
KANGAROO FLAT REGION OF THE NORTHERN ADELAIDE PLAINS PWA

T2 AQUIFER

Groundwater Level and Salinity Status Report

2013



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Water and Natural Resources

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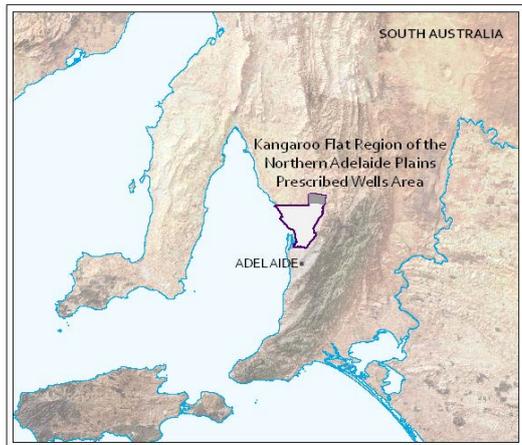
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2013 SUMMARY



The Kangaroo Flat region encompasses an area of 65 km² within the north-eastern corner of the Northern Adelaide Plains PWA, 42 km north-east of Adelaide. Groundwater use in the region was restricted in 2000 and was prescribed in 2004 as an addition to the Northern Adelaide Plains PWA under the South Australian *Natural Resources Management Act 2004*. The Kangaroo Flat region will be included in the Water Allocation Plan for the Adelaide Plains to provide for the sustainable management of the groundwater resources.

An assessment of the capacity of the groundwater resource in the Kangaroo Flat region was recently carried out to help determine the licensed allocations and consequently the status of the region has been reported on separately from the Northern Adelaide Plains PWA.

The Kangaroo Flat region contains Quaternary and Tertiary sediments that extend to a depth of about 100 m below the ground surface. These sediments can be broadly divided into four regional hydrogeologic units: the Hindmarsh Clay, Carisbrooke Sand (Q4) aquifer, a semi-confining layer consisting of weathered Quaternary and Tertiary sediments and the confined T2 aquifer. The T2 aquifer consists of limestone and sand from the lower Port Willunga Formation and is directly overlain by the Q4 aquifer and the Hindmarsh Clay aquitard. Groundwater is only extracted from the T2 aquifer in the Kangaroo Flat area.

Groundwater recharge to the T2 aquifer is thought to occur by lateral inflow from the fractured rock aquifers of the Mount Lofty Ranges at the eastern boundary of the PWA area. Groundwater outflow from the aquifer system occurs through extraction from irrigation and domestic wells and discharge beneath St Vincent's Gulf.

Metered groundwater extractions from the T2 aquifer have been recorded since 1999. The irrigation season in the Kangaroo Flat region starts earlier than the rest of the Adelaide Plains area, with maximum drawdowns due to extractions reached in December. Extraction volumes have varied since metering commenced with a general increase in extraction between the 2004–05 and 2008–09 irrigation seasons. Since 2008–09, extraction had steadily decreased until the 2011–12 season when extraction increased by 23% from the previous year. The 2012–2013 season saw a decrease of 9.5% with a total of 1187 ML extracted (Fig. 1).

The climate in the Kangaroo Flat region is characterised by hot, dry summers and cool, wet winters. Data from the Gawler rainfall station (number 23078) were chosen for the analysis of rainfall in 2013 (Fig. 2). The long-term monthly average rainfall is graphed in orange against the total monthly rainfall recorded. In 2013, the total annual rainfall was 445 mm, only 11 mm less than the long-term average annual rainfall (1889–2013) of 456 mm. The monthly data for 2013 also indicates that the region experienced significantly above-average rainfall for five out of the 12 months (April–August) and significantly below-average rainfall for five months in January and March, then from September to November.

