Clare Valley PWRA

Fractured rock aquifer

2015 Groundwater level and salinity status report

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

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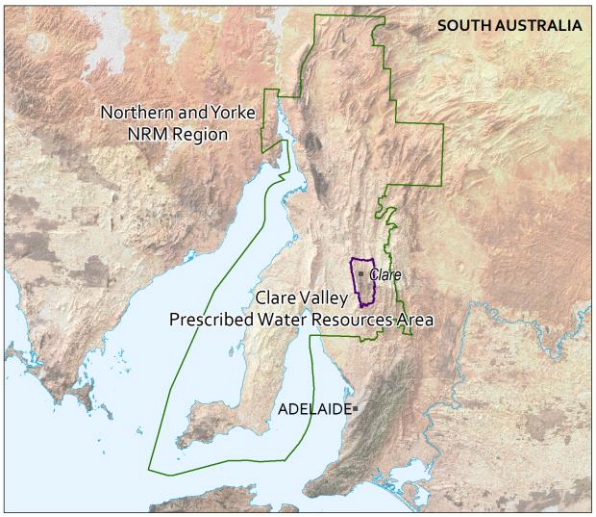
2015 Summary



The Clare Valley Prescribed Water Resources Area (PWRA) is located approximately 130 km north of Adelaide, within the Northern and Yorke Natural Resources Management (NRM) Region. It is a regional-scale resource for which surface water and groundwater are 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 groundwater systems within the Clare Valley region: (1) a Quaternary alluvial aquifer occurs at shallow depths of less than 15 m in valley floors and provides only a small portion of the groundwater resource (mainly in the vicinity of Stanley Flat); and (2) an extensive fractured rock aquifer (FRA) that underlies the Quaternary aquifer. It is the FRA that is the main groundwater system in the Clare Valley and is the focus of this report. Both aquifers are recharged by local rainfall.

The FRA, which provides groundwater for irrigation in the Clare Valley, comprises Mintaro Shale, Saddleworth Formation, Undelay 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 groundwater yield of any 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 within which 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.

The Watervale rainfall station (BoM Station 21054) recorded 457 mm of rainfall in the 2014–15 water-use year, the second lowest on record for the past 85 years. The rainfall in 2014–15 is 29% less than long-term average annual rainfall of 644 mm (1900–2015) and 28% less than the five-year average of 636 mm (Figs 1 and 2). The Clare (Calcannia) rainfall station (BoM Station 21075) recorded 437 mm of rainfall in the 2014–15 water-use year. This is 25% less than both the long-term average annual rainfall and five-year average annual rainfall of 586 mm (Figs 1 and 3). Although both rainfall stations recorded above-average rainfall in three of the past five years, a trend of declining rainfall is evident (Figs 2 and 3).

Licensed groundwater extractions across the Clare Valley PWRA totalled 936[1] ML in 2014–15. This is a 4% decrease from the previous water-use year, but 16% more than the five-year average of 805 ML (Fig. 4).

Long-term monitoring data show that, since the late-1980s, groundwater levels in the FRA have declined by around 4–6 m. However, rises of up to 3 m have been recorded between 2009 and 2010 in response to higher rainfall. In the five years to 2015, half of monitoring wells (51%) show a trend of rising groundwater levels, with another 3% showing stable water levels (Fig. 5). The remaining monitoring wells show a trend of declining groundwater levels, with 5% showing their lowest level in 2015. Wells that show a decline in water levels are often located in close proximity to those that show a rise. This follows a historical pattern of groundwater levels being influenced by local-scale variations in hydrogeological conditions and extraction regimes, and highlights the variable nature of fractured rock aquifers.

Across the Clare Valley, good quality groundwater is associated with higher rainfall and higher topography. In areas of dense groundwater development such as Watervale and Mintaro, the groundwater salinity can vary considerably between adjacent wells. In 2015, monitoring wells show salinities of less than 1000 mg/L to 3000 mg/L (Fig. 6). Long-term monitoring records show groundwater salinity trends within the FRA vary both directionally and spatially. Some wells show a rise in salinity particularly after

[1] The licensed groundwater use and managed aquifer recharge volumes for the 2014–15 water-use year are based on the best data available as of February 2016 and may be subject to change, as some extraction volumes are in the process of being verified.

the mid-2000s, while others show a decline in salinity or stable salinity. In the five years to 2015, 47% of monitoring wells show an increasing trend in salinity (Fig. 7). The remaining wells show stable salinity (47%) or a decreasing trend (6%). Five out of 22 monitored wells show salinities greater than 1500 mg/L, which is the maximum salinity tolerance for most crop types, although higher salinities are typical for these wells.

