KANGAROO FLAT REGION OF THE NORTHERN ADELAIDE PLAINS PWA

T2 AQUIFER

Groundwater Level and Salinity Status Report

2012

Government of South Australia
Department of Environment, Water and Natural Resources

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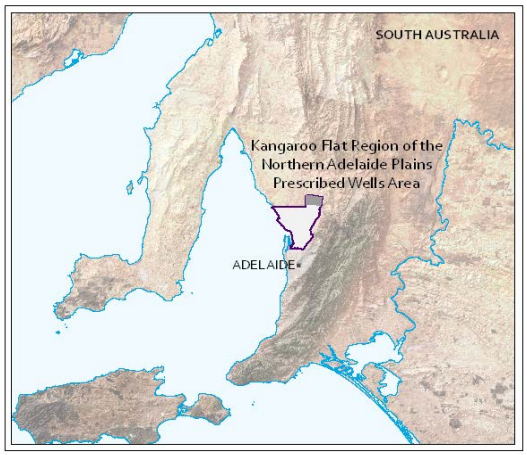
2012 SUMMARY



The Kangaroo Flat region encompasses an area of 65 km^2 within the north-eastern corner of the Northern Adelaide Plains PWA, 42 km northeast 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 600 m below 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–Tertiary sediments and the T2 confined aquifer. The confined 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. 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.

Groundwater extractions have occurred from the T2 aquifer since 1999. Extraction in the Kangaroo Flat region starts earlier with maximum drawdowns reached in December which is earlier than experienced throughout the rest of the Adelaide Plains area. 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 totalled 1312 ML, an increase of 23% from the previous year (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 2012 (Fig. 2). The long-term monthly average rainfall is graphed in orange against the total monthly rainfall recorded. In 2012, the total annual rainfall was 361 mm, 95 mm less than the long-term average annual rainfall (1889–2012) of 465 mm. The monthly rainfall data indicates that in 2012 the month of June received rainfall significantly above its long-term monthly average, but from July through to December records indicate significantly below-average rainfall (Fig. 2).

There is a localised cone of 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 2012 groundwater elevation data (Fig. 3). This is most likely the result of the intensive extraction regime that typically occurs in this region during spring. There are three observation wells which monitor water levels in the T2 aquifer of the Kangaroo Flat region (Fig. 4). Of the three observation 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 is located to the north of the other two observation wells and water levels at this location do not display significant seasonal variations. However, well MUW 31 has experienced a decline in maximum recovered water level between 2002 and 2008 of approximately 1 m, which appears to have stabilised since 2008. In

2012, all three observation wells recorded a decline in maximum recovered groundwater level of up to 0.7 m when compared to 2011 data.

Salinity monitoring was undertaken for eight licensed extraction wells in 2012 and in early February of 2013, capturing the salinity records for the 2012 irrigation season (Fig. 5). In 2012, salinity of the T2 aquifer ranged from 1,131 to 4,193 mg/L, with 63% of the 7 monitored wells recording a salinity of less than 1500mg/L (Fig. 5). Sufficient data was available for seven of the licensed extraction wells to compare the variation in salinity for the region since 2011. The salinity increased in six of these wells from 2011 to 2012 by 37 to 1,358 mg/L. These wells are located in the south near the seasonal cone of depression, whereas the only well to display a decrease in salinity concentration, a variation of 478 mg/L, is located to the north. The observed increase in salinity for the region could be due to inflows from the overlying more saline Q4 aquifer, as water levels recorded in 2012 in the Q4 aquifer are almost identical to those in the T2 aquifer.

The T2 aquifer of the Kangaroo Flat region of the Northern Adelaide Plains PWA has been assigned a red status for 2012:

2012 STATUS 

"Substantial adverse trends indicating extreme risk to the resource in the short term"

This means that very significant adverse trends in resource status have been observed over the reporting period. Continuation of these trends will almost certainly lead to negative impacts on the beneficial use of the resource within 5 years. The 2012 status for the T2 aquifer is supported by:

- an overall decline in the maximum recovered groundwater level when compared to 2011 water level data in all wells.
- a significant increase in salinity in almost all of wells monitored when compared to the salinity values previously recorded.

It is believed the current extraction regime will maintain downward leakage of saline groundwater that will cause continuing degradation of the resource.

To view the 2011 Kangaroo Flat Region of the Northern Adelaide Plains PWA Groundwater Level and Salinity Status Report 2011, which includes background information on hydrogeology, location of rainfall stations and relevant groundwater dependent ecosystems, visit WaterConnect.

