Clare Valley PWRA

Fractured rock aquifer

2014 Groundwater level and salinity status report

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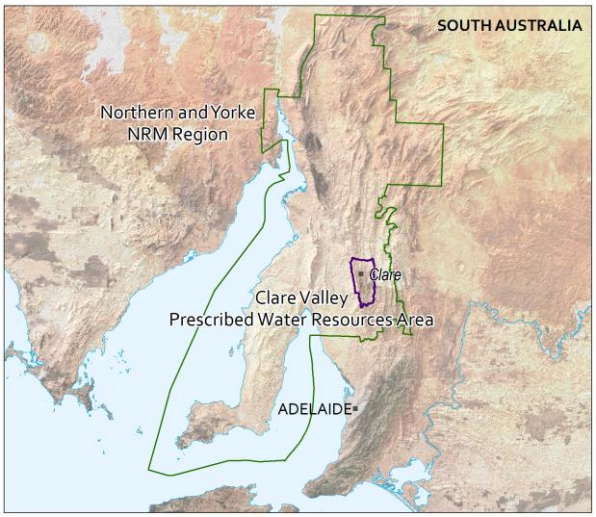
ISBN 978-1-922255-67-9

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

2014 Summary



The Clare Valley Prescribed Water Resources Area (PWRA) is located approximately 130 km north of Adelaide, within the Northern and Yorke NRM Region. It is a regional-scale resource for which surface water and groundwater is prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for the sustainable management of the groundwater resources.

There are two aquifer systems within the Clare Valley region. A Quaternary alluvial aquifer occurs at shallow depths (<15 m) in valley floors and provides only a small portion of the groundwater resource (mainly in the vicinity of Stanley Flat). The Quaternary aquifer is underlain by an extensive fractured rock aquifer which is the main aquifer system within the Clare Valley. Both aquifers are recharged by local rainfall.

The fractured rock aquifer (FRA) that provides groundwater for irrigation in the Clare Valley is composed of Mintaro Shale, Saddleworth Formation, Undalya Quartzite and Skillogalee Dolomite. Fracturing in the region is considered to be continuous and groundwater can flow across geological units. Within the FRA, the fractures act as conduits for groundwater flow. The yield of groundwater from a particular well is dependent on the size, spacing and orientation of the fractures intercepted. The FRA can be divided into two zones: a relatively permeable zone in the upper 20–40 m, within which fractures are closely spaced (generally <0.5 m), and a deeper low-permeability regional zone. The size and spacing of fractures tends to decrease with depth.

Trends in groundwater levels and salinity in the Clare Valley 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.

There are two rainfall stations, Calcannia (number 21075) and Watervale (number 21054), within the Clare Valley PWRA. Watervale rainfall station recorded 581 mm in 2014, 71 mm below the long-term (1889–2014) average annual rainfall, while the 2014 rainfall of 578 mm for Calcannia was 24 mm above the annual long-term average. At both stations, rainfall was mostly above average from February to July, with February, April and June recording rainfall well above the monthly long-term average (Figs. 1 & 2). January, March and August through to December recorded below-average rainfall at both stations.

During the 2013–14 water-use year, the total amount of groundwater extracted from the FRA within the region was 979 ML, which represents an increase of 130 ML (15%) from the previous year (Fig. 3). Since the very wet water-use year of 2010–11, which resulted in very low extractions, there has been a rising trend in extraction back to average levels.

Long-term monitoring data show that most observation wells in the FRA display declining groundwater-level trends between 1989 and 2009. This is followed by rising levels in the subsequent period up to 2013, which is associated with higher than average rainfall conditions.

In 2014, 43% of observation wells with sufficient records to compare with 2013 data recorded a rise in the maximum recovered groundwater level. These ranged between 0.06 and 2.7 m, with a median of 0.4 m. Negligible change in the groundwater level was recorded in 8% of wells with sufficient data, where the change in the maximum recorded groundwater level between 2013 and 2014 was less than 0.05 m. Declines of 0.05 to 1 m and a median of 0.7 m were recorded in 49% of observation wells with sufficient data. Wells that recorded a decline in levels are located predominantly south of Sevenhill, often in proximity to those that recorded a rise. This follows the historical pattern of groundwater levels being influenced by local variations in hydrogeological conditions and extraction regimes, and highlights the variable nature of fractured rock aquifers.

