abstracted for water supply from the Lower Thames. The diagram is also used to provide guidance on when water use restrictions should be introduced during prolonged periods of low flows.</td>
</tr>
<tr>
<td>Megalitres per day (Ml/d)</td>
<td>One mega litre = one million litres (1000 cubic metres) per day.</td>
</tr>
<tr>
<td>Meter optants</td>
<td>Properties in which a meter is voluntarily installed at the request of its occupants.</td>
</tr>
<tr>
<td>Meter programme</td>
<td>Properties, which are to be metered according to current company metering policy.</td>
</tr>
<tr>
<td><strong>Micro-component analysis</strong></td>
<td>The process of deriving estimates of future consumption based on expected changes in the individual components of customer use.</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Net Present Value</strong></td>
<td>The difference between the discounted sum of all of the benefits arising from a project and the discounted sum of all the costs arising from the project.</td>
</tr>
<tr>
<td><strong>Non-households</strong></td>
<td>Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises.</td>
</tr>
<tr>
<td><strong>Normal year annual average daily demand</strong></td>
<td>The total demand in a year with normal or average weather patterns, divided by the number of days in the year.</td>
</tr>
<tr>
<td><strong>Office of Water Services (Ofwat)</strong></td>
<td>Water industry economic regulator.</td>
</tr>
<tr>
<td><strong>Outage</strong></td>
<td>A temporary loss of Deployable Output. (Note that an outage is temporary in the sense that it is retrievable, and therefore Deployable Output can be recovered. The period of time for recovery is subject to audit and agreement. If an outage lasts longer than 3 months, analysis of the cause of the problem would be required in order to satisfy the regulating authority of the legitimacy of the outage).</td>
</tr>
<tr>
<td><strong>Per capita consumption (pcc)</strong></td>
<td>The amount of water typically used by one person in a day.</td>
</tr>
<tr>
<td><strong>Potable water produced</strong></td>
<td>Raw water treatment less treatment works operational use and treatment work losses.</td>
</tr>
<tr>
<td><strong>Potable water exported</strong></td>
<td>Potable water exports from within a defined geographical area to an area outside the defined geographical area.</td>
</tr>
<tr>
<td><strong>Potable water imported</strong></td>
<td>Potable water imports from outside a defined geographical area to the defined geographical area.</td>
</tr>
<tr>
<td><strong>Regional Spatial Strategy (RSS)</strong></td>
<td>Statutory document containing planning and transport policy for a 15-20 year period, prepared separately by each of the nine English administrative regions.</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>A measure of the probability and magnitude of an event and the consequences of its occurrence.</td>
</tr>
<tr>
<td><strong>Security of supply</strong></td>
<td>Reliability of surety of meeting water supply demand.</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>A named input to a zone. A multiple well/spring source is a named place where water is abstracted from more than one operational well/spring.</td>
</tr>
<tr>
<td><strong>Strategic Business Plan (SBP)</strong></td>
<td>Water companies investment programme for a 5-year period.</td>
</tr>
<tr>
<td><strong>Supply-demand</strong></td>
<td>The difference between water available for use (including</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>balance</td>
<td>imported water) and demand at any given point in time.</td>
</tr>
<tr>
<td>Supply pipe losses</td>
<td>The sum of underground supply pipe losses and above ground supply pipe losses.</td>
</tr>
<tr>
<td>Sustainability reduction</td>
<td>Reductions in Deployable Output required by the Environment Agency to meet statutory and/or environmental requirements.</td>
</tr>
<tr>
<td>SWOX</td>
<td>Swindon and Oxfordshire Water Resource Zone.</td>
</tr>
<tr>
<td>Target headroom</td>
<td>The threshold of minimum acceptable headroom, which would trigger the need for water management options to increase water available for use or decrease demand.</td>
</tr>
<tr>
<td>Teddington Target Flows (TTFs)</td>
<td>Minimum river flow over Teddington Weir as agreed with the Environment Agency for the purposes of maintaining satisfactory environmental conditions.</td>
</tr>
<tr>
<td>Tideway Tunnel</td>
<td>The proposed Thames Tunnel - one of two new interceptor sewers proposed by Thames Water called the London Tideway Tunnels - will run approximately 32 kilometres (20 miles) through the heart of London, beneath the River Thames. The tunnel will capture storm sewage from 34 'Combined Sewer Overflows' along the River Thames, which currently discharge untreated sewage into the river, and transfer them to Beckton Sewage Treatment works in east London for treatment.</td>
</tr>
<tr>
<td>Total leakage</td>
<td>The sum of distribution losses and underground supply pipe losses.</td>
</tr>
<tr>
<td>Water available for use (WAFU)</td>
<td>The value calculated by deducting allowable outages and planning allowances from Deployable Output in a zone.</td>
</tr>
<tr>
<td>WARMS</td>
<td>Thames Water Water Resources Model.</td>
</tr>
<tr>
<td>Water Resource Zone (WRZ)</td>
<td>The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall.</td>
</tr>
<tr>
<td>Water Resources Management Plan (WRMP)</td>
<td>Water company plan for supplying water to meet demand over a 25-year period.</td>
</tr>
</tbody>
</table>
Appendix 3: Schedule of Representations

This Appendix is available as a separate document.
Appendix M of the revised draft Plan, updates the data and assumptions contained used in demand forecasting and previously reported in Appendix B Volume 3 of the draft Plan. However the methodology and approach remain as described in Appendix B.

