# Tatiara PWA

## Unconfined aquifer

2014 Groundwater level and salinity status report

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Water and Natural Resources

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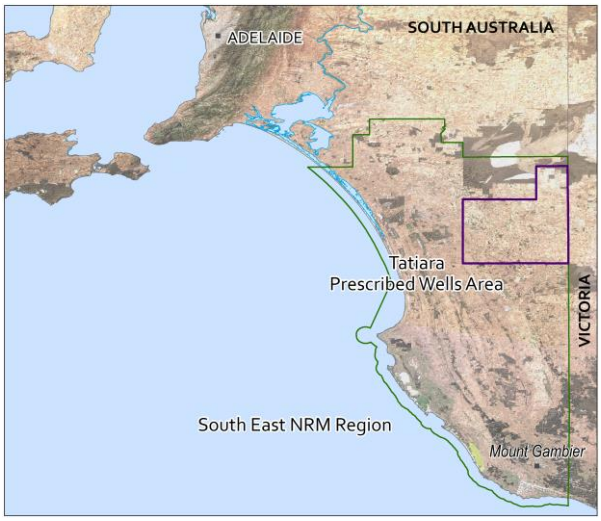
ISBN 978-1-922255-65-5

This document is available online at www.waterconnect.sa.gov.au/Systems/GSR/Pages.

# 2014 Summary




The Tatiara Prescribed Wells Area (PWA) is located in the South East NRM Region 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 underlain 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.

Trends in groundwater levels and salinity in the Tatiara PWA are primarily climate driven: below-average rainfall results in a reduction in recharge to the aquifers. Below-average summer rainfall can also result in increasing irrigation extractions, and these two elements can cause the groundwater levels to fall and salinity to increase. Conversely, increases in rainfall results in increases in recharge, decreases in irrigation extractions and groundwater levels may rise and salinity stabilise or decline. 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.

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 291 mm of rain in 2014. This is 173 mm less than the long-term average annual rainfall for this station and just over 100 mm less than that received in 2013. The month of June received rainfall significantly above the long-term monthly average, April was at average and the remaining months experienced significantly below-average rainfall (Fig. 1).

Licensed groundwater extractions (excluding stock and domestic use) in the Tatiara PWA totalled 75 523 ML[1] in 2013–14, a 2% increase (1442 ML) from the previous water-use year (Fig. 2).

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.

[1] The licensed groundwater use for the 2013–14 water-use year is based on the best data available as of June 2015 and will be subject to change, as approximately ten percent of South East annual water use reports had not been submitted at the time of printing and groundwater extracted for forestry is not included. As such, the total licensed groundwater use will be higher than the volume presented in this report.

In 2014, of the 76 observation wells with sufficient data, 55% recorded a negligible change in the maximum recovered groundwater level when compared to 2013 data and 45% recorded a decline. This is consistent with lower than average rainfall in 2013 and 2014. The declines were generally confined to the Stirling, Willalooka and Wirrega management areas (Fig. 3); these management areas also had the higher rate of extraction and the decline is likely due to the increase in extractions in these management areas.

Groundwater salinity trends in irrigation wells in 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 independently 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 2014, salinity ranged between 1000 and 10 000 mg/L and was generally stable, with 98% of wells with sufficient data recording a change salinity of less than 5% when compared to 2013 salinity data. Around half of observation wells where readings were taken in 2014 recorded groundwater salinity of less than 3000 mg/L. The wells that recorded groundwater salinity exceeding 5000 mg/L are found on the coastal plain (Fig. 3). 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 2014:

2014 Status  "Gradual adverse trends, indicating low risk to the resource in the medium term"

This means that minor adverse trends in the resource status have been observed over the 12-month reporting period. If these conditions were to continue, they are unlikely to negatively impact the beneficial uses of the resource (such as drinking water, irrigation or stock watering) for at least 15 years.

The 2014 status for the unconfined aquifer of the Tatiara PWA is supported by:

- nearly half of wells recorded a minor decline in the maximum recovered groundwater level in 2014 when compared to 2013 water level data, particularly on the low-lying coastal plain.

To view descriptions of all status symbols, please visit the *Water Resource Assessments* page on WaterConnect.

To view the *Tatiara PWA groundwater level and salinity status report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, visit WaterConnect.

To view or download groundwater level and salinity data from observation wells within the Tatiara PWA, please visit Groundwater Data on WaterConnect.

For further details about the Tatiara PWA, please see the *Tatiara Water Allocation Plan* on the Natural Resources South East website.

