Thames Water’s Water Resource Planning and Drought Planning
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Content
- Introduction to Thames Water Utilities Limited
- Water Resource Planning
- Drought Planning
Thames Water Utilities Limited

Thames Water facts and figures

**Water services**
- 9.2 million clean water customers
- 2,526m litres of drinking water supplied per day
- 87 WTWs, 30 raw water reservoirs, 288 pumping stations and 235 underground service reservoirs
- 31,186 km of water mains

**Sewerage services**
- 14.5 million wastewater customers
- 350 STWs treating an average of more than 4bn litres per day
- 65,585km of sewer, 2,800 pumping stations and 1.2 million manholes
- Two sludge-powered generators and 21 chp plants generating 176 GWh of renewable electricity
**Water Resources in the Thames Catchment**

- Thames basin is one of the most intensively used water resource systems in the world.

- Around 50% of effective rainfall is licensed for abstraction compared to other company areas

<table>
<thead>
<tr>
<th>Water Service Company</th>
<th>RF (mm)</th>
<th>IOH ave evaporation (mm)</th>
<th>Estimated pot evaporation (mm)</th>
<th>Public supply (1000m³/day)</th>
<th>% use</th>
<th>area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglian</td>
<td>611</td>
<td>480</td>
<td>520</td>
<td>1721</td>
<td>25</td>
<td>27500</td>
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<tr>
<td>Northumbria</td>
<td>879</td>
<td>485</td>
<td>525</td>
<td>1071</td>
<td>12</td>
<td>9400</td>
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<tr>
<td>N West</td>
<td>1217</td>
<td>500</td>
<td>542</td>
<td>2478</td>
<td>9</td>
<td>14445</td>
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<td>Severn Trent</td>
<td>773</td>
<td>500</td>
<td>542</td>
<td>2504</td>
<td>18</td>
<td>21650</td>
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<tr>
<td>Southern</td>
<td>787</td>
<td>480</td>
<td>520</td>
<td>1317</td>
<td>17</td>
<td>10450</td>
</tr>
<tr>
<td>S West</td>
<td>1194</td>
<td>522</td>
<td>565</td>
<td>476</td>
<td>3</td>
<td>10800</td>
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<tr>
<td><strong>Thames</strong></td>
<td><strong>704</strong></td>
<td><strong>480</strong></td>
<td><strong>520</strong></td>
<td><strong>3799</strong></td>
<td><strong>55</strong></td>
<td><strong>13750</strong></td>
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<tr>
<td>Welsh</td>
<td>1334</td>
<td>517</td>
<td>560</td>
<td>1215</td>
<td>3</td>
<td>21300</td>
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<tr>
<td>Wessex</td>
<td>864</td>
<td>514</td>
<td>557</td>
<td>926</td>
<td>11</td>
<td>10000</td>
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<tr>
<td>Yorkshire</td>
<td>818</td>
<td>485</td>
<td>525</td>
<td>1508</td>
<td>14</td>
<td>13600</td>
</tr>
</tbody>
</table>

Rainfall data from Waterfacts '95 (1941-1970 average)

Water supply data for 1994/95 from Waterfacts '95 (WOCs data has been added to water service company totals)

Evaporation data is actual average evaporation from IOH for 1995 but scaled up to give potential evaporation.
Water Resources in the Thames Catchment

- Supply is mainly through surface water abstraction supported by a series of large bunded storage reservoirs
  - London: 80% surface water and 20% groundwater
  - Thames Valley: 30% surface water and 70% groundwater

- In a typical day, we supply 2000 Ml/d London (2300 Ml/d peak); 600 Ml/d Thames Valley (peak 710 Ml/d)

- Bulk supplies to neighbouring water companies:
  - Essex and Suffolk Water – 91 Ml/d raw water
  - Affinity Water – 12 Ml/d treated water and 2 Ml/d raw water
  - Sutton and East Surrey Water - 13.6 Ml/d treated water (only 5 Ml/d taken in recent years)
The impact of winter rainfall

Winter rain is vitally important:

- Summer rain is largely used up by plants and lost to evaporation.
- Winter rain “recharges” the underground aquifers which drive base flows in rivers.
- If we get low winter rainfall aquifers don’t replenish as fully and so river levels are lower in the following year.
- That means we cannot refill our reservoirs and levels drop rapidly.
Our Existing Resources