1. Introduction

Our demand forecasts have been comprehensively reviewed largely as a result of consultee representations received during the consultation period for the draft Plan; see Section 2.3 of the Statement of Response (SOR). The following presents an integrated account of the work undertaken and resultant changes to the original Plan.

The main areas of work undertaken were in connection with:

- Demographic movements- Updating of our demographic forecast taking into account the latest Regional Spatial Strategies.
- Economic downturn -assessing the impact of the unfolding economic situation on population and housing.
- Microcomponent review- comprehensive re-assessment of our assumptions on microcomponents of water use, including Defra’s aspiration to reduce water use in existing households to 130 l/h/d by 2030.
- New properties- re-examining our water use assumptions in regard to new properties, including Defra’s goal to reduce consumption to 125 l/h/d in new properties from 2010.
- ‘Bounceback’- considering the recent decline in demand associated with the drought restrictions of 2006-07 and the wet, ‘dull’ weather of 2007-08 and 2008-09.

The first four factors were the subject of consultee representations, however ‘bounceback’ was not. That said, to a greater or lesser extent, these five factors are inter-related and together have a significant impact on our demand forecasts.

Each of the factors is discussed in the following sections.

2. Demographic movements

We anticipated within the draft Plan that we would need to update our demographic forecasts. These revised forecasts take into account updates to draft Regional Spatial Strategies (RSS), including the Secretary of State’s proposed changes to the RSS for the South East. They also use the latest (2006-based) Office of National Statistics sub-national population projections. We have also subsequently included an allowance for the impact of the economic downturn.

We instructed consultants, Experian, to update the household and demographic data as a part of a group project for the water companies in South East England. The population and household projections comply with the Environment Agency Guidelines for forecasting the customer base. As per the draft Plan, three projections have been produced:

- policy-based
• trend-based
• Experian 'most likely'.

The policy-based projections are based on the housing allocations contained within the latest available Regional Spatial Strategies combined with Communities and Local Government (CLG) household representative rates.

The trend-based households use the latest official Office of National Statistics population projections and CLG household representative rate projections.

Given that Regional Spatial Strategies are being revised to move population towards the trend at the national level, the 'most likely' scenario is designed to reconcile the difference between policy and trend. The projections necessarily cover a long time series and should be viewed as long-term projections.

Our demand forecasts are based on Experian’s policy forecasts for housing, and the 'most likely' scenario based on policy and trend based assessment of growth for population, in the same way as undertaken for the draft Plan.

We continue to add an estimate for clandestines (those not picked up in official figures) and short-term migrants to Experian’s figures as set out in the draft Plan.

Updating the demographic forecasts, before the application of an allowance for the economic downturn, resulted in increases in the growth rates for both properties and population forecasts.

Table 1A below shows the overall impact on demand from the demographic update. It can be seen that demand in London is forecast to increase by 11 Ml/d by 2015 and 51 Ml/d by 2035.

Table1A: Build-up of changes in the London demand forecast (1)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
</tbody>
</table>

The charts presented below show the population Figure 1A and household Figure 2A projections for our water supply area in terms of revised and original 'Most likely' (population) and 'Policy' (households). Note that these graphs include the allowance for the economic downturn.
Figure 1A: Population projections for the Thames Water supply area

Figure 2A: Household projections for the Thames Water supply area

Table 2A gives comparisons of the original and revised figures for property and population growth for all water resource zones and for 2010 to 2015 (AMP5 period) followed by 2015 to 2035 (AMP6 to AMP9 period). Table 3A provides the property and population growth rates for each water resource zone for each AMP period.
Table 2A: Thames Water household and population comparison (incl. economic downturn)

<table>
<thead>
<tr>
<th>Water Resource Zone</th>
<th>Population/annum</th>
<th>Properties/annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>London draft Plan</td>
<td>39,872</td>
<td>30,432</td>
</tr>
<tr>
<td>London revised</td>
<td>36,027</td>
<td>50,075</td>
</tr>
<tr>
<td>SWOX* draft Plan</td>
<td>4,871</td>
<td>4,402</td>
</tr>
<tr>
<td>SWOX revised</td>
<td>5,992</td>
<td>8,459</td>
</tr>
<tr>
<td>SWA** draft Plan</td>
<td>906</td>
<td>1,229</td>
</tr>
<tr>
<td>SWA revised</td>
<td>2,177</td>
<td>3,121</td>
</tr>
<tr>
<td>Kennet Valley draft Plan</td>
<td>1,373</td>
<td>1,212</td>
</tr>
<tr>
<td>Kennet Valley revised</td>
<td>1,876</td>
<td>2,486</td>
</tr>
<tr>
<td>Guildford draft Plan</td>
<td>468</td>
<td>574</td>
</tr>
<tr>
<td>Guildford revised</td>
<td>508</td>
<td>972</td>
</tr>
<tr>
<td>Henley draft Plan</td>
<td>67</td>
<td>94</td>
</tr>
<tr>
<td>Henley revised</td>
<td>169</td>
<td>271</td>
</tr>
</tbody>
</table>