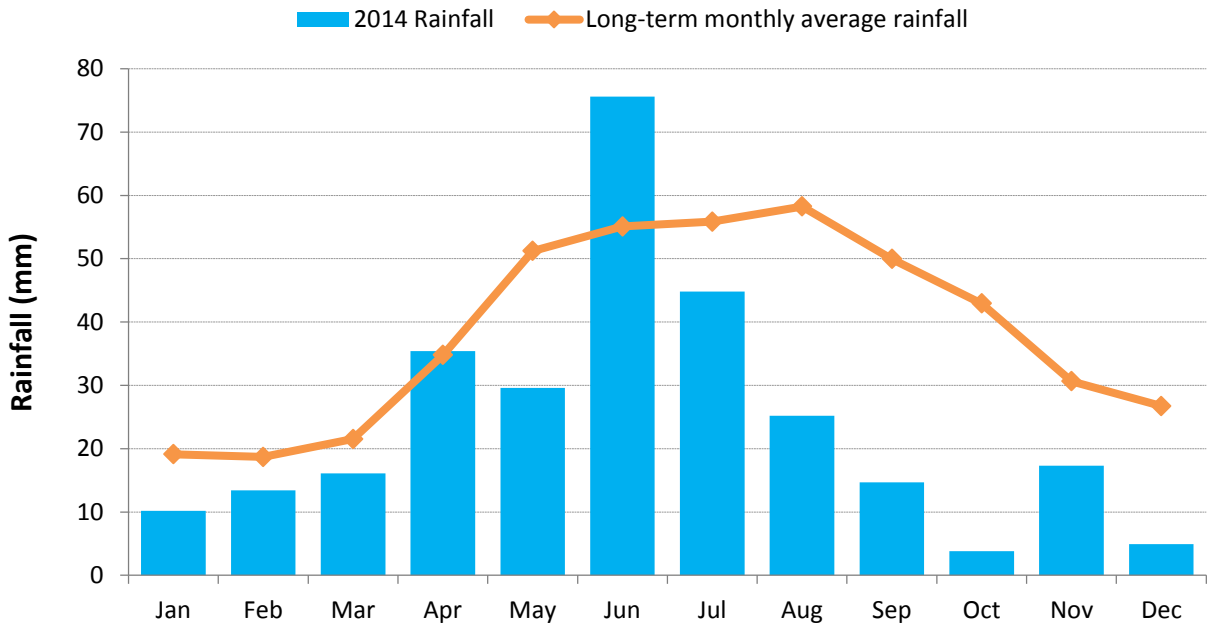



Figure 1. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Keith rainfall station (number 25507)[2] in the Tatiara Prescribed Wells Area

