MALLEE MODEL 2006

Purpose

As described in Barnett and Osei-bonsu (2006), the Mallee model is developed as a management tool to:

- predict the changes in regional groundwater levels and any salinity changes due to various pumping scenarios

- estimate the maximum local drawdown at the end of pumping seasons

- calculate the water balance and groundwater flows between aquifers

- predict the impacts of various management strategies (changes to management zone boundaries, conversion to volumetric allocations).

Background

Barnett (1990) constructed a five-layer finite element groundwater flow model, covering the whole of the Mallee region of both SA and Victoria. It was used to predict the groundwater level changes caused by increased recharge rates due to the clearing of native vegetation, and assessed the impacts on the salinity of the River Murray.

An improved model was constructed using the Visual MODFLOW package (Barnett and Yan, 2000). Improvements include incorporation of inter-aquifer leakage, a more accurate representation of the top surfaces of the various layers and a finer grid size averaging 500 m × 500 m.

The most recent model was developed by Barnett and Osei-bonsu (2006) using the Groundwater Modelling System (GMS) package. This model covers a larger area to include the expansion of the Mallee Prescribed Wells Area (PWA) and the whole Murrayville Water Supply Protection Area (WSPA).

The model developed by Barnett and Osei-bonsu (2006) has been translated from the GMS package to the Groundwater Vistas (GV) and Visual MODFLOW (VM) package.

The model covers the period between 1980 and 2030. Modelling of predictive scenarios begins in 2004-05 irrigation season.

Location

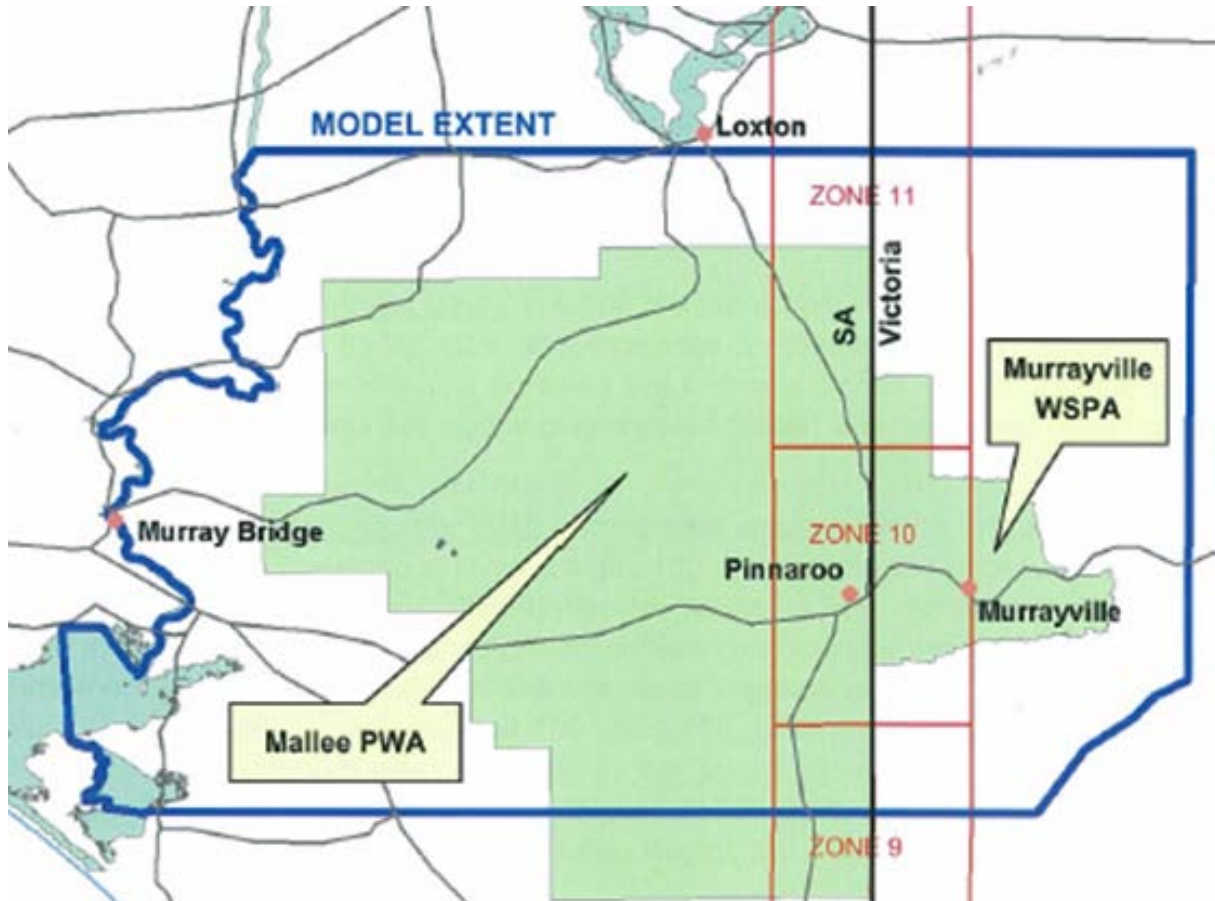The location of the model domain is shown in Figure 1.