To determine the status of the fractured rock aquifer in the Clare Valley PWRA for 2015, the trends in groundwater levels and salinities over the past five years (2011 to 2015, inclusive) were analysed. This is a new approach, in contrast to the year-to-year assessments that have been used in past *Groundwater level and salinity status reports*. Please visit the Frequently Asked Questions on the *Water Resource Assessments* page on WaterConnect for more detail on the current method of evaluating the status of groundwater resources.

The fractured rock aquifer of the Clare Valley PWRA has been assigned a green status for 2015:

2015 Status  Positive trends have been observed over the past five years

The 2015 status for the fractured rock aquifer is based on:

- most monitoring wells (54%) show a five-year trend of rising or stable groundwater levels
- most monitoring wells (53%) show a five-year trend of decreasing or stable groundwater salinities.

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

To view the *Clare Valley PWA 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 monitoring 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.

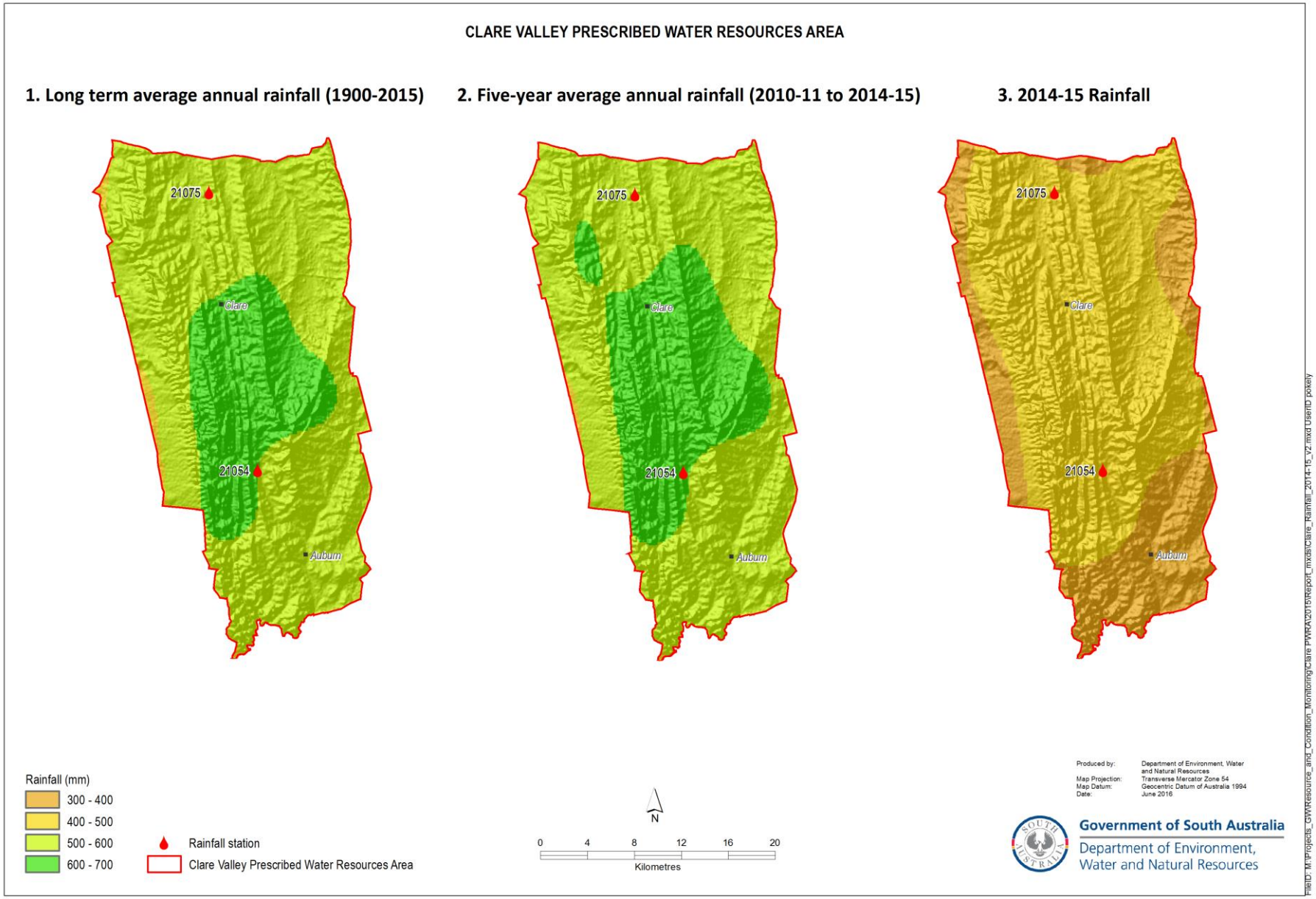


Figure 1. (1) Long-term and (2) five-year average annual rainfall and (3) annual rainfall for the 2014–15 water-use year in the Clare Valley Prescribed Water Resources Area[2]

[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.

