GEOLOGICALLY-CONSTRAINED INTERPRETATION OF AIRBORNE ELECTROMAGNETIC DATA FOR DEFINITION OF PROSPECTIVE GROUNDWATER RESOURCES, ALBANY HINTERLAND, WESTERN AUSTRALIA.

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A TEMPEST airborne electromagnetic survey was flown in the Albany Hinterland with the objective of determining likely palaeochannel locations for future groundwater exploration. The basement in the survey area is the Proterozoic Nornalup Complex, which is overlain by Tertiary-Eocene sediments, including the Werillup Formation and Pallinup Siltstone. These units are overlain by Quaternary sediments of thickness 10 – 70 m. The maximum thickness of cover materials overlying basement is ~100 m. The main aquifers in the area are Werillup Formation sands within palaeochannels incised into the basement.

The conductivity derived from the TEMPEST data shows a layer of moderate electrical conductivity (50 – 150+ mS/m), which correlates well with clayey units within the Werillup Formation, and possibly also the weathered upper part of the Proterozoic bedrock. Bedrock conductivities are typically low (average ~1.2 mS/m). The strong electrical contrast between the Werillup Formation and the bedrock allowed depth to Proterozoic basement to be interpreted from the TEMPEST data. This was done by conventional unconstrained layered-earth inversion followed by manual interpretation of the depth to bedrock on each survey line. The interpreted bedrock depths were used to construct a triangulated surface representing base of cover. Geologically-constrained inversion of the TEMPEST data was then undertaken to refine the preliminary depth to basement model. Geological constraints on the model were provided by drillhole basement pierce points and outcrop. A large number of drillholes which did not reach bedrock were also used. The inversion was constrained to place the final bedrock surface below the ends of these drillholes.

The geologically-constrained inversion and subsequent synthesised interpretation identified a number of bedrock lows which have been confirmed by drilling to correspond to palaeochannels, and has defined four main groundwater resource areas. The results of the interpretation have formed the framework for the Albany Hinterland Prospective Groundwater map (Ryan et al., 2016).