*Swindon & Oxfordshire
**Slough, Wycombe & Aylesbury

Table 3A: Property and population growth rate comparison (incl. economic downturn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>London draft Plan</td>
<td>2.480</td>
<td>2.454</td>
<td>2.426</td>
<td>2.389</td>
<td>2.357</td>
<td>2.341</td>
</tr>
<tr>
<td>London revised</td>
<td>2.488</td>
<td>2.478</td>
<td>2.459</td>
<td>2.426</td>
<td>2.386</td>
<td>2.368</td>
</tr>
<tr>
<td>SWOX draft Plan</td>
<td>2.406</td>
<td>2.342</td>
<td>2.292</td>
<td>2.247</td>
<td>2.217</td>
<td>2.195</td>
</tr>
<tr>
<td>SWOX revised</td>
<td>2.442</td>
<td>2.416</td>
<td>2.386</td>
<td>2.354</td>
<td>2.322</td>
<td>2.301</td>
</tr>
<tr>
<td>SWA draft Plan</td>
<td>2.462</td>
<td>2.396</td>
<td>2.343</td>
<td>2.294</td>
<td>2.264</td>
<td>2.241</td>
</tr>
<tr>
<td>SWA revised</td>
<td>2.508</td>
<td>2.483</td>
<td>2.457</td>
<td>2.427</td>
<td>2.391</td>
<td>2.368</td>
</tr>
<tr>
<td>Kennet Valley draft Plan</td>
<td>2.447</td>
<td>2.377</td>
<td>2.323</td>
<td>2.275</td>
<td>2.245</td>
<td>2.224</td>
</tr>
<tr>
<td>Kennet Valley revised</td>
<td>2.485</td>
<td>2.448</td>
<td>2.423</td>
<td>2.395</td>
<td>2.364</td>
<td>2.341</td>
</tr>
<tr>
<td>Guildford draft WRMP</td>
<td>2.415</td>
<td>2.360</td>
<td>2.317</td>
<td>2.282</td>
<td>2.262</td>
<td>2.237</td>
</tr>
<tr>
<td>Guildford revised</td>
<td>2.417</td>
<td>2.408</td>
<td>2.408</td>
<td>2.401</td>
<td>2.382</td>
<td>2.361</td>
</tr>
<tr>
<td>Henley draft Plan</td>
<td>2.396</td>
<td>2.369</td>
<td>2.346</td>
<td>2.321</td>
<td>2.305</td>
<td>2.298</td>
</tr>
<tr>
<td>Henley revised</td>
<td>2.374</td>
<td>2.389</td>
<td>2.385</td>
<td>2.375</td>
<td>2.357</td>
<td>2.342</td>
</tr>
</tbody>
</table>
3. Economic downturn

Household water use

In the light of the recent dramatic national and global economic downturn, Cambridge Econometrics were commissioned to undertake a study on three specific aspects: the prospects of economic growth; implications for population growth; and the interaction between the above and the impact on housing starts/completions.

Using their econometric models, they compared their most recent housing and population forecasts with forecasts run without the impact of the credit crunch to determine the level of adjustment required. This identified a series of annual reduction factors Figure 3A that could be applied to the Experian population and household forecasts to provide an adjustment to take into account the impact of the economic downturn on household projections.

We have mirrored these trends within the clandestine and short-term migrants estimates.

The results of the Cambridge Economics study showed a significant decline in both population and housing for the UK as a whole as well as the Thames Water region.

Importantly, however, the Cambridge Economics report does not show growth levels recovering back to previous policy levels. As such, the Government’s long-term targets for housing growth are not achieved in their assumptions.

We believe that policy measures will be taken to ensure eventual delivery of the Government growth targets in the longer term. This stance is supported by the forecasting requirements as set out in the Environment Agency water resources planning guidance.

We have therefore taken the view that growth levels will be reduced during the remainder of AMP4 (2005-2010), and AMP5 (2010-2015), with the overall number of properties and population being reduced below the Experian forecasts to 2016 as determined by the Cambridge Economics factors. In order that the growth levels in the policy plan are reflected in the forecasts, growth rates in our Plan have been set to increase between 2016 and 2021, so that total planned house completions and populations meet Experian’s planned levels. Beyond 2021, we have used the unadjusted Experian growth projections, which take account of RSS targets for the periods covered by each RSS and use trend projections beyond that.

These adjustments have resulted in the changes in our Plan since the draft (including the revision in the Experian forecasts to include the new trend-based data and Secretary of State requirements) shown in Figure 3A, below.

---

Non-household water use

The Company’s assessment of non-household water use is usually based on an econometric model (developed and run by Experian). The model forecasts demand by Standard Industrial Classification (SIC) code, which are then amalgamated this into trends for service industry and non-service industry sectors.

To allow for the economic downturn, we re-ran our econometric model in October 2008. However, due to the recent acceleration in economic downturn, which has become increasingly evident since the completion of the Experian study, we have added an additional allowance.

