Groundwater and Sustainable Development

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A UK Operators Experience

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Three Valleys Water

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Overview

- Who we are
- Regulatory Framework
- Abstraction Licences
- The Chalk Aquifer
- Borehole design and yields
- Groundwater treatment
- Assessing impacts of abstraction, CAMS and WFD

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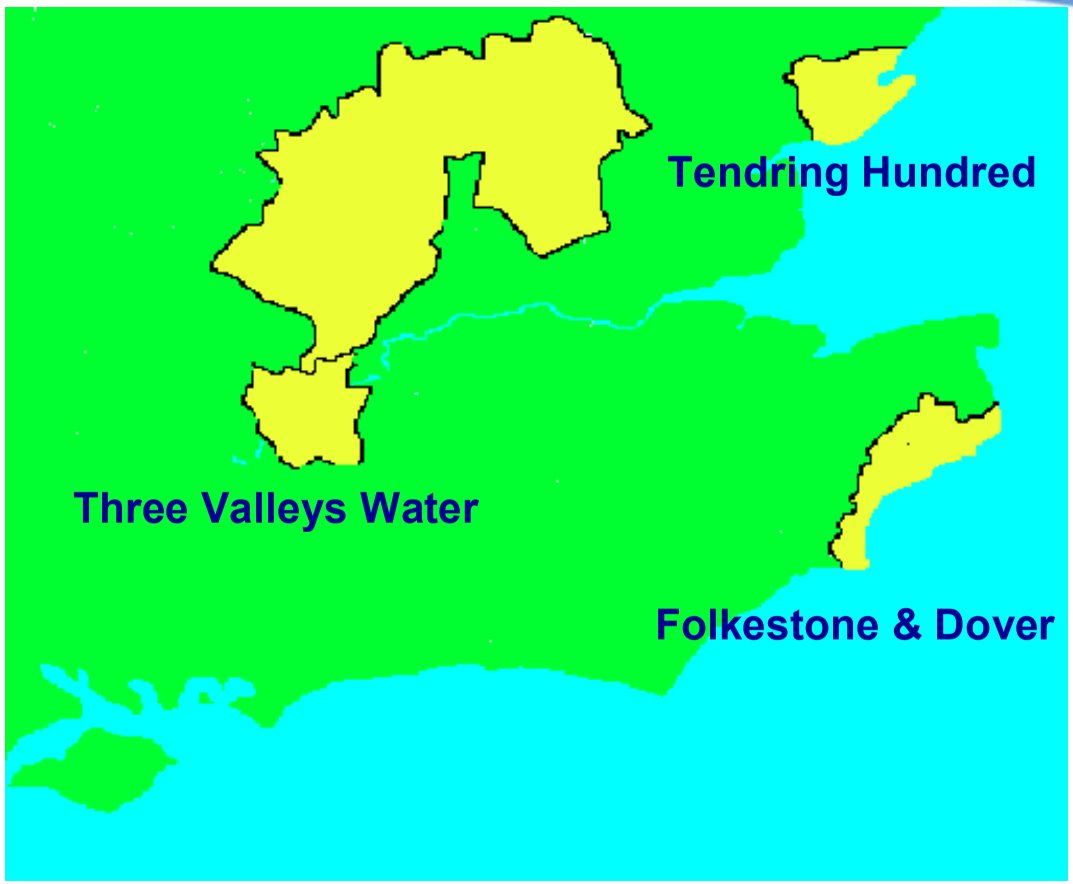
Who are Veolia Water UK ?

- *Three Water Companies, French owned since 1989*
- *Supply drinking water only (not sewerage services)*
- *Served Population 3.3 million*
- *Supply 940 Ml/d Average and 1210 Ml/d at Peak*
- *Mains 16,259 km*



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Water Resources

- **Our raw product - we couldn't provide a service without it !**
- **We need ….**
  - the right amount;
  - in the right place;
  - at the right time;
  - and of the right quality
  - with minimum impacts

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Where does our resource come from?