To view descriptions of all status symbols, click here.

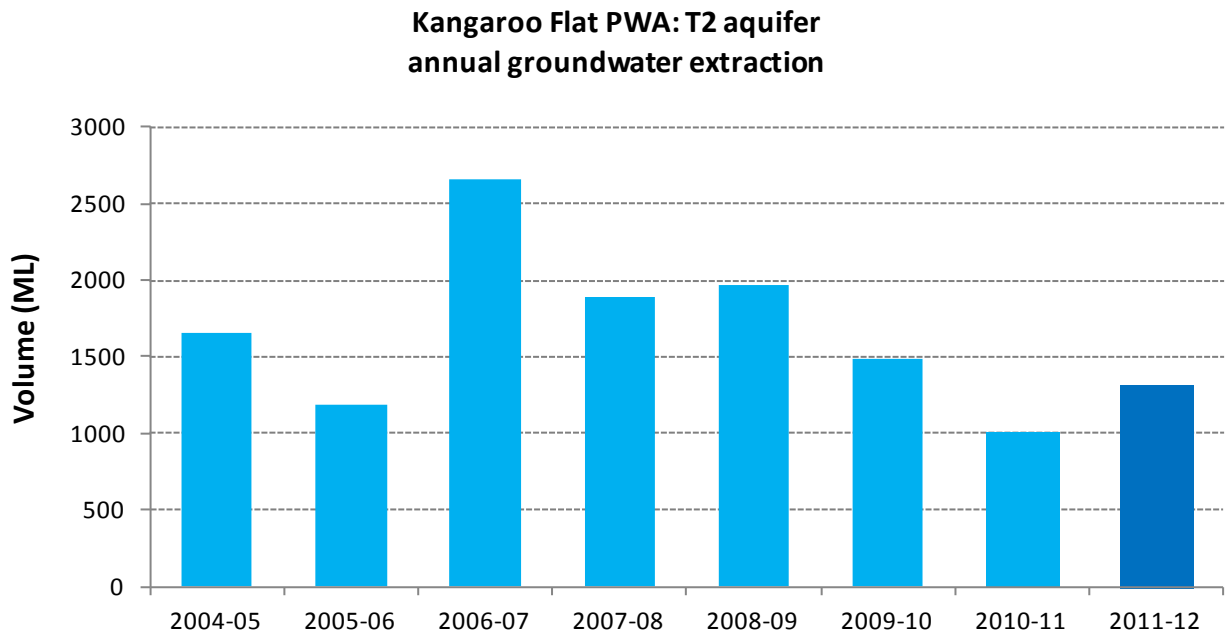


Figure 1. Historical groundwater use for the confined T2 aquifer in the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

