



Groundwater investigations and modelling Investigations Team.

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The groundwater investigation consists of a number of components designed to achieve an understanding of the geological structure and the distribution and relationship of aquifers, and to quantify both groundwater and surface flows in order to model the effects of various groundwater abstraction scenarios.

Geophysical surveys have been undertaken to map the geological formations and their structure. An aerial magnetic survey was carried out to map the distribution of Bunbury Basalt. Some new gravity measurements were made and analysed together with existing measurements in conjunction with seismic profiles to determine the geological structure and positions of faults. Ground electro-magnetic traverses were made to distinguish between Leederville Formation and Yarragadee Formation at a shallow depth.

Investigation drilling has been carried out at 47 sites, with up to three bores at each site, to a maximum depth of 400m, drilled either by air-core or mud rotary methods. The drilling sites are mostly in State forest on the Blackwood Plateau. Strata samples from the bores are described and in conjunction with down hole geophysical logging, the geological formations can be defined. The bores are cased with narrow diameter casing to allow water samples to be obtained, and water levels to be measured on an ongoing basis.

To determine recharge to the groundwater systems, six cored boreholes were drilled and the cores analysed for moisture and chloride content. The depth profiles then allow an estimate of groundwater recharge to be made, by comparing the chloride in the ground with the chloride falling from rainfall. New rainfall stations to measure the chloride content of rainfall have been set up. Another method of estimating groundwater recharge has been to use a numerical model over the area, which takes the rainfall, then calculates the loss of water through surface runoff and evapotranspiration.

The Blackwood River is a key component of the water balance, as it receives groundwater discharge from the Yarragadee Aquifer, maintaining a fresh summer flow for part of its length. Flow and salinity measurements along the river in late summer have defined the area over which groundwater discharges into the river, and allowed estimation of the monthly discharge. The investigation drilling determined that Rosa Brook is a source of recharge to the South West Yarragadee Aquifer, and so flow measurements have been commenced on the brook to determine how much flow seeps down to the groundwater table. A surface water numerical model is being used to predict flows in Rosa Brook, using the gauging information from St Johns Brook. The water balance of the Lake Jasper including the surface water and groundwater interaction has also been assessed.

All the information from these studies is being used in the construction of a numerical groundwater flow model, which reproduces the geological formations as layers of different hydraulic properties. The model is able to simulate and quantify the movement of groundwater through and between the aquifers, and then to estimate the effects of various pumping scenarios on water levels.

Further information on groundwater investigations is presented in 11 FactSheets that are available on the project web site - www.wrc.wa.gov.au/whicher.