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# TATIARA PWA

## UNCONFINED AQUIFER

Groundwater Level and Salinity Status Report

2013

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Water and Natural Resources

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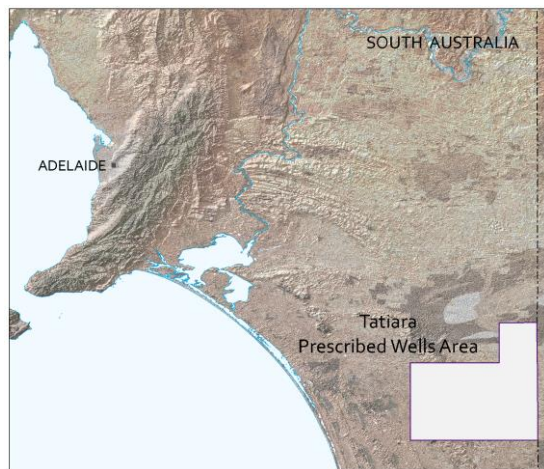
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# 2013 SUMMARY

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The Tatiara Prescribed Wells Area (PWA) is located in the upper South East of South Australia, approximately 200 km south-east of Adelaide. It is a regional-scale resource for which groundwater is prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for the sustainable use of the groundwater resources.

The Tatiara PWA is characterised by sediments of the Murray Basin and can be divided topographically into two discrete landforms, each with different hydrogeological characteristics and different groundwater management issues. A low-lying coastal plain lies to the west, with the highlands located to the east. Both regions are underlain by two aquifer systems—an unconfined aquifer comprising various Quaternary and Tertiary limestones and an underlying confined Tertiary Sand aquifer. The Quaternary-aged

Padthaway, Coomandook and Bridgewater Formations form the unconfined aquifer on the coastal plain. In the highlands, the Tertiary-aged Murray Group limestone forms the unconfined aquifer. The main source of recharge to the unconfined aquifer is the direct infiltration of rainfall and groundwater flows from east to west.

Groundwater extractions (excluding stock and domestic use) in the Tatiara PWA for 2012-13 totalled 74,081 ML which represents a 4% decrease (3315 ML) from the previous year (Fig. 1).

Analysis of climatic trends in the South East has revealed a general drying trend since the early 1950s. This is reflected in most groundwater hydrographs and a strong relationship has been demonstrated between decreases in average annual rainfall and declining water levels measured in observation wells for both the confined and unconfined aquifers over the last 40 years. The Keith rainfall station (number 25507) is located in the township of Keith and recorded 409 mm of rain in 2013. This is 57 mm less than the long-term average annual rainfall for this station. The months of May, June, July and August received rainfall significantly above the long-term monthly average; February was at average and the remaining months experienced significantly below-average rainfall (Fig. 2). The response of groundwater levels of the unconfined aquifer to rainfall varies between the coastal plain and the highlands primarily due to the depth of the watertable. The shallow watertable on the low-lying coastal plain is strongly influenced by the timing and magnitude of rainfall events. In the highlands the watertable is more than 10 m below the surface resulting in a delayed response, with a lag time dependent on the depth to the watertable and the permeability of the sediments.

Observation wells on the coastal plain display a consistent long-term trend of declining groundwater levels that corresponds with a prolonged period of below-average rainfall since 1996. Above-average rainfall from 2009 to 2011 appears to have resulted in a stabilisation of groundwater levels. The widespread clearance of native vegetation in the highlands resulted in increased recharge rates and subsequent rise in groundwater levels. This long-term trend of rising levels persisted for several years after the prolonged period of below-average rainfall commenced in the mid-1990s. The majority of observation wells display stable or declining water levels since the mid-2000s in a delayed response to the below-average rainfall.

