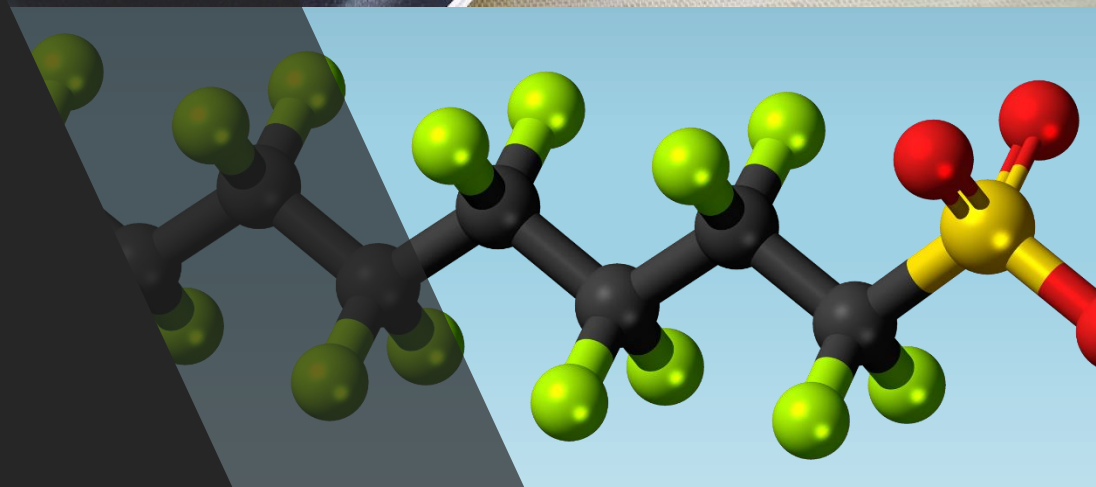
CIRIA 12th October 2017

Beverley Parrish

Parrish Environmental Consulting Ltd

# PFAS Meeting



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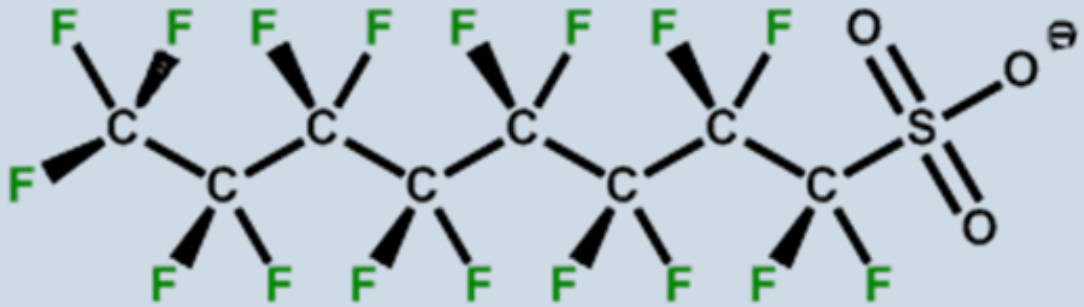
# What Are PFAS?

- PFAS is generic term for a large subclass of fluorinated chemicals
- Used in a wide range of industrial applications, commercial products and Aqueous Film Forming Foams (AFFF) –fire fighting foams
- Able to repel water, grease and oils
- Stable, non-reactive chemicals, resistant to degradation and heat resistant
- Relatively mobile in water, moderate solubility
- The focus has been on two of these compounds, PFOS and PFOA, which were regulated under the Stockholm Convention on persistent organic pollutants (2009)
- Complicated by vast numbers of associated compounds or precurors

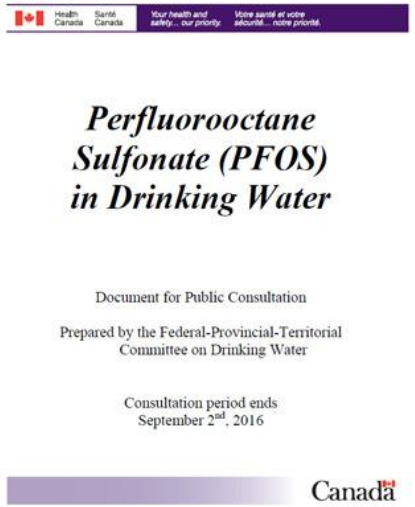


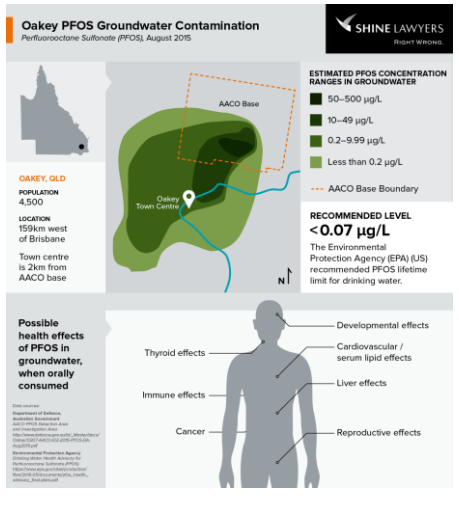
Molecular Structure of PFOS - PFOS consists of a fully fluorinated alkyl chain that contains eight carbons and a sulfonate group

