HR Wallingford
Working with water

Introduction to HR Wallingford

Andrew Brown - Business Development Director

India UK water Security Exchange Initiative - Feb 2016 Visit

HR Wallingford
Working with water

Our vision

To be the most respected international research and consultancy organisation in civil engineering and environmental hydraulics

Water	Floods	Coasts	Maritime	Energy
				

Research

Our history

1947	Hydraulics Research Organisation is formed
1951	The Hydraulics Research Station comes to Wallingford
1982	Privatisation to create Hydraulics Research
1991	Company becomes HR Wallingford
1993	HR Wallingford Group set up
2010	Kestrel House opened

Today: a few facts and figures

- HR Wallingford Group (parent) has two wholly owned subsidiaries
  - HR Wallingford
  - Howbery Park Estates
- Limited by guarantee, non profit distributing, independent
- Turnover £26 million
- £14 million in total assets
- Offices and agents world-wide - more than half our income from overseas
- Over 250 staff including world leading experts

International offices

What makes us different?

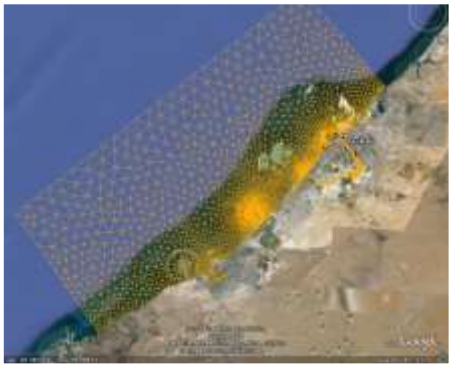
Our people

- Highest quality, motivated staff
- Many international authorities in their field
- 80% first degree, 40% masters, 20% doctorate
- Chairs of international committees etc

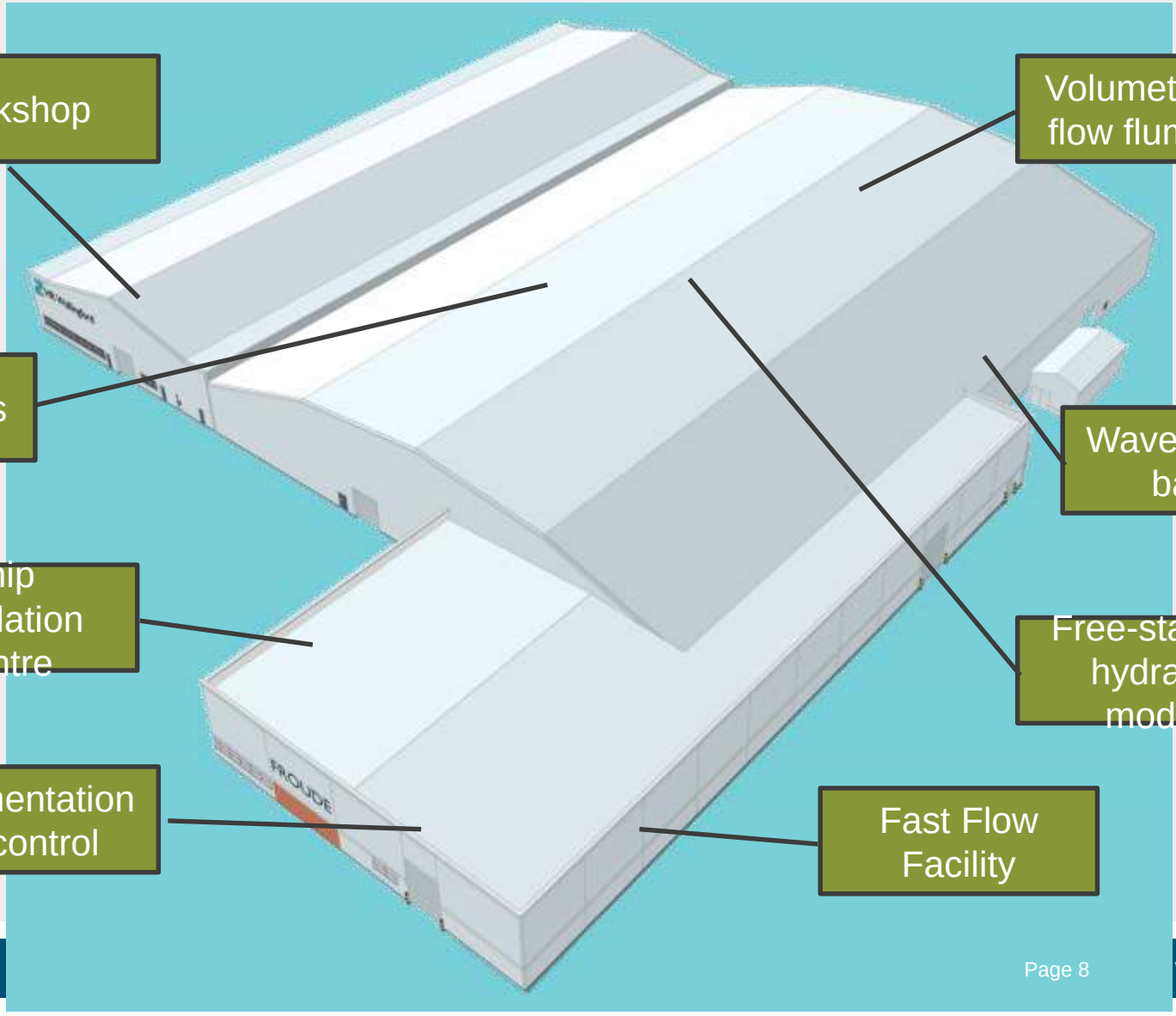
What makes us different?