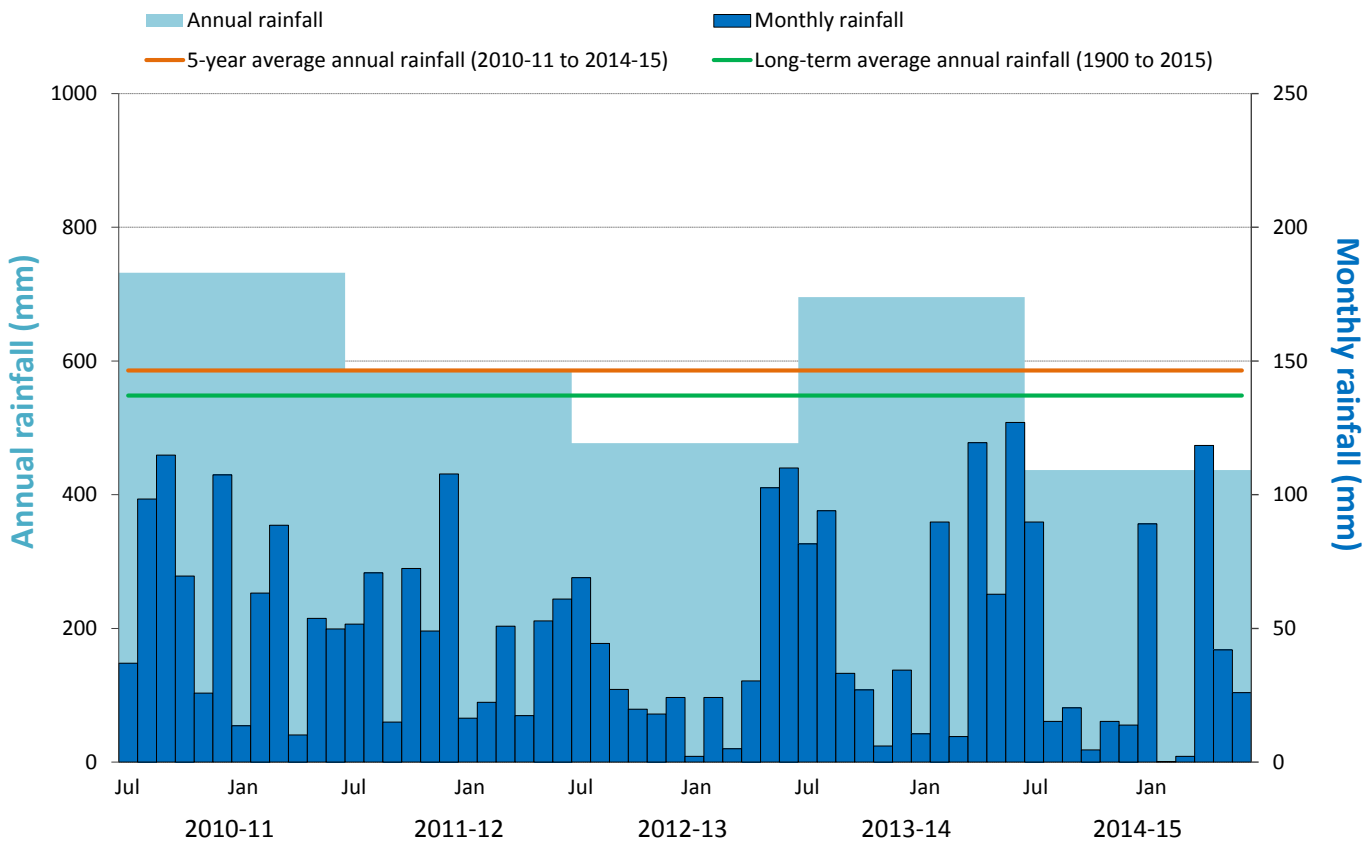


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Clare (Calcannia) (BoM Station 21075)[3]

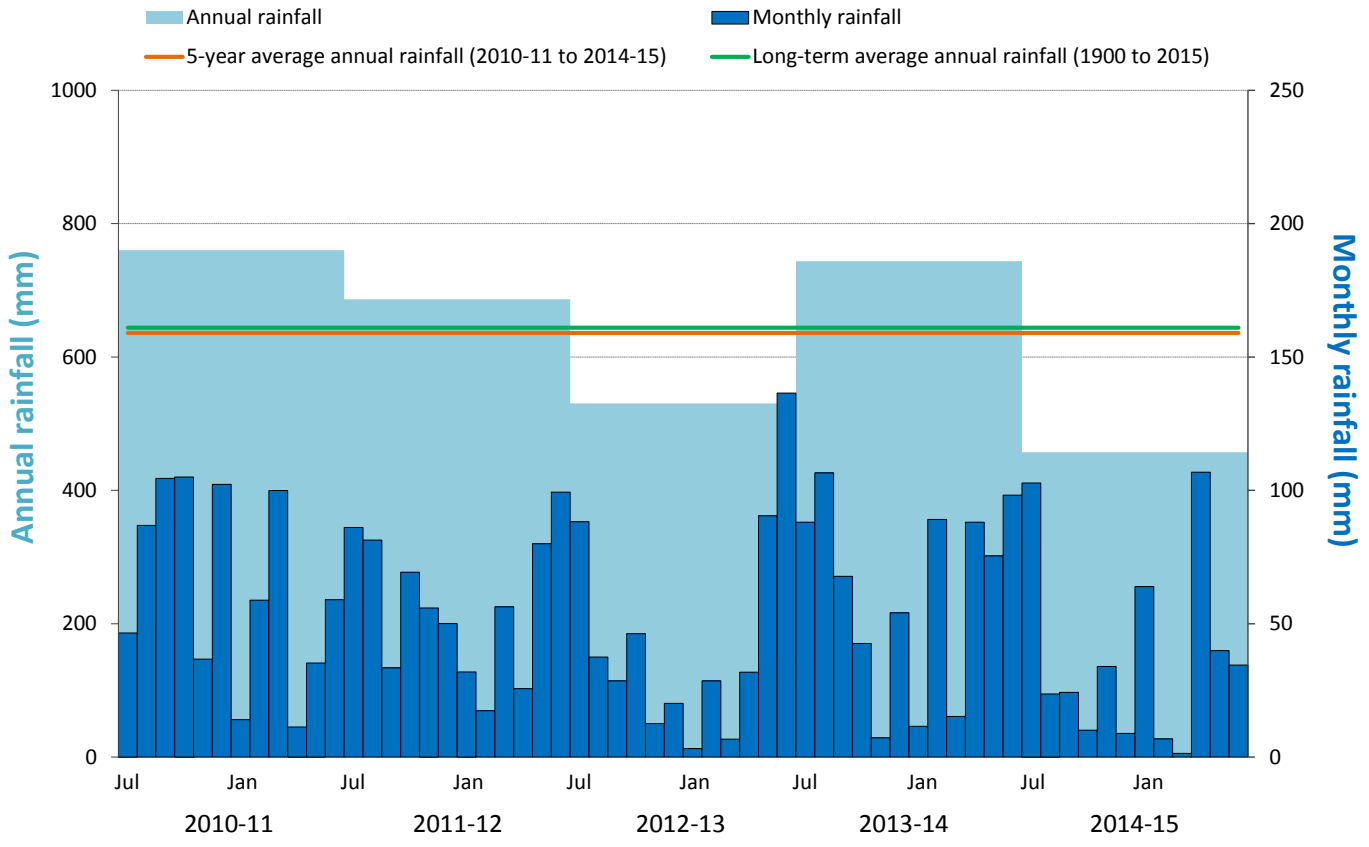


Figure 3. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Watervale (BoM Station 21054)[1]

[3] 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.