In 2013, 66% of the 83 observation wells with sufficient data recorded a decline in the maximum recovered groundwater elevation when compared to 2012 data (Fig. 3), with most of them (96%) recording declines of less than 0.25 m. This is consistent with lower than average rainfall in 2012 and 2013, and in the highlands areas, continues the long-term declining trend. The management areas of Stirling and Wirrega show a higher decline in water level compared to the rest of the Tatiara PWA; these management areas also have a higher rate of extraction and the decline is likely due to the increase in extractions in these management areas. Twenty five wells recorded a rise, mostly less than 0.5 m, and groundwater levels remained the same in four wells. The rise in

water levels mostly occurred on the coastal plain and is likely due to a quick response to recharge events (shallow groundwater level) and a decrease in groundwater extraction throughout 2013 compared to 2012.

Groundwater salinity trends in irrigation wells within the unconfined aquifer are quite variable. Many wells display a long-term trend of rising salinity due to the recycling of irrigation water to the shallow unconfined aquifer. However, some wells on the eastern margin of the coastal plain reveal trends of stabilising or declining salinity since the late 1990s. The widespread clearance of native vegetation across the highlands has resulted in increased recharge rates and the flushing of salt, which was previously stored in the root zone of the native vegetation, down to the watertable. This process is occurring independent of any irrigation activity, although drainage from irrigated areas will accelerate the process locally. Decreasing salinities recorded in a number of observation wells over the last 10 years may indicate that in areas of lower topography near the boundary with the coastal plain, the salt in the unsaturated zone has almost been completely flushed out and lower-salinity water is now recharging the aquifer. This freshening of the groundwater following a salinity increase is well documented in the Padthaway PWA to the south.

In 2013, salinity ranged between 1000 and 10 000 mg/L and 34% of the 41 wells with sufficient data recorded an increase in salinity when compared to 2012 salinity data. Around 44% of observation wells where readings were taken in 2013 recorded groundwater salinity of less than 3000 mg/L (Fig. 3). The 24% that recorded groundwater salinity exceeding 5000 mg/L are found on the coastal plain. This is likely due to the recycling of irrigation drainage water where the aquifer is shallow.

The unconfined aquifer of the Tatiara PWA has been assigned a yellow status for 2013:

## 2012 STATUS "Gradual adverse trends, indicating low risk to the resource in the medium term"

This means that gradual adverse trends in the resource status have been observed over the reporting period. Continuation of these trends is unlikely to negatively impact the beneficial use of the resource for at least 15 years. The 2013 status for unconfined aquifer of the Tatiara PWA is supported by:

- An overall slight decline in the maximum recovered groundwater level in 2013 when compared to 2012 water level data, particularly in the low-lying coastal plain.

To view the *Tatiara PWA groundwater level and salinity status report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater dependent ecosystems, and to view descriptions for all status symbols, please the Water Resources page on [WaterConnect](#).

For further details about the Tatiara PWA, please see the [Tatiara Water Allocation Plan](#).

