OUR RESEARCH AND PARTNERING WITH INDUSTRY

PROF JOBY BOXALL, DR STEVE MOUNCE, DR WILL FURNASS

Who we are

150+ researchers, students and academics from across the University of Sheffield interested in water

- 15+ research groups
- Engineering, sciences, social sciences, management, health

Dedicated to a highly collaborative approach to solving the major challenges in the water sector

Pennine Water Group
- 70+ researchers focused on urban water systems

Urban Water Research Strengths

Buried infrastructure (distributed infrastructure)

- Water distribution
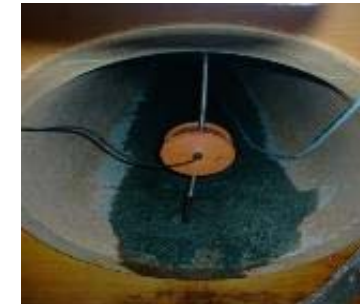- Sewers
- Storm water management
- Data/analytics

Sensors

- Acoustic
- Biotechnology
- Deployment/implementation

Customers and Stakeholders

- Stakeholder engagement
- Working in partnerships
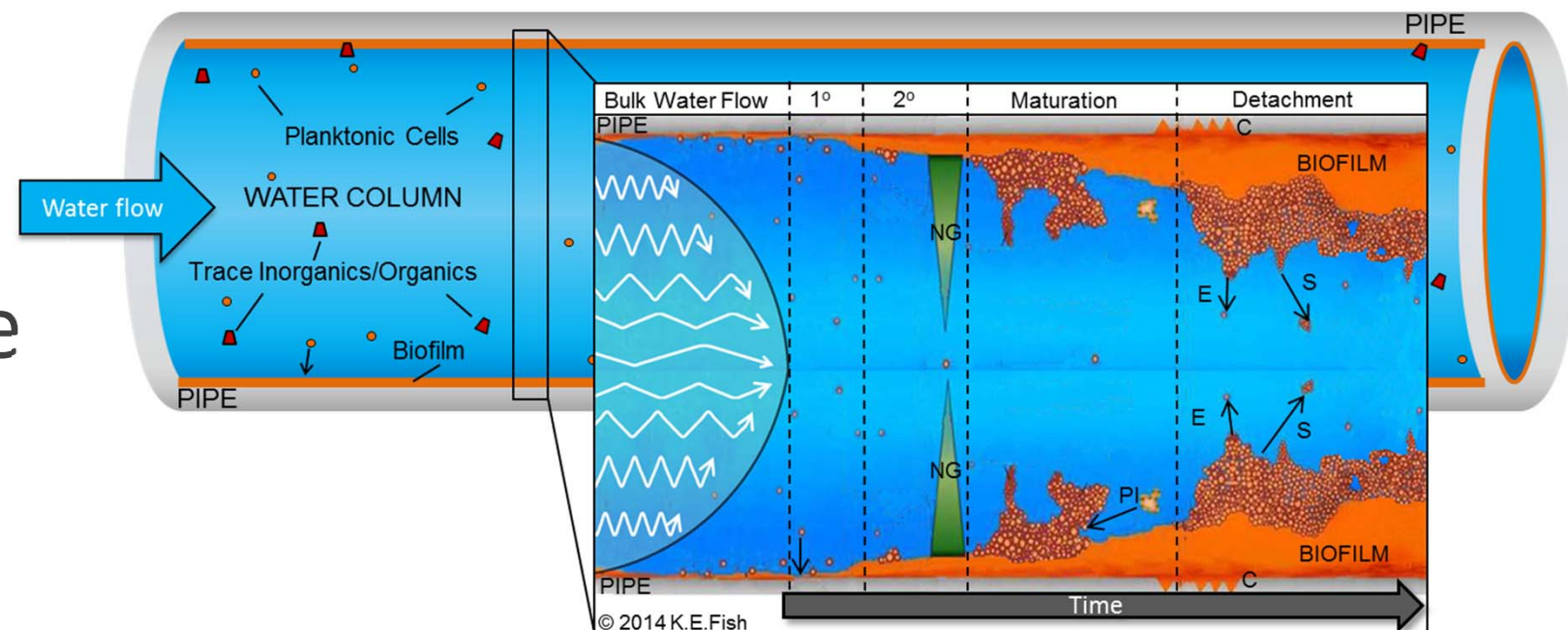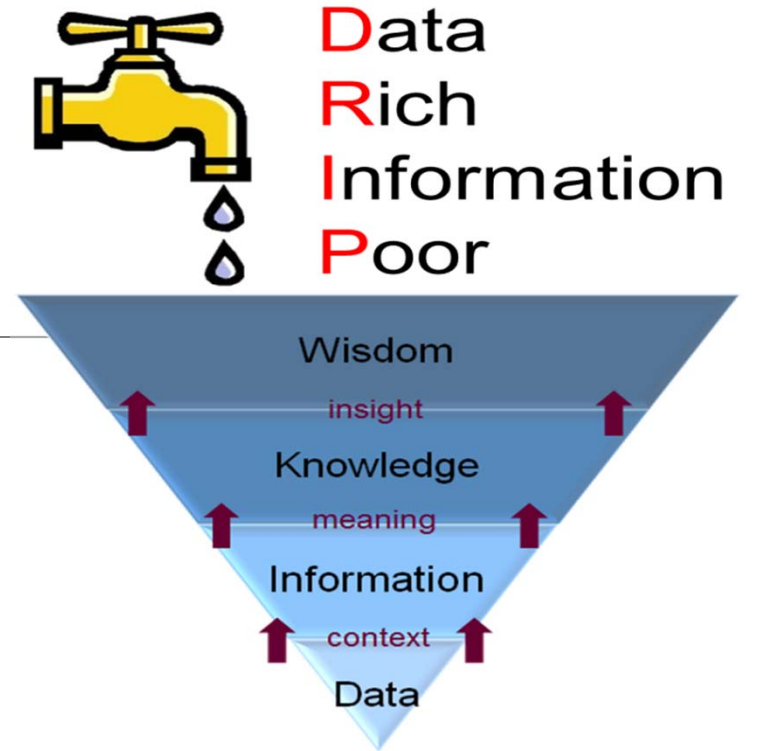- Internal organisation and innovation