Long-term monitoring records show the large spatial variation in water quality within the FRA. Groundwater salinity varies from less than 500 mg/L to greater than 3000 mg/L. In areas of dense well development such as Watervale and Mintaro, groundwater salinity can vary considerably between adjacent wells. The best quality groundwater is associated with higher rainfall, higher topography and generally the Mintaro Shale Formation between Gillentown and Watervale (<1000 mg/L). Groundwater salinity generally

increases away from this central band, where salinity exceeds 1000 mg/L. Salinity trends over the last five years indicate that salinity has been declining west of Watervale and between Armagh and Gillentown, but increasing elsewhere.

In 2014, of the wells with available data, most (63%) observed salinity levels of less than 1500 mg/L (Fig. 5), the maximum recommended salinity concentration for most grape varieties, the primary use for irrigation water in the PWRA. When compared to 2013 data, most wells with available data (79%) recorded an increase in salinity, with a median rise of 5%. The wells recording a decrease in salinity are located between Gillentown and Watervale.

The fractured rock aquifer of the Clare Valley PWRA has been assigned a yellow status for 2014:

2014 Status

"Gradual adverse changes, indicating a low risk to the resource in the medium term."

This means that minor adverse changes in the resource have been observed over the 12-month reporting period. If these conditions were to continue, they are unlikely to negatively impact the beneficial use of the resource for at least 15 years.

The 2014 status for the fractured rock aquifer is supported by:

- half of wells with sufficient data recorded declines in the maximum recovered groundwater level when compared to 2013 data
- an overall increase in groundwater salinity when compared to 2013 data.

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

To view the *Clare Valley Prescribed Wells Area Groundwater Level and Salinity Status Report 2009–10*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit WaterConnect.

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

For further details about the Clare Valley PWRA, please see the *Water Allocation Plan for the Clare Valley Prescribed Water Resources Area* on the Natural Resources Northern and Yorke website.

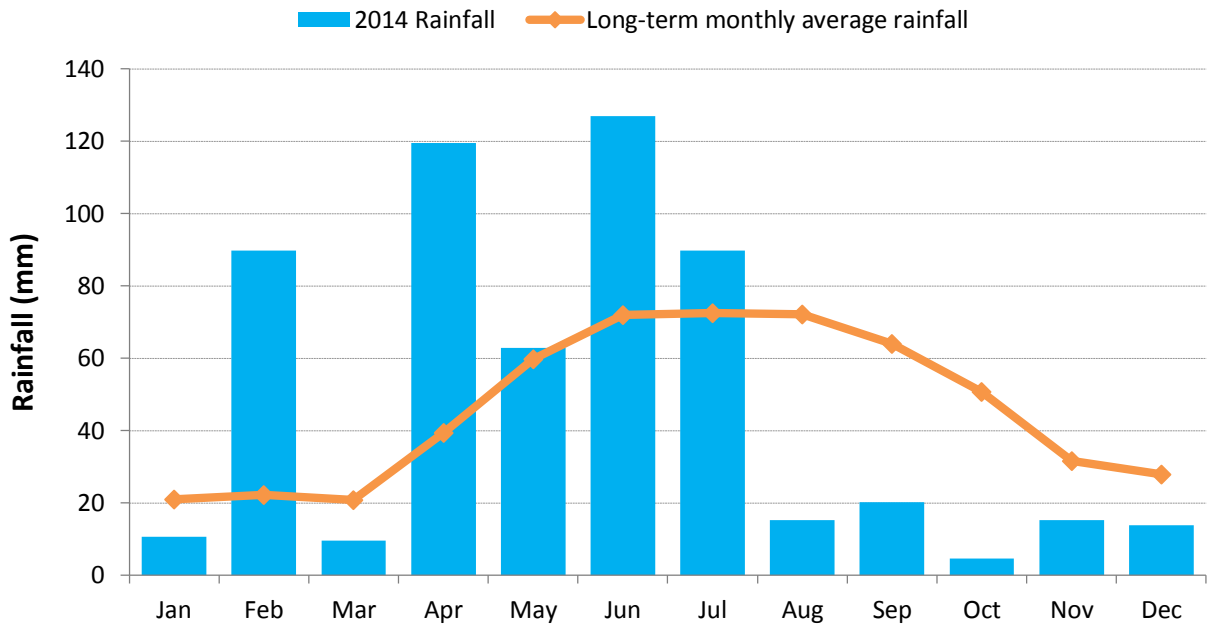


Figure 1. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Calcannia rainfall station[1] (number 20175) in the Clare Valley Prescribed Water Resources Area

