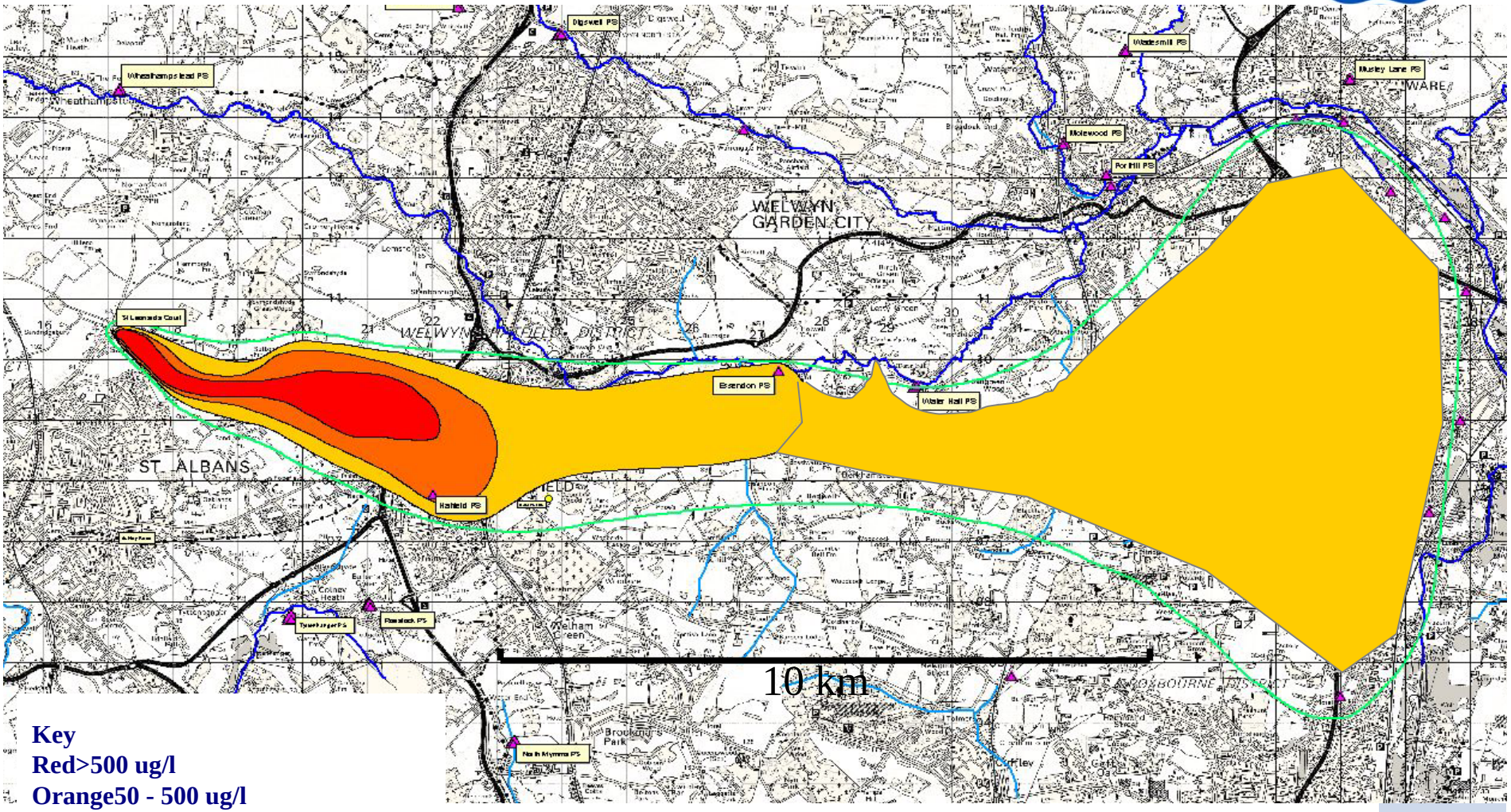
CASE STUDY – BROMATE CONTAMINATION OF GROUNDWATER AND IMPACT ON THAMES WATER OPERATIONS