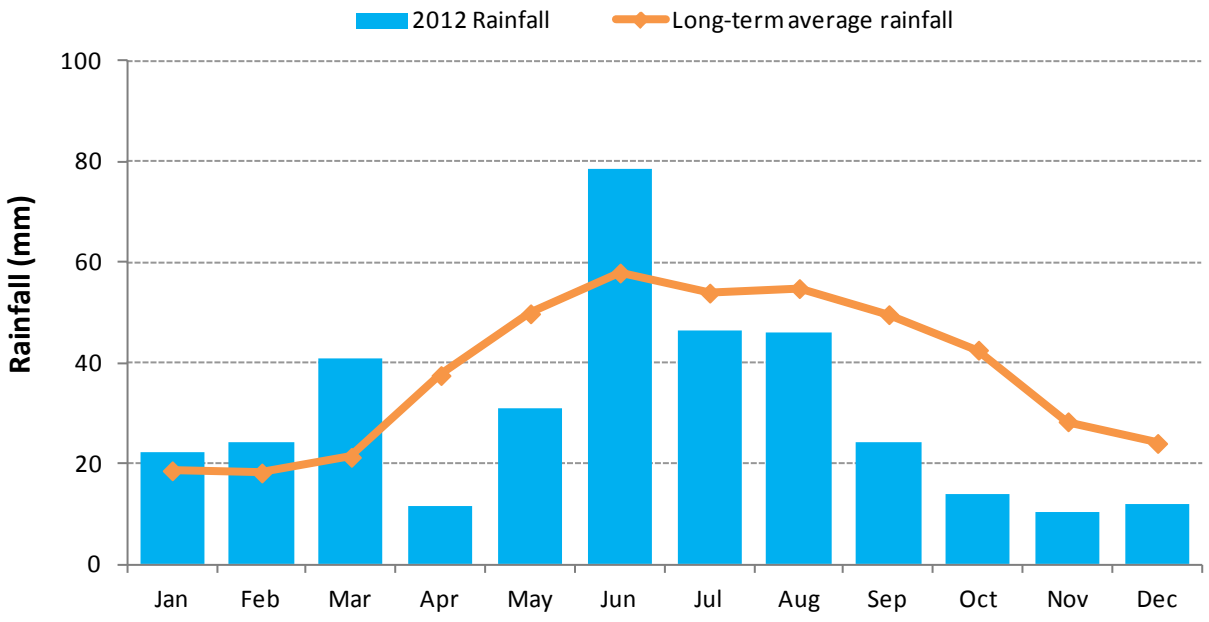


Figure 2. Monthly rainfall (mm) for 2012 and the long-term average monthly rainfall (mm) at the Gawler rainfall station (number 23078) in the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