Our toolbox

- Physical modelling
- Numerical modelling
- Navigation simulation
- Ecological modelling



Froude Modelling Hall



Fast Flow Facility

Key features

- Main working channel size of 70 m by 4 m
- Water depth range 0.5 m to 2 m
- 1 m deep (16 m^3) test pit for sediment studies
- Significant wave heights up to 0.5 m and maximum wave height 1.0 m
- State of the art monitoring and data collection instrumentation
- Versatile facility for general science and engineering

Fast Flow Facility

A unique, dual channel flume delivering a world-leading capability in wave-current-sediment modelling

Scientific and engineering research applications:

- Foundation stability and scour
- Seabed–structure interaction
- Wave–current interaction
- Sediment transport: flow, waves and currents
- Morphology: rivers, coasts and estuaries
- Loading on structures
- Floating structures
- Sea-keeping tests
- Drag tests

Our clients

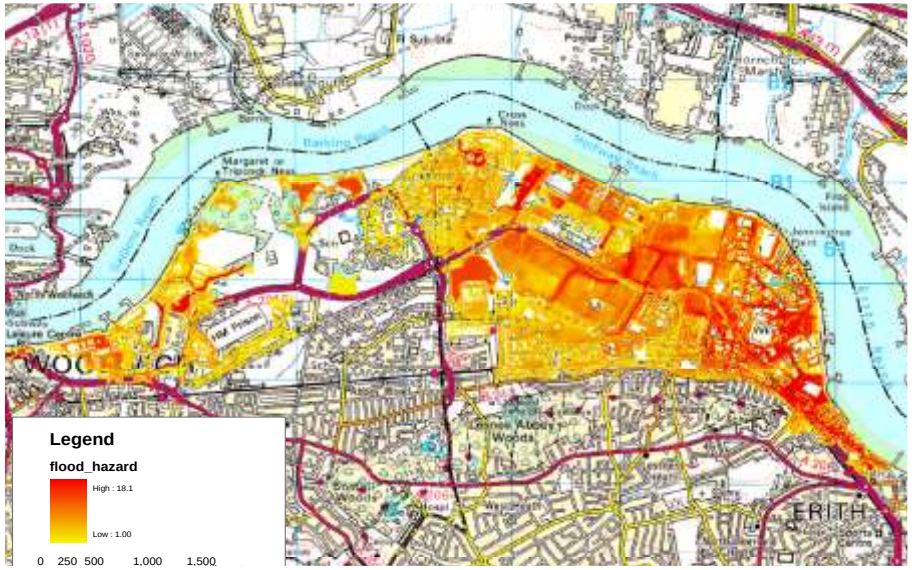
- Governments and public authorities
- International funding agencies
- Consultants and contractors
- Public and private developers
- Port owners and operators
- Utilities

Technical areas

Water

- Resources
- Water quality
- Irrigation
- Catchment processes
- Climate change
- Drainage
- Hydrology

Technical areas



Floods

- Risk analysis
- Forecasting
- Defences
- Fluvial morphology
- Extreme floods
- Natural hazards
- Environment

Technical areas

Coasts

- Coastal morphology
- Coastal structures
- Sediment processes
- Joint-probability analysis

Technical areas

Maritime

- Ports and harbours
- Dredging
- Waterfront developments
- Environment

Technical areas

Energy and industry

- Cooling water intakes and outfalls
- Pumping stations
- LNG terminals
- Pipelines