There is a localised depression centred in the south-western corner of the Kangaroo Flat region that occurs on a seasonal basis, which is represented through the analysis of December 2013 groundwater elevation data (Fig. 3). This is most likely to be the result of the intensive extraction regime that typically occurs in this region during spring/early summer. There are three observation wells that monitor water levels in the T2 aquifer of the Kangaroo Flat region (Fig. 4). Wells MUW 29 and MUW 30 indicate significant seasonal drawdowns (up to 20 m) due to irrigation, however water levels generally recover after the irrigation season, indicating fairly stable long-term trends. In contrast, well MUW 31, which is located to the north of the other two observation wells, does not display significant seasonal variations. Well MUW 31 has recorded a long-term decline in the maximum recovered water level of approximately one metre between 2002 and 2008, but the level appears to have stabilised

since 2008. In 2013, all three observation wells recorded a rise in the maximum recovered groundwater level when compared to 2012 data.

Irrigation wells with multiple salinity readings over the past 30 years indicate an overall increase in salinity with rates of increase varying from 5 to 25 mg/L/y. However, a lack of salinity monitoring before 2008 makes interpretation of any historical groundwater salinity trends difficult. A notable increase in salinity was noted between 2008 and 2010, corresponding to a period of heightened extraction and a change in the pumping regime to an earlier and more prolonged irrigation season. At the start of 2008, there were 8 monitored wells with salinity levels below 1500 mg/L, and at times in recent years, three of these wells have seen levels fluctuate above the 1500 mg/L level. Since 2010, salinity trends have stabilised or decreased in response to the decrease in extraction and the accompanying likely reduction in saline inflows from the overlying Q4 aquifer.

Salinity monitoring of the T2 aquifer was undertaken for ten licensed extraction wells in early 2013, providing an indication of salinity levels at the end of the 2012/2013 irrigation season (Fig. 5). The salinity of the T2 aquifer ranged from 1130 to 2940 mg/L, with six of the 10 monitored wells recording a salinity of less than 1500 mg/L (Fig. 5). As there was no salinity data available for these wells in 2012, a comparison was made with readings taken in February 2011. The salinity increased in four out of seven wells during this period and decreased in the remainder, with an average change of -16 mg/L. Two additional observation wells monitored in June 2013 showed a slight decrease in salinity compared with 2012 levels. The water levels measured in two observation wells in the overlying and more saline Q4 aquifer continue to closely mirror the levels in the T2 aquifer. This indicates that the aquifers are closely connected in these locations such that pumping from the T2 aquifer is likely to induce some inflows from the Q4 aquifer.

The T2 aquifer of the Kangaroo Flat region of the Northern Adelaide Plains PWA has been assigned an orange status for 2013:

2013 STATUS  "Significant adverse trends, indicating high risk to the resource in the short to medium term"

This means that significant adverse trends in resource status have been observed over the reporting period. Continuation of these trends will likely lead to negative impacts on the beneficial use of the resource within 5 to 10 years. The 2013 status for the T2 aquifer is supported by:

- an increase in salinity in a significant number of monitored wells when compared to the salinity values previously recorded, with levels nearing the 1500 mg/L limit for vegetable irrigation.

Higher rates of extraction appear to exacerbate the inflow of more saline groundwater from the upper Q4 aquifer, and so there is an ever present risk of salinization of the resource over the course of a few years.

To view the *Kangaroo Flat Region of the Northern Adelaide Plains PWA Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, and to view the descriptions of all status symbols, please visit the *Water Resources* page on [WaterConnect](#).

For further details about the Kangaroo Flat Region of the Northern Adelaide Plains PWA, please see the *Water Allocation Plan for the Northern Adelaide Plains Wells Area* on the Adelaide and Mount Lofty Ranges Natural Resources Management [website](#).