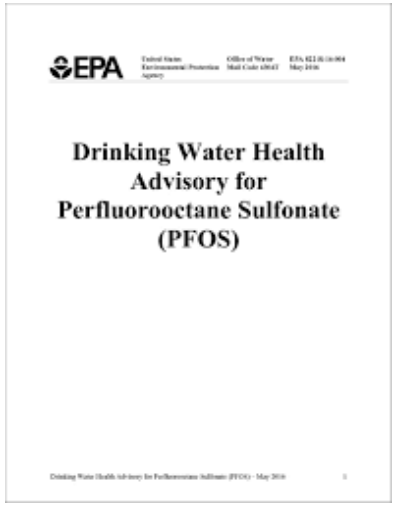
# Typical historical uses

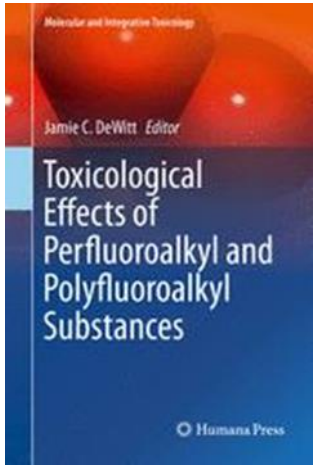
- Metal and plastic coatings
- Coating of photographic films, printing plates
- Detergents, carpet cleaners
- Insecticides
- Cleaning fluids, shampoos, hand creams
- Hydraulic fluids
- AFFF
- Food packaging
- Textile, carpets, furniture, outdoor clothing (e.g., Stainmaster, Scotchguard and Goretex)
- Oil and gas industry
- Polishes, ink, paint, varnishes





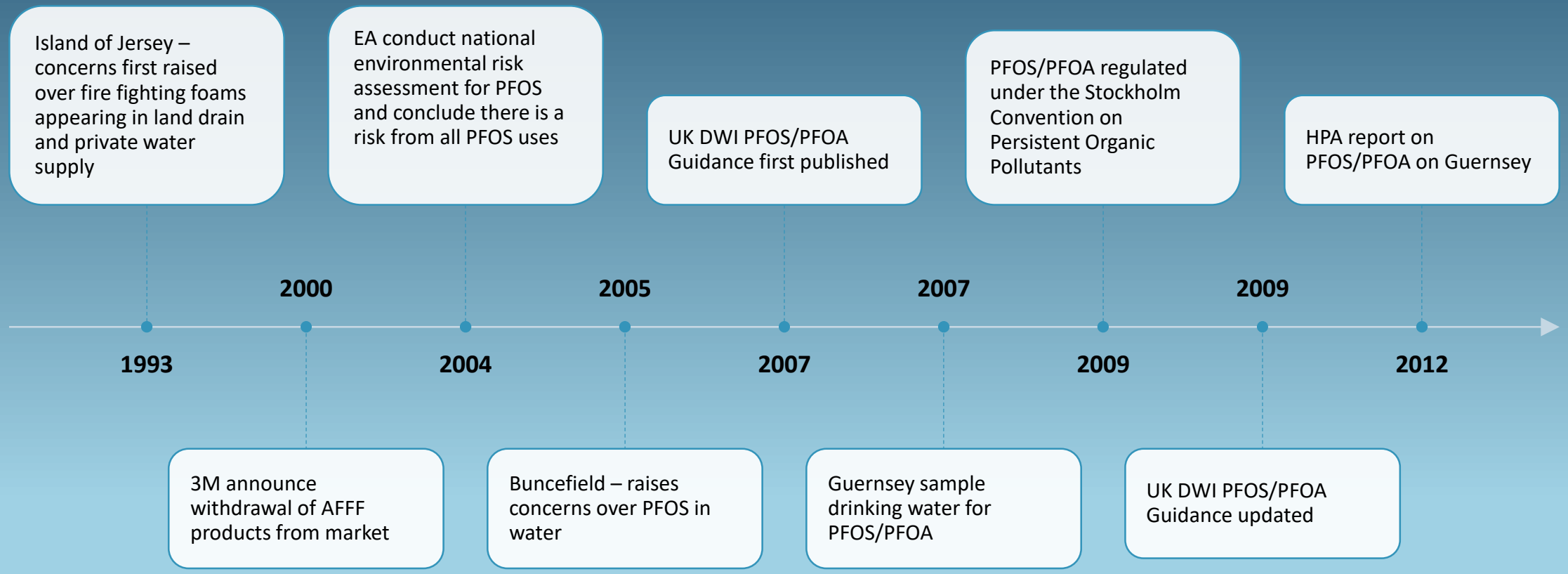




- Readily absorbed but not metabolised (unlike some other chemicals)
- Tendency to bioaccumulate
- Present in liver and blood serum
- Exposure for general population primarily through drinking water and food
- Is excreted but slowly eg PFOS half life estimates – around 5 years
- Links to Cholesterol? High blood pressure? Liver Effects? Immune system? Nervous system? Thyroid hormones? Developmental and reproductive effects? Cancer?
- Complicated by dose – response relationship, epidemiology, extrapolation from animal to human, exposure frequency and exposure period, determining causation, setting toxicity criteria