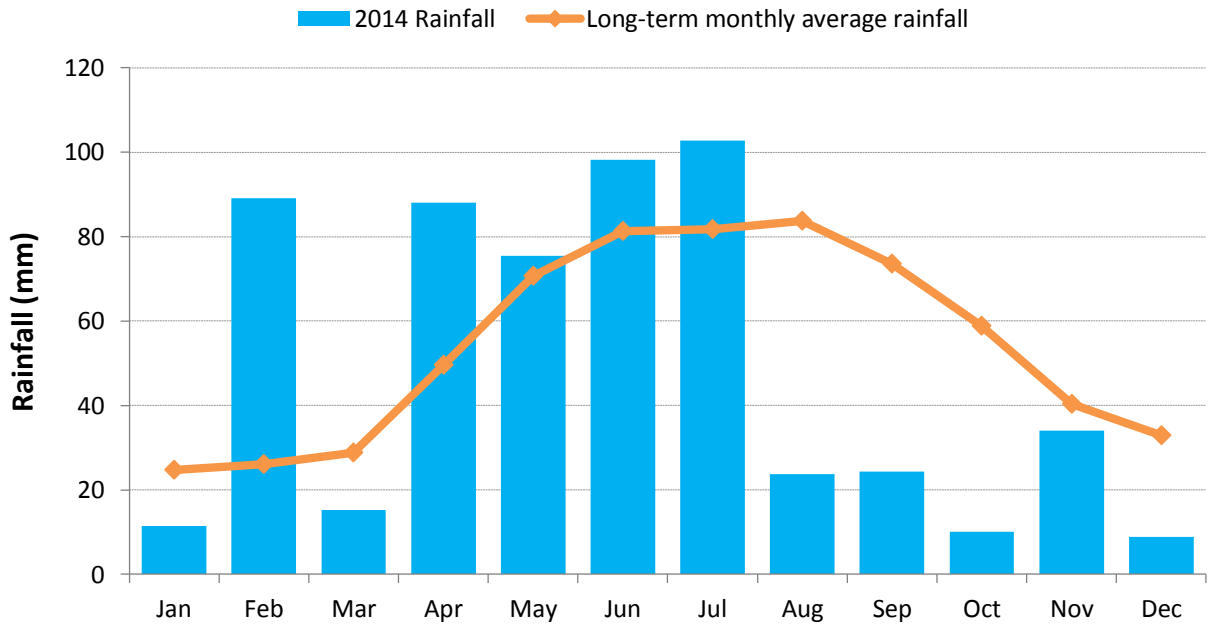


Figure 2. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Watervale rainfall station (number 21054) in the Clare Valley Prescribed Water Resources Area

[1] 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.