Kangaroo Flat PWA: T2 aquifer annual groundwater extraction

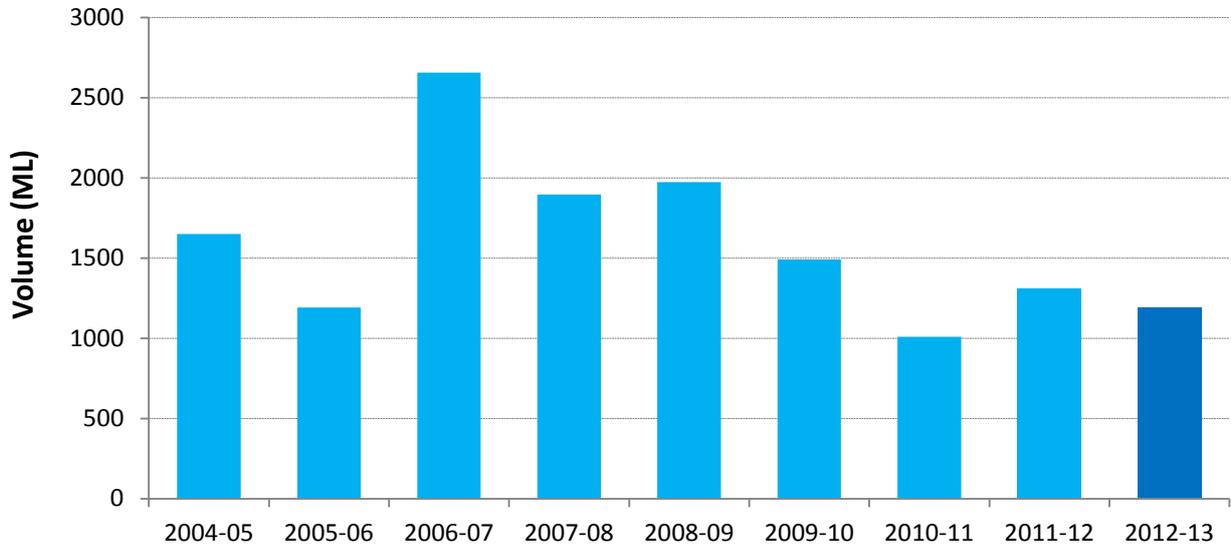


Figure 1. Historical groundwater use for the confined T2 aquifer in the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

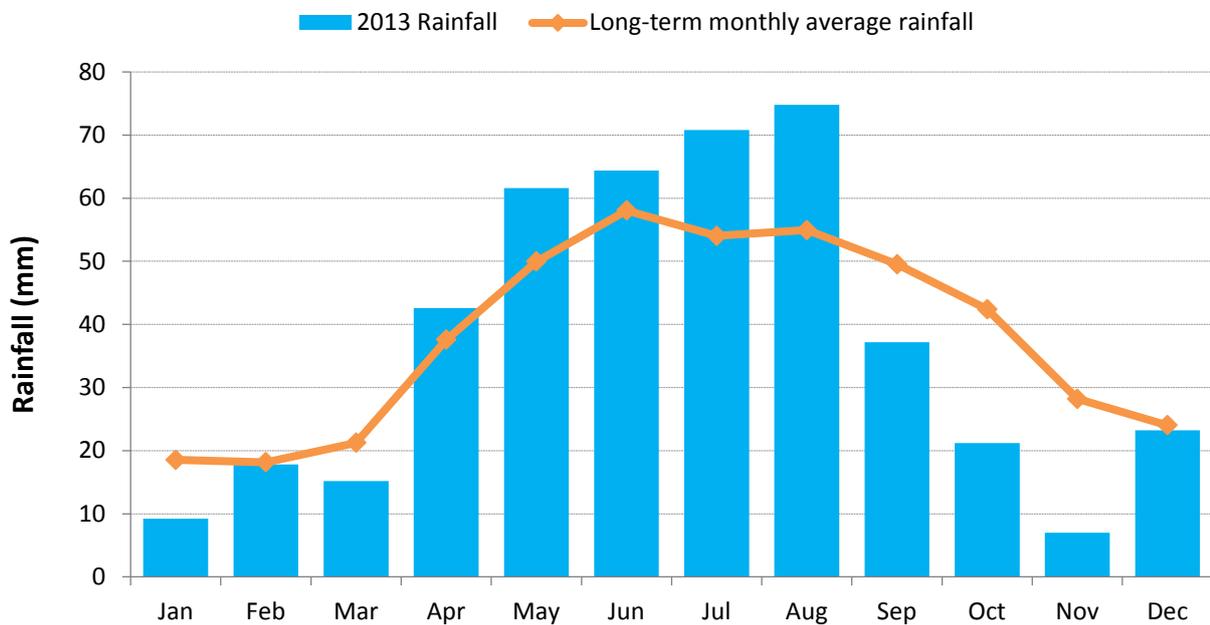


Figure 2. Monthly rainfall (mm) for 2013 and the long-term average monthly rainfall (mm) at the Gawler rainfall station (number 23078) in the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

