HIGH RESOLUTION SEISMIC REFLECTION AND RADAR FOR HYDROGEOLOGY: THE GNANGARA MOUND, PERTH BASIN, WESTERN AUSTRALIA

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Curtin University Department of Exploration Geophysics in collaboration with Water Corporation of Western Australia have undertaken a comprehensive geophysical program with the overall objective of resolving hydraulic properties and boundaries below the Gnangara mound. Initial results have been highly encouraging. Radar transects, more than 15 km in length, reveal up to three shallow potentially "water retentive" layers above the regional water table for the superficial aquifer. Both shallow sedimentation such as buried dunes and post deposition layering can be readily interpreted over large areas from the radar data. Interpretation of the radar data is assisting in developing a large scale infiltration distribution models for the Gnangara Mound. The high resolution seismic reflection surveys aim to resolve hydrostratigraphy from surface to 1500m depth. Of particular interest is large scale hydraulic separation between Perth's major aquifers, which include the Superficial, Leederville and Yarragadee. Previous seismic surveys in this area produced low-resolution discontinuous events that could not be used for such purposes. Recently we acquired high-resolution seismic profiles using our telemetric system and a high-power impact source. High CMP fold combined with careful target oriented data processing produced quality images. These enable interpretation of up to 20 layers including several unconformities in the top 1500m. Further advance in acquisition, particularly application of high-power, high-frequency seismic sources and data processing are hoped to enable routine application of reflection seismic methods in hydrogeology. Current results demonstrate significant advances have been achieved with respect to the past trials even at these early stages of the Gnangara Mound research program. Results from the seismic reflection and radar surveys will feed into the PRAMS hydraulic flow model for the Perth Basin.