
Wessex Water
a YTL company

Pharmaceuticals & the UK Water Industry: a wastewater perspective

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Introduction

- Sewage Treatment
- Background
- Evidence
- Water Industry Concerns
- Water Industry Actions
- Water Industry Findings
- Next steps
- Concerns and questions

Introduction to sewage treatment

- Natural process- optimised
- Removes organic material
- Reduces polluting potential

Wessex Water:

- 405 STWs, >85% filter beds

More advanced treatment:

- Phosphorus removal
- Metals removal

Background- scientific / environmental

- **1970s** - Pharmacologically active compounds first reported in sewage effluents
- **1998** – high incidence of intersex in riverine roach in UK
- **2014** – wild vulture population crash in India from diclofenac
- Impacts of anti-depressants on fish populations

- Usage likely to increase due to an aging and more sedentary population
- Environmental presence attributed to poor metabolism and incomplete removal during sewage treatment

Background- regulatory

- **2000** – EU Water Framework Directive
- **2008** - Environmental Quality Standards Directive
- **2013** - Revisions to EQS Directive

In the UK:

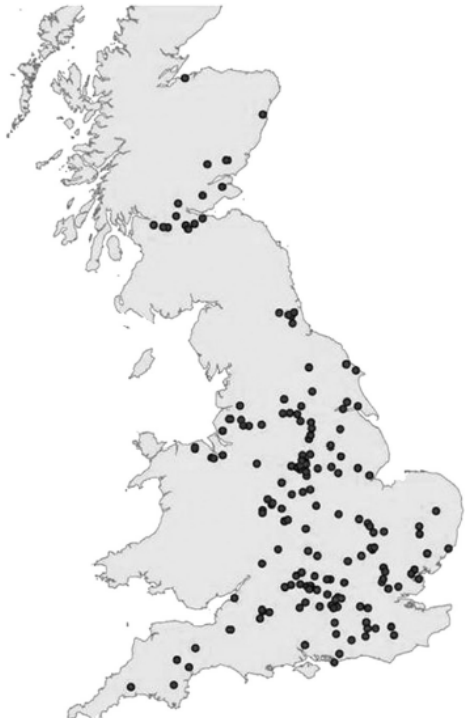
- Chemical Investigation Programme 1 (CIP1)
- Recognition of evidence requirements
- Feeding existing data to EU