Close working and strategic partnerships with UK water companies

Water Distribution Research

Quantity: Data Rich Information Poor - DRIP

Quality: Understand the interactions between physical (hydraulic), chemical and biological complex interactors of pipe networks

Water Quantity: Leakage

Automated Data Analysis - soft computing approaches for turning data into information

Optimal instrumentation location and development

Transients for leak detection

Dynamic behaviour of leakage

Fixing the DRIP (data rich information poor)

Fuzzy diagnostics for event detection and identification (quantity and quality)

Local vs. central intelligence

Smart Water 4 Europe

Four sites allowing demonstration
of solutions incorporating sensors,
data processing, modelling and ICT technologies

UK site (Thames Water)

◦ Integration of multiple data sources: DMA meters, Burstminders, Trunkminders, Incertameters and AMR data

◦ Online sensor data storage and availability

◦ Implement work flows and services on Cloud based portal called youShare

◦ AURA-Alert online enhancements for WDS specific processing and settings including 'sequence of states' event detection

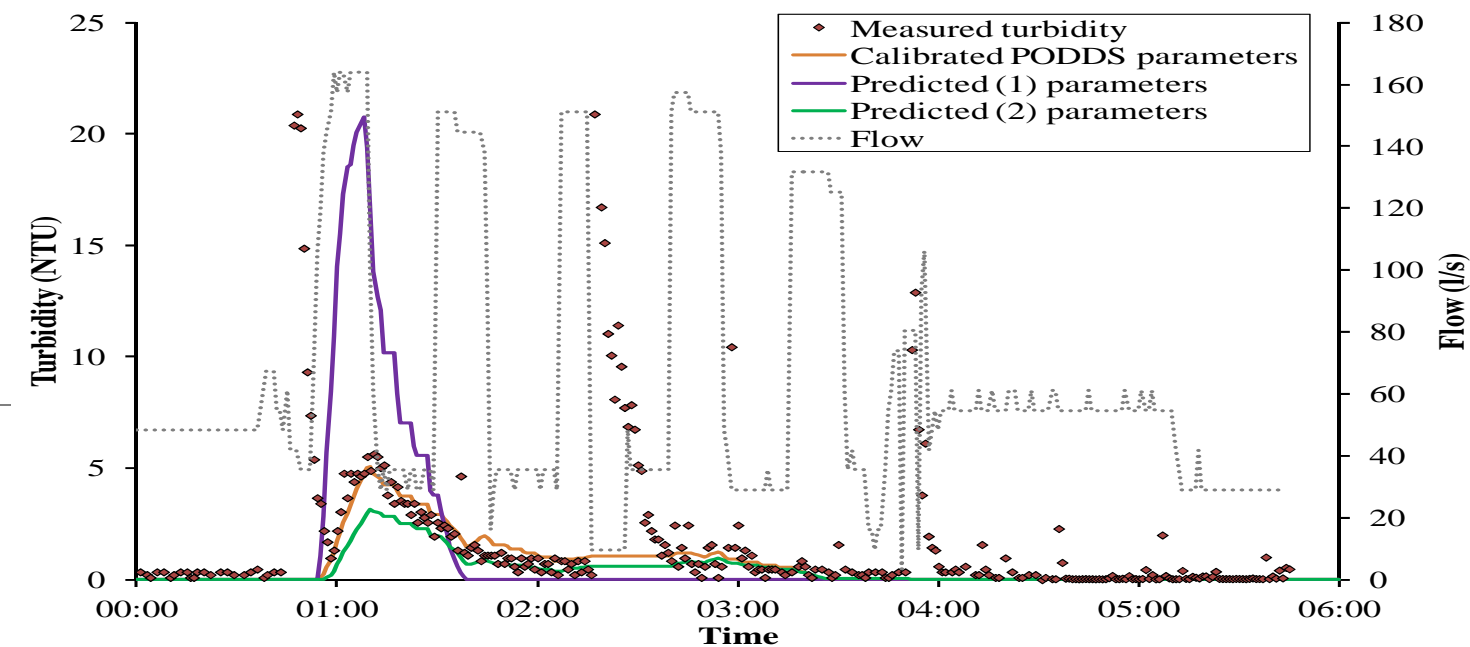◦ Optimal instrumentation studies, integrating flow and pressure

◦ Validation trials and cost benefit analysis
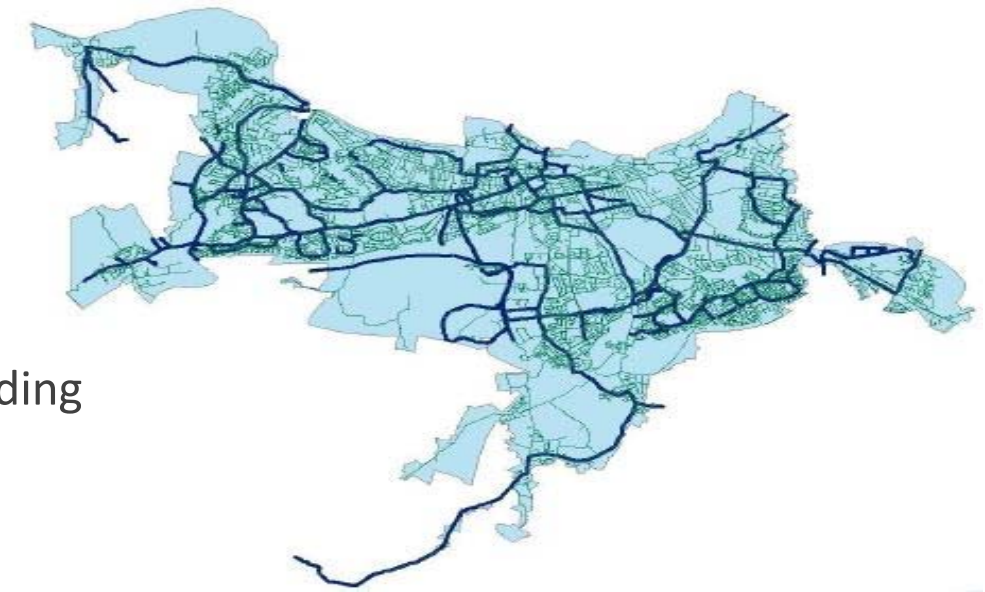
Water Quality: Discolouration