Background

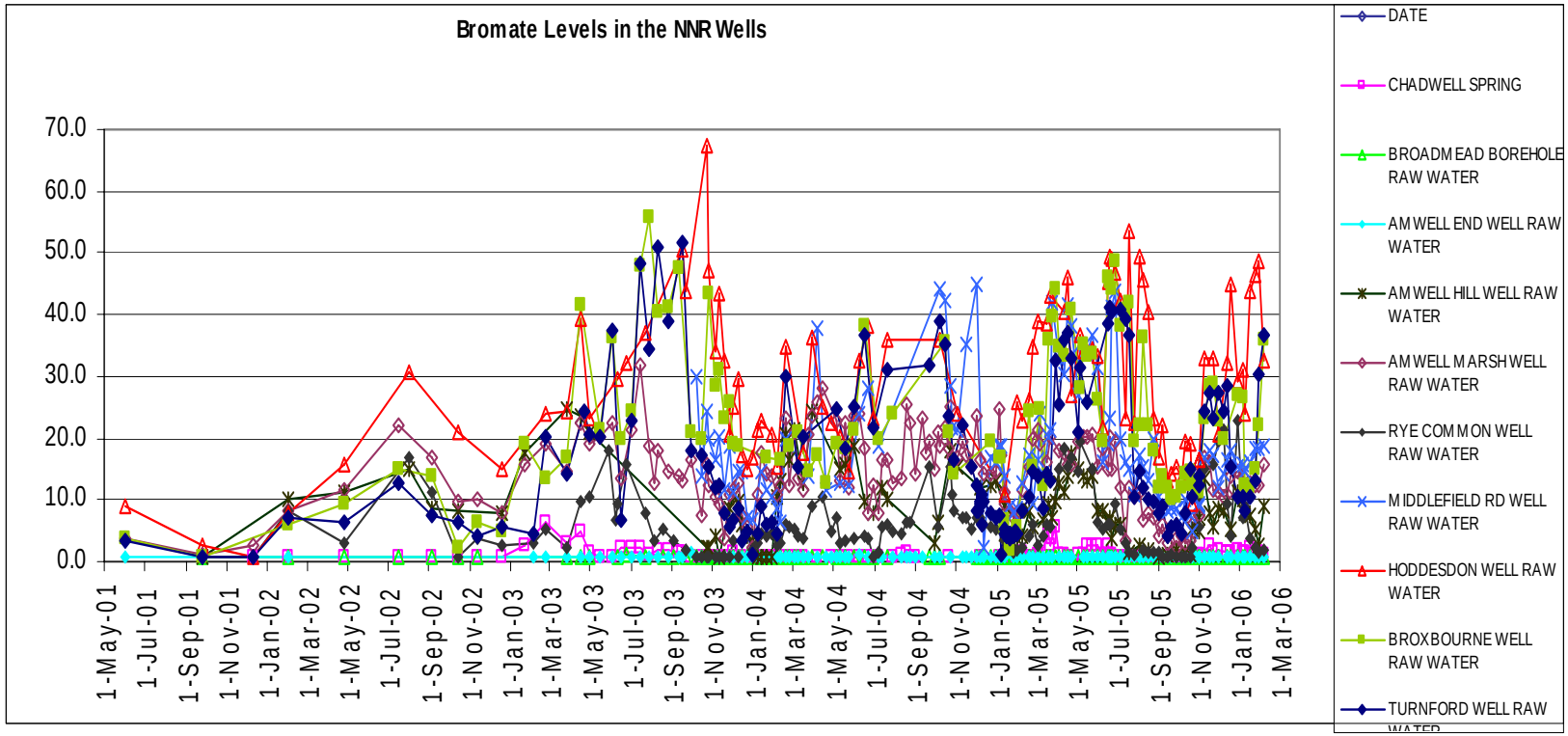
- New drinking water standard for bromate (2003) = 10 ug/l.
- Bromate contamination of Hertfordshire Chalk discovered mid-2000
- Groundwater pollution plume of some 20 km length from Sandridge to Middle Lee valley
- Contamination impacts two Three Valleys PWS boreholes and several Thames Water boreholes (the Northern New River (NNR) wells)