Water Industry concerns

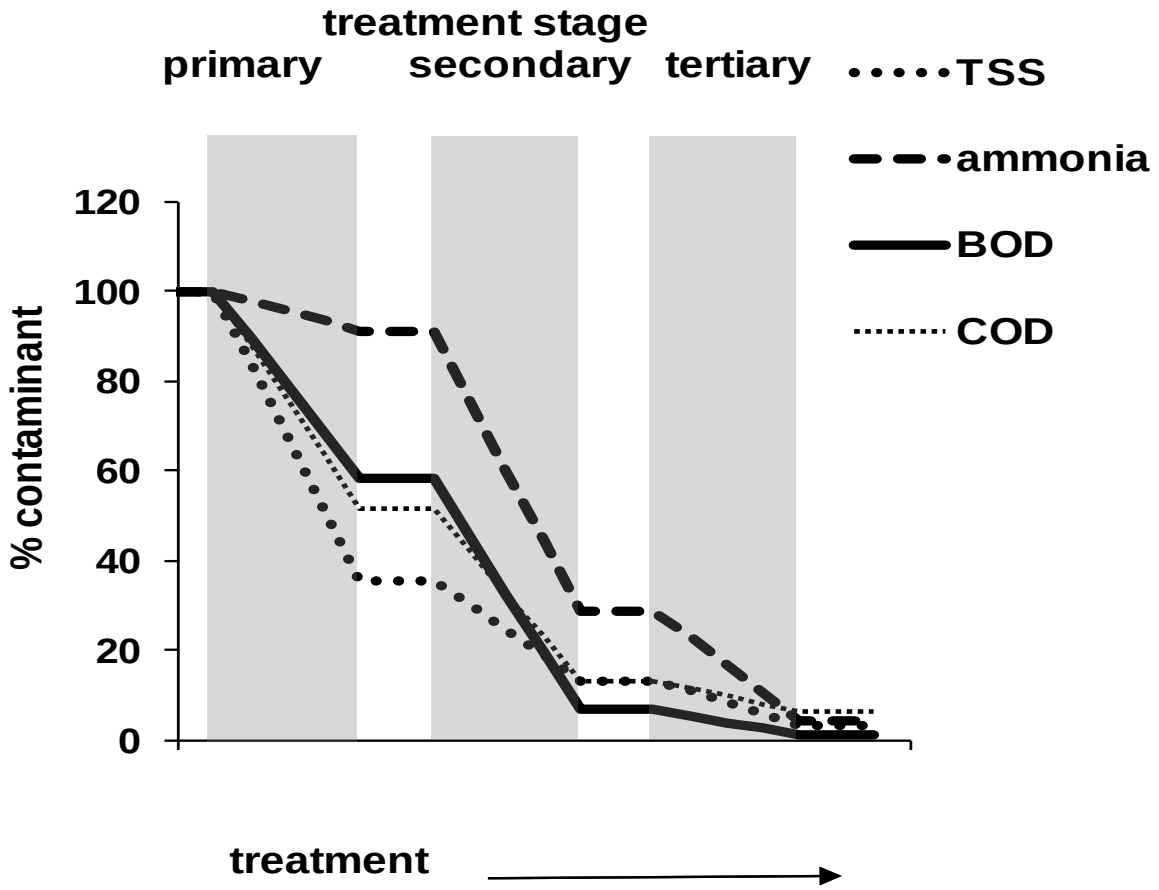
- It's **NOT** about drinking water
- Focus is on environmental protection and Water Industry contribution (others are involved) to WFD
- Pharmaceuticals' fate largely to sewer
- End of pipe treatment not the only option – but part of the mix
- Need to evaluate risks & address concerns that are justifiable and demonstrable – potential costs v high
- Criterion is compliance – not necessarily proven harm (risk safety factors mean that EQS can be unrealistically low)
- Customers- affordability, sustainability, benefits