Figure 1. **Mallee model domain**

Model structure

Model domain and grid size

The model encompasses an area of approximately 23600 km^2 and extends 200 km (east to west) by 114 km (north to south). The bounding coordinates are 334519E, 6054148N (south-west) and 560206E, 6184809N (north-east) (GDA 1994, MGA Zone 54).

There are 212 rows and 284 columns in each model layer. The model has a grid size of 430 m × 430 m at the centre, increasing to 1800 m × 1200 m at the edges of the model. There are a total of 301 040 cells, 245 710 of which are active.

Model layers

The regional aquifer system is conceptualised as five layers, including three aquifer layers and one aquitard layer (Table 1 and Figure 2).

Table 1.   Model layers

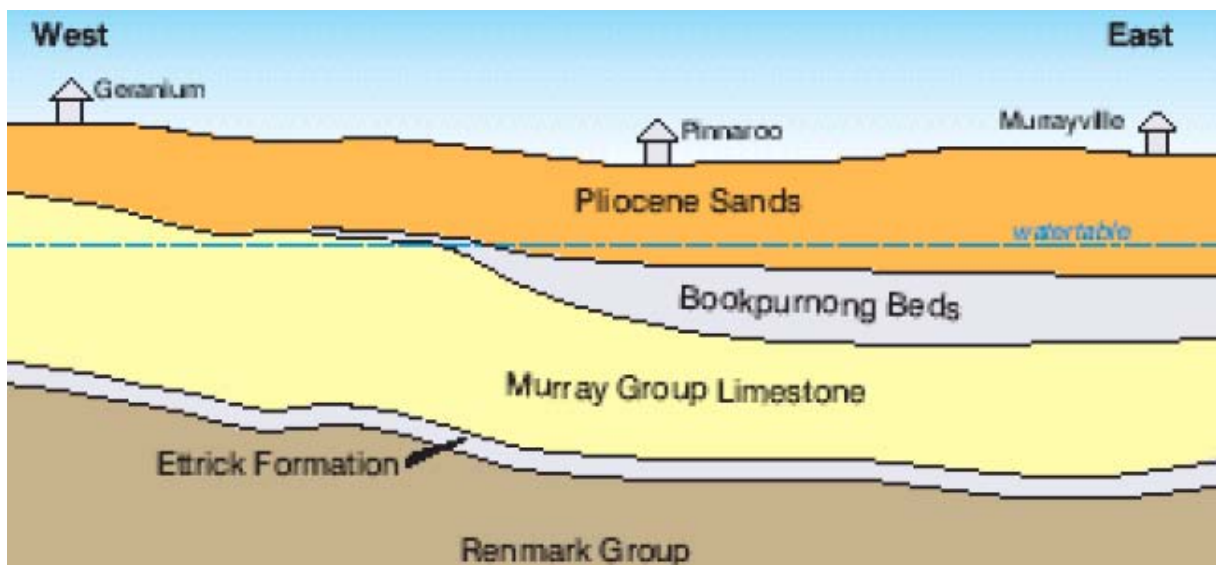| Layer	Hydrogeological unit	Aquifer/Aquitard	MODFLOW layer
1	Pliocene Sands	Aquifer	Type-1
2	Bookpurnong Beds	Aquitard	Type-0
3	Murray Group Limestone	Aquifer	Type-3
4	Ettrick Formation	Aquitard	Type-3
5	Renmark Group	Aquifer	Type-0

Figure 2.   Cross-section

Reports

Barnett S and Osei-bonsu K, 2006, *Mallee PWA-Murrayville WSPA Groundwater Model*, Report DWLBC 2006/27, Department of Water, Land and Biodiversity Conservation, Adelaide

Barnett S and Yan W, 2000, *Mallee Region Groundwater Modelling*, Report DPIR 2000/00004, Department of Primary Industries and Resources, Adelaide