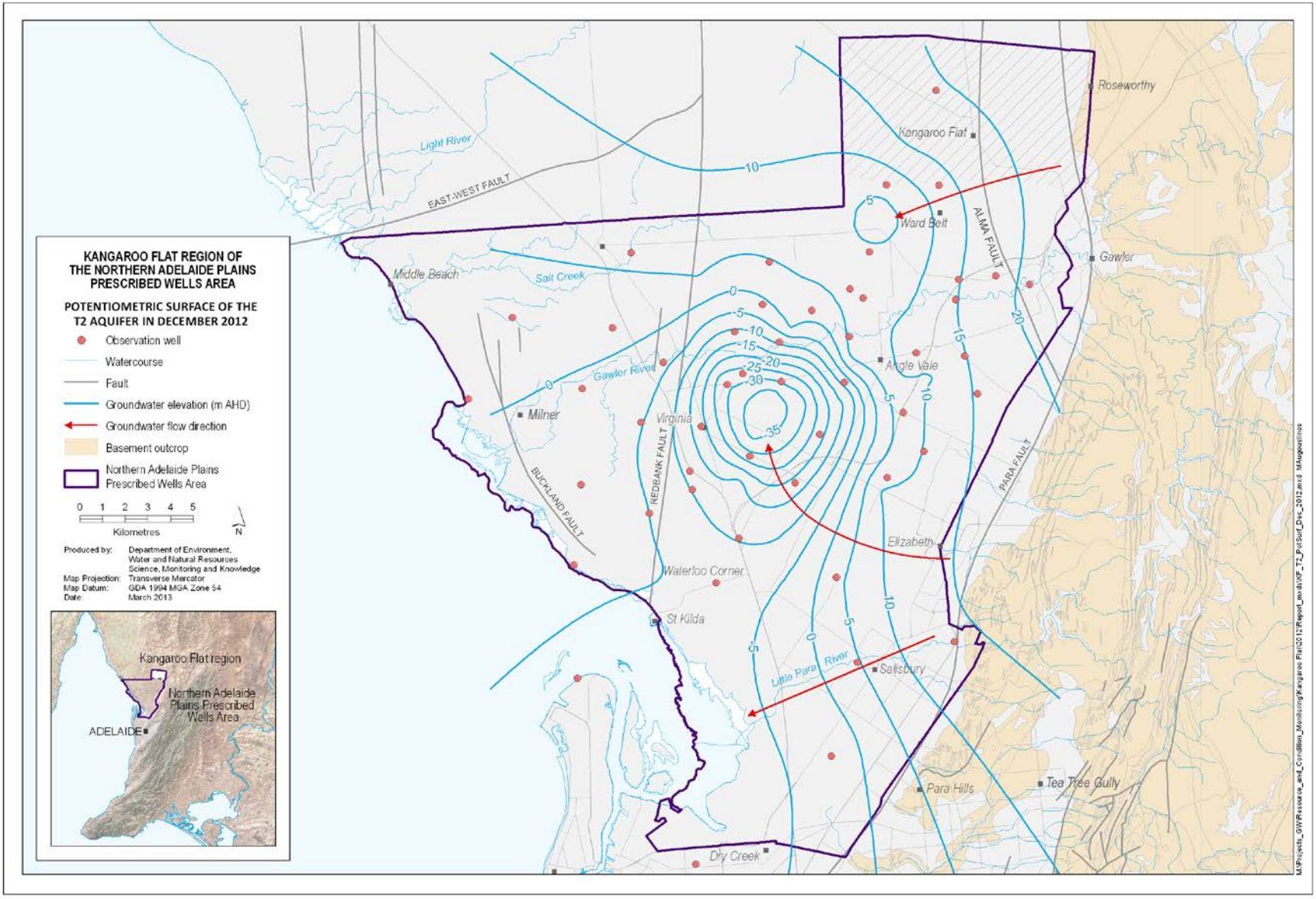


Figure 3. Potentiometric surface and direction of groundwater flow in T2 aquifer of the Northern Adelaide Plains Prescribed Wells Area

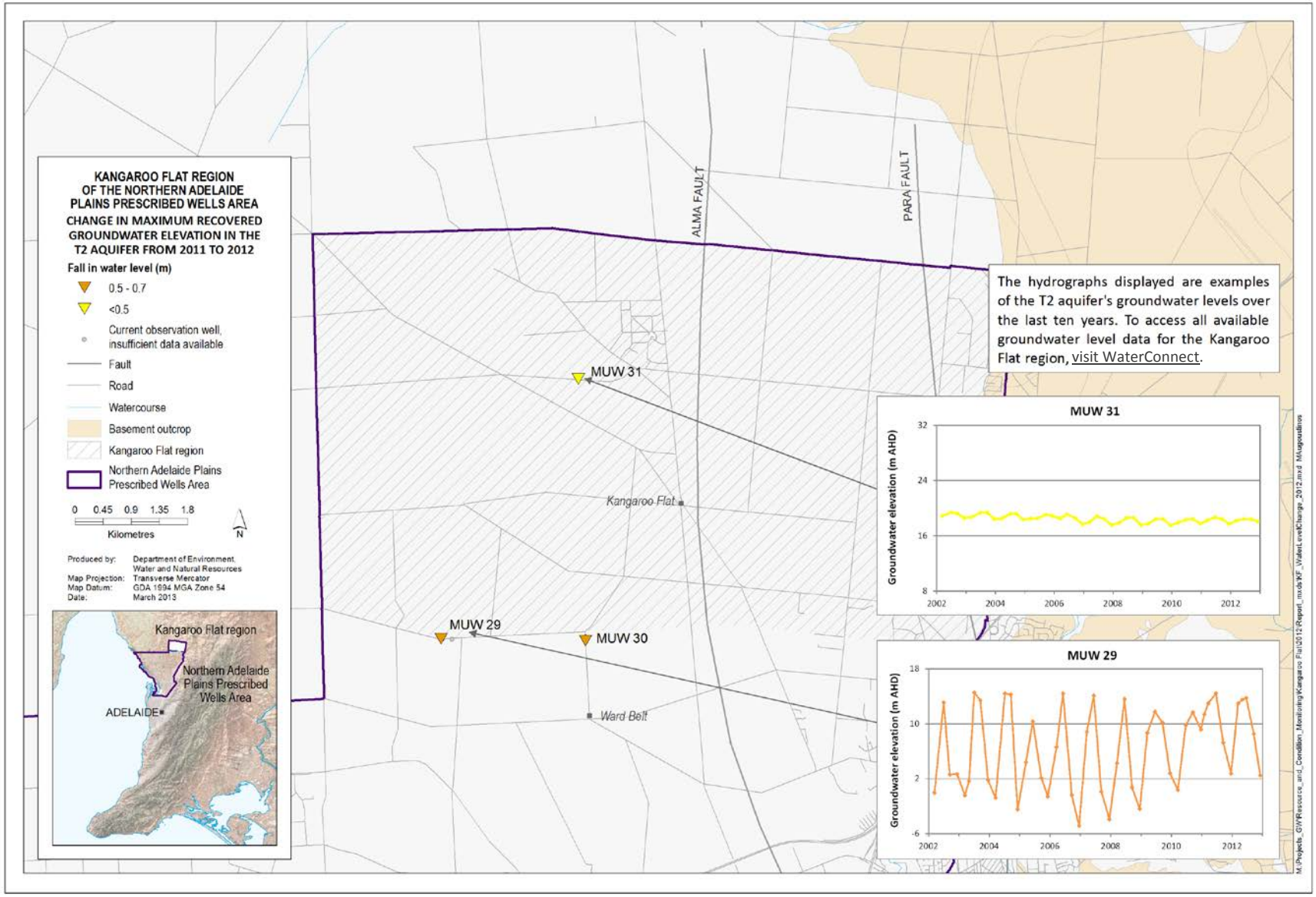


Figure 4. Overall changes in maximum groundwater levels in the T2 aquifer of the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area