- **Ultimately rainfall, but via**
  - 5 major river and reservoir sources (40%)
  - 92 groundwater sources (60%)
  - 3 aquifer types, Chalk, Gravels, Greensand
  - + Imports from and Exports to other Water Companies

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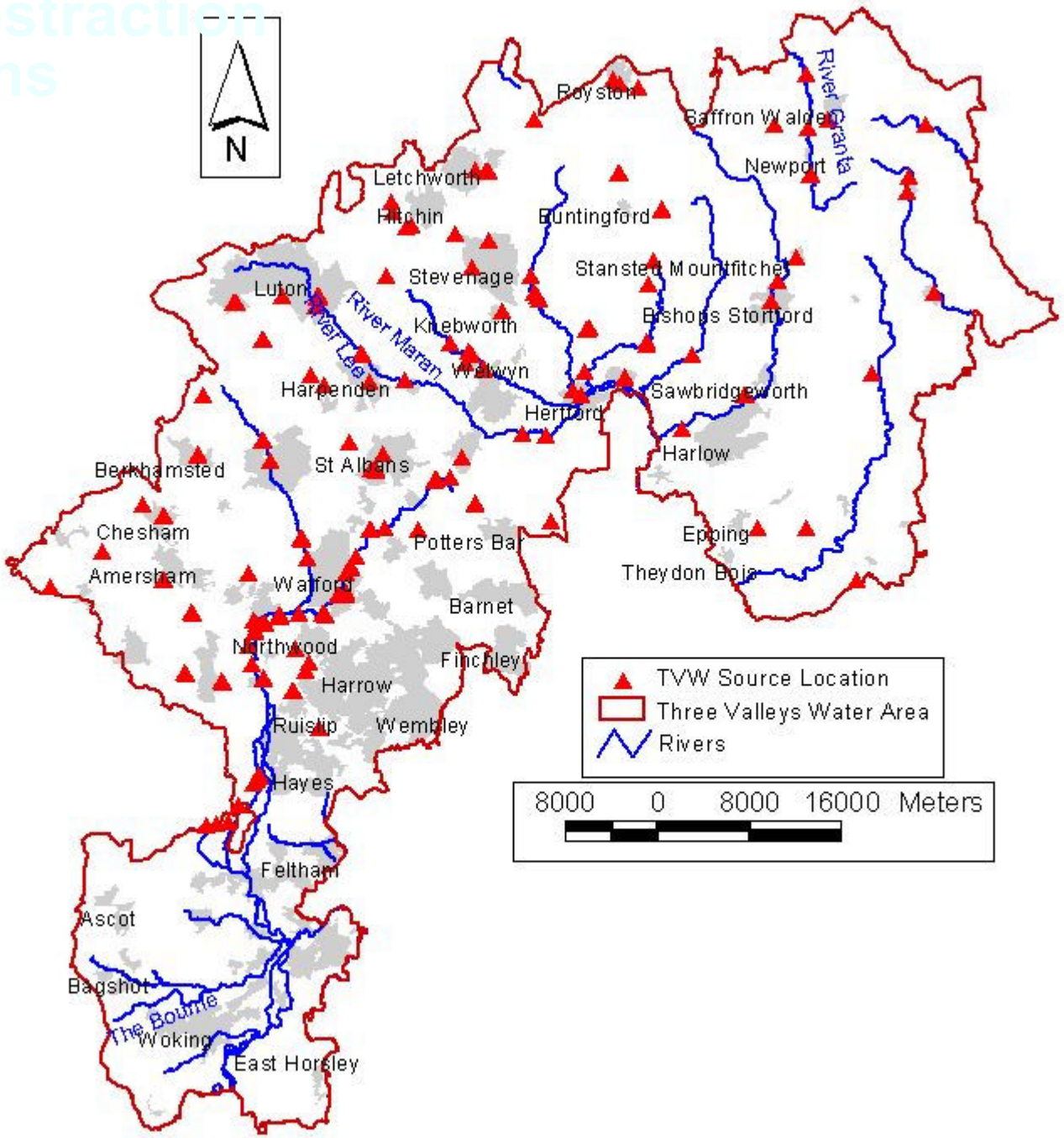
TVW Abstraction Locations



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Regulatory Framework

- **Heavily Regulated Business**
- **Different regulators for**
  - Environmental Issues (EA)
  - Drinking Water Quality (DWI)
  - Finance/Economic (Ofwat)
  - Consumer Council for Water (CCW)
- **Significant Governmental Influence (DEFRA)**

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The Environment Agency

- **Regulates the impact on the environment** of the water industry, principally through its operation of the licensing system for water abstraction and impounding.