Prediction of Discolouration in Distribution Systems – PODDS (research council to multiple water company consoria)

Discolouration processes of cohesive layer *mobilisation*, *regeneration* and *conditioning*

- Mobilisation and conditioning by hydraulic conditions (shear stress)
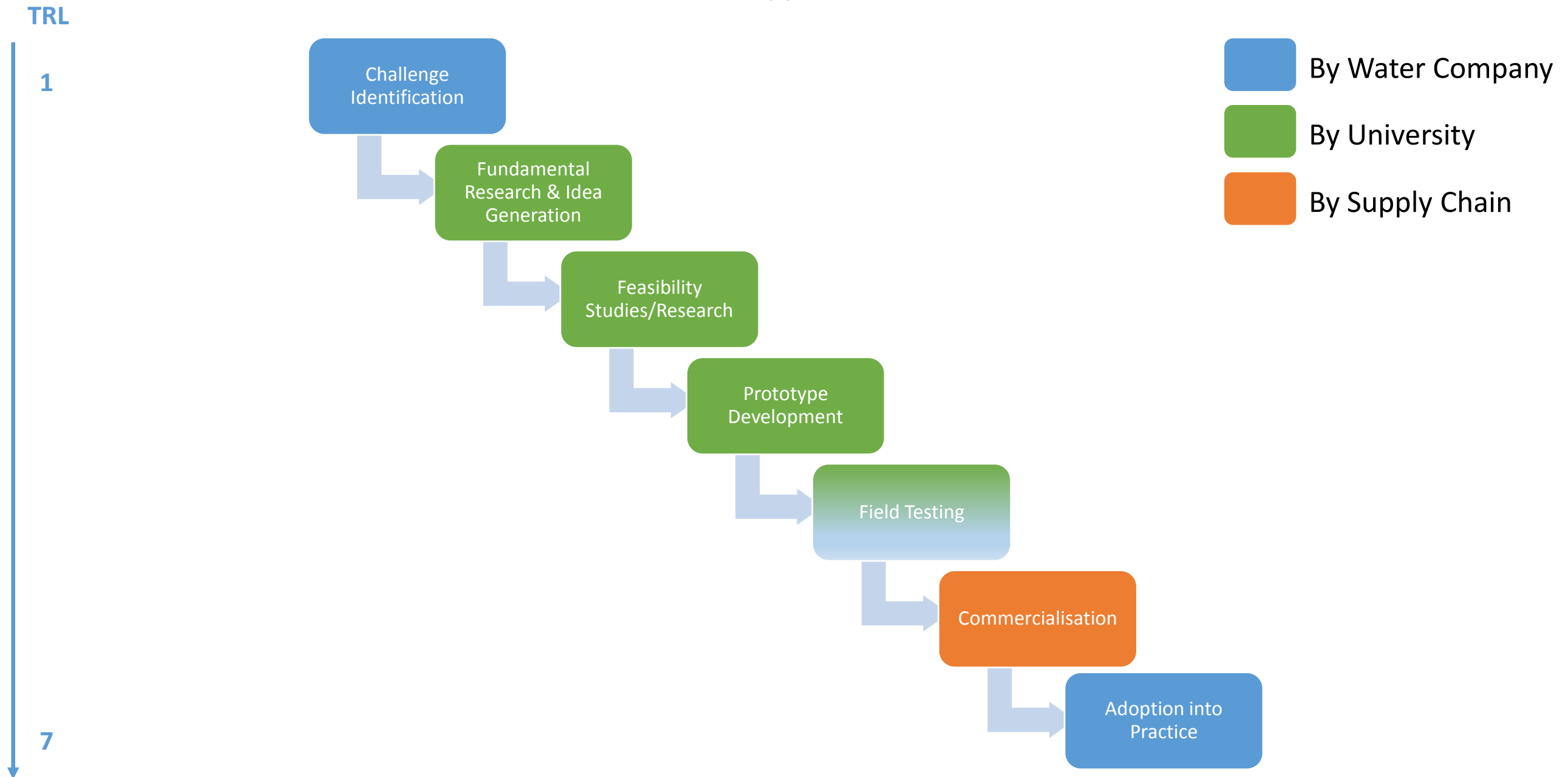- Regeneration facilitated by biofilms and corrosion and sources of inorganics (WTW)