Experian model forecasts

A comparison of the draft Plan (2007) and revised (2008) commercial water demand forecasts (Ml/d) is provided in Figure 4A below. Breaking this out by sector, the non-service forecast is almost identical in both versions, the downward adjustments in the water demand forecast therefore reflecting the downturn’s direct impact on employment within the service industries.
Accelerated downturn

The economic impact experienced at the end of last year has deteriorated rapidly over the few months. In October we identified a number of key customers who were reducing capacity or closing. This has accelerated and more recent information shows that all our top 6 customers are either planning to close in 2009 or 2010 or reducing capacity significantly or considering closure for 2010.

Several of these have been well publicised. These include the temporary closures of the Honda car plant in Swindon, the BMW Mini Cowley works in Oxford and the brewery closures in Reading and Richmond.

The full year impact of these reductions and closure will not only be seen in 2009 but also in subsequent years. The spheres of influence of these companies are such that the impact of closure will have local impacts on smaller feeder or supply chain companies. It would be reasonable to assess that this will have an equal impact on commercial demand for water.

As an example when MG Rover closed in April 2005 there were circa 6,000 jobs immediately impacted, but a further 7,500 in the local economy of those companies supplying MG Rover.

Key customers identified who plan to close are on such a scale that they would not be easily or quickly replaced by other companies who would wish to locate in the Thames Valley, South East area of the UK.

The CBI February economic forecast confirms the changes we are now seeing:

“The global economic outlook has deteriorated rapidly in the months since our November forecast, as the real economy impact of the banking crisis intensification post-Lehmans revealed itself to be far reaching and intense. A significant slowdown was already evident in the advanced economies, but this is being accelerated by dramatic falls in international consumer and business confidence, and the lack of
available credit. Emerging market economies, which had previously shown a surprising degree of resilience, are now also suffering the effects of global financial crisis and the sharp downturn in demand. Industrial production has plummeted across many countries and world trade is falling rapidly too. Economic prospects also look considerably weaker here in the UK, where access to credit has deteriorated further. A deep and prolonged recession is now expected."

These specific economic changes would not have been factored in the overall 25-year econometric trends on which the initial forecast was based. Consequently, we have made a further 5% reduction to non-household demand in all water resource zones, maintained over the planning horizon. See Figure 5A, below.

Figure 5A: Revised assessment of economic downturn – non-households

The overall impact of economic downturn

The combined impact of the economic downturn on the baseline demand forecast in London is -59 Ml/d by 2015 and -25 Ml/d by 2035, as shown in Table 4A.

Table 4A: Build-up of changes in the London demand forecast (2)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (Ml/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
</tbody>
</table>
4. Water use in existing properties - microcomponent review

We have carried out a comprehensive review of our micro-component assumptions, which form the basis of projections of household demand. We have considered the representations on our draft plan, Government aspirations for future water use, benchmarked our assumptions within the wider industry and validated our position with external experts.

The review has focused on two main areas and been carried out with the support of Artesia Consulting:

- An in-depth assessment of Defra’s 130 l/h/d aspirational target
- A technical review of micro-component assumptions.

As we set out in the draft Plan, we fully support Defra’s aspirational target to reduce household demand. This remains the case and the changes we explain below have brought us closer to the aspiration. However, we maintain our view that achieving the aspirational target is not solely down to water companies and requires concerted and targeted action by a wide range of stakeholders.

Artesia Consulting\(^48\) examined the basis of the Government’s 130 l/h/d aspiration and qualitatively assessed the risks and uncertainties associated with each of the Government’s identified areas for driving change as set out in Future Water. These include: changing household behaviour, metering and tariffs, new buildings, existing homes, and products and appliances.

In summary, the findings of the Artesia study were:

- There is no real scientific basis for selecting a value of 130 l/h/d. It has not been based on a bottom-up calculation of potential interventions. Rather it is a pragmatic figure based on benchmarking Per Capita Consumption across Europe.
- Defra makes it clear in Future Water that all stakeholders and individuals have shared responsibility to save water.
- A number of initiatives have been implemented to tackle some of Defra’s areas for change. However, it is clear that many of the initiatives required, and the evidence of their impacts, have yet to be realised.
- The only stakeholders with enforceable actual numerical targets are the water companies, through Ofwat’s new water efficiency targets\(^49\).
- There is a need to measure progress and to decide how all stakeholders can be accountable for achieving the vision and delivering on their actions.
- Due to the large number of stakeholders that need to align themselves to achieving the reduction in Per Capita Consumption, the whole process needs to be owned and driven forward. The Water Savings Group was carrying out

\(^{48}\) Artesia Consulting: Defra's vision for new and existing household per capita consumption: Study for Thames Water, December 2008

\(^{49}\) For more details of how our proposed water efficiency programme has been shaped by these targets please refer to Section 2.4.4.
this function, but the group ceased to exist at the end of 2008. It is vital that this focus and leadership is strengthened and maintained, otherwise there is a significant risk that the various initiatives could falter and timescales slip further.

Artesia concluded that:

‘At this moment in time, Thames Water are justified in their statement that achieving the vision is particularly high risk for companies with a supply demand deficit. The vision should be aimed for, but there is considerable uncertainty in the outcomes and timescales of achieving this and therefore, planning on the basis of 130l/h/d is potentially high risk.’