- **Requires each water company to maintain a 25-year Water Resources Management Plan** showing how it proposes to maintain an adequate balance between water supply and demand

- **Requires a separate plan for dealing with drought**

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Abstraction Licences

- All abstraction is governed by Licences issued by the Environment Agency
- Licences state point(s) of abstraction, hourly, daily and annual volumes
- Can include conditions requiring lower outputs or support to rivers during low flow periods
- Licences of Right, time limited Licences
- Renewals/revisions must be supported by environmental assessments and statements of need
- Licences are assets

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Chalk

- The Chalk is a calcareous aquifer of Cretaceous age
- Predominantly unconfined, dips SE into the London Basin, where it becomes confined by Tertiary sediments
- Dual porosity aquifer, dominated by fissure flow
- Transmissivities highest in river valleys, lower in interfluves
- Depth to water varies from surface to over 100m

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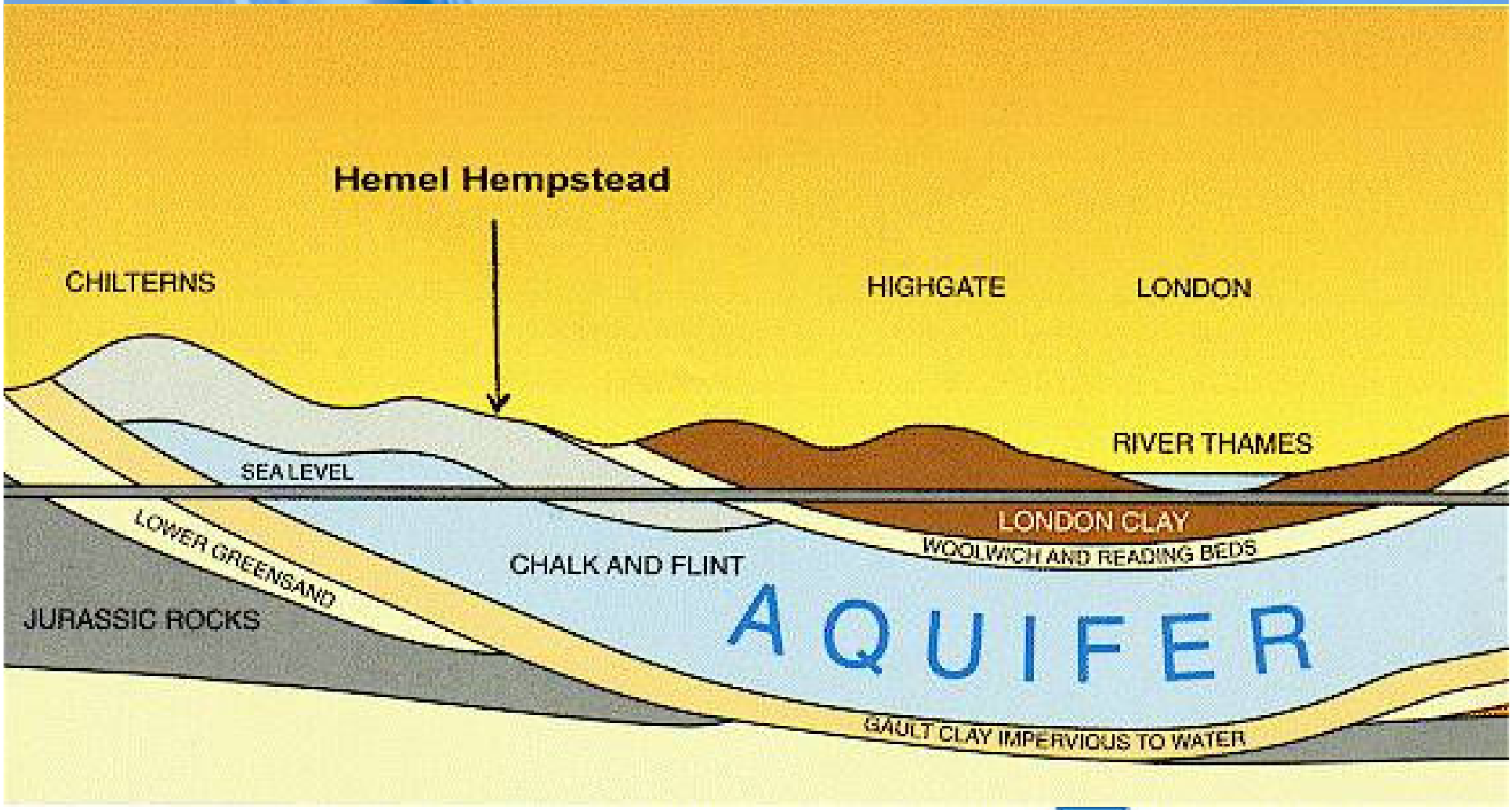
Groundwater: The Chalk Aquifer



