

## The vertical permeability of the Leederville Formation and South Perth Shale – New insights from centrifuge testing in Perth, WA.

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More than half of Perth's potable water supply is derived from groundwater with as much as 20% being sourced from the Leederville aquifer, part of the Gnangara groundwater system, which supports groundwater dependent ecosystems and associated ecological, social and cultural value. Management of these resources by the West Australian Department of Water (DOW) is facilitated with several tools including the Perth Regional Aquifer Modelling System (PRAMS); a modelling tool developed within the MODFLOW software framework. In their model calibration report for PRAMS CyMod Systems (2009) draw attention to a lack of direct measurement of vertical leakage and vertical aquifer properties in the Leederville aquifer and its adjacent aquitards. It suggests additional quantification and spatial mapping to improve model calibration for more accurate predictions of impacts of groundwater abstraction. DOW are now undertaking a groundwater management study, the Perth Confined Aquifer Capacity study, to better examine the impacts of continued groundwater use from the Leederville and Yarragadee aquifers. This paper documents the results of recent vertical hydraulic conductivity testing on thirteen drill core samples recovered from the South Perth Shale and the Leederville Formation (comprised of the Pinjar, Wanneroo and Mariginiup members). The core samples were tested at UNSW Australia's Geotechnical Centrifuge Laboratory using established centrifuge techniques that have been adapted by the Water Research Laboratory (WRL). WRL's new test method relies upon a combination of constant and falling head centrifuge measurements at accelerated gravity (up to 500G) to provide reliable estimates of the in-situ core scale vertical and horizontal hydraulic conductivity. The technique can provide accurate data in short-time frames (0.5 to 5.0 days) for regular and irregularly shaped samples with hydraulic conductivities in the range of 0.1 m/d to 3E-07 m/d. This new vertical hydraulic conductivity data-set has only just been made available. The benefits of the data-set for the management and modelling of mining and water resource projects will be discussed.