

Adler & Allan
ENVIRONMENTAL RISK REDUCTION

Operational Insights from Solving PFAS Problems

Dr Tom Richards
Senior Chemical & Pollutants Advisor

Daniel Harbour
Senior Scientific Advisor

Introducing Adler & Allan

Adler & Allan
ENVIRONMENTAL RISK REDUCTION

We help you achieve safer, greener and more compliant ways of working.

For over 90 years, organisations have trusted us to optimise their assets and energy infrastructure, cutting the risks that lead to penalties, pollution events, and helping to create a greener operating model.

With more than 100 specialist services, Adler & Allan delivers quality solutions that make sense and reduce long term cost. We're here to transform your operations, helping you keep pace with changing legislation and the demands of decarbonisation.

We help reduce risks, fines and reputational damage via our five service groups:

1. **Environmental risk consultancy**
   Environmental protection, advice and monitoring
2. **Pollution management**
   Pollution prevention and reduction strategy and implementation
3. **Energy Infrastructure and transformation**
4. **Asset management**
   Design, preventative maintenance, upgrade, decommissioning and transition across asset life-cycle
5. **Environmental emergency response**
   24/7 365 environmental emergency response services

Our clients include:

mitie · Department for Work & Pensions · Ministry of Justice · BMW · bp · defra · BT · Sainsbury's · nationalgrid · EQUANS · npower · vodafone · SSE · VINCI · ENGIE · e·on · ZURICH