On this basis, Thames Water consideration of the 130 l/h/d aspiration for existing properties remains unchanged. We will not specifically incorporate the achievement of this aspiration within our Plan, because at the current time this represents too high a risk. However, we support the need to reduce water use in existing households and we will play our part in making this happen through our programmes of demand management.

To keep from losing momentum, we believe that a Government-led ‘Knowledge Integration Community’ should be set up to build upon the work of the Water Savings Group.

This is ‘a group of end-to-end stakeholders (academics, industry, government and others) who craft, own and run an integrated programme of education, multidisciplinary research and outreach on a topic that goes to the heart of future UK prosperity’.

The concept could provide a vehicle to drive knowledge exchange and research in a co-ordinated way, and to ensure widespread engagement to deliver common outcomes. Figure 6A illustrates how the range of stakeholders might integrate around a common vision to share knowledge and drive the process forward.

Figure 6A: Possible knowledge integrated community

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The Opportunities Available Through Knowledge Sharing in the Water Sector, presented by Michael Kelly, Chief Scientific Advisor, CLG on 5 September 2007
Each of the stakeholders would need to be engaged and have action plans, goals and deliverables. This has already started in the Water Savings Group with the statement of overarching goals and the delivery of some of the early goals such as the water efficiency targets. The aim would be to exchange and impart knowledge on to each of the stakeholders.

The review of the micro-components followed the process as set out in Figure 7A below.

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**Figure 7A: Flowchart of the micro-component review process**

For the most part, the review supported the assumptions we used in the draft Plan. However, industry benchmarking identified three main areas for re-assessment:

- Showers – assumed volume per use
- Toilets – assumed frequency and volume per use
- Internal tap – categorisation and overall contribution to household use.

Key to the review of the micro-components has been the incorporation of data sources such as the metered datasets generated by the WRC plc Identiflow software\(^{51}\) and the forecasts of Defra’s Market Transformation Programme (MTP)\(^{52}\). These have replaced assumptions taken from our latest customer survey, which were compromised by the impact of drought water use restrictions (as discussed in 2.3.1).

Additionally, the Identiflow methodology carries a greater data confidence than the customer survey, as by measuring the flow to a property it removes inaccuracies in how customers reported their water consumption. Furthermore, the data taken from the customer survey needs several key assumptions to be applied to it such as toilet cistern size and shower flow rates. There is inevitably a degree of uncertainty surrounding these assumptions. The Identiflow studies however incorporate actual consumption figures for unmetered properties, providing a much higher quality of data.

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\(^{51}\) http://www.wrcplc.co.uk/pdf/Identiflowflyer08.pdf
\(^{52}\) http://www.mtprog.com/
The main *Identiflow* studies are:

- Thames Water/WRC plc, 2002: *Critical evaluation of customer water use components* (78 monitored households)

Our findings on the above three categories are as follows.

**Showers**

The volume of water used per shower for both normal and power showers were reviewed against industry assumptions, *Identiflow* flow monitoring studies and published data from other stakeholders. This indicated that the assumptions in the draft Plan were high.

Volume per use is derived from assumptions of normal and power shower flow rates and shower duration. Of the two, our flow rates appeared to be in line with published data, however while there is a relatively wide range of literature supporting various shower durations, we found that our draft Plan assumption was towards the high end of this range.

We have therefore reduced the assumed shower duration in the revised draft Plan, dropping from 8 minutes in 2007/08 to 5.2 minutes and then subsequently increasing over the planning horizon to 5.85 by 2035, based on the MTP53. This is summarised in Table 5A below, which is a review of Table 2 from Volume 3 Appendix B4.4.2 of the draft Plan.

<table>
<thead>
<tr>
<th>Shower Type</th>
<th>Plan</th>
<th>Unmetered customers</th>
<th>Metered customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal showers</td>
<td>draft Plan</td>
<td>64.68 litres</td>
<td>65.28 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td></td>
<td>36.4 litres</td>
</tr>
<tr>
<td>Power showers</td>
<td>draft Plan</td>
<td>120.12 litres</td>
<td>116.12 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft Plan</td>
<td></td>
<td>67.6 litres</td>
</tr>
</tbody>
</table>

This change in shower consumption, bringing us more in line with the industry results, is a reduction in the proportion of base year Per Capita Consumption assigned to this component, from 30 per cent in the draft Plan to 17 per cent in the revised draft Plan.

Assumptions within the draft Plan on ownership, frequency of use and predicted growth and replacement rates were validated and accepted. Table 5A summarises our assumption changes.

---

53 Actions to improve shower design and efficiency - Briefing note relating to policy scenario objectives in policy brief, MTP report BN DW Shower.
Toilets

The review indicated that our assumptions on toilet use, particularly the frequency of use and average flush volumes, were relatively low. Assumptions within the draft Plan on ownership, predicted growth and replacement rates were validated and accepted for use in the revised draft Plan.

In the draft Plan we used a frequency of use of 4.1 flushes per day derived from the customer survey. This frequency of use is notably less than that recorded in two *Identiflow* datasets, 4.65 (Thames Water/WRc plc, 2002) and 5.05 (WRc plc, CP337).