Water Industry Actions: CIP1

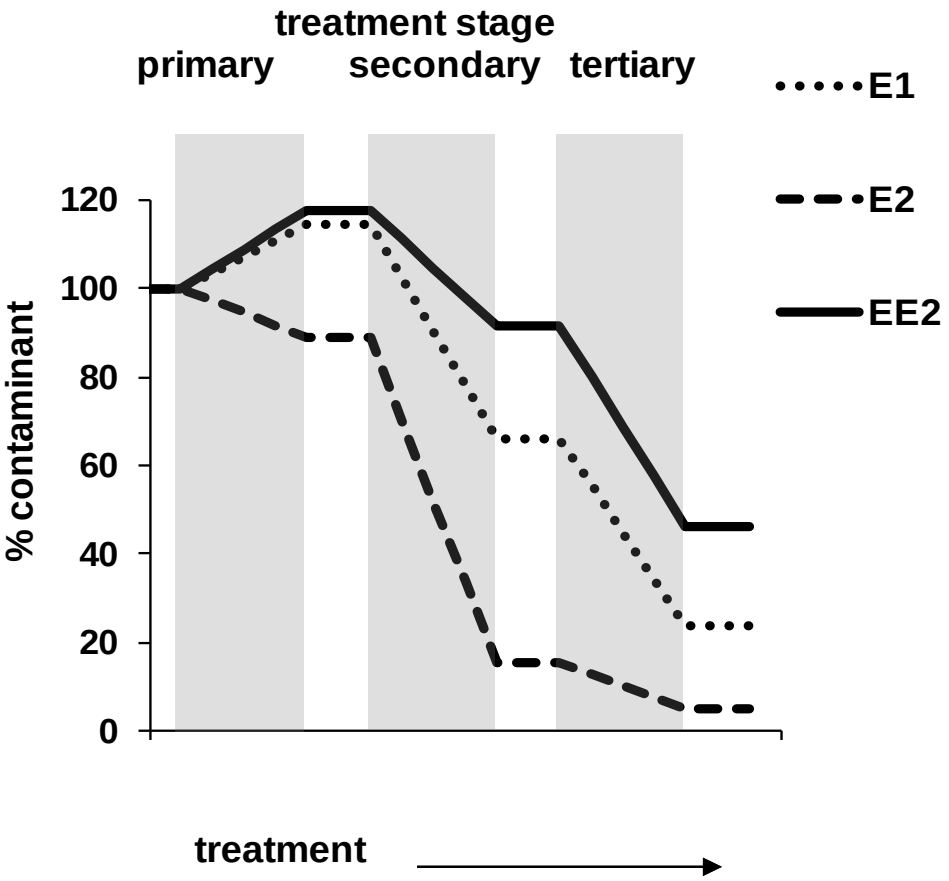
- **£25M programme 2010-2013**
- 70 priority chemicals were determined in 162 STW effluents
- 11 pharms (not yet regulated but EQSs at the time proposed for 3 of them (DCF E2 EE2)
- All substances selected for analysis were detected in sewage effluents.
- Levels of many priority chemicals in effluent exceeded water quality standards.
- After dilution with river water some chemicals will still exceed standards.

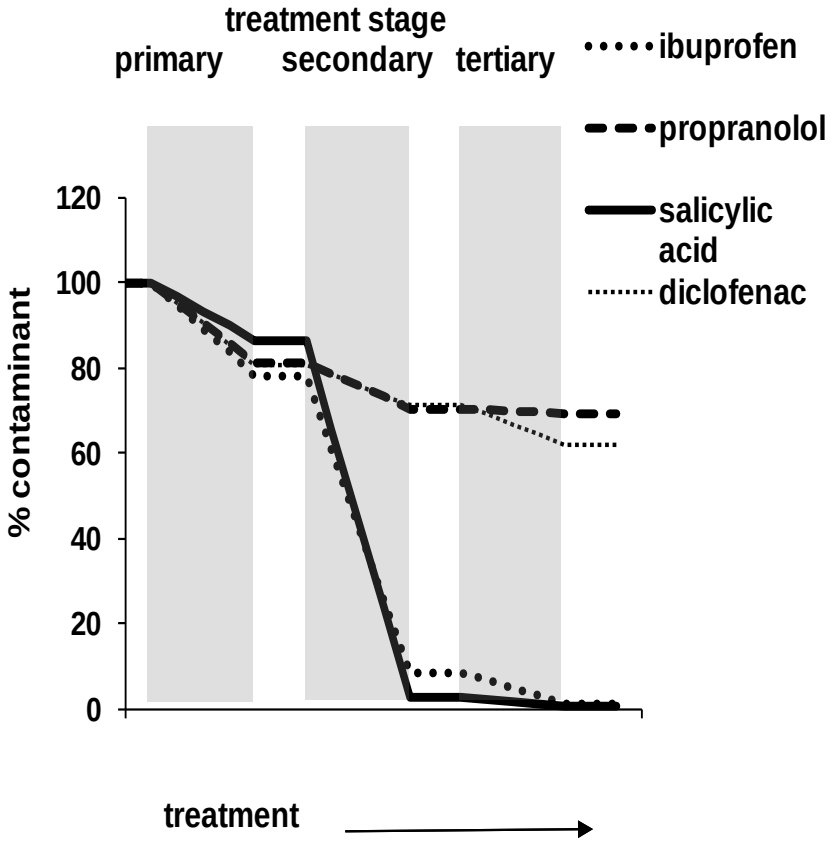


Water Industry Findings (1)



Water Industry Findings (2)





Water Industry Findings- discussion

- **Metals-** removed relatively poorly and variably by both primary and secondary treatment;
- **Hydrophobi**c Priority Substances- removed relatively well overall, apparently largely in secondary treatment;
- **Emerging** substances and **pharmaceutical**s show variable removal, some being removed relatively poorly.