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Relevant recent project

National Waterway -1 Feasibility Study

Detailed Feasibility Study for augmenting the waterway capacity of NW-1 (Jal Marg Vikas Project);

Study area runs from Haldia to Allahabad on the River Ganga (1,000 miles);

Client is Inland Waterways Authority of India (IWAI), Govt. of India and funded by World Bank;

HR Wallingford are working in JV with Howe Engineering Projects (India) Pvt. Ltd;

Our main contributions entail:

- flow and morphology studies of the navigable length of the River Ganga;
- comprehensive analysis of navigation constraints throughout the waterway; and
- development of feasible intervention measures to improve the capacity of the waterway.

NW-1 route between Haldia and Allahabad

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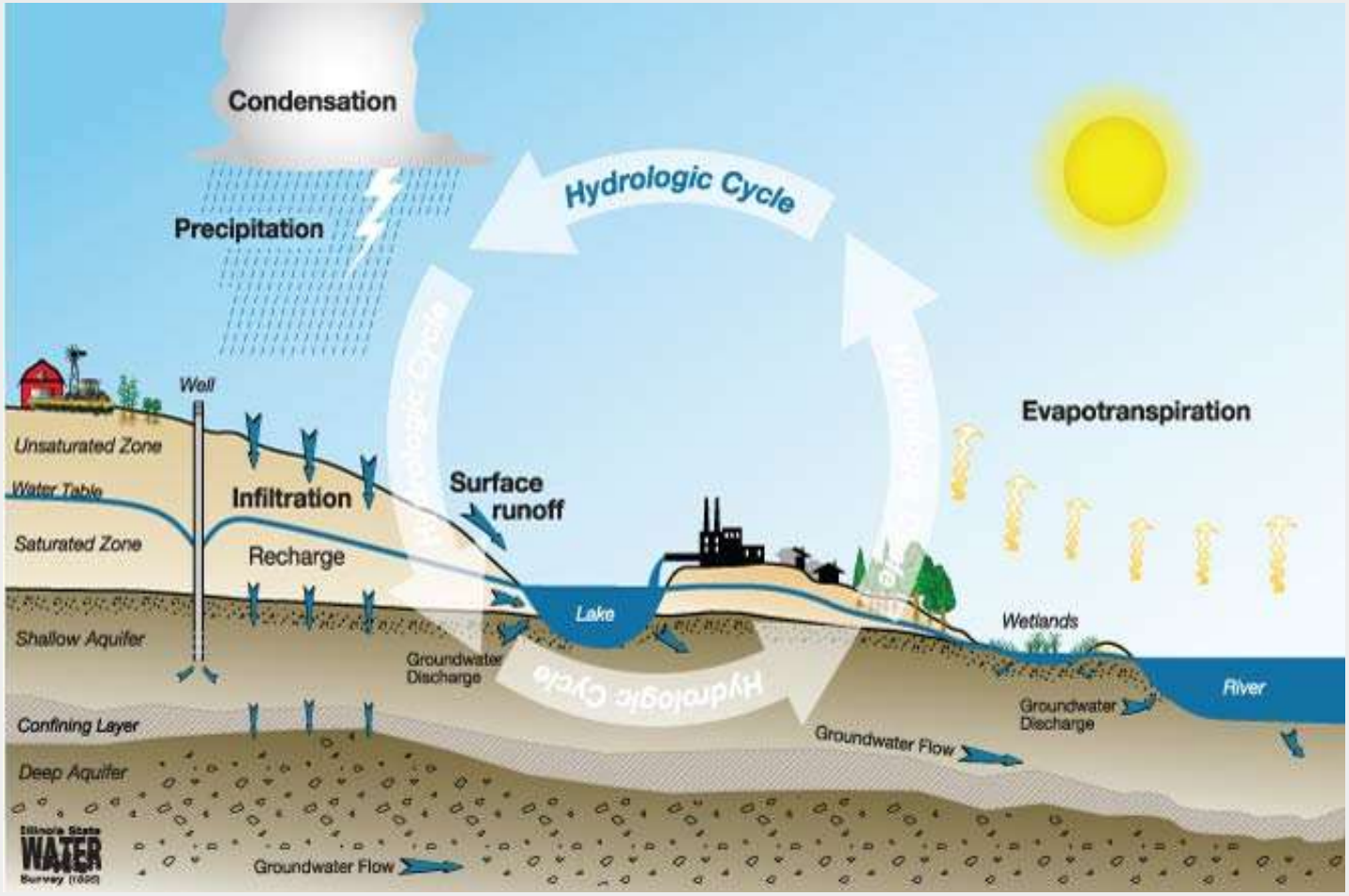
Water Quality processes

