BORDER TO LOCK 3 MODEL

Purpose

The purpose of the model, as described in Yan, Li and Woods (2011), is to provide a management tool for determining salt loads entering the River Murray from the major irrigation areas. Following accreditation by the Murray-Darling Basin Authority (MDBA), the model results are used to evaluate salt loads from accountable actions, such as irrigation practice, irrigation area development and Salt Interception Schemes.

Background

The Department for Water (DFW) and its consultants, Australian Water Environments (AWE), Aquaterra and Resource and Environmental Management (REM), have progressively developed the Border to Lock 3 model. The model covers the entire Riverland Region.

The Border to Lock 3 model is a set of four modelling works. All of the modelling works have used the same regional model however each unit of modelling work involves detailed modelling of different irrigation areas (Loxton–Bookpurnong; Pike-Murtho; Berri – Renmark and Pyap to Kingston).

The model covers the period between 1920 and 2110.

The latest version of the model was developed using Visual MODFLOW version 2010.1.

Location

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

Model structure

Model domain and grid size

The model domain simulates an area 75 km (east to west) by 78.3 km (north to south). The bounding coordinates of the model domain are 425122E, 6160180N (south-west) and 500122E, 6238500N (north-east) (GDA 1994, MGA Zone 54).

The rectangular model grid was divided into 491 columns and 472 rows. The model grid was applied to the five layers resulting in 1 158 760 finite difference cells. The minimum grid size is 125 m x 125 m in the irrigation areas (Loxton–Bookpurnong, Pike–Murtho Berri–Renmark and Pyap to Kingston). The maximum grid size is 375 m (Δx) x 500m (Δy) in the remaining model area.

Model layers

The regional aquifer system in the Riverland area was conceptualised as a five layer model, including four aquifer layers and one aquitard layer (Table 1 and Figure 2).
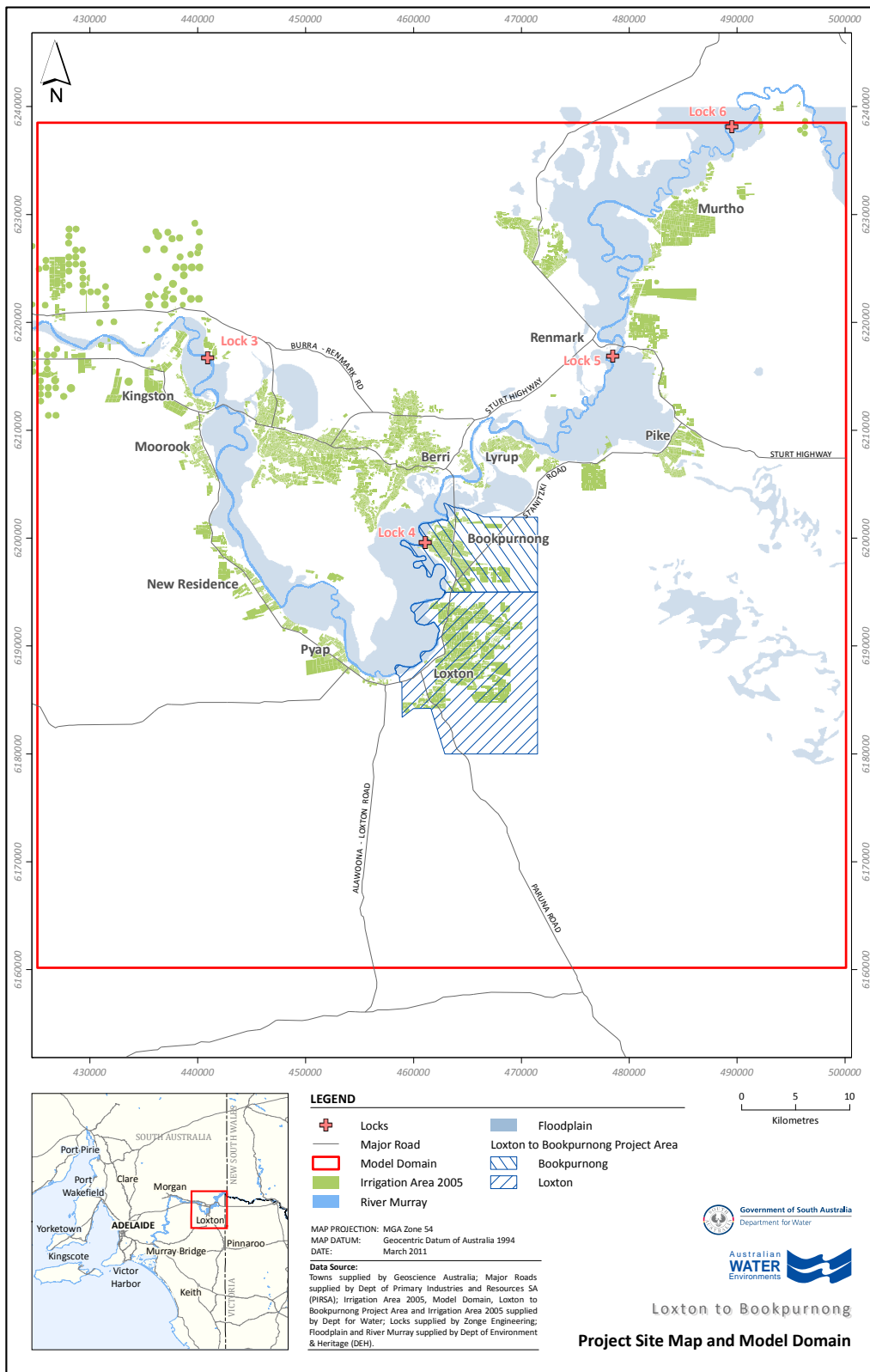
Figure 1.   Border to Lock 3 model domain