We consider that this is another area where the customer survey could have been biased by the weather conditions at that time. Water use restrictions were in place and there were campaigns specifically aimed at reducing the number of flushes.

For the revised draft Plan we have changed our frequency of use to 4.65, at it was sourced from an *Identiflow* dataset specific to us.

Average flush volume has been calculated through proportionally allocating ownership of toilets across six different cistern generations. In the draft Plan, average flush volumes of 7.73 and 7.87 litres were used for unmetered and metered properties respectively.

Average flush volume is difficult to establish, as cistern size is not something customers are generally aware of. In our surveys, we use a proxy of toilet age, as there is often recollection of when a toilet was replaced and a size can then be reasonably inferred. For the revised draft Plan we used revised average flush volumes of 8.19 litres for unmetered and 8.05 litres for metered properties.

**Table 6A: Frequency and Volume per use assumptions for toilets**

<table>
<thead>
<tr>
<th>Toilet use assumptions</th>
<th>Plan</th>
<th>Unmetered customers</th>
<th>Metered customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of use</td>
<td>Draft Plan</td>
<td>4.1 flushes per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revised draft</td>
<td>4.65 flushes per day</td>
<td></td>
</tr>
<tr>
<td>Average flush volume</td>
<td>Draft Plan</td>
<td>7.73 litres</td>
<td>7.87 litres</td>
</tr>
<tr>
<td></td>
<td>Revised draft</td>
<td>8.19 litres</td>
<td>8.05 litres</td>
</tr>
</tbody>
</table>

The above changes result in the proportion of base year Per Capita Consumption considered to be related to toilet use increasing from 20 per cent in the draft Plan to 24 per cent in the revised draft Plan.

The above changes result in the proportion of base year Per Capita Consumption considered to be related to toilet use increasing from 20 per cent in the draft Plan to 24 per cent in the revised draft Plan.
**Internal tap**

We have merged the ‘Sundry use’ and ‘Hand-dishes’ categories from the draft Plan into an ‘Internal tap’ use category. This is a more familiar component of water use, more in keeping with industry understanding, and is commonly derived by the WRc plc Identiflow sampling methodology.

In the draft Plan the inferred ‘tap use’ was noted as being low in comparison to previous studies. (CP187 and CP337) The available literature for internal tap use is fairly consistent, and the revised consumption figures for internal tap are consistent with the Thames Water WRc plc Identiflow study.

The proportion of Per Capita Consumption due to internal tap use was 13 per cent in the draft Plan. This has been increased in the revised draft Plan to 24 per cent.

No increase in internal tap use is forecast over the planning period, as most tap use is for basic hygiene purposes (e.g. washing hands after toilet use and brushing teeth) and is therefore not discretionary use.

**Overall impact**

The draft Plan and revised micro-component breakdown is shown in Figure 8A and Figure 9A.

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![Figure 8A: Draft Plan typical Per Capita Consumption split](image1)

![Figure 9A: Revised Draft Plan typical Per Capita Consumption split](image2)
The overall impact of the micro-component review is to reduce the average annual rate of change over the planning horizon from an increase of around 0.6 l/h/d per annum in the draft Plan to around 0.15 l/h/d per annum in the revised assessment.

Table 7A: Rate of change in Per Capita Consumption

<table>
<thead>
<tr>
<th>Per Capita Consumption (l/h/d per annum)</th>
<th>draft WRMP</th>
<th>Revised draft WRMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmeasured household</td>
<td>0.59</td>
<td>0.11</td>
</tr>
<tr>
<td>Measured household</td>
<td>0.51</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Our assumptions on shower usage counterbalanced and surpassed the impact of all the demand reducing components i.e. reducing cistern size in toilets and white goods becoming more efficient. This resulted in an increasing and positive rate of change over the planning horizon.

The above changes have served to reduce the influence of the shower assumptions in the revised draft Plan. This means the Per Capita Consumption rates of change are initially negative (i.e. underlying use is reducing) and it is not until later in the planning horizon that it begins to grow, when the increase in showering suppresses the reductions in demand from other components.

Table 8A below shows the impact of the micro-component review for London together with the other factors of demographic update and economic downturn. It can be seen that the review has resulted in a significant reduction in demand both by the end of AMP5 (2010-2015) and the 25-year planning period.

Table 8A: Build-up of changes in the London demand forecast (3)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (ML/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Microcomponent review</td>
<td>0</td>
</tr>
</tbody>
</table>

5. Water use in new properties

Since the draft Plan we have re-examined the Per Capita Consumption assumptions with regard to new properties. We have improved the way we model new property Per Capita Consumption so that it better reflects the latest Government aspirations for reduced water use.

There are two main elements to the modelling of new property Per Capita Consumption:

3. Assumed water usage on construction
4. How usage will change in the years after construction.
Assumed usage on construction

In the draft Plan we assumed that, in the base year, water use on construction would match the Government aspiration of 125 l/h/d. We stated that this assumption was potentially high risk, but that as the methods by which the aspiration could be achieved were clear, we felt it could be accommodated.