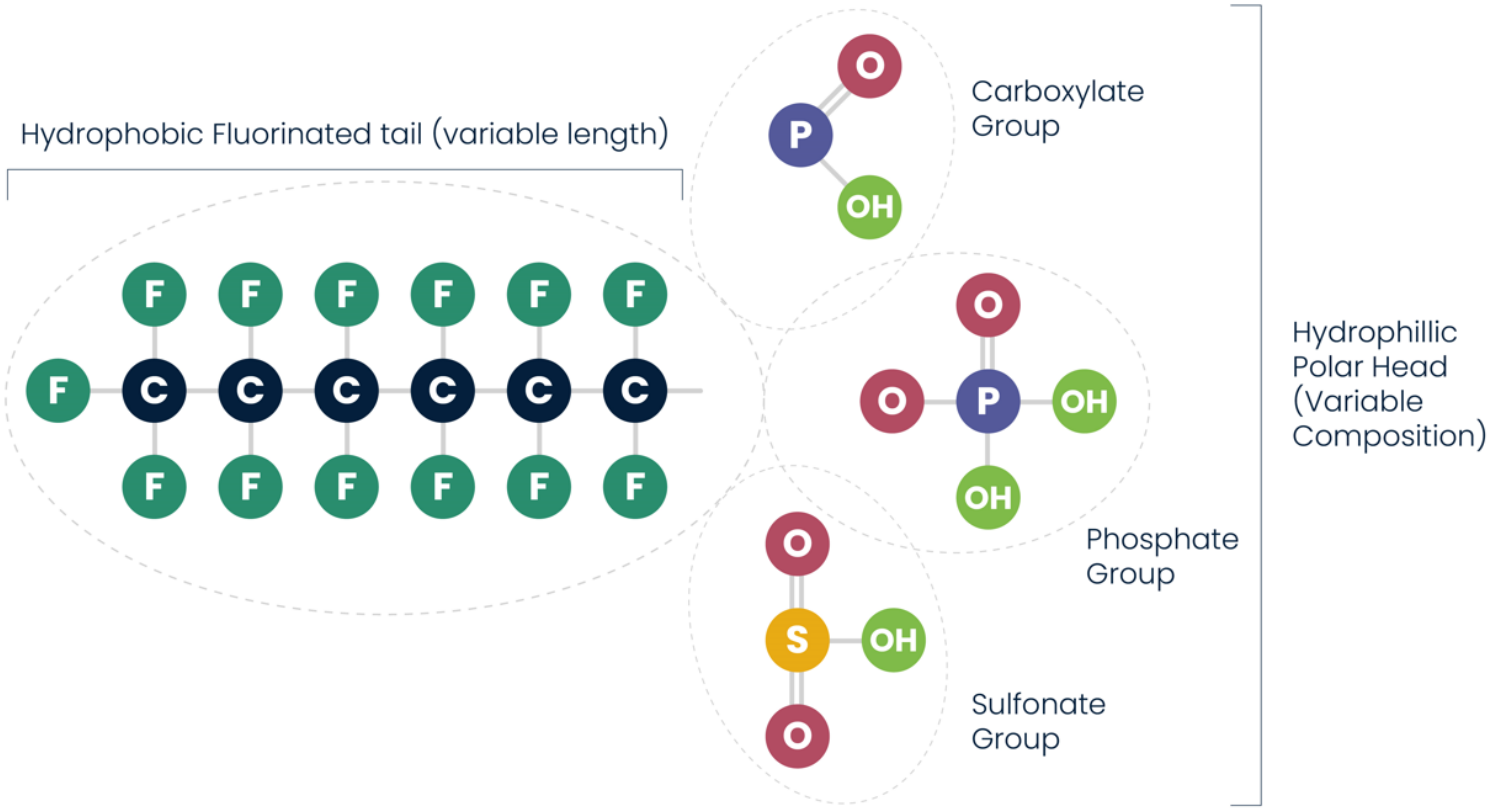
Agenda

- What is PFAS?
- Why should I be concerned?
- Operational insights



What is PFAS?


Forever


Hydrophobic Fluorinated tail (variable length)
F
C
O
P
OH
S
Carboxylate Group
Phosphate Group
Sulfonate Group
Hydrophillic Polar Head (Variable Composition)

What is PFAS?



Source: https://www.dcceew.gov.au/about/initiatives/pfas

Why should I be concerned?



Increases in cholesterol levels (PFOA, PFOS, PFNA, PFDA)



Lower antibody response to some vaccines (PFOA, PFOS, PFHxS, PFDA)



Changes in liver enzymes (PFOA, PFOS, PFHxS)



Pregnancy-induced hypertension and preeclampsia (PFOA, PFOS)



Small decreases in birth weight (PFOA, PFOS)



Kidney and testicular cancer (PFOA)



Persistent, bioaccumulative, mobile & toxic to the environment (PFOA)

Source: Agency for Toxic Substances and Disease Registry

Why should I be concerned?

UK launches plan to tackle 'forever chemicals' amid growing concerns



Forever chemicals - or PFAs (per-and poly fluoroalkyl substances) - pollute long-term and don't degrade easily (generic photo)

The UK is to increase testing for so-called "forever chemicals" in the environment as part of a national plan to tackle the substances, which have prompted environmental and health concerns.

Fears over 'forever chemicals' at development site



Architects have previously released images of what Heyford Park could look like in the future

Concerns have been raised about potential chemical pollution at a former RAF base earmarked for development in Oxfordshire.

Source: BBC News

Why should I be concerned?

Legislation updates & regulators

- UK Government
  - DEFRA PFAS Plan
  - EAC PFAS report
- UK REACH
- Persistent Organic Pollutants (POPs) Regulations (PFOS, PFOA & PFHxS)
- Drinking Water Inspectorate – 100 ng/L
- Water Framework Directive – 0.65 ng/mL (PFOS)
- EU - Classification, labelling & packaging (CLP)
- EU – Drinking water directive
- Watchout: EU affects ROI, which has a bearing on NI



Why should I be concerned?