Water Quality processes

Water flow

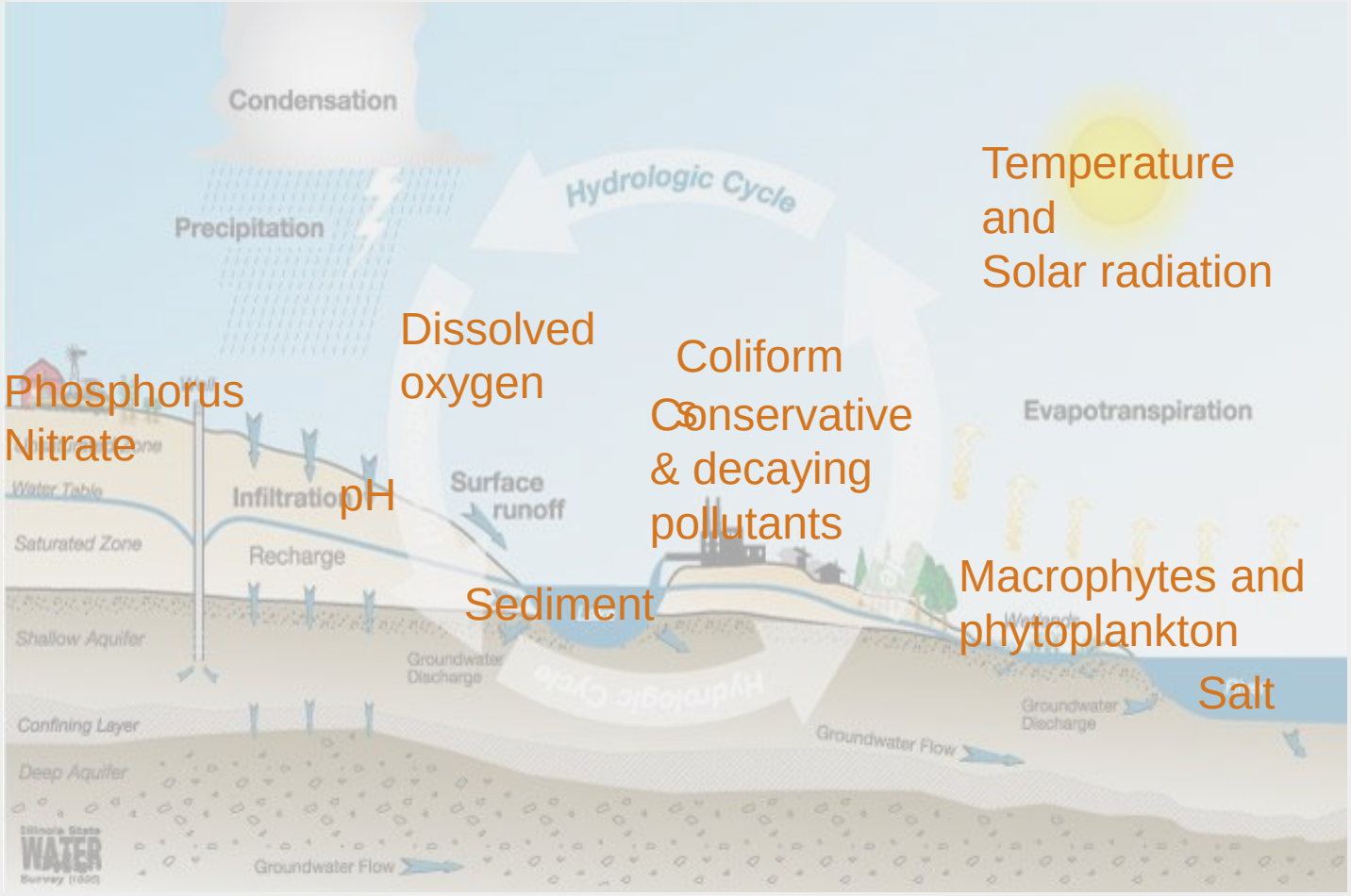
Mostly dealing with:

- Flow
- Depth & Velocity



Water Quality processes

Water flow and Water quality

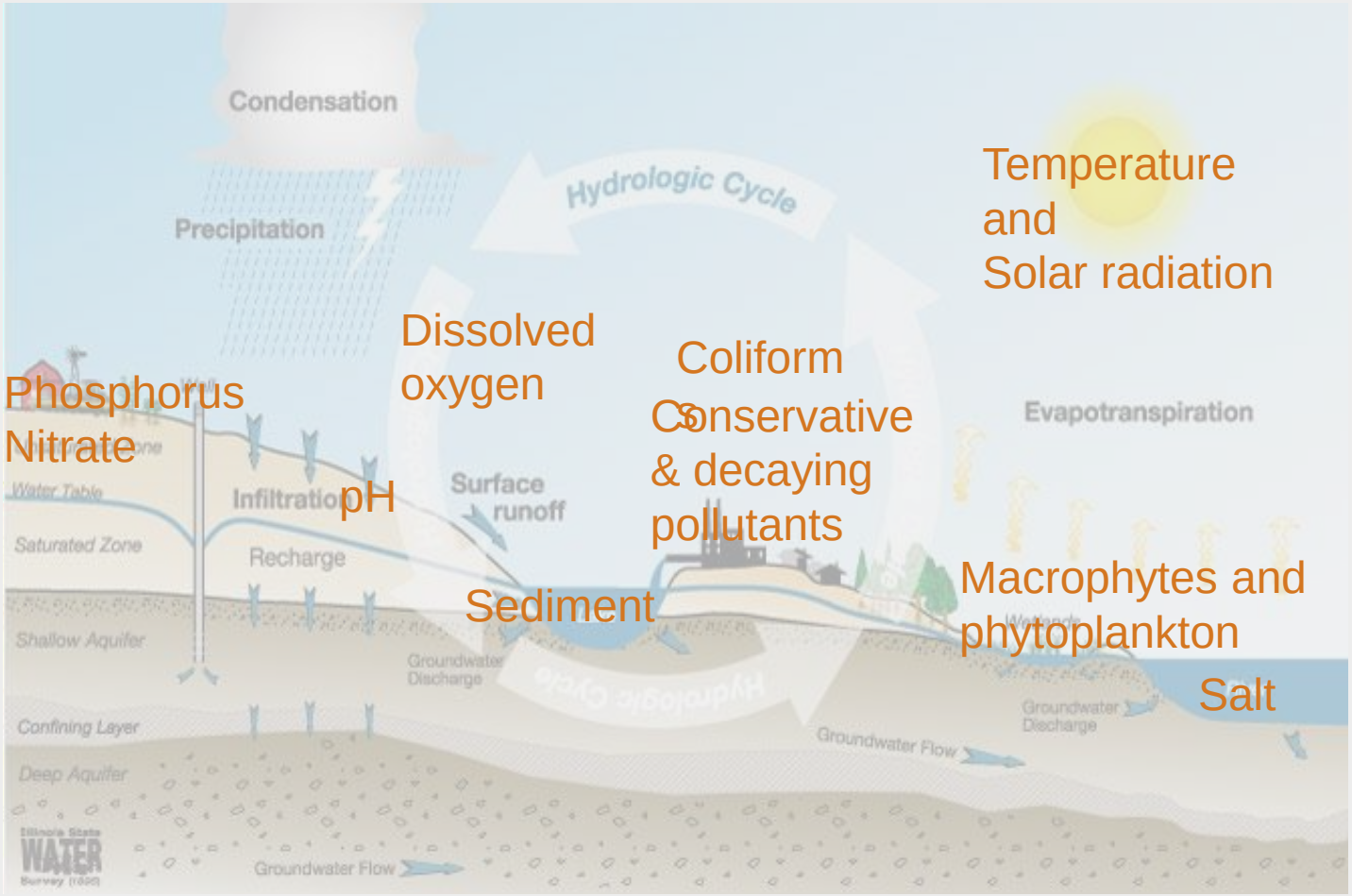


Water Quality processes

Water flow and

Water quality

→ New layer of complexity



The cycles involving water quality processes

These are key to making the Earth capable of sustaining life

- Water cycle – Already covered by hydrological/hydraulic modelling
- Carbon cycle
- Nitrogen cycle

