Western Water Centre

RESEARCH THEME

- Groundwater
  - >$20M in external funding
  - Current HQP: 25 graduate students & PDFs
  - 5 state-of-the-art laboratories
2. Groundwater

FOCUS
- Fate and transport of contaminants
- Novel site characterization techniques
- Innovative remediation technologies
- Waste reduction/conversion to energy

OVERVIEW
- 25 postdocs and graduate students
- >$20M in external funding
- 15+ industrial partners
- 25+ international academic collaborators
- 5 state-of-the-art laboratories
- Advanced computer modelling capabilities
- Field equipment for characterization/monitoring
2. Groundwater

Fate and Transport of Contaminants

FIELD ANALYSIS: GROUNDWATER, SOIL, SURFACE WATER

- Metals
- Emerging contaminants
- NAPLs
- Nutrients

![Sulfate (mg/L)](image1)

![Arsenic (µg/L)](image2)
2. Groundwater

Fate and Transport of Contaminants

ADVANCED NUMERICAL MODELING CAPABILITIES

Multi-phase flow

Reactive transport
2. Groundwater

Novel Site Characterization Techniques

GEOPHYSICAL TECHNIQUES

- Electrical resistivity tomography
- Electromagnetic induction
- Induced polarization; ground penetrating radar
2. Groundwater

Novel Site Characterization Tech

APPLICATIONS OF GEOELECTRICAL IMAGING

- Monitoring of NAPL migration
- Site remediation monitoring
- Mine waste: composition and cover integrity

NAPL migration

NAPL Remediation

Waste Cover Defects
2. Groundwater

Novel Remediation Technologies

- Bioremediation
- Dual-phase recovery
- *In situ* chemical oxidation
- Electrokinetics
- Nanoparticles
- *In situ* thermal
- Smouldering destruction (STAR)
EXAMPLE: FIELD TRIAL OF ELECTROKINETICS TO ACHIEVE BIOREMEDIATION IN CLAY

- Chlorinated solvent contamination in clay
- EK to deliver lactate to stimulate bioremediation
- Extensive analysis of soil and gw including qPCR and metagenomic sequencing
2. Groundwater

Novel Remediation Technologies

EXAMPLE: NANOPARTICLE TECHNOLOGY

- Several successful field trials
- Destruction of groundwater pollutants in short- and long-term

Iron Nanoparticle

≤50 nm→
2. Groundwater

Novel Remediation Technologies

EXAMPLE: SMOULDERING DESTRUCTION (STAR) OF CONTAMINATED SOIL

- Novel site treatment
- Highly destructive for organic pollutants
- Developed from concept to full scale in situ and ex situ applications
2. Groundwater
Waste Reduction/Conversion to Energy

EXAMPLE: STAR TREATMENT OF ORGANIC WASTES

- Destruction of organic wastes using minimal energy
- WWTP biosolids, pulp and paper waste, faeces, agricultural waste
- Recover excess energy, recover metals and nutrients, treat emissions