### Tatiara PWA: Unconfined aquifer annual groundwater extraction

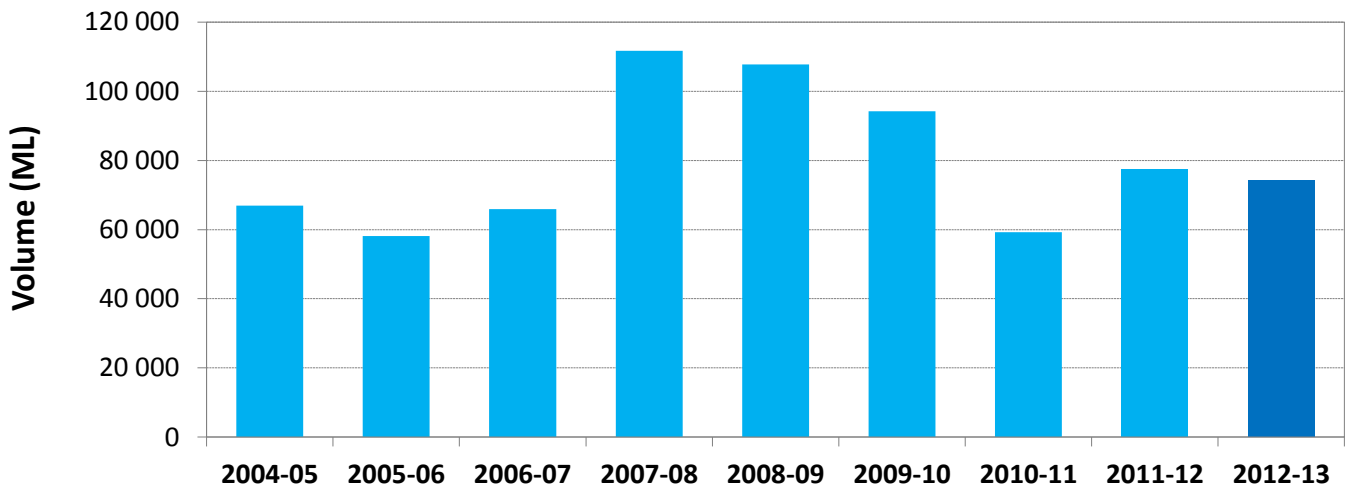


Figure 1. Historical licensed groundwater use for the Tatiara PWA.

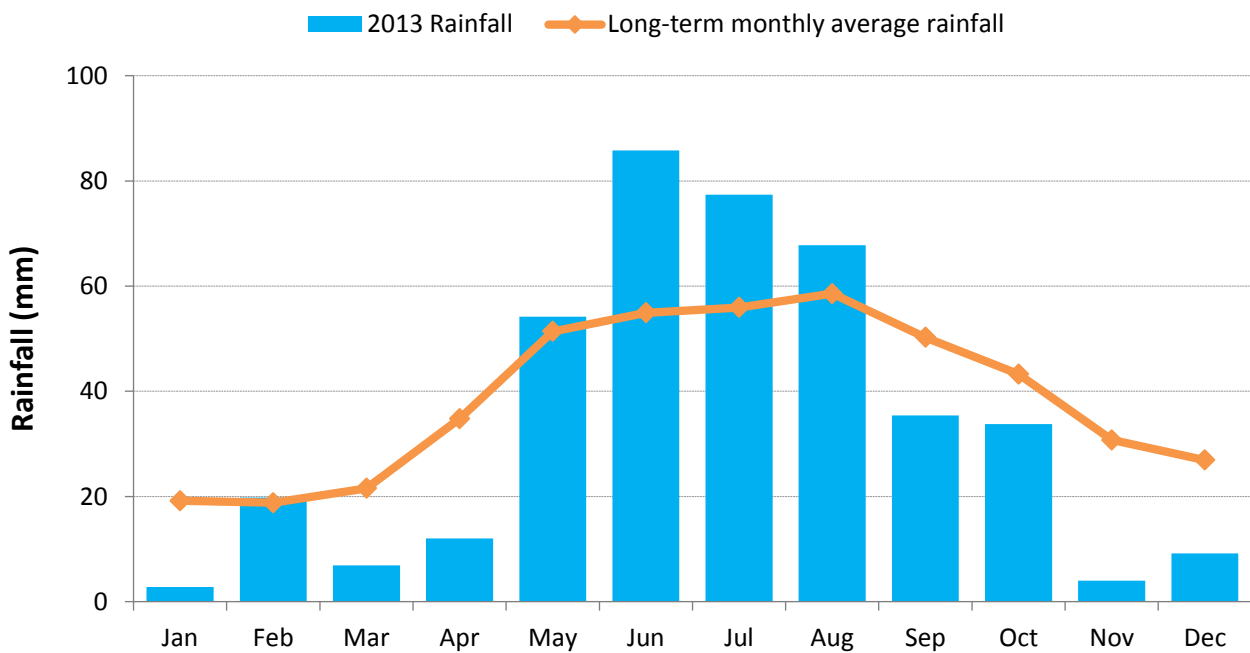


Figure 2. Monthly rainfall (mm) for 2013 and the long-term average monthly rainfall (mm) at the Keith rainfall station (number 25507) in the Tatiara PWA

Rainfall data used in this report is sourced from the SILO Patched Point Dataset, which uses original Bureau of Meteorology daily rainfall measurements and is available online at [www.longpaddock.qld.gov.au/silo](http://www.longpaddock.qld.gov.au/silo).