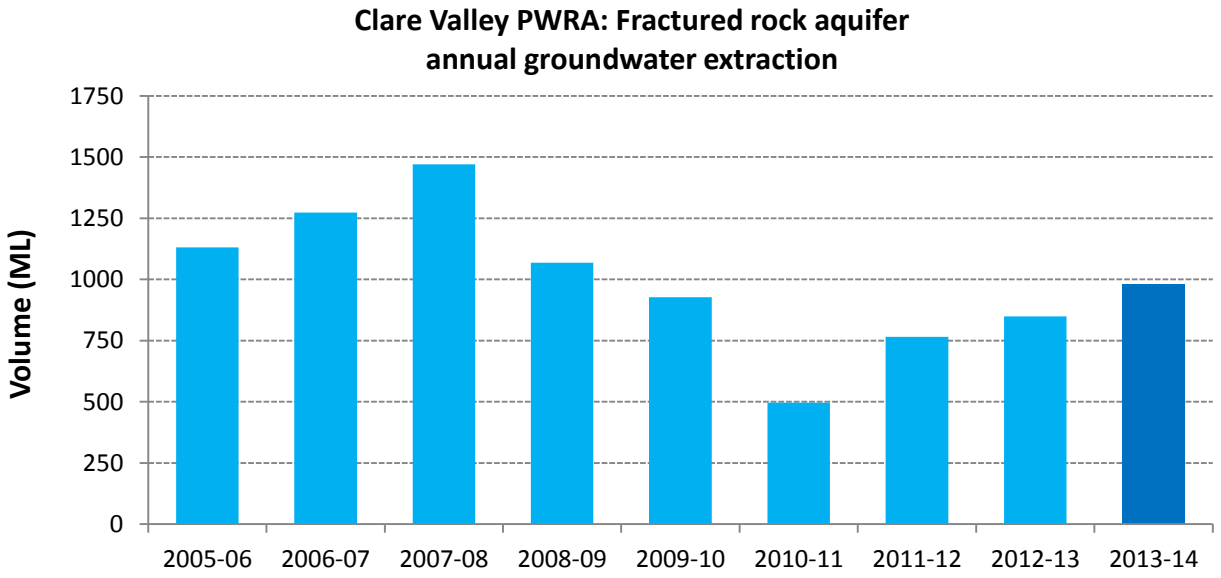


Figure 3. Historical licensed groundwater use in the fractured rock aquifer in the Clare Valley Prescribed Water Resources Area

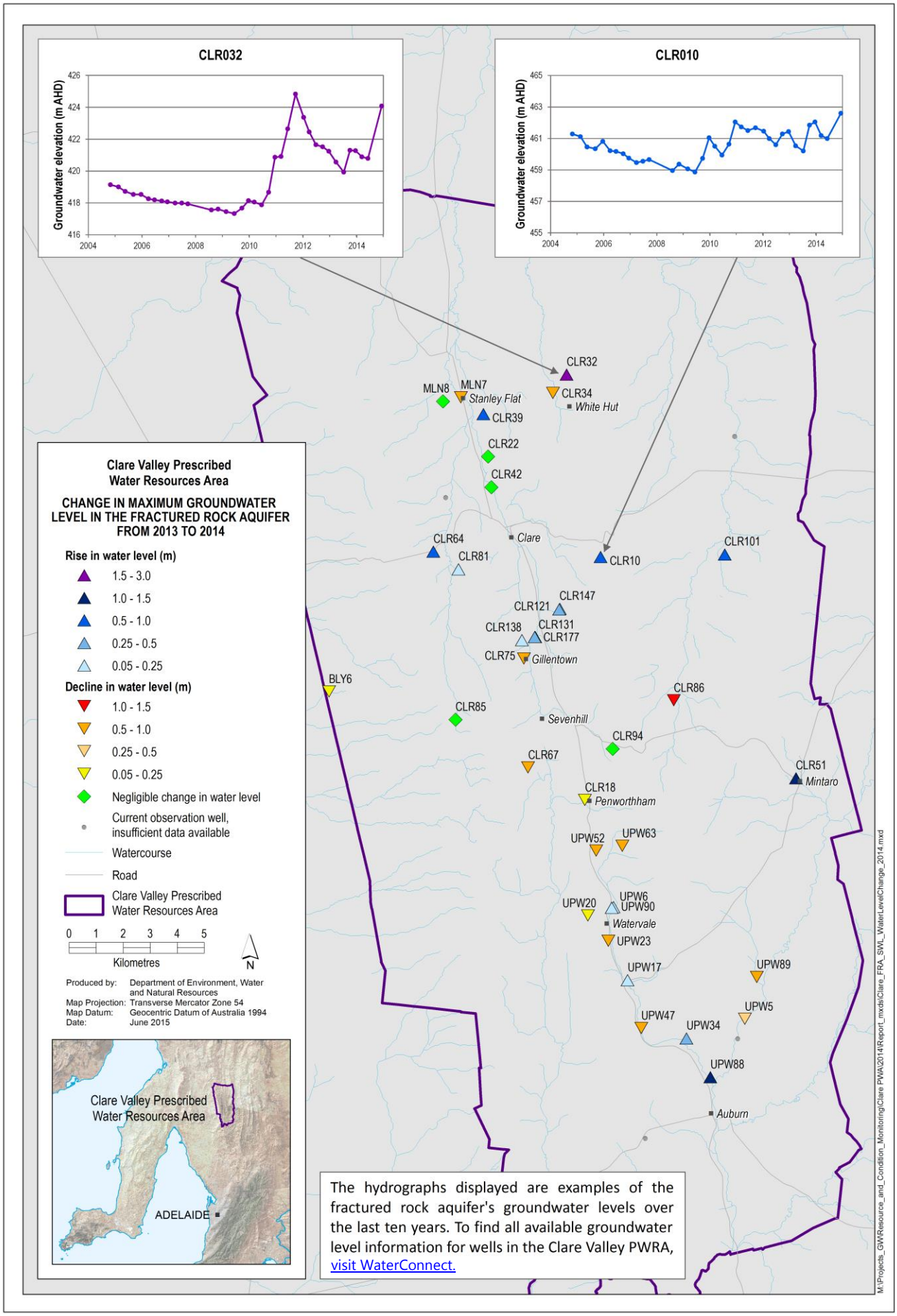


Figure 4. Overall changes in maximum groundwater levels of the fractured rock aquifer in the Clare Valley Prescribed Water Resources Area from 2013 to 2014