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Borehole Design

- Most sources have more than one borehole
- Most boreholes have conductor casing to between 20 and 50m below ground level, then open hole below
- A few have slotted casing where the Chalk is blocky and prone to collapse
- Very few have wire wrap slotted casing, with a formation stabiliser
- Drilled diameters range from 150mm to over 1m
- Old hand dug wells, often with Adits can be over 3m in diameter.

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Borehole Yields

- Individual borehole yields range from 0.3 to 30 Ml/d
- Average individual yield 7.72 Ml/d
- Pumping head to surface ranges from a few metres to over 100m
- Drawdowns range from a few metres to over 50m
- Assessments of borehole conditions, outputs and water levels are routinely undertaken
- Leads to a programme of maintenance, and replacement

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Groundwater Treatment

- **Originally most sources only received disinfection to leave a chlorine residual in the distribution network**
- **More and more treatment has been introduced to counter rising pollution levels or tightening of water quality standards:**
  - 6 membrane plants for high cryptosporidium risk sites
  - 15 GAC for pesticides and solvents
  - 1 nitrate removal plant, other nitrate rich sources are blended
  - 34 orthophosphate dosing plants for lead protection
- **8 sources closed due to pollution**

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Impacts of Abstraction

- Our supply area is one of environmental sensitivity
- Most of the Chalk outcrop is in an area of outstanding natural beauty
- The Chalk streams are a unique habitat
- Variations in flows and spring heads are natural, and can be impacted by abstraction
- This is of particular concern during droughts

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Catchment Abstraction Management Strategies CAMS

- CAMS is an EA evaluation tool for assessing status of Catchments
- Uses a Resource Assessment Methodology to determine environmental requirements
- Compares with actual flows to determine status
- Categorises are: water available, no water available, over licensed and over abstracted
- All TVW catchments fall in the ‘over licensed category’, as does most of the south east of England
- Solution to this is not yet clear

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Impacts of Abstraction

- **Alleviation of Low Flow Schemes**
  - NRA Driven (1990-2000)
  - looked at solving low flows in isolation from other rivers
  - Led to some solutions being implemented
- **National Environment Programme**
  - Water Company led (funded) investigations (2001 to present)
  - May be Habitats Directive sites or local drivers
  - Studies to assess impacts and suggest solutions
- **Water Framework Directive**
  - Could lead to 'poor status' on quantative/qualatative grounds
  - Will require actions to return to good status

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Water Framework & Groundwater Directives

- **As with surface water Requirement: to *"prevent deterioration"* and *"aim to achieve good groundwater status"* by 2015, unlike surface waters, there are only two categories either good or poor.**

- **Good Status Indicators - Specifics in Groundwater Directive (UKTAG guidance)**
  - Abstraction does not exceed recharge (water balance)
  - Groundwater quality does not exceed threshold values or show deteriorating trend
  - Drinking Water Protected areas, linked to baseline quality
  - Groundwater levels or chemical quality do not cause surface waters to deteriorate or fail to achieve status objectives
  - No significant damage to terrestrial ecosystems which depend on the groundwater body.
  - No saline or other intrusions