Restrictions & bans

- Ban on PFOA-based foam in fire extinguishers & suppressions systems
  - July 2025
- HSE opinion on UK REACH restriction of PFAS in fire fighting foams
  - late 2026/early 2027
- EU – ECHA Restriction of PFAS
  - Send to European committee in 2027

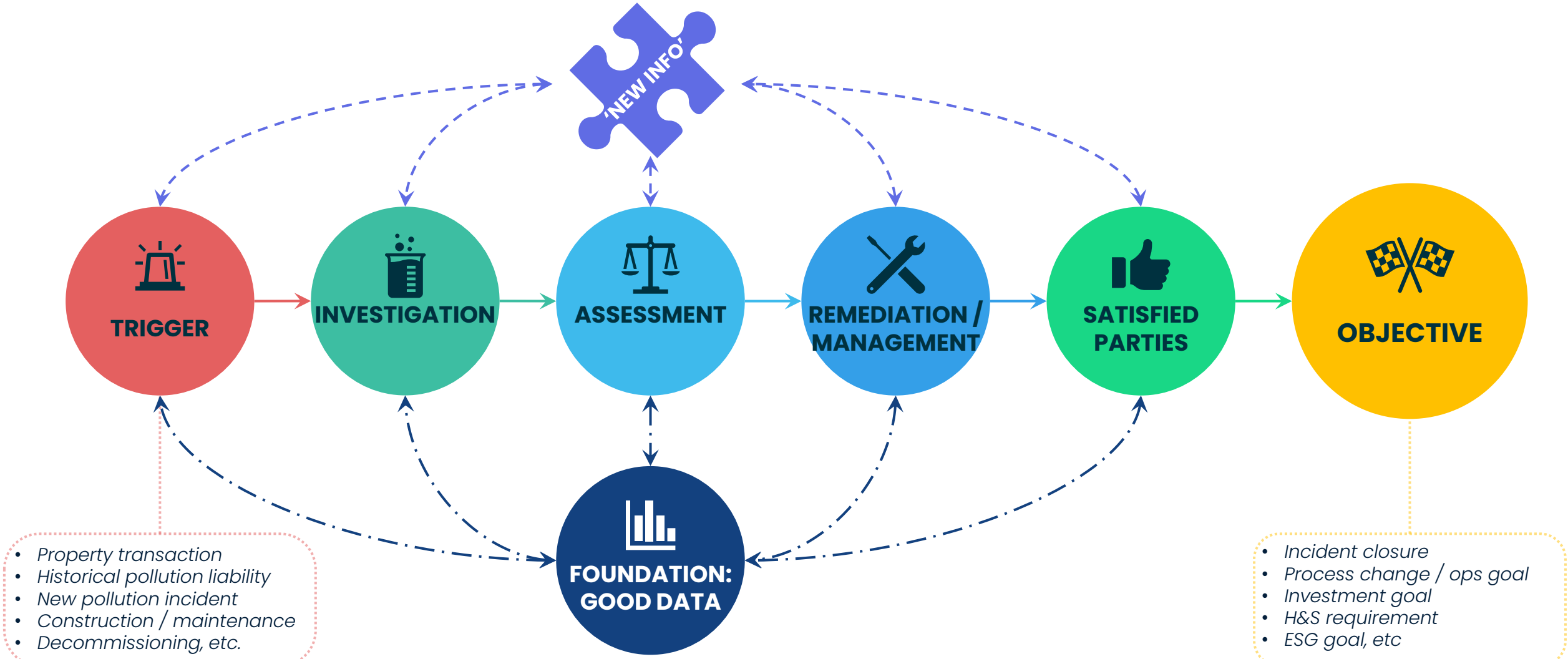


Operational insights



1. Route map to exit

KEY TAKEAWAY > > Set your objective(s), make a plan



2. Understand your site

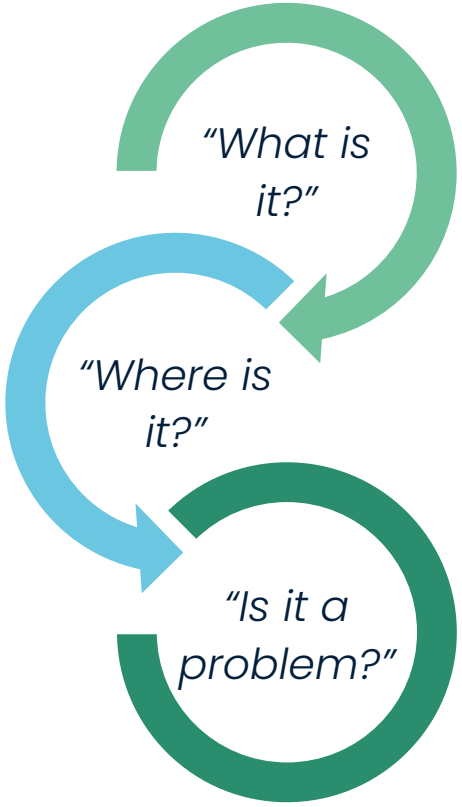
KEY TAKEAWAY > > Characterise the issue, identify gaps, work to fill them