Water quality processes

The carbon cycle

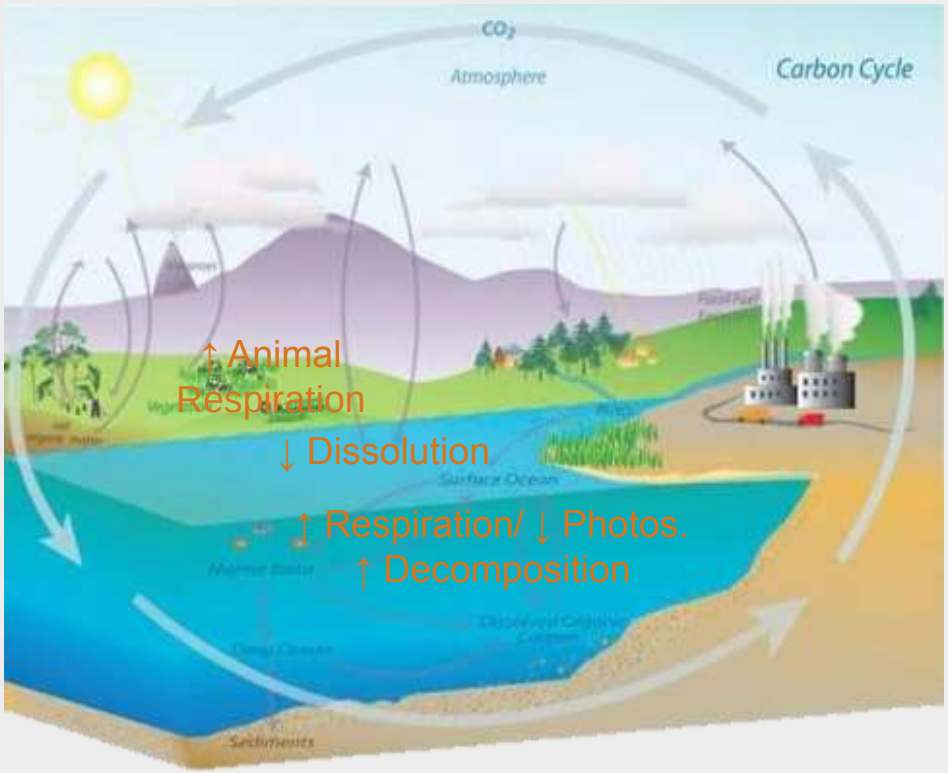
Biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere, and atmosphere

↑Plant Respiration

↓Photosynthesis

↑ Decomposition

↓ Sedimentation



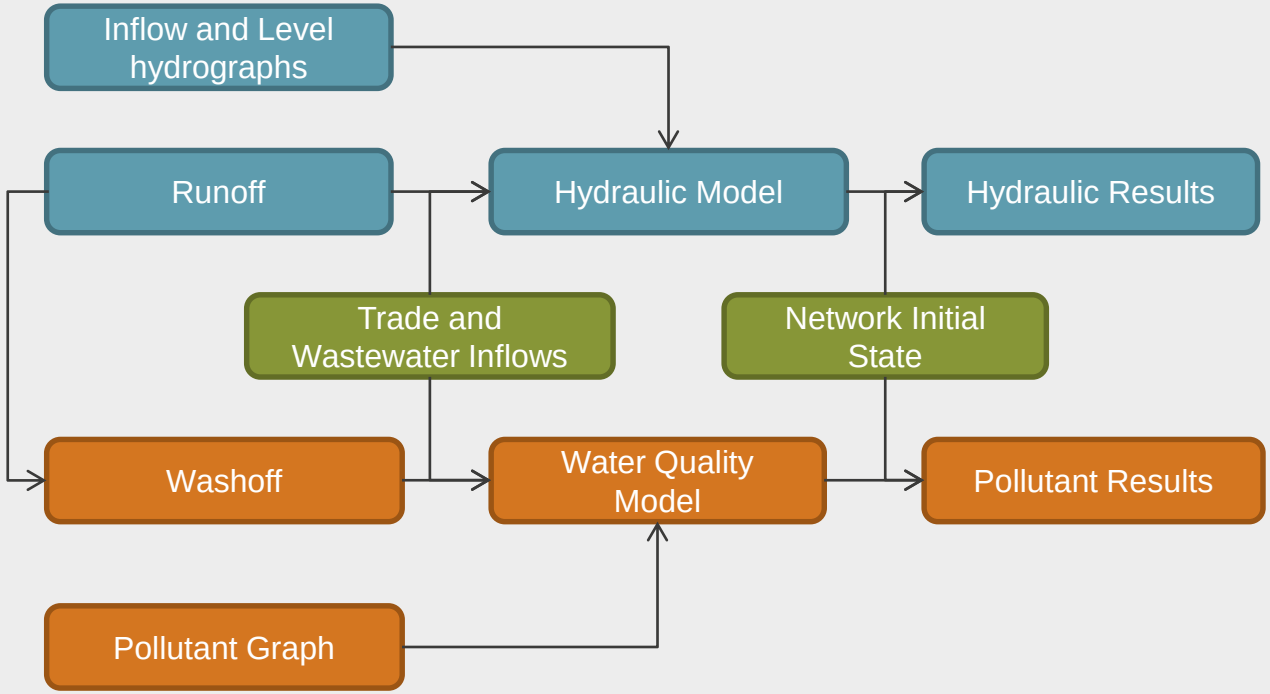
↑ Combustion

Source: NOAA

ICM Water Quality theory

Water quality in ICM

Water quality calculations take place after the hydraulic calculations for each timestep. Some output from the hydraulic model is fed in as input to the water quality model.