Plume

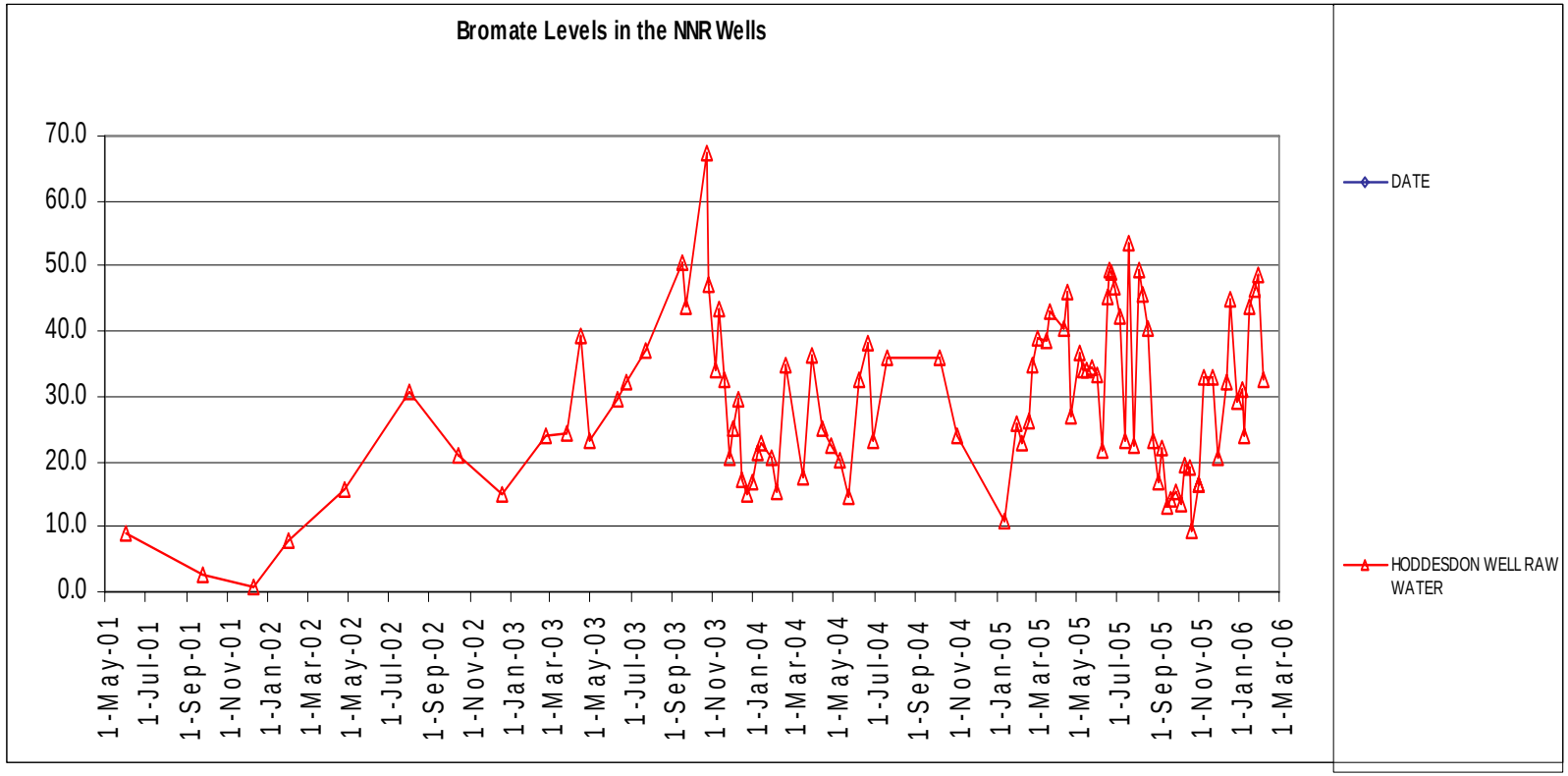


Key
Red>500 ug/l
Orange50 - 500 ug/l
Yellow10 - 50 ug/l

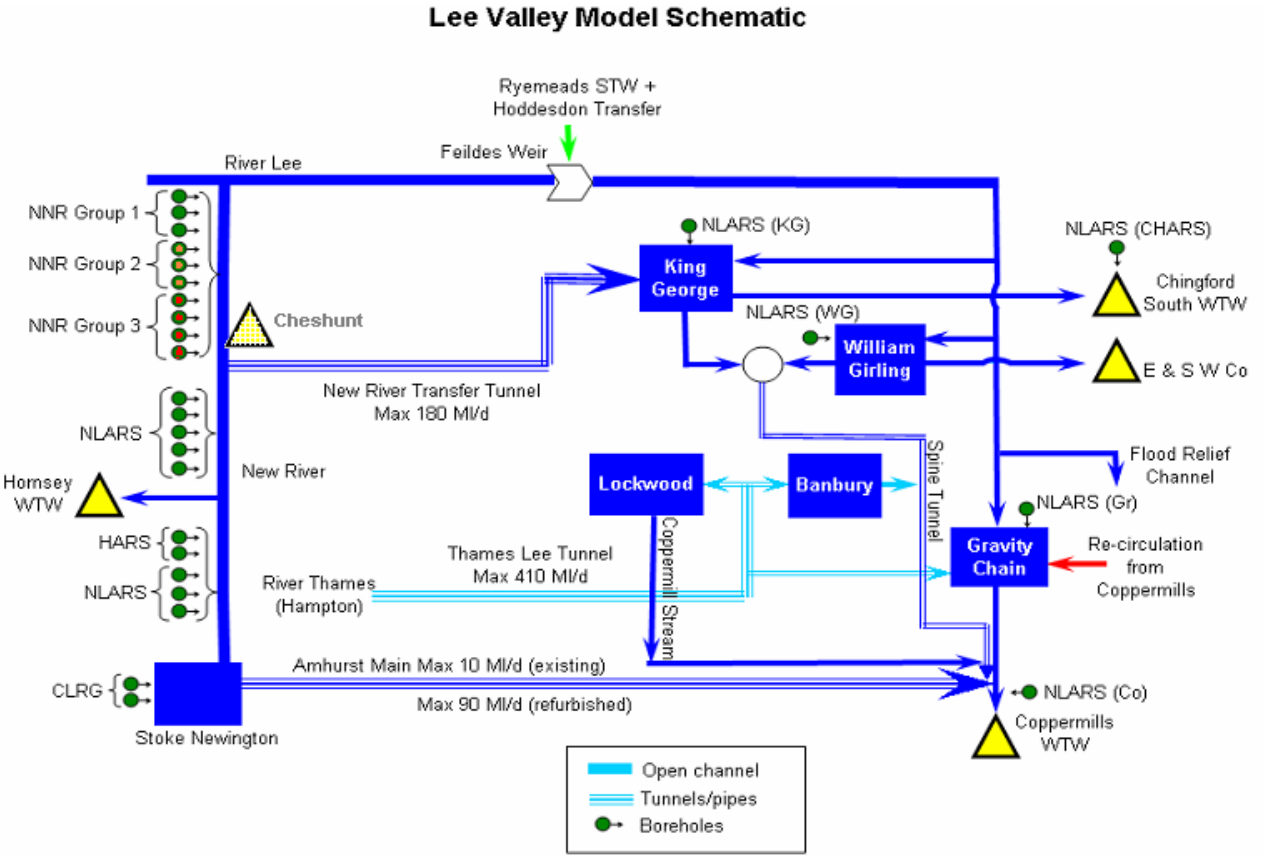
Bromate at NNR wells



Bromate at Hoddesdon



Lee Valley system



Recharge to New River from Groundwater Source

Operational impacts

- TW takes a Deployable Output (DO) hit at Hornsey if unable to use NNR wells – bromate contamination likely to be highest in drought years
- DO impact on Hornsey = DO impact for London
- Impacts on operational flexibility for Hornsey – Hornsey currently relies on well water dilution to overcome problems with river water source (turbidity, algal blooms, etc)
- Hornsey serves a discrete area not easily served by other Works – risks of disruption to supply