Additionally, we applied an annual rate of change to this value, eg if the rate of change was an increase of 0.5 l/h/d per annum, then new properties built in year 2 would have an assumed Per Capita Consumption of 125.5 l/h/d, year 3 would be 126, and so on.

After due consideration, we consider that if the Government successfully enacts its proposed legislative changes, for example the delivery of Part G of the Building Regulations, then houses built in future years could eventually achieve 125 l/h/d. However, this change will need a period of bedding in. Also, if changes are appropriately supported and policed, we need not apply the incremental rate of change, as properties would be built to the same standard in all years.

We have assumed that although new legislation will be introduced in 2010 defining the water use requirements of new properties, it will take up to five years before this becomes fully effective. Therefore the target of 125 l/h/d is not achieved until 2015. This is a trend that is consistent with the achievement of the Government’s historical water efficiency targets.

In the revised draft Plan we have assumed the following new property Per Capita Consumptions as set out in Table 9A below.

Table 9A: Revised property Per Capita Consumptions

<table>
<thead>
<tr>
<th>Period</th>
<th>Per Capita Consumption on construction (l/h/d)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to March 2010</td>
<td>143</td>
<td>Current usage in new properties. This allows for any delays in the delivery of Part G.</td>
</tr>
<tr>
<td>From Apr 2010 to Mar 2015</td>
<td>143 to 125</td>
<td>A linear decrease in Per Capita Consumption to allow time for part G to be implemented and enforced.</td>
</tr>
<tr>
<td>From Apr 2015 to 2035</td>
<td>125</td>
<td>New properties built to achieve 125 l/h/d aspiration over the remainder of the planning horizon.</td>
</tr>
</tbody>
</table>

Change in usage after construction

Once built, the annual change in usage for new properties is assumed to follow that applied to the remainder of the metered housing stock, as discussed in the previous section.

These changes reduce the demand forecast. This impact increases over time as the cumulative number of new properties increases.

Table 10A adds the new property correction to the cumulative table of changes to demand for London. It can be seen that there is little impact in AMP5 (2010-2015) but a significant reduction in demand of 82 Ml/d by the end of the planning period.
Table 10A: Build-up of changes in the London demand forecast (4)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (ML/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Micro-component review</td>
<td>0</td>
</tr>
<tr>
<td>New property Per Capita Consumption</td>
<td>0</td>
</tr>
</tbody>
</table>

6. Bounceback and other adjustments

There is an additional factor that is not directly attributable to a specific consultee representation, but which nevertheless represents an impact primarily on our demand projections in London. The water resource zones in the Thames Valley see minimal impact.

Since the drought of 2006 and subsequent ‘dull, wet weather’ years (2007/08 and 2008/09), underlying Per Capita Consumption in unmetered properties has been significantly lower than predicted in the draft Plan.

The explanation for the continuing low demand in 2007/08 and 2008/09 is probably the prolonged dull and exceptionally wet weather, as reported in June Return 2008. For the London Water Resource Zone, the dip in customer demand has amounted to some 40 ML/d, a significant decline. Such dips in demand following drought or prolonged dull and wet weather have occurred in the past and have been followed by a subsequent ‘bounceback’ to the underlying longer-term trend.

Despite monthly modelling using our weather-related demand models, it has not been possible to conclude whether the continued low demands since the drought restrictions are purely due to the extended period of dull weather or whether this actually represents a longer-term step change in water usage behaviour.

It is likely that until we encounter a dry summer or a short period of hot weather we will not be able to see the likely longer-term trend.

For the revised draft Plan we have assumed that the recent trend in lower customer demand will continue, ie. we have not assumed that demand will return to the draft Plan trend. This results in a step change in the demand forecast in London of approximately 40 ML/d when compared to the draft Plan.

However, this so-called ‘bounceback’ phenomenon is an important planning uncertainty and so we have included an allowance in ‘target headroom’ to cover the strong possibility of a partial degree of ‘bounceback’ over the planning period.

Other factors

In addition to the ‘bounceback’ factor, there are two other changes to the baseline demand forecast that have been included in our revised draft Plan but are not in response to a consultee representation. These relate to:
• changes in baseline demand management assumptions
• changes due to rolling the base year forward one year, from 2006/07 to 2007/08.

With regard to baseline demand management, we have brought our baseline water efficiency figures into line with the Ofwat targets and revised the meter optant forecast.

In the draft Plan we explained that there had been a significant increase in optants’ take-up of meters in the past couple of years and we surpassed the five-year forecast from the previous Business Plan within three years. We suggest that this was down to a combination of drought restrictions and bill increases, meaning customers were taking a closer interest in opportunities to save money.

We have still not seen a slowdown in requests for meters, perhaps due to the current economic situation, and therefore, in the revised draft Plan, we have increased the forecast of optant take-up from approximately 14,000 per annum to 24,000 per annum.

Optant forecasts are discussed further in Section 3 with regard to how we have considered the take-up rate will be affected by the selective metering plans.

With regard to base year changes, the impacts are generally minor and would be expected given that we have actual figures to replace previous forecasts. However, one point of note is the leakage level in London. However, in 2007/08 we outperformed our leakage target in London. Therefore the Distribution Input in the revised draft Plan is markedly lower.

