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Subtheme 3.3.2 – New groundwater technologies and approaches
This session focuses on the state-of-the-art technologies and approaches that are employed to understand, conceptualise, predict, model, measure and manage groundwater across a large range of spatial and temporal scales.

The importance of measuring flows in long-screened or open wells

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Abstract

Effective groundwater management depends on understanding heterogeneity at a relevant scale both vertically and spatially in an aquifer system. Studies usually rely on data from wells, which are expensive to install, so use of available infrastructure is the economical approach. Despite potential complications, long-screened or open wells can provide valuable data and insight, if used correctly. Quantifying the in-well flow regime is essential. In un-pumped conditions, a flow profile shows the producing and receiving zones of vertical flow, the relative vertical head gradient in the aquifer system, and potential bias in water chemistry samples. A flow profile while pumping can be used to quantify aquifer heterogeneity and the sampled water mixture. This presentation describes a new tracer dilution method to determine the pumped flow regime in a well that can be used instead of, or complementary to, a wireline borehole flowmeter. A steady-state EC tracer dilution profile is established under constant injection and pumping. A 1D solution of the advection-dispersion equation for solute transport is fitted to the data by visually identifying producing zones and assigning a fraction of yield to each zone. This test is distinct from transient "moving front" tracer dilution methods because there is no concern about the rate of fluid column wash-out, the analysis is independent of time and the effect of dispersion is minimised. Like the borehole flowmeter, the method is particularly suited to high yield long-screened wells, where other methods such as packers or liners are not effective.

David has a B.Env.Sc majoring in Hydrogeology (1st Class Hons) from Flinders University and he has worked as a hydrogeologist in industry and government since graduating in 2003. He is currently working on a PhD as part of a collaborative study between the NCGRT, Flinders University and mining industry partner Rio Tinto based in the Pilbara region of Western Australia. Groundwater recharge, flow and residence time in this complex geological setting are being examined. The work aims to contribute some broadly relevant science while helping to inform environmental impact assessment and future mine decommissioning in the Pilbara.