

What is HydraLink?

HydraLink is a centralised water management platform that brings together real-time data from multiple agencies — including the Environment Agency, water companies, Met Office and local authorities — into a single operational dashboard. By combining rainfall forecasts with live sewer sensor readings, storage tank levels, river gauges and coastal data, it predicts whether the existing drainage network has sufficient capacity to handle an incoming weather event and, if not, calculates what pre-emptive action is needed to prevent overflow before it occurs.

The Problem

Flood risk management in the UK is currently fragmented across multiple organisations. The Environment Agency monitors river levels, water companies manage sewer networks and storage infrastructure, the Met Office provides weather forecasting, local authorities oversee surface water drainage, and National Highways manages road drainage. Each operates independently with their own data systems, meaning no single entity has a complete picture of total system capacity at any given time. When a severe weather event approaches, this fragmentation delays coordinated response and prevents the kind of pre-emptive action that could avoid flooding entirely.

The National Audit Office (2020) identified that flood risk investment has historically been reactive rather than preventative, and the Environmental Audit Committee (2024) called for solutions that address the systemic interaction between historic drainage design, modern rainfall extremes, and the limitations of centralised water systems. HydraLink directly addresses this gap.

How It Works

HydraLink operates through a four-layer architecture, each building upon the last to transform raw infrastructure data into actionable operational decisions.

Layer	Function	Data Sources
1. Data Capture	Collects real-time readings from all water-related infrastructure	Street sensors, EOWs, pumping stations, storage tanks, SuDS assets
2. Predictive Forecasting	Combines rainfall forecasting with hydrological models to predict inflows	Met Office, catchment rainfall, flood forecasts, river levels
3. Risk Analysis	Assesses probability of overflow events, network capacity, and critical thresholds	Capacity models, historical data, critical thresholds, asset health
4. Operational Dashboard	Presents unified view enabling coordinated action	Water utilities, local authorities, regulatory bodies, emergency services

The Predictive Model

The core of HydraLink is a capacity balance model. It converts forecast rainfall into a predicted inflow volume, then compares it against the combined remaining capacity across all sewer nodes and storage tanks. If predicted inflow exceeds available capacity, it calculates the surplus and determines the required pre-release

rate and timeline to create sufficient headroom before the storm arrives, while flagging any downstream bottlenecks that could constrain discharge.

Worked Example

For a high-intensity rainfall event of 30 mm/hr over 1 km², using a runoff coefficient of 0.8 for impermeable surfaces:

Parameter	Calculation	Result
Inflow Rate (Q)	30 mm/hr × 1,000,000 m ² × 0.8	24,000 m ³ /hr
Available Sewer Capacity	Measured from live sensors	18,000 m ³ /hr
Storage Buffer	Tank volume – current level	10,000 m ³
Excess Flow	24,000 – 18,000	6,000 m ³ /hr
Time to Overflow	10,000 m ³ ÷ 6,000 m ³ /hr	≈ 1.67 hours

This allows HydraLink to predict overflow approximately 2 hours before the critical threshold is reached, enabling pre-emptive actions such as releasing stored water, activating pumps, or coordinating responses across agencies.

Connected Agencies

HydraLink integrates data feeds from the following organisations into a single operational view:

Agency	Data Provided	Role
Environment Agency	River levels, flood warnings, monitoring AR	Regulatory oversight
South West Water	Sewer sensors, storage tanks, EDMs, pumps	Network operator
Met Office	Rainfall radar, forecasts, severe weather alerts	Weather forecasting
National Highways	Road drainage, highway flooding data	Road network
Devon County Council	Surface water drainage, LLFA responsibilities	Local flood authority
Exeter City Council	Local drainage, planning data, SuDS assets	Local authority

Key Features

- **Real-Time Capacity Monitoring** — Live sewer fill levels, storage tank volumes, and flow rates across the entire network, updated every 15 seconds.
- **Predictive Flood Modelling** — Converts rainfall forecasts into inflow volumes and compares against available system capacity to predict overflow events hours in advance.
- **Pre-Release Calculation** — Determines exactly how much stored water needs to be released, at what rate, and from which tanks to create headroom before a storm arrives.
- **Bottleneck Detection** — Identifies downstream constraints where maximum release rates could cause backup, preventing one solution from creating another problem.

- **Multi-Agency Dashboard** — Single operational view for all stakeholders, replacing fragmented data systems with coordinated situational awareness.
- **River and Coastal Integration** — Incorporates EA river gauge data and tidal conditions, which constrain when and where water can be discharged.

Why It Matters

Current flood management in the UK is predominantly reactive — focused on reducing damage after flooding occurs rather than preventing it. HydraLink shifts this paradigm by providing the predictive capability and cross-agency coordination needed to act before critical thresholds are reached. It does not replace existing infrastructure; it functions as a coordination layer positioned above it, consolidating multiple disparate data sources into a single actionable operational view. By using validated hydrological techniques combined with publicly available data from the Environment Agency's Real-Time Flood Monitoring API and Met Office radar, it enables operational flood prediction without requiring a full hydraulic simulation model.