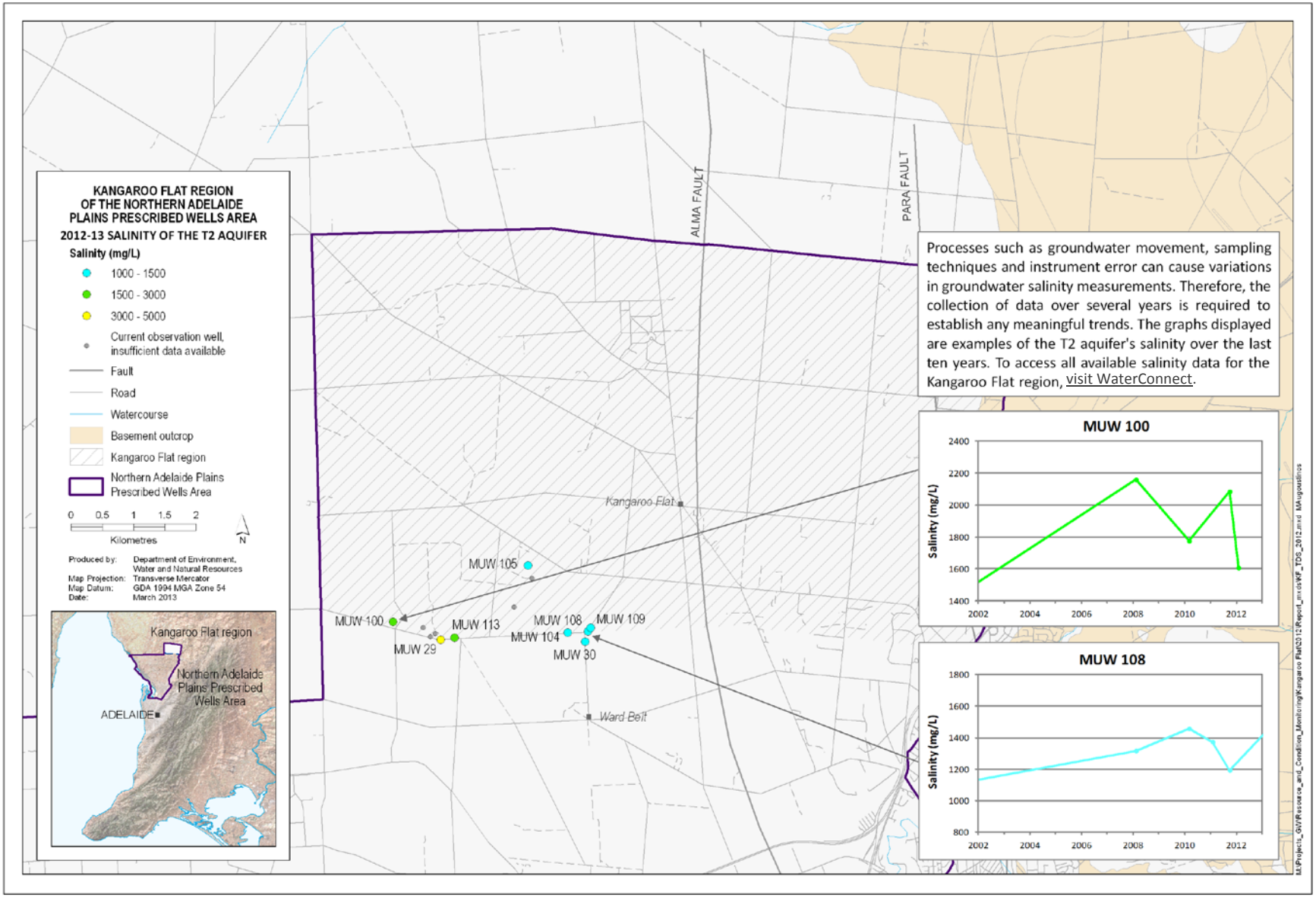


Figure 5. Groundwater salinity of the T2 aquifer of the Kangaroo Flat Region of the Northern Adelaide Plains Prescribed Wells Area