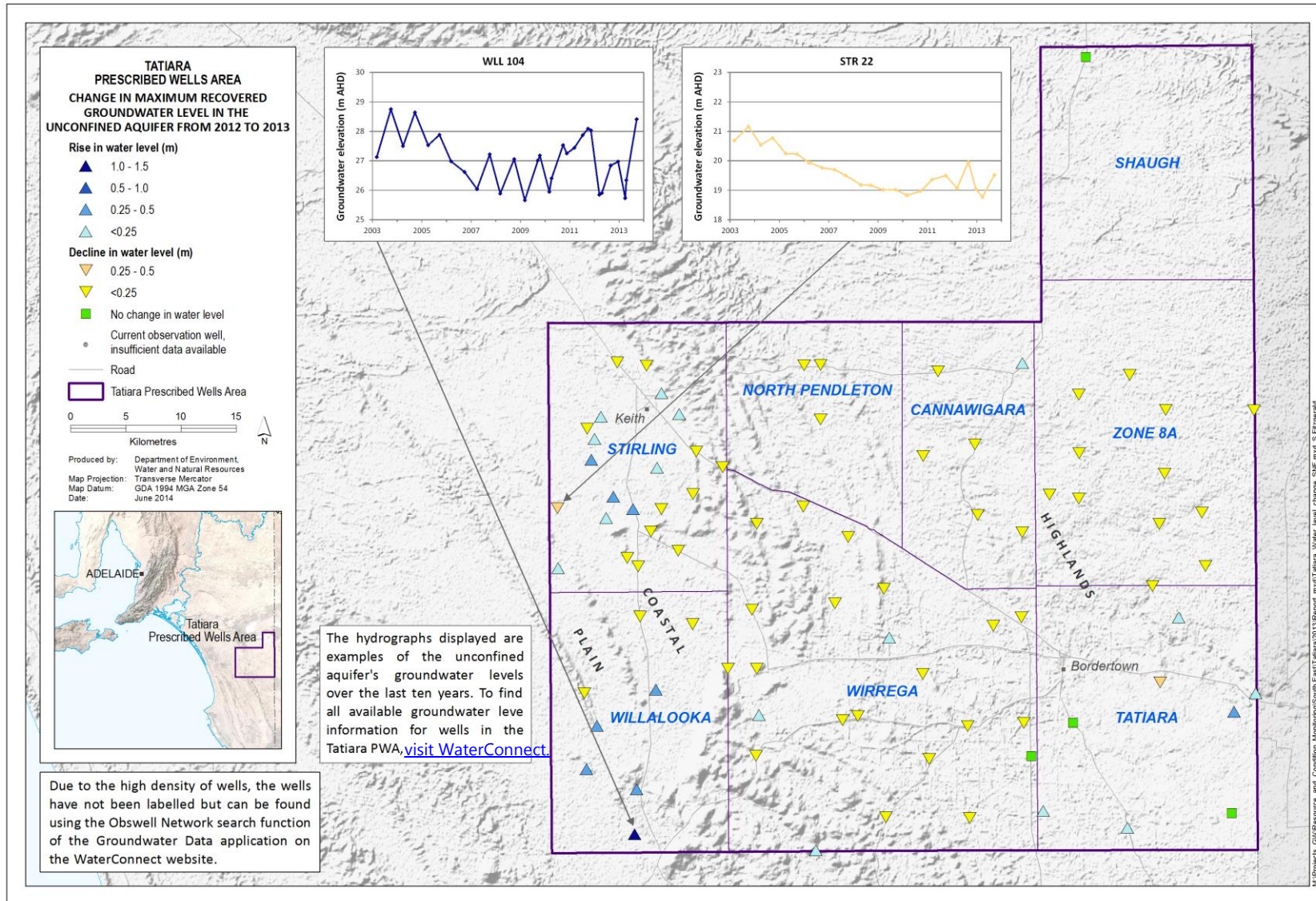


Figure 3. Overall changes in maximum groundwater levels in the unconfined aquifer of the Tatiara PWA from 2012 to 2013