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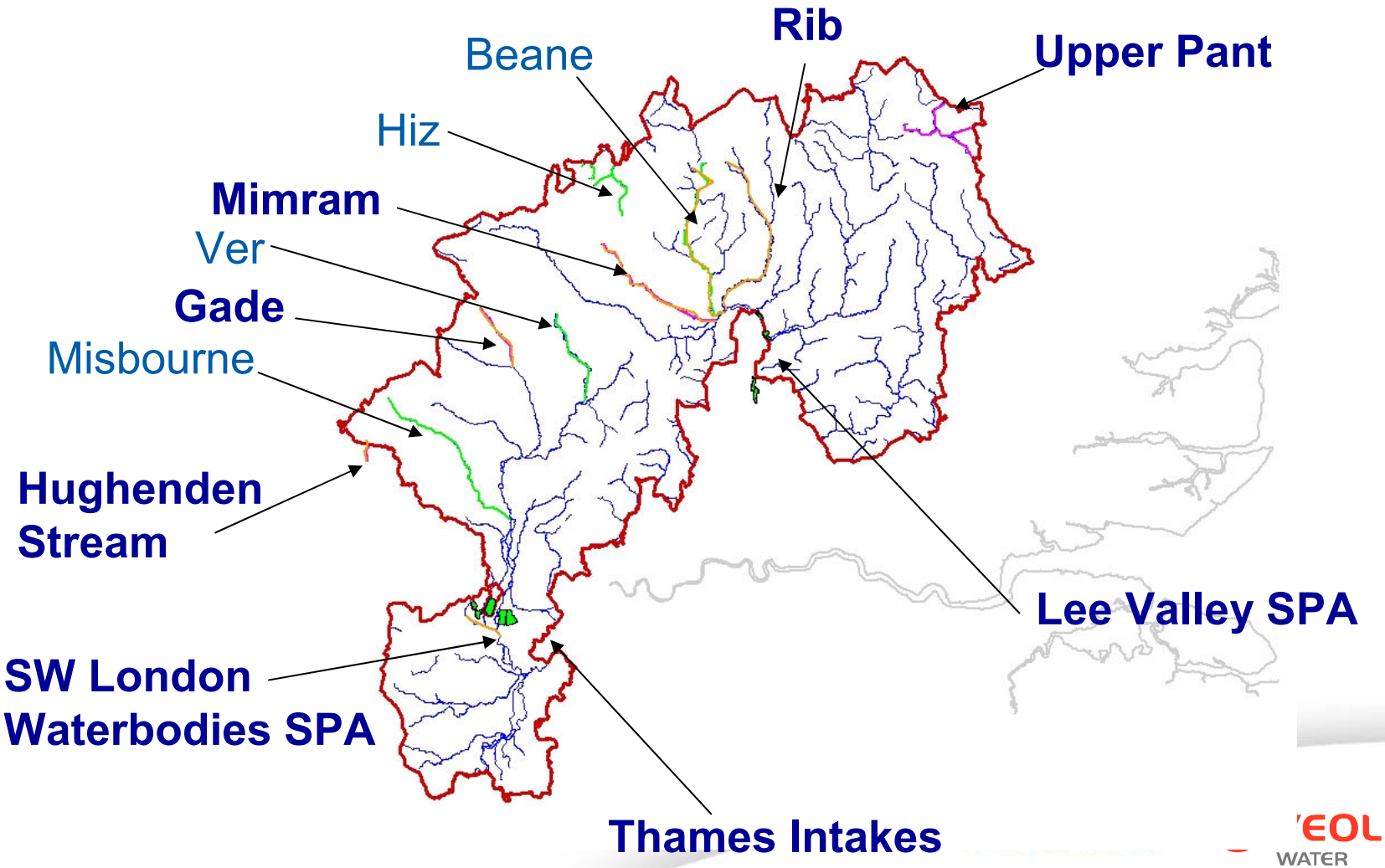
ALF and Environment Programme sites



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How We Assess Our Impact?

- Install monitoring, initiate/continue surveys
- Historic Study - are things worse than they were?
- Involve local stakeholders
- Undertake pumping tests
- Construction and use of Large Groundwater Models
- Scenario modeling
- Determine likely environmental impact of scenarios
- Identify possible solutions and do Cost Benefit Analysis
- Promote most favorable solution, subject to funding

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Summary

- Groundwater forms an important component of water supply in SE England
- Water Companies are heavily regulated
- Impacts of abstraction on river flows are of concern
- Water Companies are active in undertaking assessments of impacts, in conjunction with regulators and local groups
- WFD will produce programmes of measures to improve status, these are likely to be significant
- Impacts on our ability to maintain supply are uncertain

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Thank you for listening

Any Questions?

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