Build conceptual model – relevant to <u>your</u> situation

- What **sources** of PFAS might be relevant?
- Via what **pathways** could PFAS move around?
- What **receptors** could be harmed?

Include consideration of

- Storage and use of PFAS-containing materials
- Containment measures and drainage system
- Ground conditions
- Environmental setting
- Site history
- Surroundings
- Proactive monitoring of water quality / discharges
- Benchmark conditions



2. Understand your site: example



Receptor: Network discharges into surface water

Pollutant linkage 1

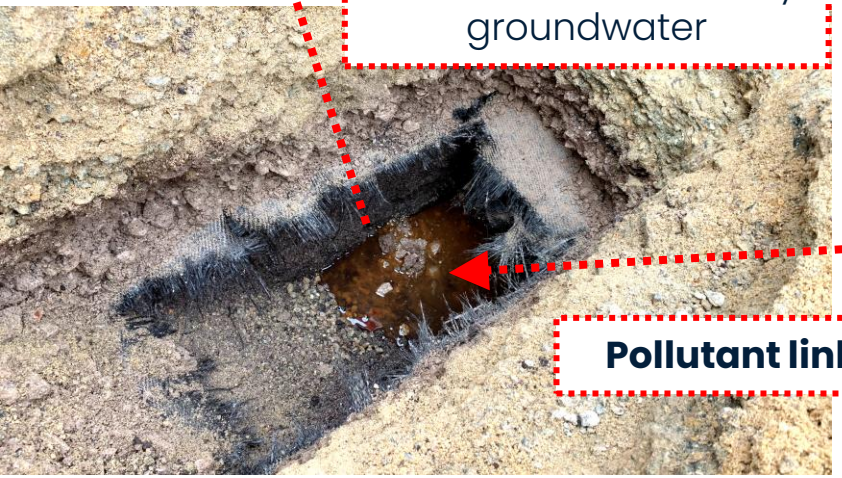


Pathway: Drain flows into site-wide network



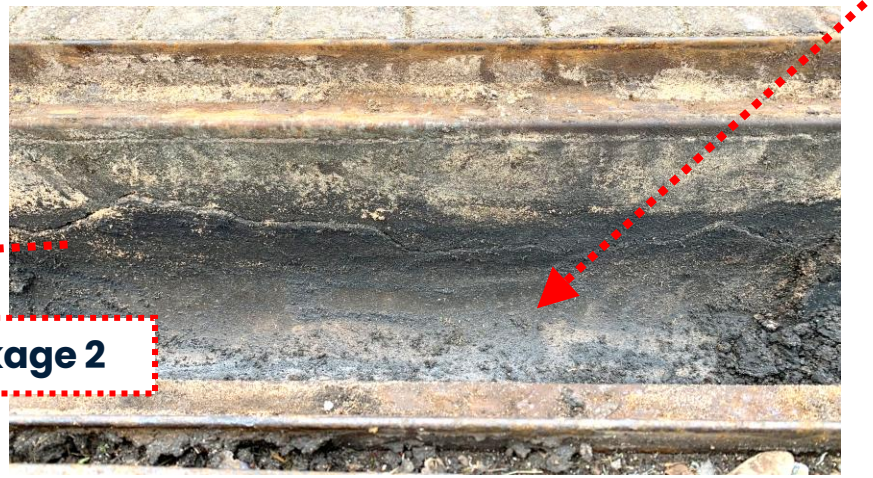
Source: runoff from fire suppression test enters drain