- River Thames
- River Lee
- Banbury
- Cirencester
- Swindon
- Oxford
- River Thames
- River Kennet
- Reading
- Oxford
- River Colne
- River Wey
- River Lee
- NE London
- Groundwater
- Lee Valley Reservoirs
- Lower Thames Reservoirs
- NLARS
- Chilterns Groundwater Sources
- Cotswold Groundwater Sources
- Grimsbury Reservoir
- Farmoor Reservoir
- Gatehampton Groundwater
- Chalk Groundwater Sources
- Beckton Desalination
- Chalk Groundwater Sources
- NE London Groundwater
- Groundwater Sources
- Boundary of Region of Operation
- Desalination
- Reservoir
- Groundwater
- Urban area
- Artificial Recharge
- River
- London Metropolitan area
Water Resource Planning

- Companies plan on the basis of the worst-case scenario in the historical record.
- This assumes the future will be a variation of the past.
- An extended dry period - such as three dry winters - could lead to level 4 restrictions.
London - water resource challenge

By 2020 demand is forecast to outstrip supply by 133 million litres of water per day (Ml/d), growing to 414 million litres per day (Ml/d) by 2040: equivalent to the water needed by 2 million people.

Forecast gap between supply and demand in London

Source: Draft Water Resources Management Plan, 2014
## WRMP14: The planning problem

### Baseline supply-demand forecast

<table>
<thead>
<tr>
<th>Water resource zone</th>
<th>2011</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>18.8</td>
<td>-59.4</td>
<td>-132.7</td>
<td>-213.1</td>
<td>-291.7</td>
<td>-359.1</td>
<td>-413.9</td>
</tr>
<tr>
<td>Swindon and Oxfordshire</td>
<td>37.34</td>
<td>27.08</td>
<td>-0.14</td>
<td>-12.05</td>
<td>-21.30</td>
<td>-26.70</td>
<td>-32.66</td>
</tr>
<tr>
<td>Slough, Wycombe and Aylesbury</td>
<td>21.47</td>
<td>11.57</td>
<td>7.93</td>
<td>4.89</td>
<td>0.77</td>
<td>-2.60</td>
<td>-6.09</td>
</tr>
<tr>
<td>Guildford</td>
<td>6.85</td>
<td>0.85</td>
<td>0.06</td>
<td>-1.14</td>
<td>-2.14</td>
<td>-2.85</td>
<td>-3.80</td>
</tr>
<tr>
<td>Henley</td>
<td>5.32</td>
<td>5.14</td>
<td>4.76</td>
<td>4.31</td>
<td>3.80</td>
<td>3.26</td>
<td>2.67</td>
</tr>
<tr>
<td>Kennet Valley</td>
<td>41.25</td>
<td>26.05</td>
<td>21.68</td>
<td>16.38</td>
<td>11.41</td>
<td>7.84</td>
<td>5.49</td>
</tr>
</tbody>
</table>
London – preferred programme

- 2015 to 2020
- Leakage reduction
- Metering saving
- Water efficiency saving
- Bulk Water Supply
- Commercial agreement
- Groundwater schemes (Elred, Tottenham, Honor Oak)
- Horton Kirby (ASR)
- Leakage reduction
- Metering saving
- Water efficiency & tariffs
- Bulk Water Supply
- GW & AR schemes
- Reuse
- Oxford Canal Transfer

- 2020 to 2040
Investigation of the resource options
Why metering?

• On average, our customers each use almost a third more water than they did 30 years ago.

• London average 164 litres per person day compared to the national average 147 litres per person per day.

• Currently only one in three homes in our region have a water meter.

• We plan to fit over 500,000 meters in London between 2014 and 2020.
Will we see more severe droughts in future?
Risk and uncertainty – it is not just climate change…

+1.4m-2m
Thinking big

- Major projects take time to plan, develop and deliver

- We need an overarching long-term plan for water resources

- Our draft Water Resources Management Plan 2014 lists 3 large scale resource options for further investigation – wastewater reuse, regional water transfers and reservoir storage

- We need to look beyond our borders to identify opportunities to collaborate
Aims of Drought Plan

- Drought poses the ultimate test for the supply demand balance and represents the greatest risk for the company
- Statutory Requirement (Water 2003) - Conserves reservoir storage as much as possible – security of supply
- Through timely actions, protect water supply and the environment
- Improve communication with customers, regulators & stakeholders through clarity of decision making before and during drought
- Minimise the adverse impact on reputation of drought measures
- Minimise, as far as possible, the risk of severe use restrictions
The 1976 Drought

- Following a dry summer in 1975 with approximately 80% average rainfall, October 75 to March 76 saw only 45% average rainfall.

- The unprecedented dry spell continued, average rainfall April 76 to September 76 being just 68% of average.

- Thames Water is vulnerable to such extended “two year droughts”.