ICM Water Quality theory - Determinants

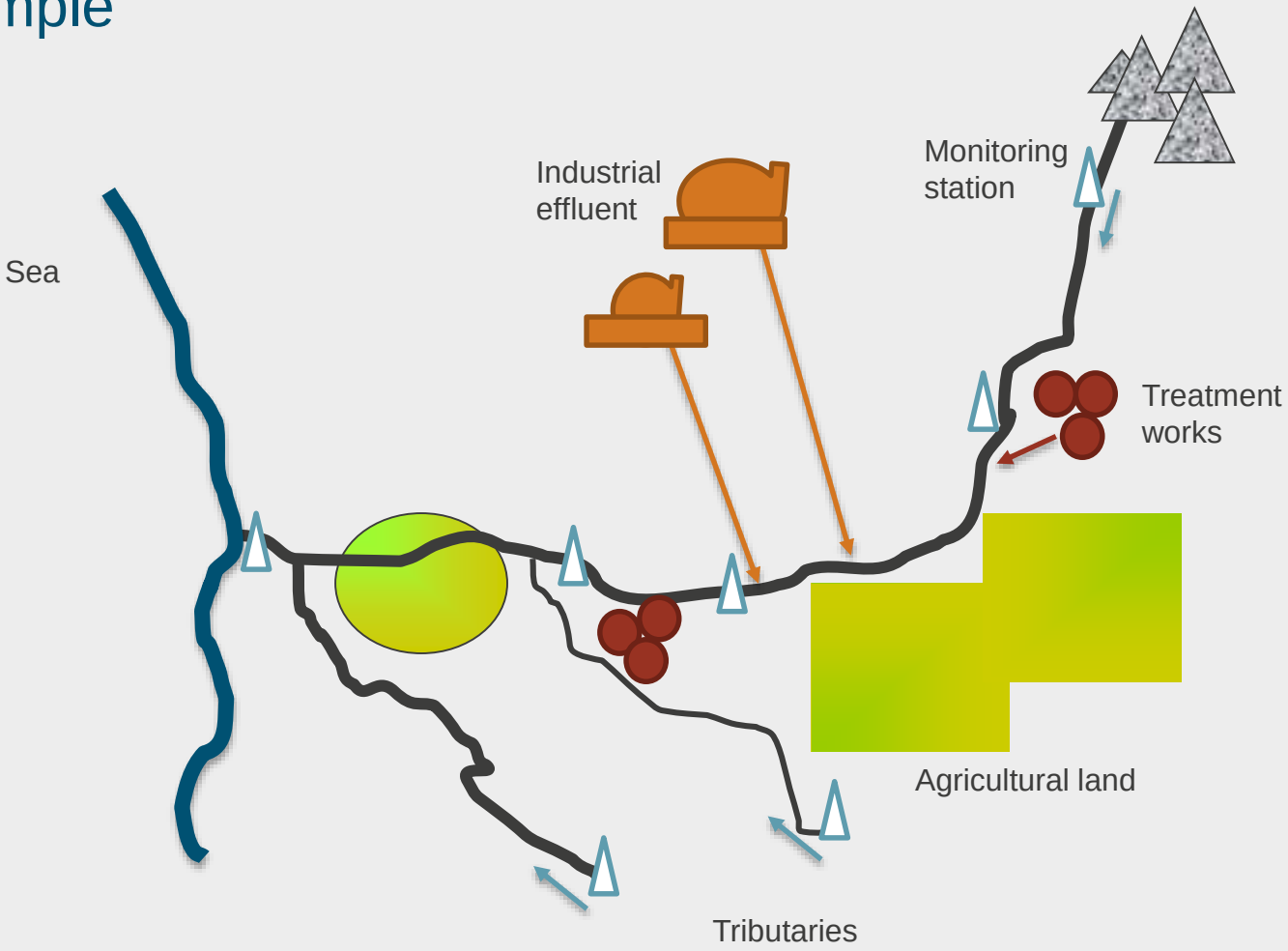
Determinants

InfoWorks ICM is capable of modelling a range of water quality variables and processes simultaneously. These include:

