ANGAS BREMER MODEL 2010

Purpose

The scope of work, as described in Aquaterra (2010), comprised of developing an impact assessment (moderate to high complexity) 3D multi-layered numerical model for the Angas-Bremer and Currency Creek region, to simulate groundwater flow and solute (salt) transport movement. The model was used as a predictive tool for evaluating current and future groundwater management options for the region, particularly relating to the salinity impacts of groundwater use (which threatens the long term viability of the substantial irrigation industry), and various management options, notably Aquifer Storage and Recovery (ASR) initiatives.

Background

From Aquaterra (2010), salinity monitoring has shown consistent increases in salinity of up to 50 mg/L/year since 1999, which has lead to a dramatic reduction in the area of groundwater with salinities below 1500 mg/L in both the Angas-Bremer Prescribed Wells Area (Zulfic and Barnett, 2007) and the Currency Limestone Groundwater Management Area (Barnett, 2007). In the Currency Creek GMA, it is thought that downward leakage from the overlying high salinity Quaternary aquifer appears to be the dominant cause of salinity increase, partly because the rate of rise seems to be dependent on the magnitude of drawdown due to pumping (although there is uncertainty due to a lack of metering in the area). In the Angas-Bremer PWA, it is suspected that the lens of fresh groundwater in the confined aquifer that is subject to concentrated pumping, may have been principally established between 5000 and 8000 years ago during a much wetter climate. This groundwater modelling project has the goal of developing a robust predictive scientific tool to:

- verify the hydrogeological processes proposed by Zulfic and Barnett (2007)
- determine the viability of large scale ASR and evaluate groundwater management options for use to inform the community
- assist the development of sustainable water policy settings.

Location

The model was developed for the location of the Angas Bremer and Currency Creek area, as shown in Figure 1.