Surface water is fed by groundwater



Pathway: Runoff enters groundwater

Pollutant linkage 2



Pathway: Runoff enters cracks in the drain

3. Establish clear targets

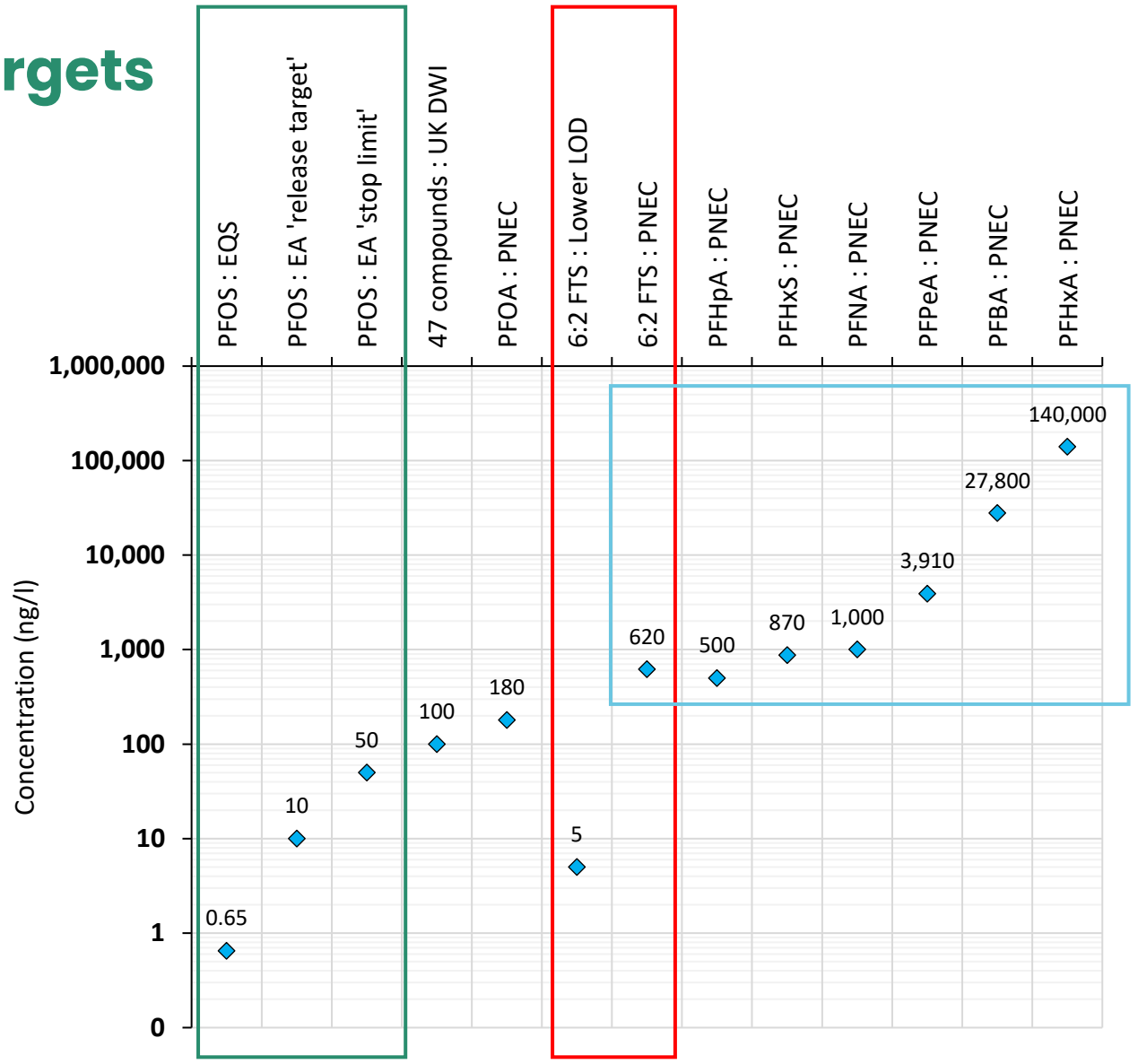
KEY TAKEAWAY > > Work with stakeholders to fill the regulatory gap