Table 1.   Model layers

| Layer	Hydrogeological unit	Aquifer/ Aquitard	MODFLOW layer
1	Loxton Sands, Monoman Formation	Aquifer	Type-1
2	Lower Loxton Clay and Shells, Bookpurnong Formation	Aquitard	Type-3
3	Pata Formation	Aquifer	Type-3
-	Winnambool Formation	Aquitard	Simulated as leakage
4	Glenforslan Formation	Aquifer	Type-0
-	Finnis Formation	Aquitard	Simulated as leakage
5	Mannum Formation	Aquifer	Type-0
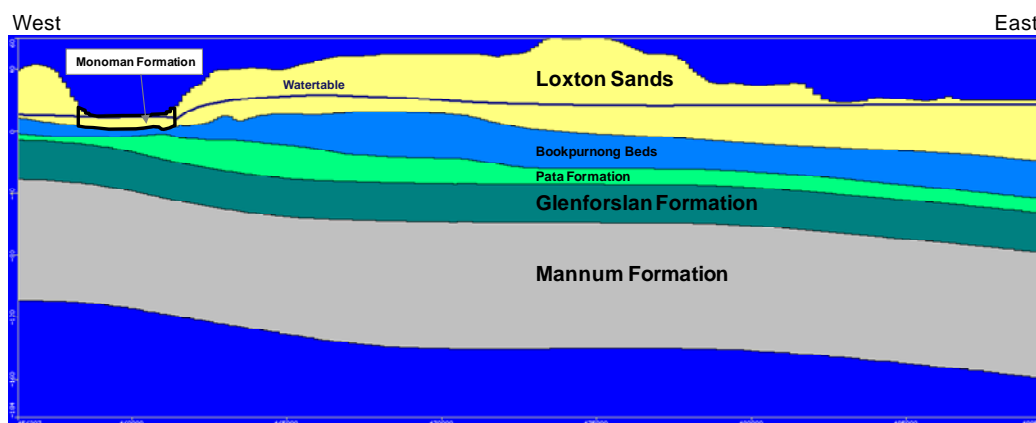
Figure 2.   Model layers (Cross-section through model row 340, approx N6193900)

Reports

Yan W, Li C and Woods J, 2011, *Loxton-Bookpurnong Numerical Groundwater Model 2011*, Report DFW 2011/22, Department for Water, Adelaide

Yan W, Howles S, Howe B and Hill T, 2005, *Loxton-Bookpurnong Numerical Groundwater Model 2005*, Report DWLBC 2005/17, Department of Water, Land and Biodiversity Conservation, Adelaide

Yan W, Howe B, Hodgkin T and Stadter M, 2006, *Pike-Murtho Numerical Groundwater Model 2006*, Report DWLBC 2006/26, Department of Water, Land and Biodiversity Conservation, Adelaide

Yan W, Georgiou J, Howe B, Armstrong D and Barnett S, 2007, *Berri Renmark Numerical Groundwater Model 2007*, Report DWLBC 2007/30, Department of Water, Land and Biodiversity Conservation, Adelaide

Yan W and Stadter M, 2008, *Pyap to Kingston Numerical Groundwater Model 2008*, Report DWLBC 2008/19, Department of Water, Land and Biodiversity Conservation, Adelaide