The Hyporheic Network: Record of workshop discussions, 11-12 July 2007

Workshop number: Day 1, Group 4
Workshop leader: Jonathan Smith, EA / Sheffield Uni

Workshop goal:
"Identify what science new and/or emerging legislation and policies require from the research community. Identify the main drivers for environmental management and enhancement, and consider what science is needed to deliver them, but which does not currently exist.
Outcomes:

- **Identify the main legislation / policy drivers for understanding GW-SW interactions**
- **Consider what science is needed to implement them**
- **Prioritise a list of knowledge requirements on GW-SW and HZ processes."**

Identification of key legislative drivers:

- EU Water Framework Directive
  - Integrated catchment management; GW-SW interactions
  - Emphasis towards regional (waterbody) scale (diffuse?) pollution management
  - Need to be able to design optimal Programmes of Measures (PoM) to restore poor status water bodies.

- Part IIa, EPA 1990
  - Contaminant land regime
  - CL requires 'significant risk of significant harm'
  - HZ ecology an ecological receptor?

- EU Habitats Directive
  - Protection of designated habitats and species
  - Hypogean crustacean in candidate UK Biodiversity Action Plan list

- River restoration and flood risk management
  - Are we considering all the ecological functions in our assessment / design processes?

Possible constraints:
- Nobody 'owns' the HZ
- Lack of knowledge / perception
  - Definition of the HZ
  - Processes
  - Which ecological services are we interested in?

Key science needs from environmental management community:

- Does HZ impact pollutant fate and NA?
  - Controls on HZ flux
  - How important and how heterogeneous is HZ NA?
  - Spatial and temporal variability – is it reliable is a risk management strategy?

- What is the ecology and habitat value of the HZ?
  - What ecological functions does the HZ offer?
  - What is the value of those functions and services?
  - What flow / chemical / physical conditions do they require?
  - How significantly does the HZ contribute to river biodiversity?

- What are the controls on water exchange across the GW-SW interface?
  - Sedimentary / geomorphological controls on water exchange between GW and SW
  - How variable in space and time?
  - Implications for GW abstraction impact on river flow and ecology?

- Can HZ biogeochemical processes contribute to pollutant risk management?
  - Quantify the contribution of natural HZs on basin-scale pollutant fluxes
  - Can we enhance these processes in some rivers?
  - Could be install an artificial HZ (riverbank and/or horizontal PRBs)?

- How can we monitor the system to generate reliable data?
  - Flux
    - Of water
    - Of solutes
    - Of energy
    - Of temperature

  - Natural attenuation
    - High resolution sampling
    - Dynamic system
    - Demonstrate which NA processes are effective under what conditions
    - Residence times / kinetics

- Biomonitoring
  - Are HZ animals more responsive / sensitive to GW-borne pollution – sensitive biomarker?
  - Standard sampling techniques needed?

- Technologies
  - For all of the above

Rationalising the system

We need to be able to understand:
1. What can be simplified?
2. Which are robust system descriptors
3. Which parameters we can rely of generic parameters