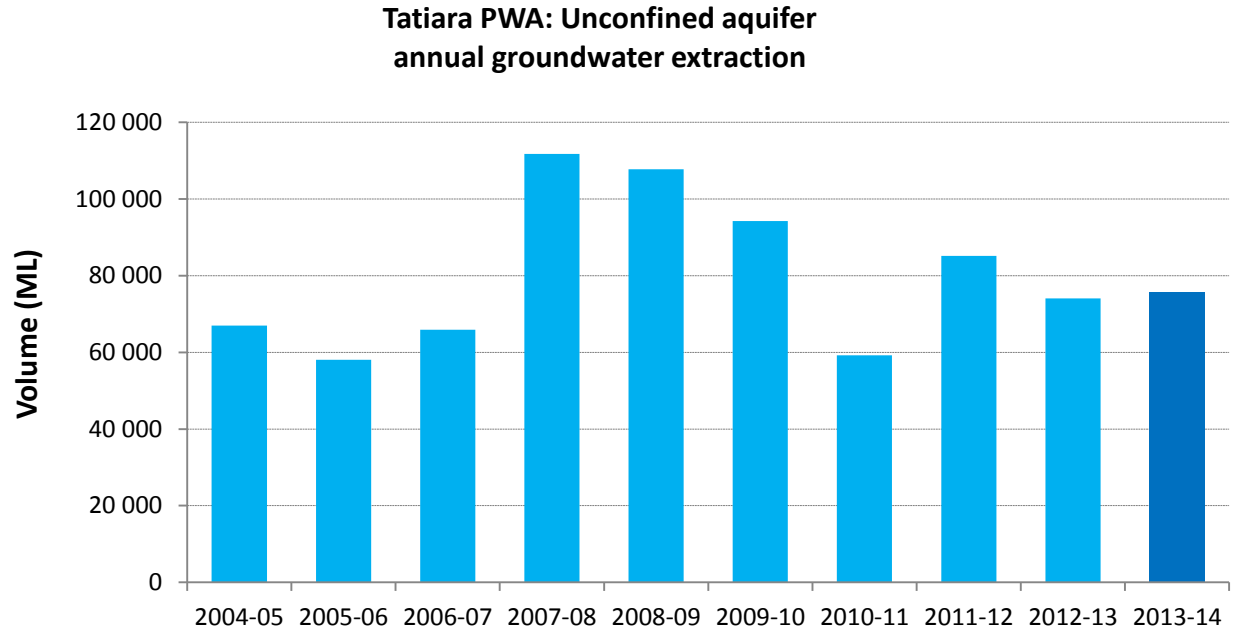



Figure 2. Historical licensed groundwater use[3] for the Tatiara Prescribed Wells Area

[2] 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.
[3] Groundwater extracted for forestry not included.

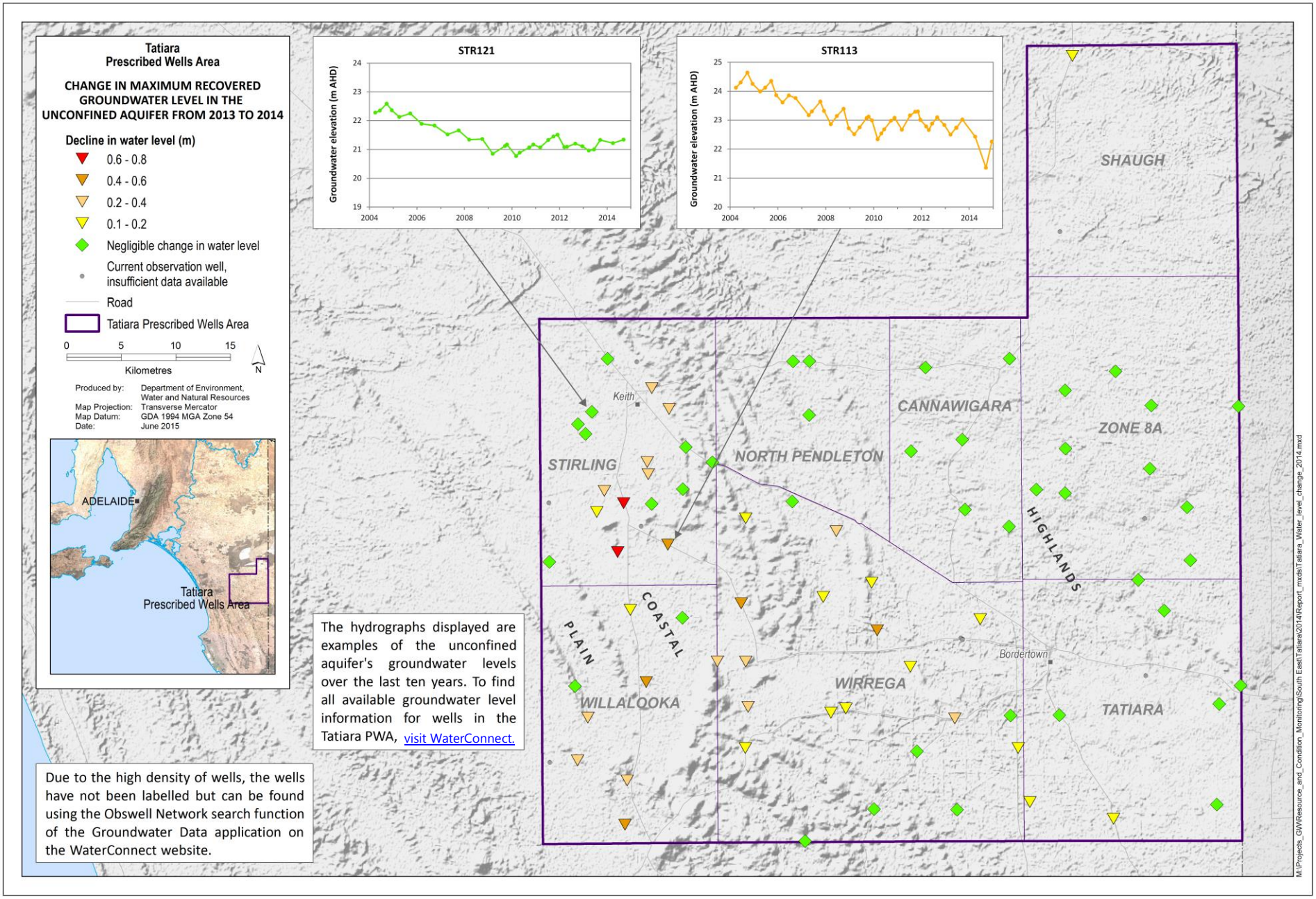



Figure 3. Overall changes in maximum groundwater levels in the unconfined aquifer of the Tatiara Prescribed Wells Area from 2013 to 2014