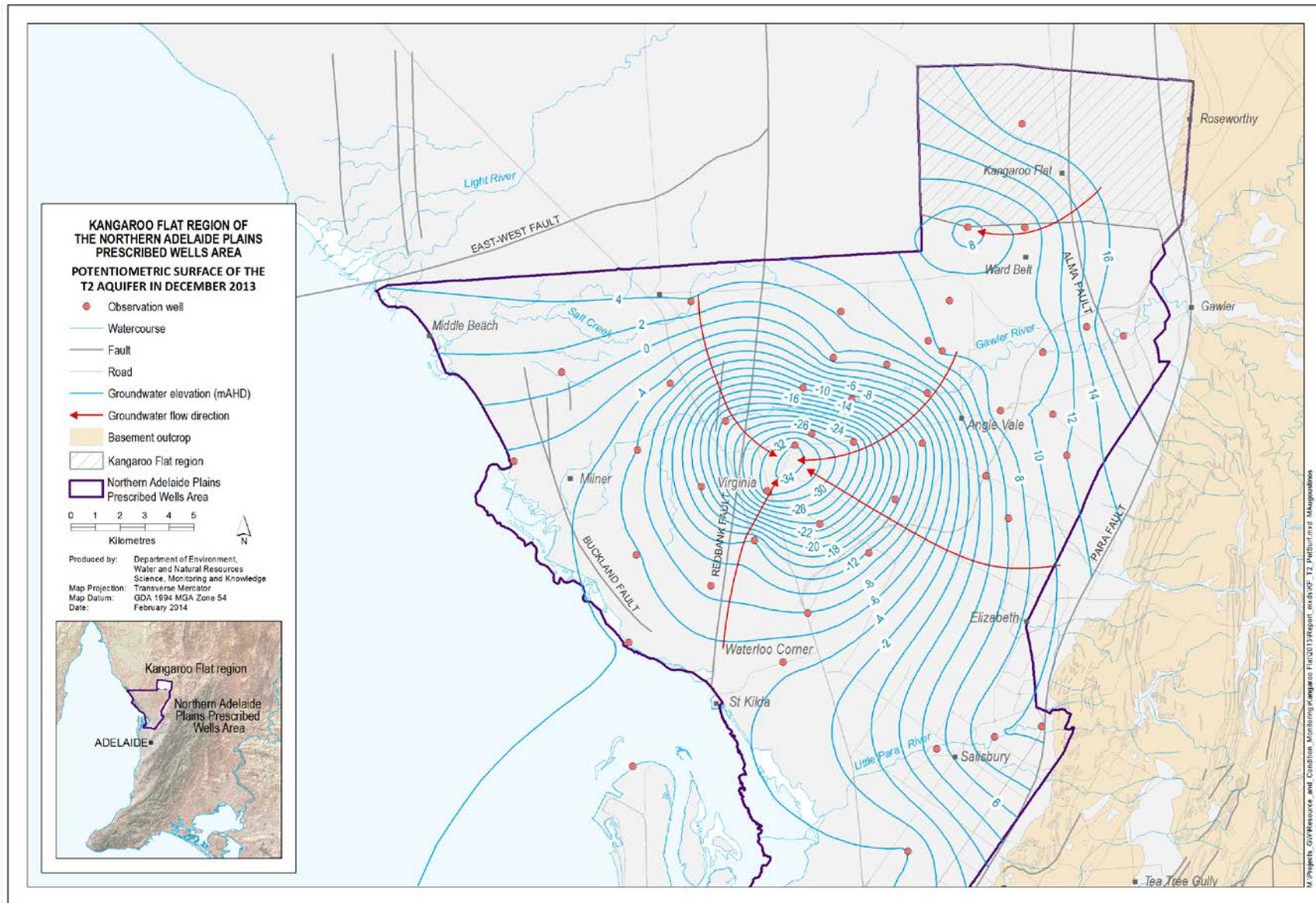


Figure 3. Potentiometric surface and direction of groundwater flow in T2 aquifer of the Kangaroo Flat Region Northern Adelaide Plains Prescribed Wells Area