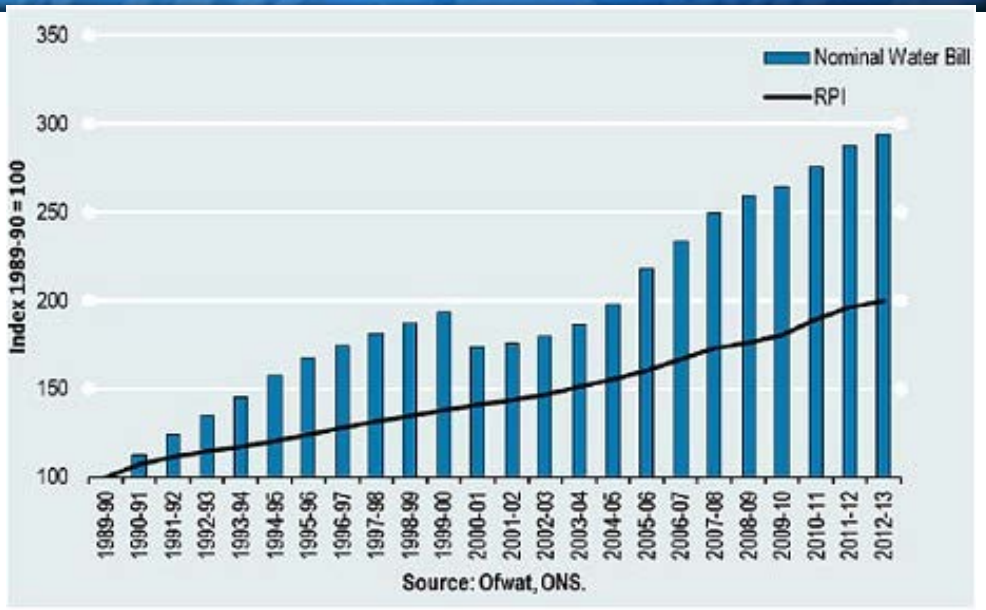
Next steps: CIP2

- c. **£100M**, 3 million determinations - site specific testing to prefigure remedial works. Reporting March 2017
- Main focus on 24 current WFD chemicals – monitoring at 600 “at risk” sewage works + pilot/full scale demonstration of new treatment technologies at 10 – 30 sites, river catchment studies….and….
- Monitoring of prioritised pharmaceuticals included at 45 works – 2,000 samples to assess effluent concentrations, removal, and dilution
- Appraisal of policy options re end-of-pipe versus other control approaches (restriction, reformation, social measures)

Concerns

Cost

- Bill impacts on customers
- Is end of pipe appropriate?
- Removal of EDC- £27bn
- Law of diminishing returns!



Sustainability of high tech treatment processes

- Microfiltration / Reverse Osmosis
- >61% removal
- Greatest CO_2 emissions

Questions

- Benefits and valuation of benefits?
- Substitutes / reformation / control at source?
- Environmental risk assessments?
- Society- knowledge, decision making?
- NOT how much is used (might not be toxic)
- NOT how much is detected (might not cause harm)
  - though both often the basis of prioritisation
- Need to consider Actual (or predicted) concentration versus lowest concentration that might effect aquatic life (PNEC)
- Metabolites, chiral properties?

Conclusions

- Pharmaceuticals are not always easily removed by conventional sewage treatment
- Understanding levels of substances which could impact aquatic life is critical
- Societal / political solutions
- Data, data, data…

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