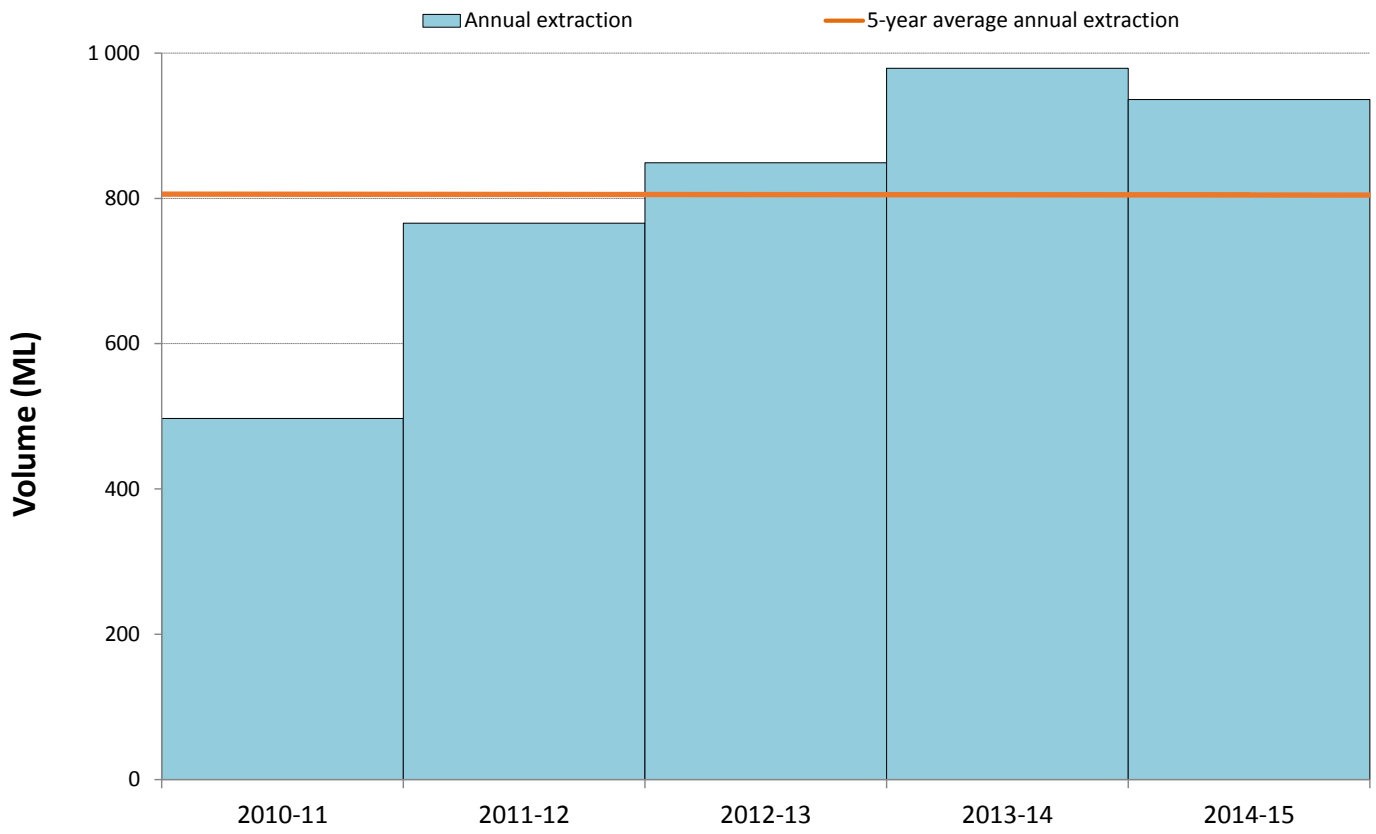


Figure 4. Licensed groundwater extraction volumes for the past five water-use years from the fractured rock aquifer in the Clare Valley Prescribed Water Resources Area