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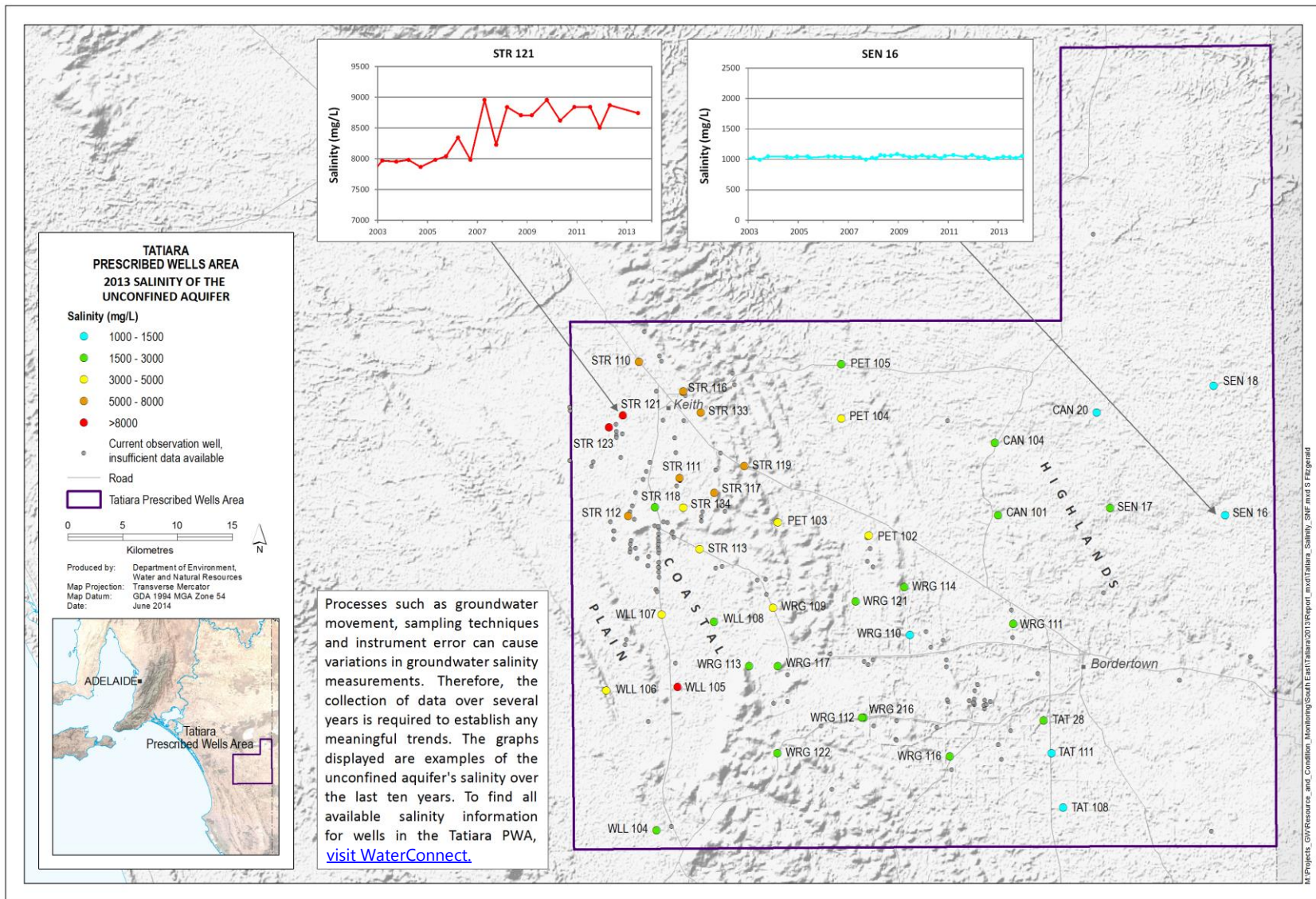


Figure 4. Groundwater salinity of the unconfined aquifer in the Tatiara PWA for 2013

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