Field studies and modelling, Laboratory studies, Data analysis

Company	Essex Water	Essex Water	Essex Water	Essex Water	NWG living water	United Utilities	YorkshireWater
Properties	4km, 600 to 400mm Mixed	7km, 450mm AC	6km 350mm Unlined Ductile Iron	10km 500mm and a 18" Mixed	4km 800mm DICL	8.4 km 18" CI	Re-route flows from short section 21" to 18" CI Main
Proposed cost	Swabbing £490K	Swabbing £530K	Main replacement £2M	Flushing infrastructure £1.3M	Jetting £300K	Main Replacement £5.2M	Restrictive issues(Line stops, overland main) £70k
PODDS mediated cost	Overnight flushing £227K	Trunk main conditioning £150K	PODDS Trunk main conditioning [2]£40K	PODDS Trunk Main conditioning [2]£40K	PODDS Trunk Main conditioning [3]£5K	PODDS Trunk Main conditioning (currently via flushing, automated strategies being investigated)	PODDS Trunk Main conditioning (no supply interruption, capital spend or discolouration contacts)
Savings	£263K	£380K	[1]£2M	£1.3M	£295K	[1]£5.2M	£70K

Current Approach to Innovation

TRL

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Challenge Identification

Fundamental Research & Idea Generation

Feasibility Studies/Research

Prototype Development

Field Testing

Commercialisation

Adoption into Practice

By Water Company

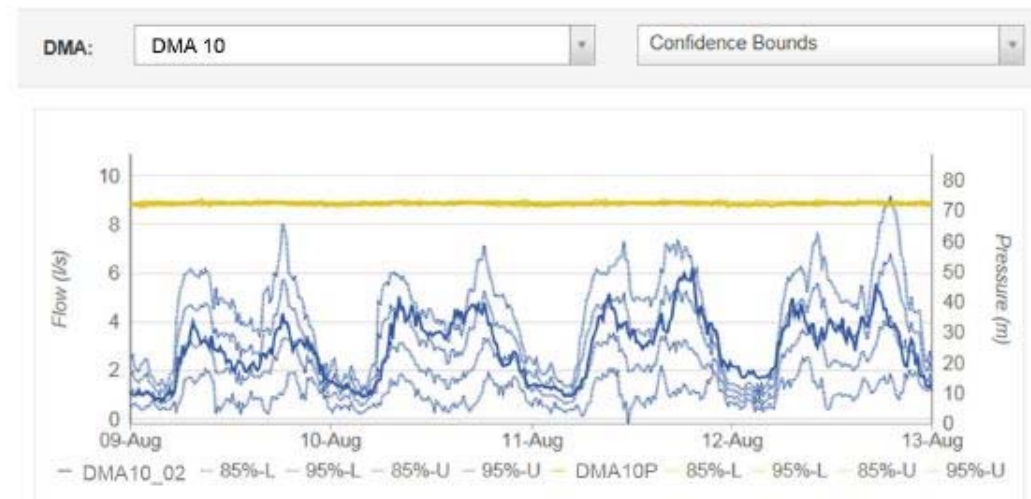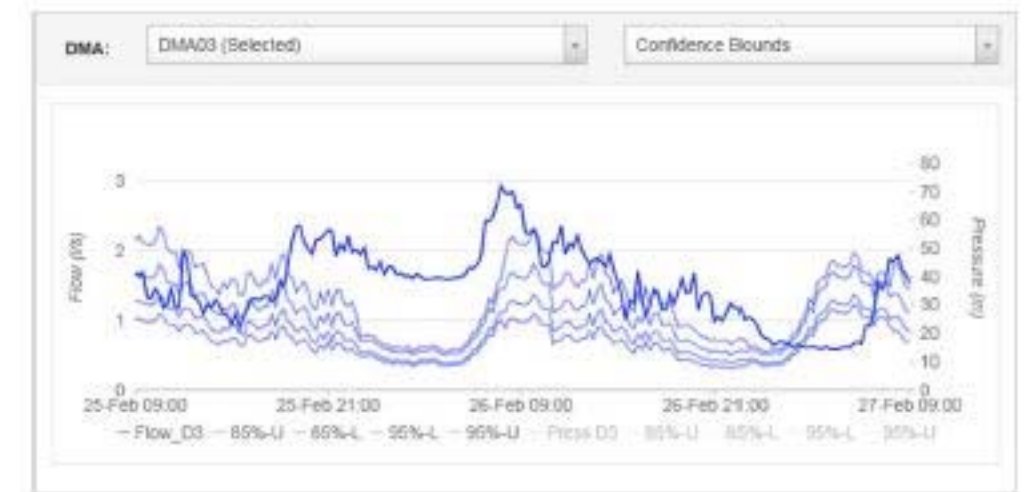By University

