

AQUIFER DELINEATION WITH THE TEMPEST FIXED-WING AEM SYSTEM IN THE PERTH BASIN

Adam Smiarowski, CGG; Sheryl Ryan; David Schafer

In order to image hydrogeology relevant to groundwater resources important to the public water supply in Perth, Australia, the Western Australia Department of Water and Environmental Regulation (DWER) utilized the Tempest system in a survey over the North Gnangara Mound, Perth Basin in 2013. In 2017, DWER extended the survey to target the Leederville-Parmelia aquifer, by flying an adjacent area covering the Dandaragan Plateau just north of the 2013 survey, using an updated Tempest system. In total over 10 000 line kilometres have been flown covering a combined area of over 6000 km². Borehole resistivity, lithological logs and groundwater chemistry from over 300 bores was used to help interpret and constrain the inversion of the acquired AEM data. Recharge zones, regional throughflow directions, faults that act as flow barriers, groundwater discharge zones, and the extent of regionally important aquitards have been able to be inferred and mapped. Estimates of the minimum thicknesses of fresh groundwater (< 500mg/L and < 1000 mg/L TDS) have been made for the Superficial and Leederville-Parmelia aquifers. The surveys have helped clarify hypotheses about faults that act as flow barriers and regional flow directions that are important for groundwater allocation planning.

In this paper we present the results of both surveys and key hydrogeological outcomes. We compare the AEM data from to borehole lithology and resistivity and provide a comparison of the two AEM surveys. Finally we discuss recent system development (including changes to receiver sampling and bandwidth, sharper transmitter waveform turn-off and monitoring of system geometry), and outline how data quality is improved, leading to better hydrogeological interpretation.