Table 11A: Build-up of changes in the London demand forecast (5)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (ML/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Micro-component review</td>
<td>0</td>
</tr>
<tr>
<td>New property Per Capita Consumption</td>
<td>0</td>
</tr>
<tr>
<td>Other (including ‘bounceback’, demand management programmes and base year movement)</td>
<td>-82</td>
</tr>
</tbody>
</table>
7. Summary of changes

Table 12A shows the impact from the factors described above. It can be seen that there is a cumulative net reduction in London’s demand ranging from 82 ML/d in the base year to 212 ML/d by the end of the planning period. These are significant changes to the original demand forecast profile.

Table 12A: Build-up of changes in the London demand forecast (5)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changes to original demand forecasts (ML/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007/08</td>
</tr>
<tr>
<td>Demographic update</td>
<td>0</td>
</tr>
<tr>
<td>Economic downturn</td>
<td>0</td>
</tr>
<tr>
<td>Micro-component review</td>
<td>0</td>
</tr>
<tr>
<td>New property Per Capita Consumption</td>
<td>0</td>
</tr>
<tr>
<td>Other (including ‘bounceback’, demand management programmes and base year movement)</td>
<td>-82</td>
</tr>
<tr>
<td><strong>Net Movement</strong></td>
<td><strong>-82</strong></td>
</tr>
</tbody>
</table>
Appendix 5: Update of Strategic Environmental Assessment
London and SWOX Water Resource Zones

Update on Strategic Environmental Assessment

London Water Resource Zone

We have assessed the impact of each scheme’s contribution to a programme in terms of water yield or saving, as set out in Chapter 8 of the Environmental Report, Volume 6 of the draft Plan. Similarly to the preferred programme for London in the draft WRMP, the preferred programme for the final WRMP has a large core component of demand management schemes, comprising active leakage control, Victorian Mains Replacement, metering and water efficiency. These account for approximately 70% of the water yield/saving provided by the programme, and will be deployed before any new water resource development schemes are introduced. The demand management schemes have more beneficial impacts and fewer adverse impacts, particularly during their longer-term, operational phases. By their nature they are more sustainable than schemes to develop new water resources and this is reflected in their very favourable performance against the SEA criteria. The programmes emphasis on demand management accords with policies set out in Thames Water’s Strategic Direction Statement and will help to meet Ofwat’s water efficiency targets. Increased efficiency of water use was identified as a key message in Future Water – the Government’s water strategy for England54.

As the supply/demand deficit cannot be met by demand management alone, some development of new water resources will be necessary. Two small groundwater development schemes (Amwell End and ELRED) and a medium sized aquifer recharge scheme (SLARS) have been included in the preferred programme for the final WRMP. This is a similar combination of schemes to that proposed in the draft WRMP, but with SLARS replacing AR Kidbrooke. The groundwater schemes perform favourably against the SEA criteria and were recommended for inclusion both in the draft and final programmes on the basis that they have few adverse effects, particularly during their operational phases. SLARS has a higher yield than AR Kidbrooke, although similar impacts were identified for both by the SEA.

A large reservoir scheme is included in both programmes. However, since the formulation of the preferred programme for the draft WRMP, demand projections have been revised downwards. Accordingly, the revised programme deploys a smaller reservoir (100Mm³) later in the planning period (2026 as opposed to 2021). The duration of impacts within the plan period are reduced and because the reservoir is smaller the magnitude of impacts will also be reduced.

The reservoir could be used to generate a surplus of water. With the likelihood of increased sustainability reductions in the south-east in response to the Water Framework Directive, the reservoir could potentially provide a regional resource. This has been recognised by the Environment Agency and other water companies through the work of the WRSE Group. This could potentially reduce cumulative impacts of alternative supply schemes implemented by the individual water companies across the south-east region.

SWOX Water Resource Zone

Similarly to the preferred programme for SWOX in the draft WRMP, the preferred programme in the final WRMP features a core component of demand management schemes including active leakage control, metering and water efficiency. These are introduced at the start of the programme in AMP5. These schemes perform favourably against the SEA criteria, though both metering and leakage control cause some operational impacts associated with transport.

The programme for the final WRMP includes network constraint options. These are new schemes and were not available for formulation of the draft WRMP. They cause few operational or construction impacts as they seek to improve the efficiency of existing infrastructure. By replacing other higher impact schemes, their inclusion in the final programme reduces the overall impact compared to the preferred programme in the draft WRMP.

Both the draft and final WRMP programmes feature similar mixes of groundwater development schemes and a large reservoir towards the end of the planning period. However, the programme for the draft WRMP introduces a larger reservoir (150Mm$^3$) at a slightly earlier stage (2020), while the revised programme introduces a smaller reservoir (100Mm$^3$) at a later stage. The impacts caused by the later introduction of the smaller reservoir are therefore comparatively less than in the draft WRMP programme.

As the reservoir is already included in the London programme, its use to balance supply and demand in the later part of the plan period for SWOX avoids the need for development of any further schemes within SWOX.

A comparison of the final WRMP programme with alternative programmes will be made in an addendum to the SEA Environment Report to be published in spring 2009.