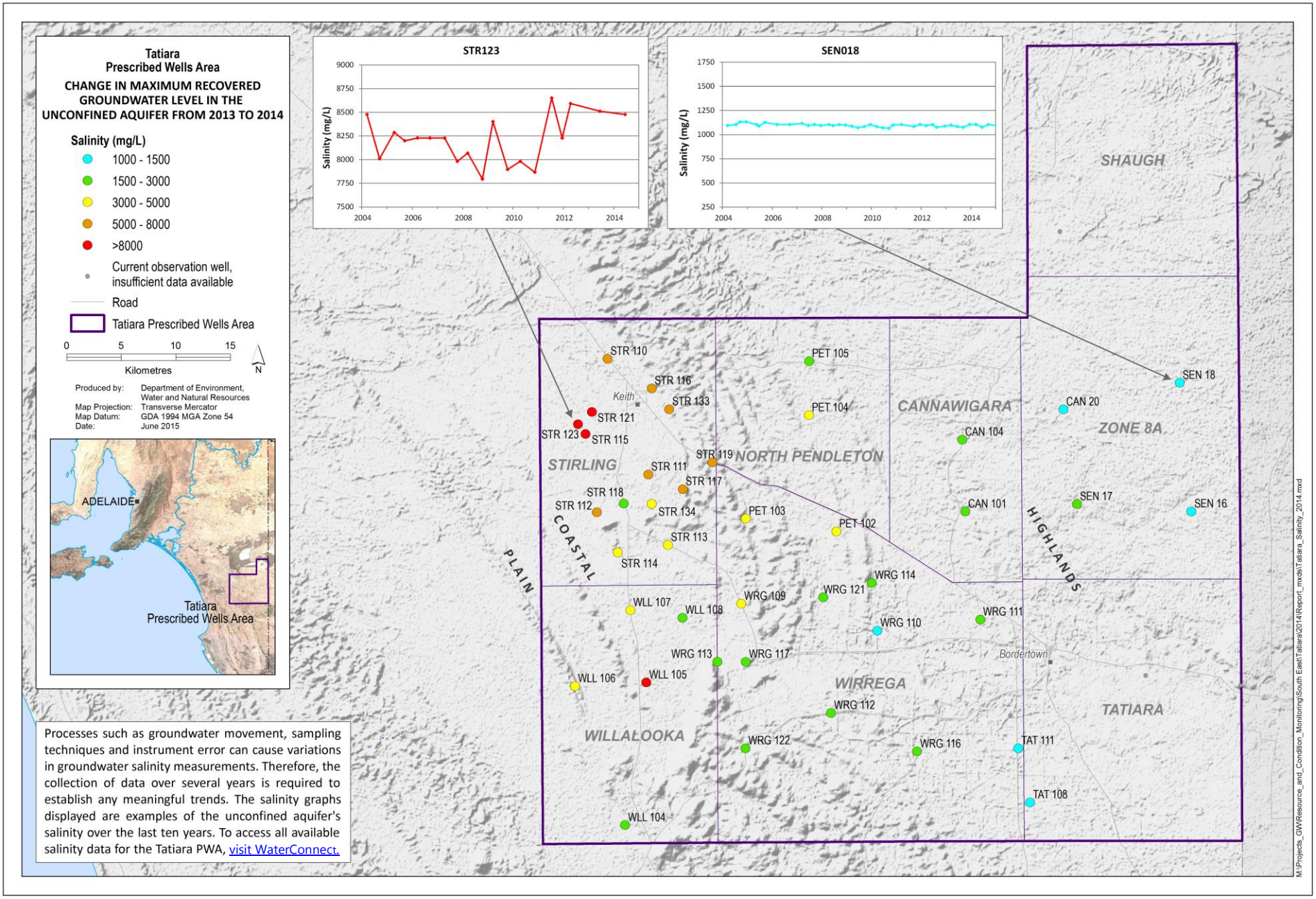



Figure 4. Groundwater salinity of the unconfined aquifer in the Tatiara Prescribed Wells Area for 2014