- 1,000s of PFAS compounds
- Virtually no regulatory quality targets available in the UK (for any sample matrix)
- Examples of what is available
  - Surface Water: EQS for PFOS (Annual Average of 0.65 ng/l)
  - Drinking Water: 10 ng/l for any of 47 individual compounds
  - Soil: Interim C4SLs for PFOA, PFOS, PFNA, PFHxS
- No single quality target for 'total PFAS' is available, or suitable
- Laboratory Limits of Detection often become the *de facto* target
- Agree quality targets that are suitable for **your** situation

3. Establish clear targets

Comparison of some quality targets

- Waters
- Wide range
- Orders of magnitude apart
- Wide range of detection limits required



Pause for context…

…how small is 1 ng/l?

- Loch Ness
- 36 km long
- Up to 2.7 km wide
- 132 m av. depth
- Holds 7.45 km^3 of freshwater
- More than all lakes in England & Wales combined

In Loch Ness…

1 ng/l is equivalent to 7 bags of sugar



Pause for context…

…how small is 1 ng/l?



4. Quantify the problem

KEY TAKEAWAY > > Get good data

- Robust procedures are needed to minimize errors
- Know what you are looking for
- Good lab partner needed
  - Quality
  - LODs (…two sugar cubes)
- Sense check target compounds vs ‘total’ load
  - Confidence
- Set expectations on turnaround times



5. Treatment and removal

KEY TAKEAWAY > > Use a suitable and effective solution

Based on

- Clear objectives
- Case specific conditions
- Normal process of Investigation > Assessment > Remediation Options Appraisal
- Experience and track record

What approaches can we rule out? (ineffective / uncertain outcomes)

- Conventional treatment (chemical)
- Low pressure membranes
- Biological treatment (including slow sand filtration)
- Disinfection
- Oxidation / Advanced oxidation

5. Treatment and removal

KEY TAKEAWAY > > Use a suitable and effective solution

Successful treatment of PFAS in waters

Treatment	% removal	Conclusion
Ion Exchange Resin (IEX)	90 to 99	Effective
High Pressure Membranes	93 to 99	Effective
Powdered Activated Carbon (PAC)	10 to 97	Effective for some applications only
Granular Activated Carbon (GAC) ○ Extended Run Time	0 to 26	Ineffective
○ Designed for PFAS Removal	89 to > 98	Effective

- Most success from deployment of GAC
  - Liquids passed through filter vessels
  - Applied as a cleaning liquid

5. Treatment and removal

Example of a treatment train to remove PFAS and co-contaminants



- Static tanks and multiple GAC filter tanks connected in sequence and parallel
- Optimise your system – ‘divide and conquer’ sediments / floating oils / metals / other pollutants

6. Changing conditions

KEY TAKEAWAY > > Keep your eye on the ball



Evolving regulation – over time, the regulatory gap should close



New knowledge – better characterisation / risk assessment



New technologies – different / more efficient treatment options



Weather conditions – rainfall in particular affects mobility of PFAS



Metabolites – PFAS fingerprint is not static, look out for transition and terminal products