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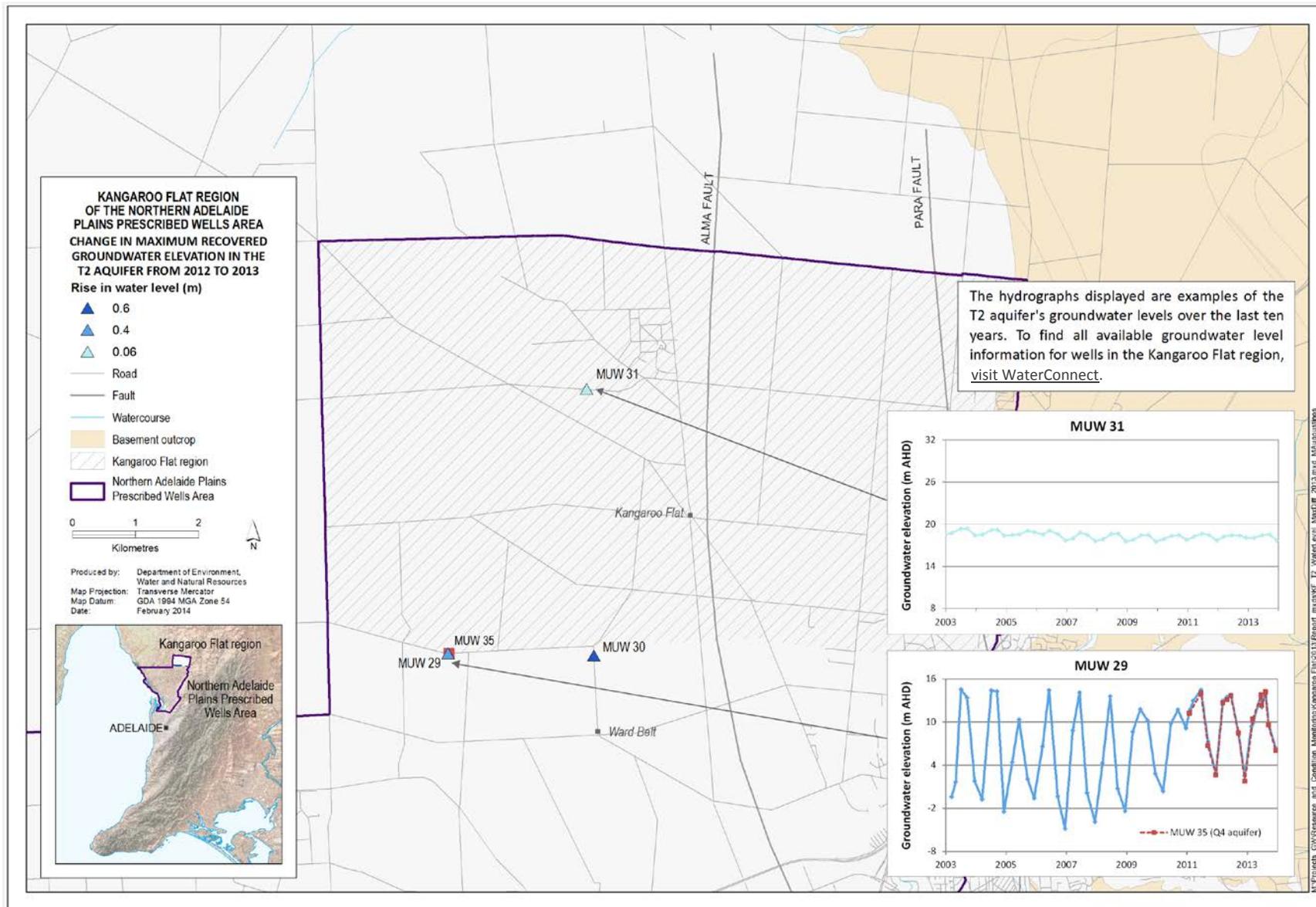