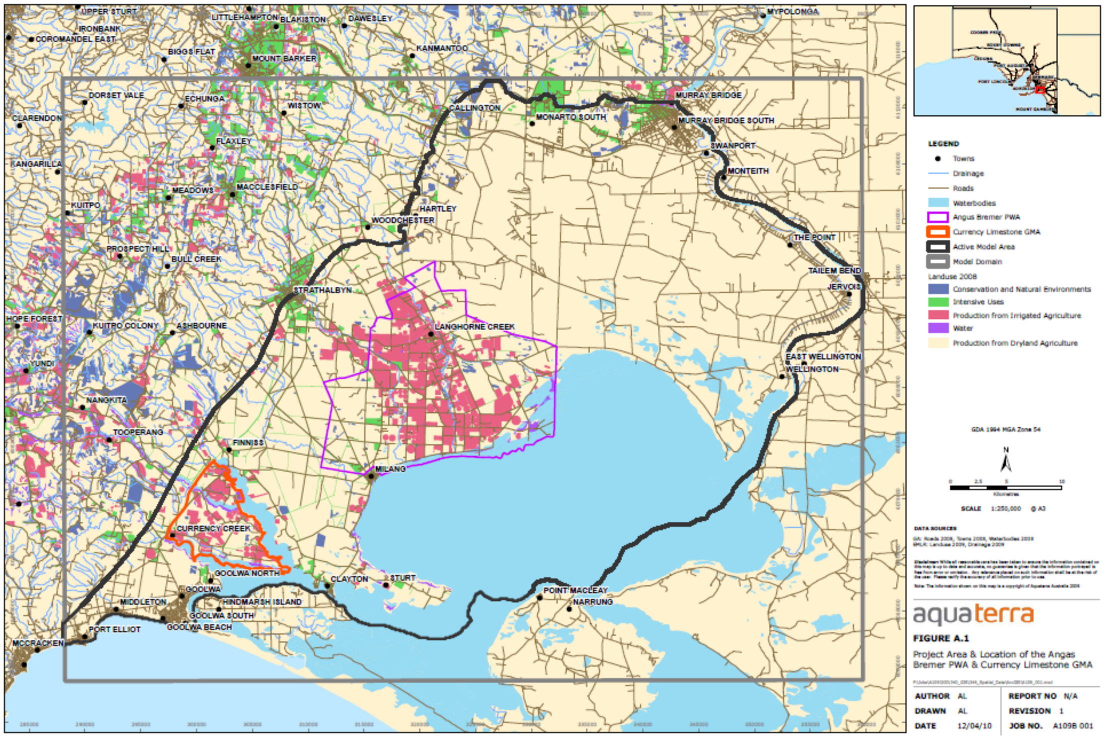

Figure 1. Model domain

Model structure

Visual MODFLOW Version 4.1 (Waterloo Hydrogeologic Inc) was selected for this modelling as the pre- and post-processor for quick generation and analysis of data files for MODFLOW and MT3D.

Model domain and grid size

The model domain covers an approximate area of 72 km (east-west) by 54 km (north-south). As shown in Figure 1, the bounding coordinates of the model domain are (south-west) 288200E, 6061700N and (north-east) 359600E, 6115600N (GDA 1994, MGA Zone 54).

The rectangular model grid was divided into 717 columns and 539 rows with a regular model cell size of 100 x 100 m over the entire domain, resulting in a total of 1 545 852 finite difference cells over the four model layers.

Model layers

The model was constructed as four layers model as shown Table 1 below and details of model layer and hydrogeological conceptual model shown in Figure 2.

Table 1. Model layers

Layer	Hydrogeological unit	Aquifer/Aquitard	MODFLOW layer
1	Quaternary Sediments	Aquifer	Type-1
2	Murray Group Limestone	Aquifer	Type-3
3	Renmark Group	Aquifer	Type-3
4	Kanmantoo Formation and Permian Sands	Aquifer	Type-3

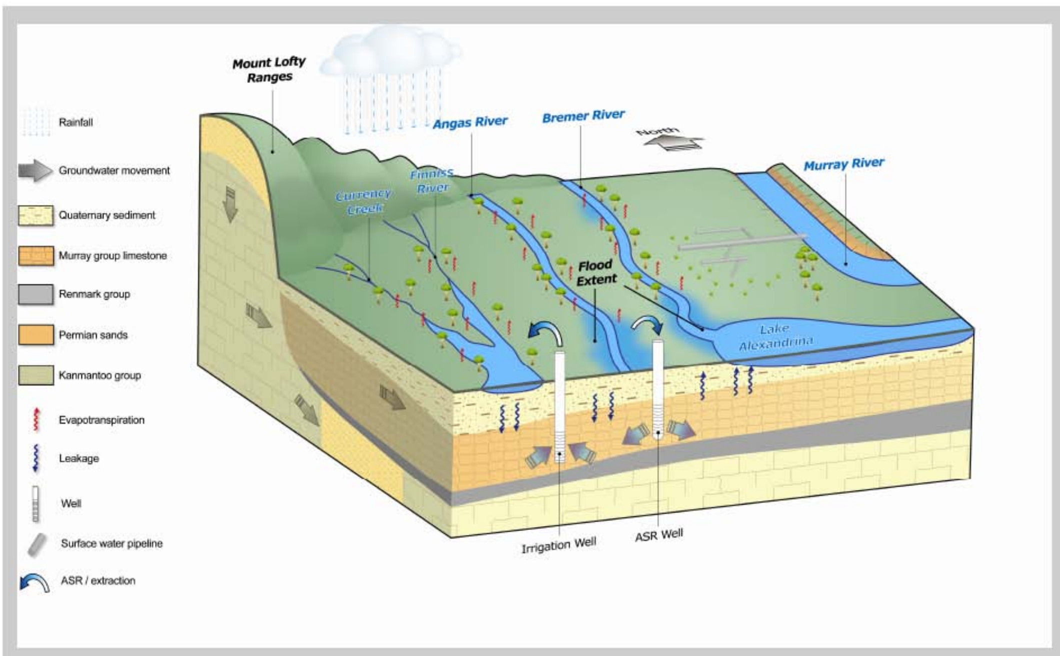

Figure 2. Cross-section and hydrogeological conceptual model

Report

Aquaterra, 2010, *Angas-Bremer and Currency Creek Flow and Solute Transport Model- AB2010*, prepared for the Department for Water