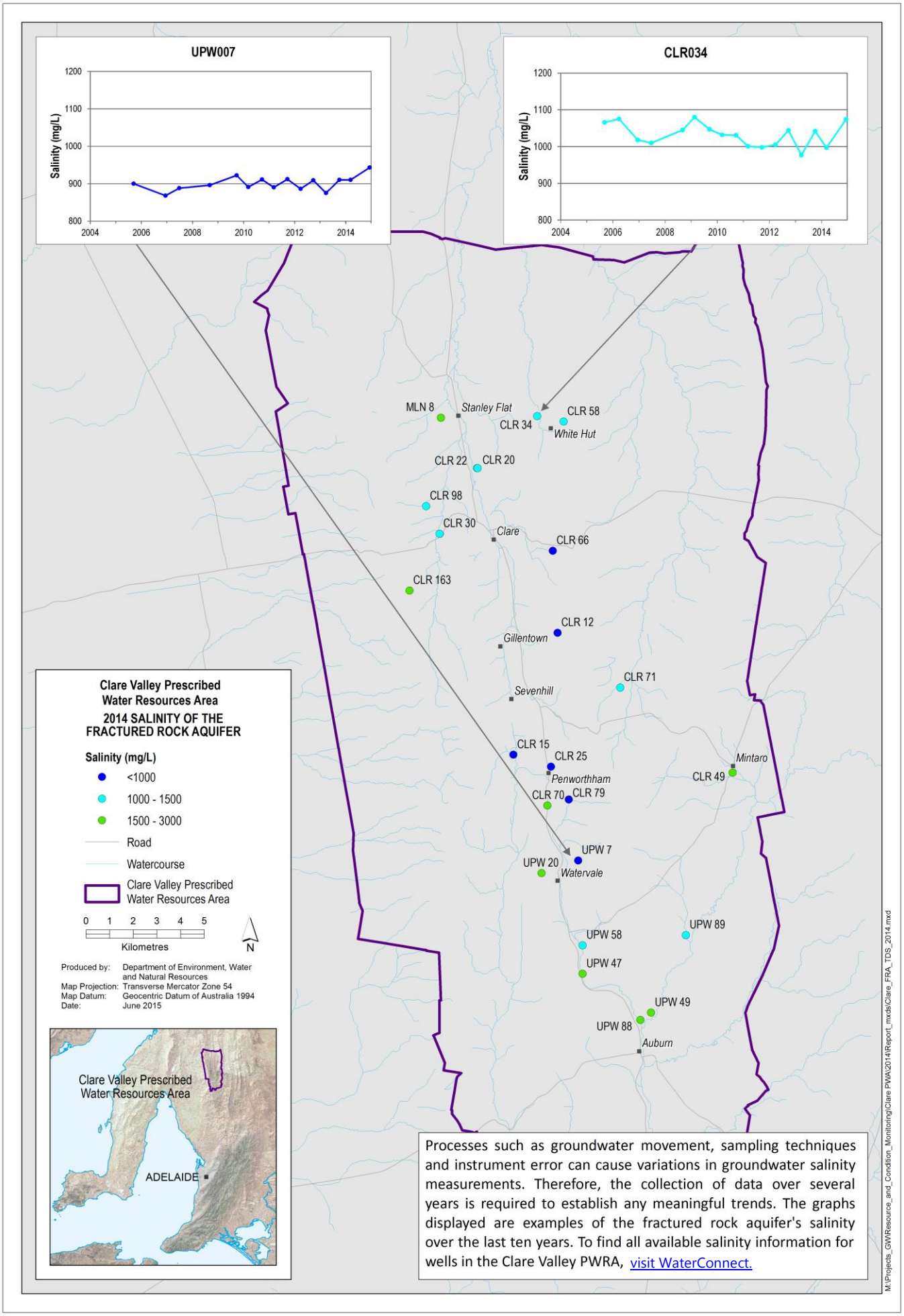


Figure 5. Groundwater salinity of the fractured rock aquifer in the Clare Valley Prescribed Water Resources Area for 2014