Figure 4. Overall changes in maximum groundwater levels in the T2 aquifer of the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

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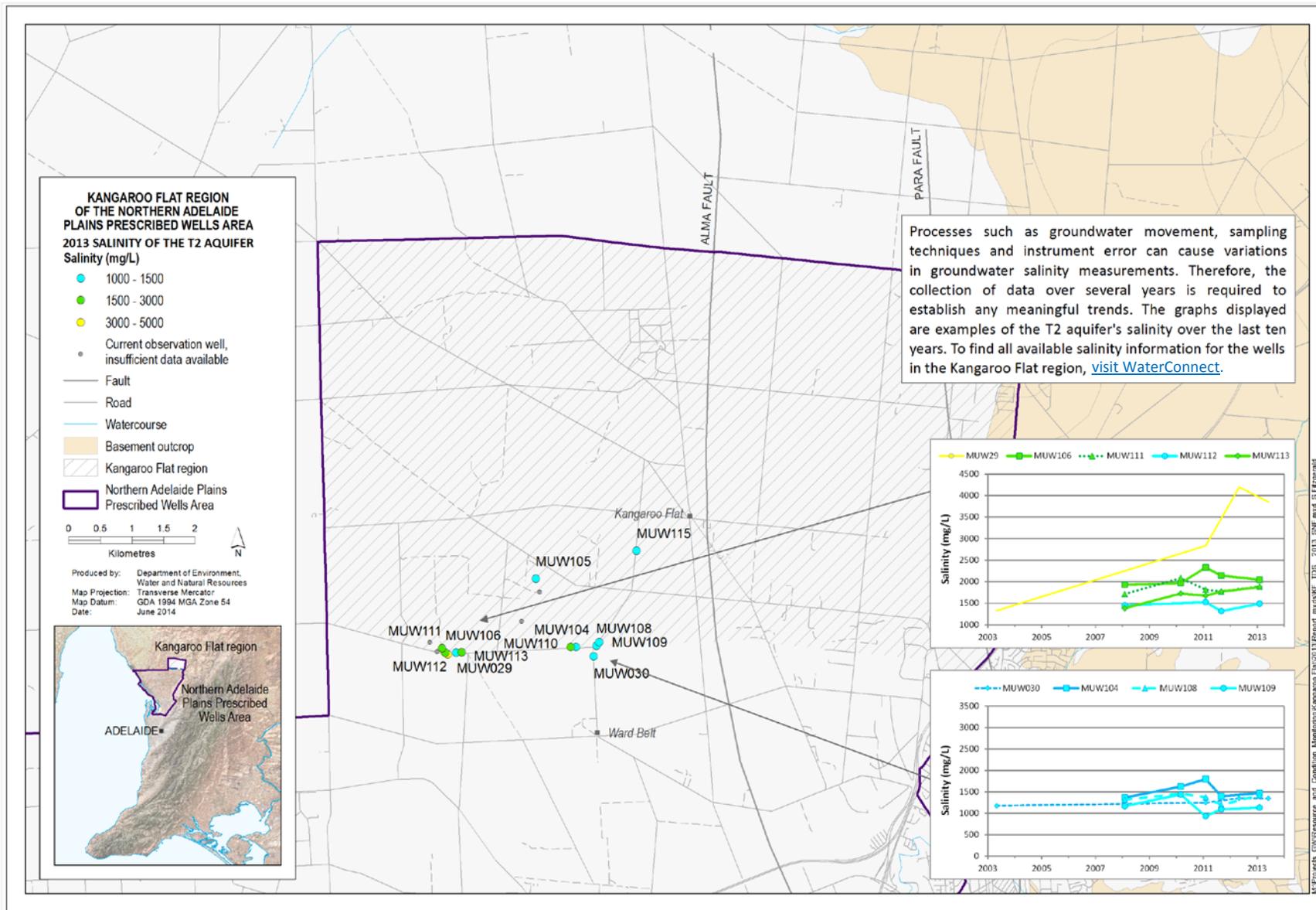


Figure 5. Groundwater salinity of the T2 aquifer of the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

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