# Toxicology

# UK – Timeline


Island of Jersey – concerns first raised over fire fighting foams appearing in land drain and private water supply
1993
3M announce withdrawal of AFFF products from market
2000
EA conduct national environmental risk assessment for PFOS and conclude there is a risk from all PFOS uses
2004
Buncefield – raises concerns over PFOS in water
2005
UK DWI PFOS/PFOA Guidance first published
2007
Guernsey sample drinking water for PFOS/PFOA
2007
PFOS/PFOA regulated under the Stockholm Convention on Persistent Organic Pollutants
2009
UK DWI PFOS/PFOA Guidance updated
2009
HPA report on PFOS/PFOA on Guernsey
2012

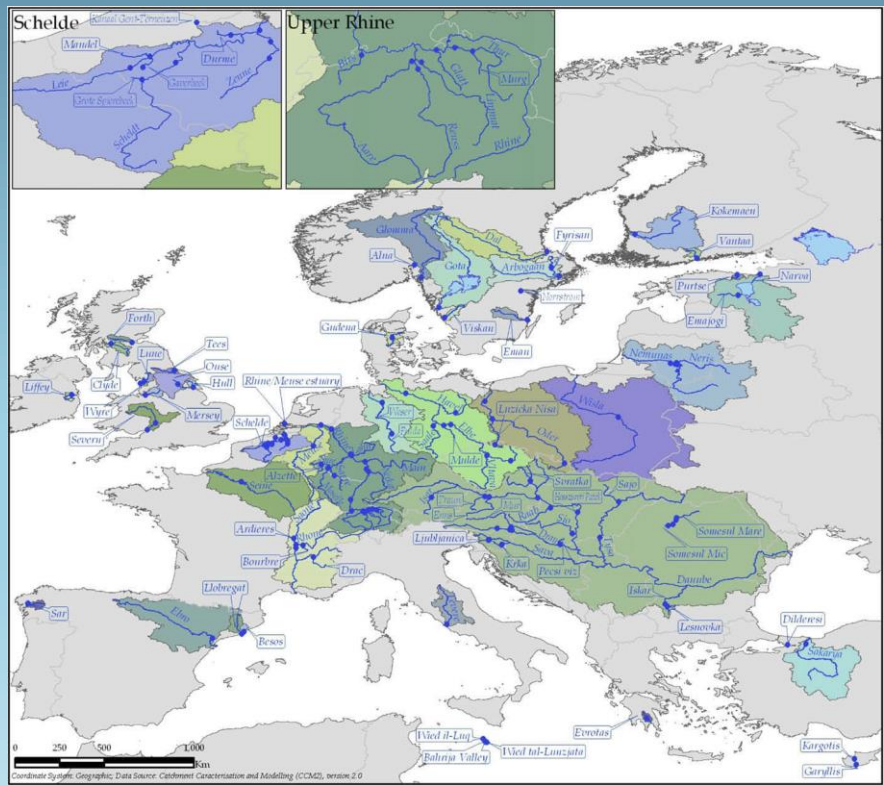
# UK- EU Data – some headlines

- Research into prevalence of the polar organic compounds, measured in the rivers and streams across Europe showed that the most frequently detected compounds **PFOA (97%) and PFOS (94%)** (Loos 2009)

- A higher Median concentration for all river samples was found for PFOS(6 ng/l), compared to PFOA (3 ng/l).

- UK Rivers
  - River Wyre – PFOA 100 ng/l
  - Severn – PFOS 238 ng/l

- Existing UK specific data is fairly limited
  - EA 2007 study into groundwater and surface water
  - Defra 2008 study into drinking water for DWI



# UK Drinking Water Inspectorate Guidance levels for PFOS, 2009

| Item | Regulatory requirement | Guidance value (concentration) | Minimum action to be taken |
|---|---|---|---|
| **Perfluorooctane sulphonate (PFOS)** | | | |
| Tier 1 | Regulation 27<br>(Risk assessment) | potential hazard | • ensure considered as part of statutory risk assessment |
| Tier 2 | Regulation 10<br>(Sampling: further provisions) | > 0.3µg/l | • consult with local health professionals;<br>• monitor levels in drinking water. |
| Tier 3 | Regulation 4(2)<br>(Wholesomeness) | > 1.0µg/l | As tier 2 plus:<br>• put in place measures to reduce concentrations to below 1.0µg/l as soon as is practicable. |
| Tier 4* | Water Industry (Suppliers' Information Direction) 2009<br>(Notification of events) | > 9.0ug/l | As tier 3 plus:<br>• ensure consultation with local health professionals takes place as soon as possible;<br>• take action to reduce exposure from drinking water within 7 days. |
| *Note - notification to the Inspectorate under the Information Direction may also be triggered at lower levels due to Tier 1, 2 or 3 activities | | | |