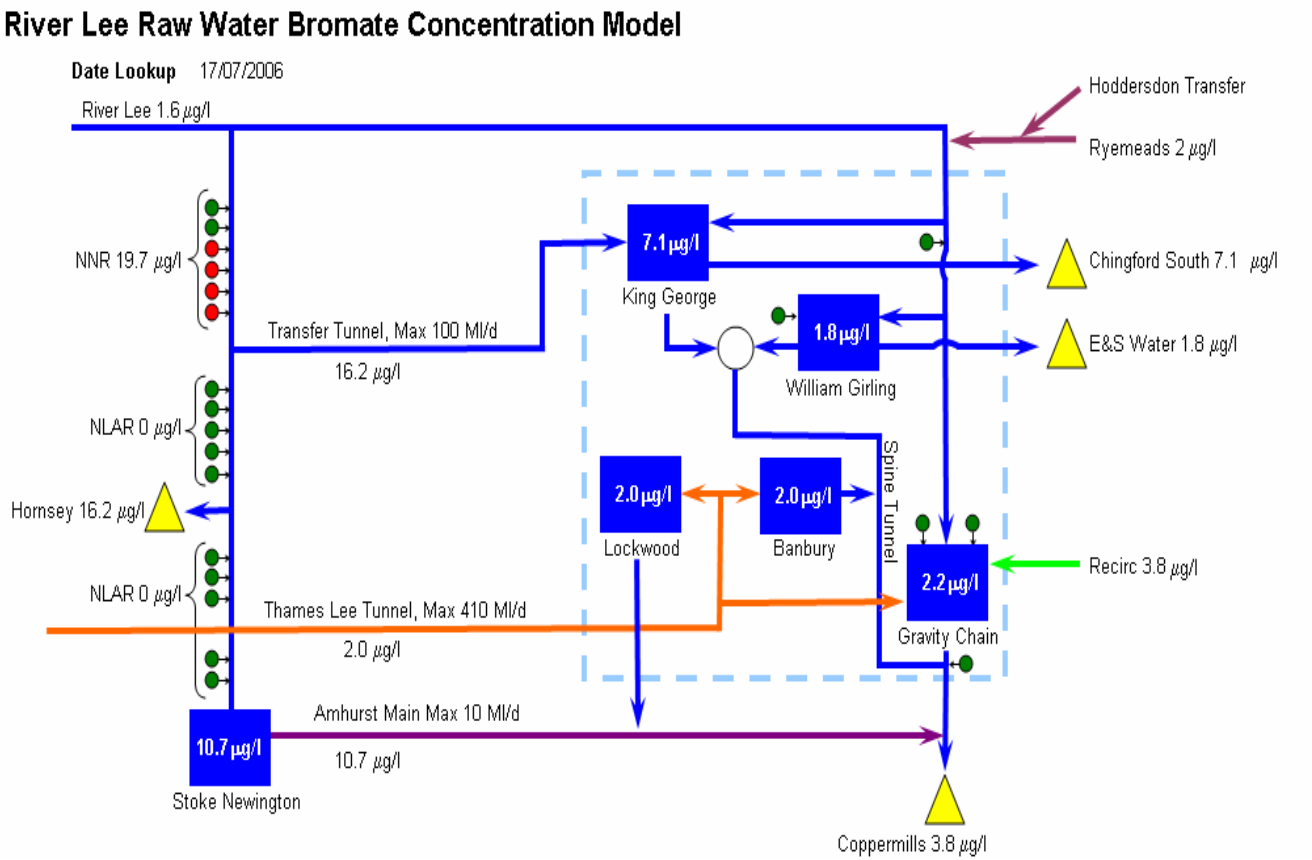
Management to date

- TW has a crude spreadsheet mass balance model for the NNR/New River system
- Assumes a % growth factor year-on-year for NNR well bromate concentrations and suggests which wells can be operated each month
- Situation reassessed continuously and modifications to suggested operating profile made
- North London Artificial Recharge Scheme (NLARS) boreholes used to dilute bromate concentrations in 2003
- No bromate exceedences at Hornsey to date

AMP4 (and beyond?)

- AMP4 solution treatment at Hornsey
- 2 phases – pre-treatment (to allow more use of river water) by December 2006 and bromate treatment by December 2008 (RO formal basis of AMP4 submission)
- Potential impacts of bromate on wider Lee Valley system via Northern Transfer Tunnel and bromate in River Lee – AMP5?

Wider Impacts



Understanding (or misunderstanding?) the plume

- Atkins commissioned to refine predictions for NNR wells
- Short timescale, but did develop flow and contaminant transport models (Modflow/MT3DMS)
- Significant problems modelling plume between Hatfield area and NNR (last 10 km of plume) – indicates bromate flow in discrete fractures
- “scoping” calculations and modelling did provide some further insight (to be advanced with UCL)

Contaminated Land Regulations

- EPA 1990 Part IIA – Contaminated Land Regulations
- Focussed on source of contamination – contaminated land
- Local Authority proceedings started in 2000
- Special Site status declared in 2002 and passed to EA
- Remediation Notice served in 2005
- Appropriate Persons (2) have appealed
- Remediation timescale ?

Conclusions/what can we learn?

- Largest groundwater pollution plume in UK (?)
- Major impact on water resources – drinking water quality, operational flexibility, DO
- Thames Water (and Three Valleys Water) have already spent substantial sums on investigation and much more will be spent
- We still don't know how the problem may develop in the future and the wider impacts
- The Regulations have proved a slow vehicle for delivering a solution which benefits the Water Industry
- Just like the CWC vs ECL case, the issue of "foreseeability" arises