- Conservative determinants
- Decaying determinants
- Salt
- Temperature
- Algae
- Macrophytes
- BOD, COD
- TKN, NH4, NO3, NO2
- Dissolved oxygen
- Sediment fractions
- Hydrogen sulphide
- Coliforms
- pH
- Silicate
- Phosphorus

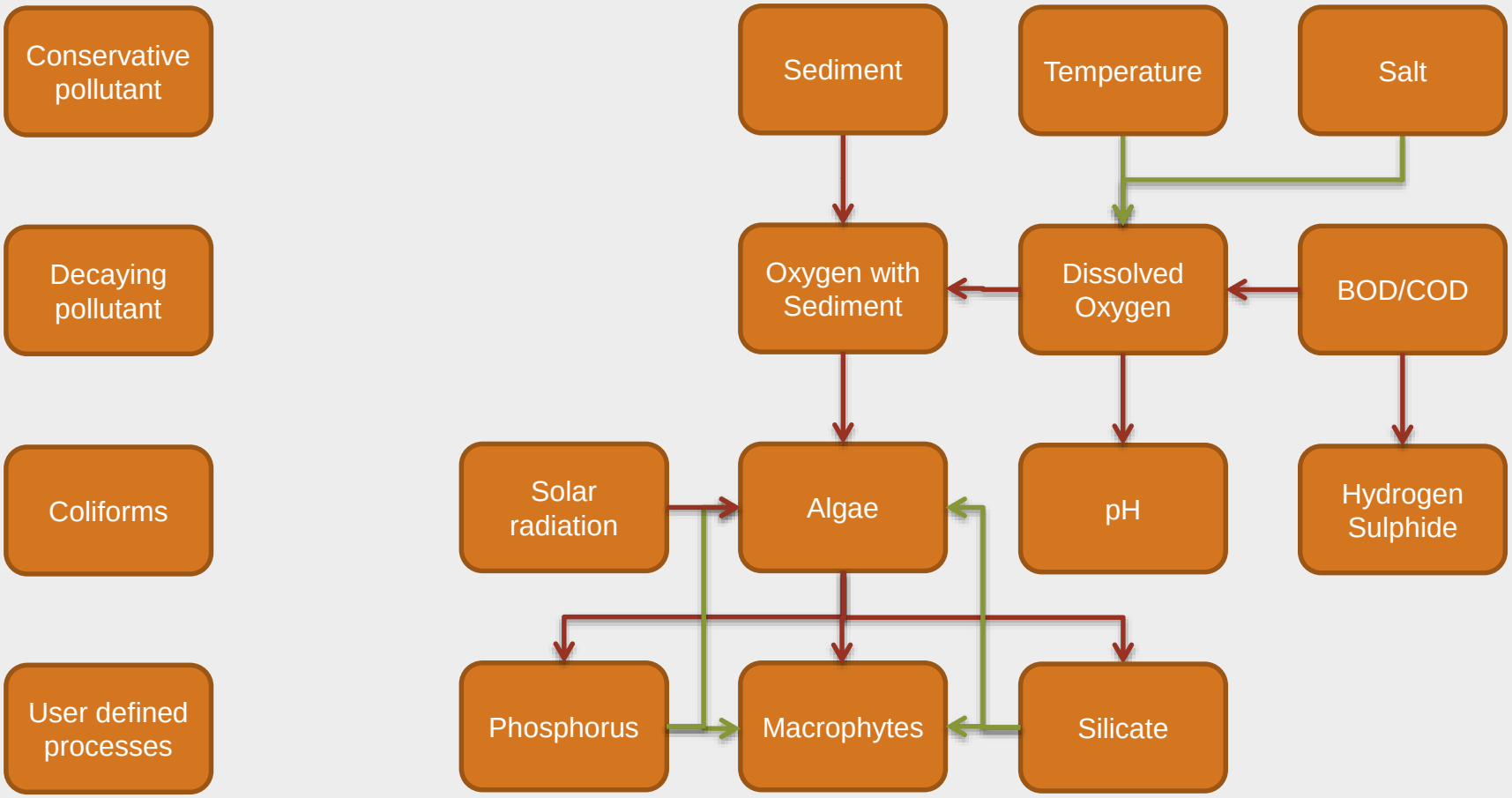
ICM Water Quality theory - Input data

An example



ICM Water Quality theory - Processes

Water quality processes



Delivering solutions to problems in civil engineering and environmental hydraulics