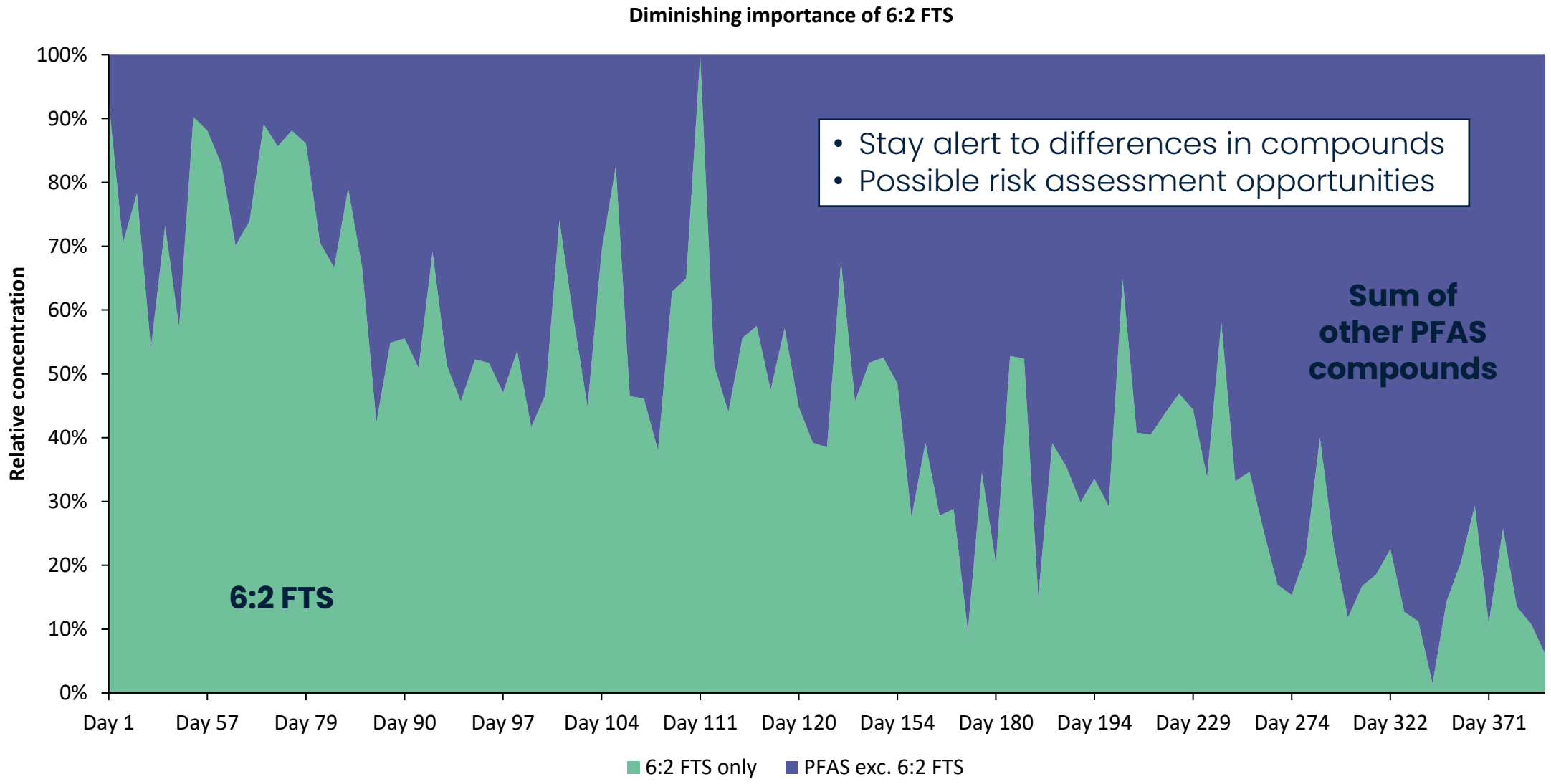


Operations – maintain and monitor your activities e.g. analysis of drainage discharges



Seek support if you don't have the skills or capacity

6. Change: example of evolving compounds



7. Plan for emergencies

KEY TAKEAWAY > > Make a pollution incident response plan

What is it?

- Outlines actions to prevent the release or spread of pollution

Why?

- Good practice
- PPC and COMAH sites must have one
- Protects the environment
- Protects yourselves

Consider

- Your understanding of your site
  - What are you storing and using?
  - Have you got suitable containment?
  - Do you know where your drains go?
- What actions to take in-house
- Who to call if you need help with emergency response



Questions

Thomas.Richards@adlerandallan.co.uk

Daniel.Harbour@adlerandallan.co.uk

www.adlerandallan.co.uk

0800 592 827

adlerandallan.co.uk

