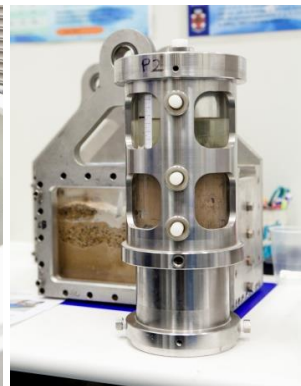
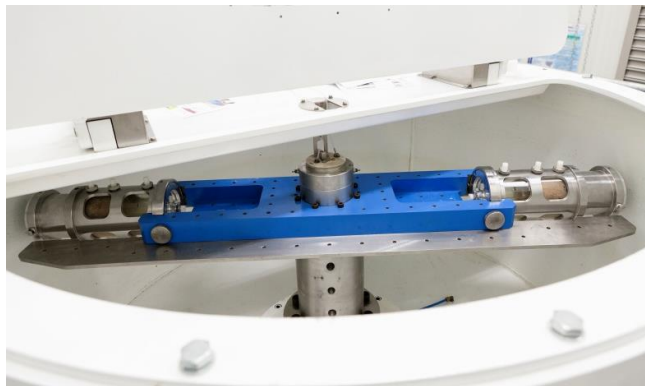




The Water Research Laboratory centrifuge permeameter facility constructed for the National Centre for Groundwater Research and Training (NCGRT) is one of only two of its type in the world for hydraulic characterisation of aquitards including clayey sediments and rock drill core. The Broadbent G-18 geotechnical centrifuge (2 m diameter), commissioned in March 2011, includes a permeameter module (~500 g-max) and strong box module for physical modelling. An Allegra X-15R centrifuge with two specialist rotors (~11000 g-max) was commissioned in December 2011 for fluid-solid separations. The facility is available to researchers and provides services to industry.

The centrifuge enables measurement of the hydraulic properties of aquitards. A multi-scaled approach of field and laboratory centrifuge testing, combined with numerical modelling is essential to fully characterise complex aquitard systems. Using the centrifuge, WRL can determine in-situ hydraulic storage and diffusivity of aquitards, quantify fluxes of water and contaminants through aquitards, and identify the significance of leakage pathways such as corroded bores.

The centrifuge provides opportunities for leading edge research focused on fluid flow processes over spatial and time scales that are not otherwise possible, simulating flow over thousands of years within a reasonable experimental time frame of weeks or months. Importantly, in-situ stresses can be applied. Pore pressures and core effluent can be analysed while the centrifuge is in operation. Advanced data acquisition systems (DAS) designed by UWA COFS and sensors that operate 'in-flight' provide continuous measurements in real-time and at in-situ stress conditions.



Centrifuge Applications

- Repeatable testing of recharge rates and permeability for a variety of sandy and clayey soils
- Physical models of long term performance of natural and engineered seepage barriers
- Measurement of contaminant retardation at in-situ stress conditions and liquid:solid ratios
- Efficient pore water extraction for estuarine muds and contaminated sediments
- Rapid measurement of soil-water-characteristic-curves for unsaturated sediments
- Interactions of contaminants that are geochemically reactive or subject to radioactive decay such as landfills, hazardous waste disposal, tailings containment and uranium mining

Centrifuge Specifications

Broadbent GMT GT 18/0.7 F:

- Speed 10 to 875 RPM, 18 g-tonne, 0.7 m radius
- Hydraulic rotary union 2x port 10 bar g
- Fibre optic rotary union

Permeameter Module:

- Effective radius 0.4 to 0.6 m
- Acceleration 514 g max, 428 g mean
- Diameter 100 mm max
- Length 200 mm max

- Payload volume 1.6 Litres
- Collection reservoir 1.0 Litre

Beam Module:

- Speed 10 to 638 RPM
- Acceleration 300 g max
- Effective radius 0.66 m
- Payload volume 5.4 Litres
- Payload size 100 x 300 mm, 180 mm high