By Supply Chain
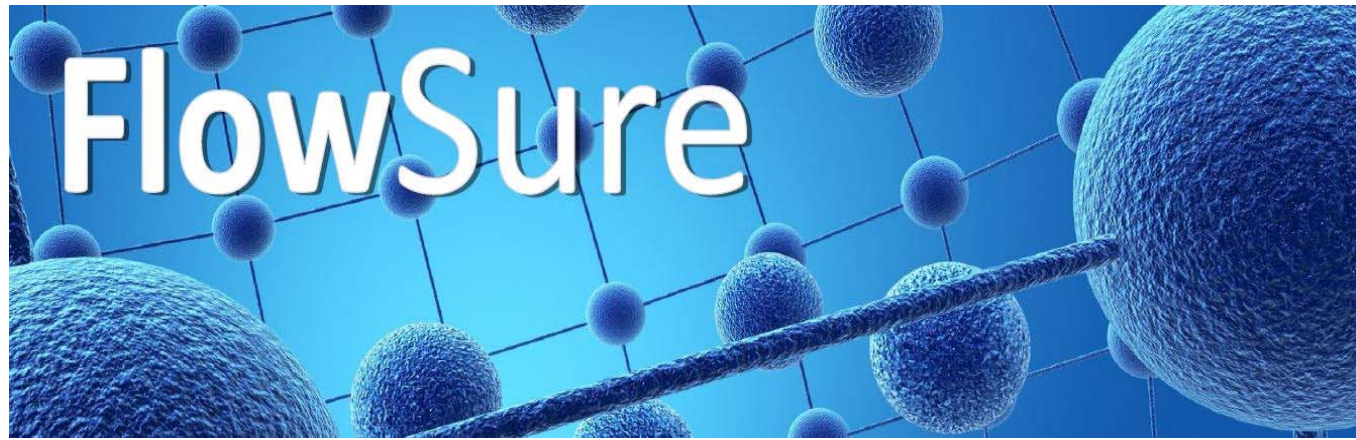
FlowSure uses readily available meter data and smart algorithms to automatically identify when a significant burst or other large, unusual flow has occurred