- Without groundwater recharge during the wetter winter months, baseflows in the River Thames quickly deplete and we are not able to abstract sufficient water to maintain reservoir storage levels; security of supply is dependent on water stored in our reservoirs.
Forecast London reservoir storage to determine drought management measures

London Storage Predictions from 1 April 2012
Current Assumptions (including outages)

Total London Reservoir Storage (Ml)

Percent of Usable Capacity

800 Ml/d
600 Ml/d
400 Ml/d
300 Ml/d
Level 1
Level 2
Level 3
Level 4
Actual storage
60% Average Rainfall
1976 Rainfall
## Thames Water Drought Plan

### Levels of Service

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Action</th>
<th>Frequency (drought severity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Intensive media campaign</td>
<td>1 in 5 years</td>
</tr>
<tr>
<td>Level 2</td>
<td>Sprinkler/unattended hosepipe ban</td>
<td>1 in 10 years</td>
</tr>
<tr>
<td>Level 3</td>
<td>Temporary Use Ban, Drought Permits, Ordinary Drought Order</td>
<td>1 in 20 years</td>
</tr>
<tr>
<td>Level 4</td>
<td>Standpipes and rota cuts requiring an emergency Drought Order</td>
<td>Never</td>
</tr>
</tbody>
</table>
Severe Water Use Restrictions

- Level 4 restrictions represent the point at which London’s reservoir storage has declined to its emergency reserve (equivalent to approximately 30 days storage)

- Demand must be drastically reduced so that London does not run out of water

- Level 4 has major social, economic, environmental and regulatory consequences

- The estimated average daily cost in London is >£250 million

- The company must be able to demonstrate that it has done everything in its power to prevent reaching Level 4
Thames Area Monthly Rainfall Totals (mm)
Above or below average between March 2010 & March 2012
Groundwater (GW) levels – forecast of Stonor Park borehole for determining London drought levels
## Demand side measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description of measure</th>
<th>Drought Event Level (DEL)</th>
<th>Company Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media / water efficiency campaign</td>
<td>Wide-scale media activity and advertising to encourage voluntary reduction in water usage</td>
<td>DEL1</td>
<td>Level 1</td>
</tr>
<tr>
<td>Enhanced media / water efficiency campaign</td>
<td>Enhancement of above activity</td>
<td>DEL2</td>
<td>Level 2</td>
</tr>
<tr>
<td>Leakage reduction</td>
<td>Increased leakage activity / Network pressure management</td>
<td>DEL1-DEL2</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Sprinkler and unattended hosepipe ban</td>
<td>Sprinkler and unattended hosepipe ban</td>
<td>DEL2</td>
<td>Level 2</td>
</tr>
<tr>
<td>Temporary Use Ban (formerly hosepipe ban)</td>
<td>11 categories of use (largely domestic) banning the use of a hosepipe.</td>
<td>DEL3</td>
<td>Level 3</td>
</tr>
<tr>
<td>Drought Direction 2011 measures (formerly non-essential use ban Ordinary Drought Order)</td>
<td>Application to Defra to grant all 10 categories of non-essential use restrictions affecting commercial businesses.</td>
<td>DEL3</td>
<td>Level 3 - if enacted</td>
</tr>
<tr>
<td>Emergency Drought Order</td>
<td>Application to Defra to grant an emergency drought order, including rota cuts and stand pipes.</td>
<td>DEL4</td>
<td>Level 4 - if enacted</td>
</tr>
</tbody>
</table>
Where we started
Communications
Drought campaign 2012
Awareness

- Almost all Thames Water customers (96%) were aware of drought

- 2 in 3 (65%) customers had seen our advertising - compared to national average of 54%

- Billboard and bus stop advertising was most effective
Supply Side Measures

- Make best use of existing sources – e.g. conserve reservoir storage
- London drought schemes

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Benefit Ml/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>North London Artificial Recharge Scheme (NLARS)</td>
<td>125 – 210</td>
</tr>
<tr>
<td>Hoddesden Transfer scheme</td>
<td>12.5 – 25</td>
</tr>
<tr>
<td>Thames Gateway Water Treatment Works (TGWTW)</td>
<td>150</td>
</tr>
<tr>
<td>West Berkshire Groundwater Scheme (WBGWS)</td>
<td>90</td>
</tr>
<tr>
<td>Small scale groundwater schemes</td>
<td></td>
</tr>
<tr>
<td>- ELRED, Stratford Box and Old Ford</td>
<td>28</td>
</tr>
<tr>
<td>- Chingford Artificial Recharge Scheme (CHARS)</td>
<td>11 – 18</td>
</tr>
</tbody>
</table>

- Bulk supplies
- Drought permits to increase existing abstractions  e.g. London residual flows
- Re-commissioning of disused sources e.g. Blewbury
- Options of last resort e.g. tankering, non-potable usage
Our desalination plant at Beckton is capable of putting an additional 150m litres a day - enough for 1m people - into the supply network for London if required.