

## THE 'EXPLORING FOR THE FUTURE' GROUNDWATER PROGRAMME: A MULTI-PHYSICS, INTER-DISCIPLINARY SYSTEMS APPROACH FOR DE-RISKING INVESTMENT IN AGRICULTURE IN NORTHERN AUSTRALIA

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The Australian Government has recently provided Aus\$100.5M to Geoscience Australia over 4 years (2016-2020) to manage the Exploring for the Future (EFTF) programme designed to increase investment in minerals, energy and groundwater resources, primarily in Northern Australia. The programme includes Aus\$30.8M for groundwater-specific investigations, recognizing that there are major gaps in our knowledge of Northern Australia's groundwater systems and resources. The groundwater component of the EFTF programme is focused on addressing these knowledge gaps, with the aim of underpinning future opportunities for irrigated agriculture, mineral and energy development, and community water supply. The groundwater programme will include identification and assessment of potential groundwater resources and water banking options in priority regional areas, while also analyzing the salinity risk (including seawater intrusion).

To rapidly map, characterise and assess regional groundwater systems and resources in the data-poor 'frontier' areas of Northern Australia, a multi-physics, inter-disciplinary approach has been developed. The programme involves the initial use of temporal remote sensing 'data cube' technologies for surface hydrology and landscape mapping, and acquisition of airborne electromagnetic (AEM) and Ground Magnetic Resonance (GMR) datasets. This provides a framework for targeted investigations including passive seismic, microgravity and GPR; borehole geophysics (Induction, gamma and Nuclear Magnetic Resonance (NMR)); drilling and pump testing; hydrochemistry and geochronology (water, landscapes and geology); as well as soils, regolith and basin/bedrock geological, hydrogeological and structural mapping and modelling.

This methodology has enabled rapid identification and assessment of potential groundwater resources, salinity and seawater intrusion hazards, and groundwater dependent ecosystems in several priority regions.