The software uses an artificial neural network to learn how the water supply network behaves normally and then applies fuzzy logic to detect abnormality
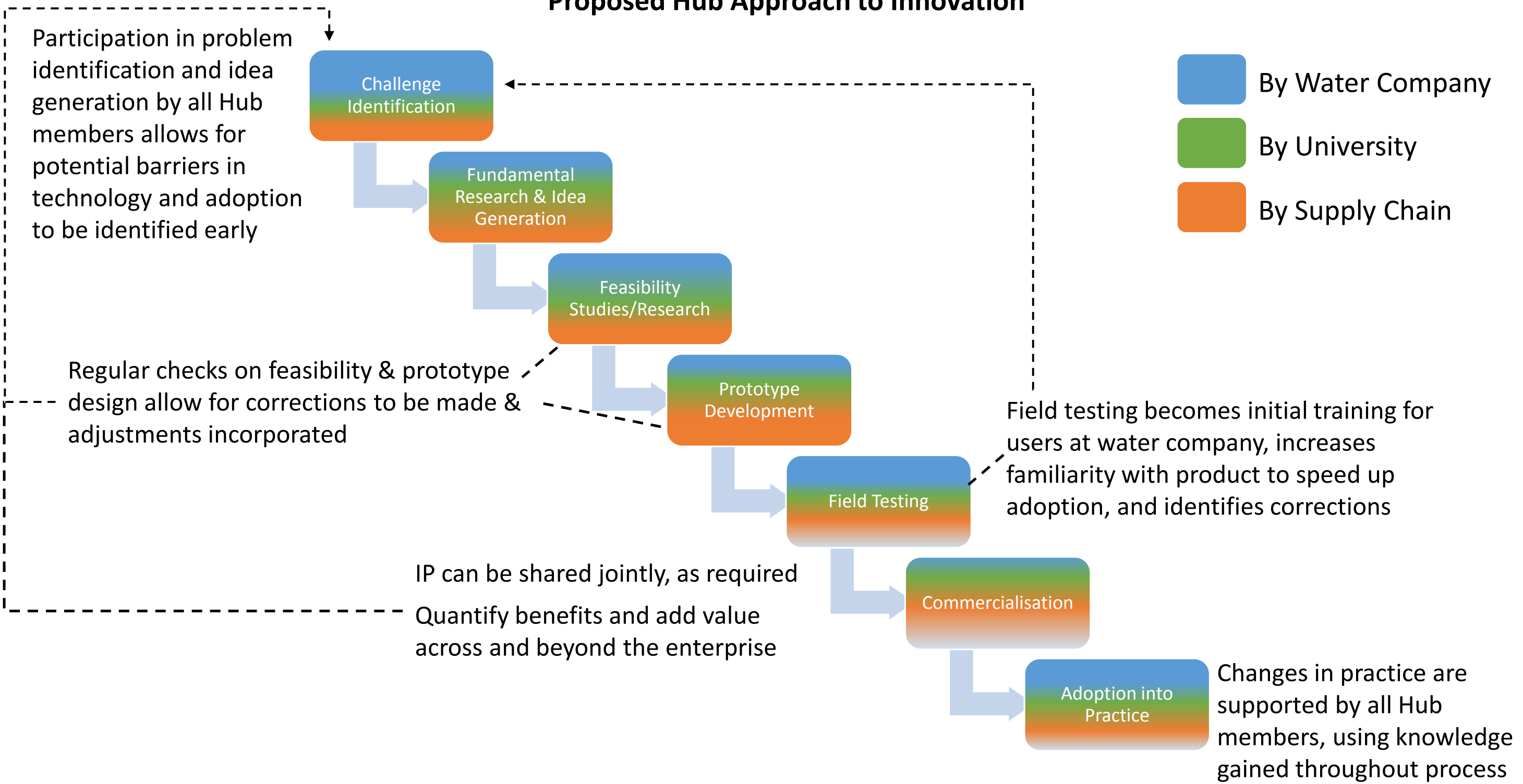
Commercialisation of PhD research and R&D pilots (ADA)

Proposed Hub Approach to Innovation

Participation in problem identification and idea generation by all Hub members allows for potential barriers in technology and adoption to be identified early

Challenge Identification

Fundamental Research & Idea Generation

Feasibility Studies/Research

Regular checks on feasibility & prototype design allow for corrections to be made & adjustments incorporated

Prototype Development

Field Testing

Field testing becomes initial training for users at water company, increases familiarity with product to speed up adoption, and identifies corrections

IP can be shared jointly, as required

Quantify benefits and add value across and beyond the enterprise

Commercialisation

Adoption into Practice

Changes in practice are supported by all Hub members, using knowledge gained throughout process

By Water Company

By University

By Supply Chain

TWENTY65

EPSRC funded research consortium, addressing the grand challenge:

Providing sustainable water for all by working in partnership across the water sector to tailor water systems so that they deliver positive impact on health, the environment, the economy, and society.