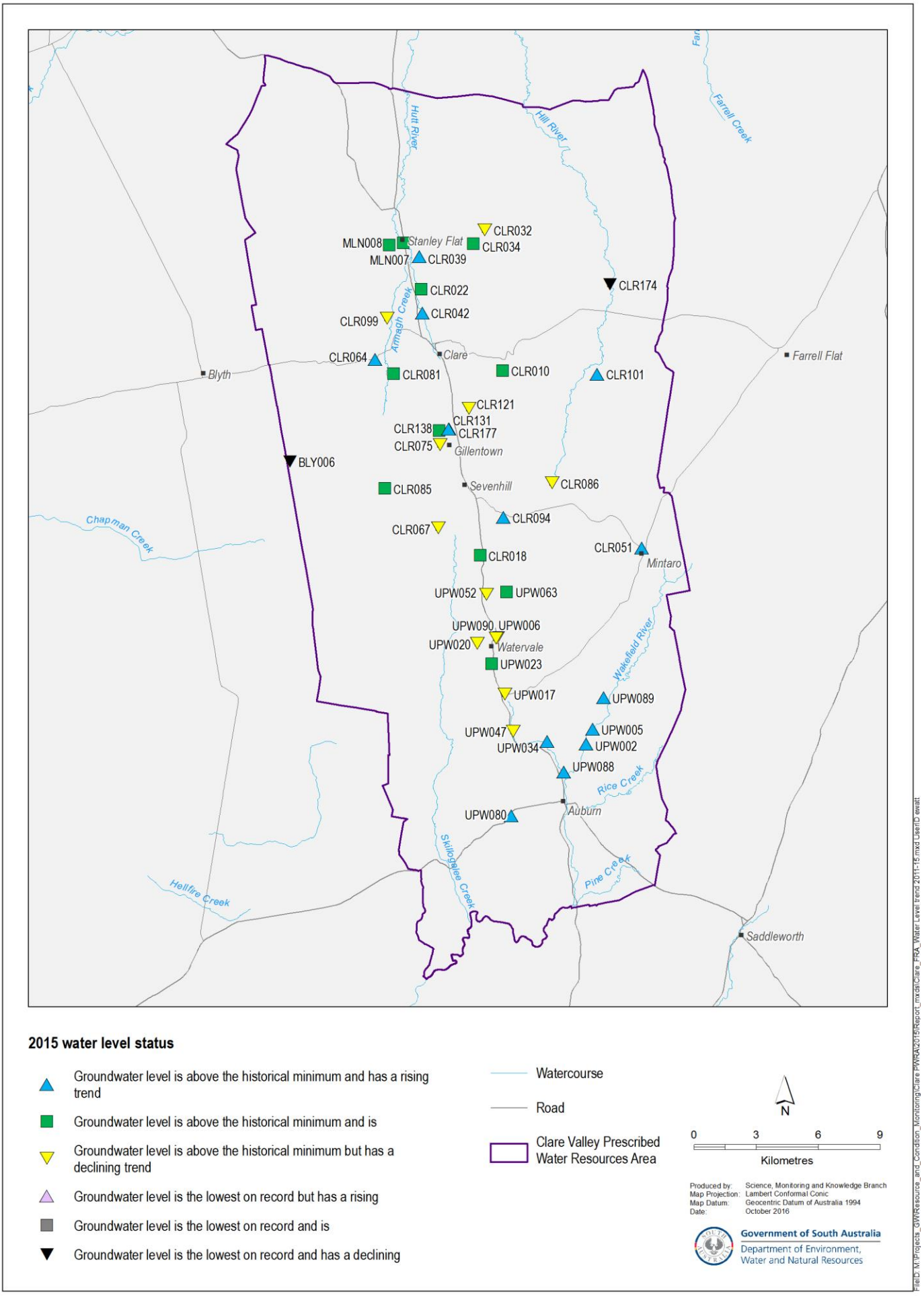


Figure 5. 2015 status of groundwater levels in the fractured rock aquifer of the Clare Valley Prescribed Water Resources Area, based on the five-year trend from 2011 to 2015

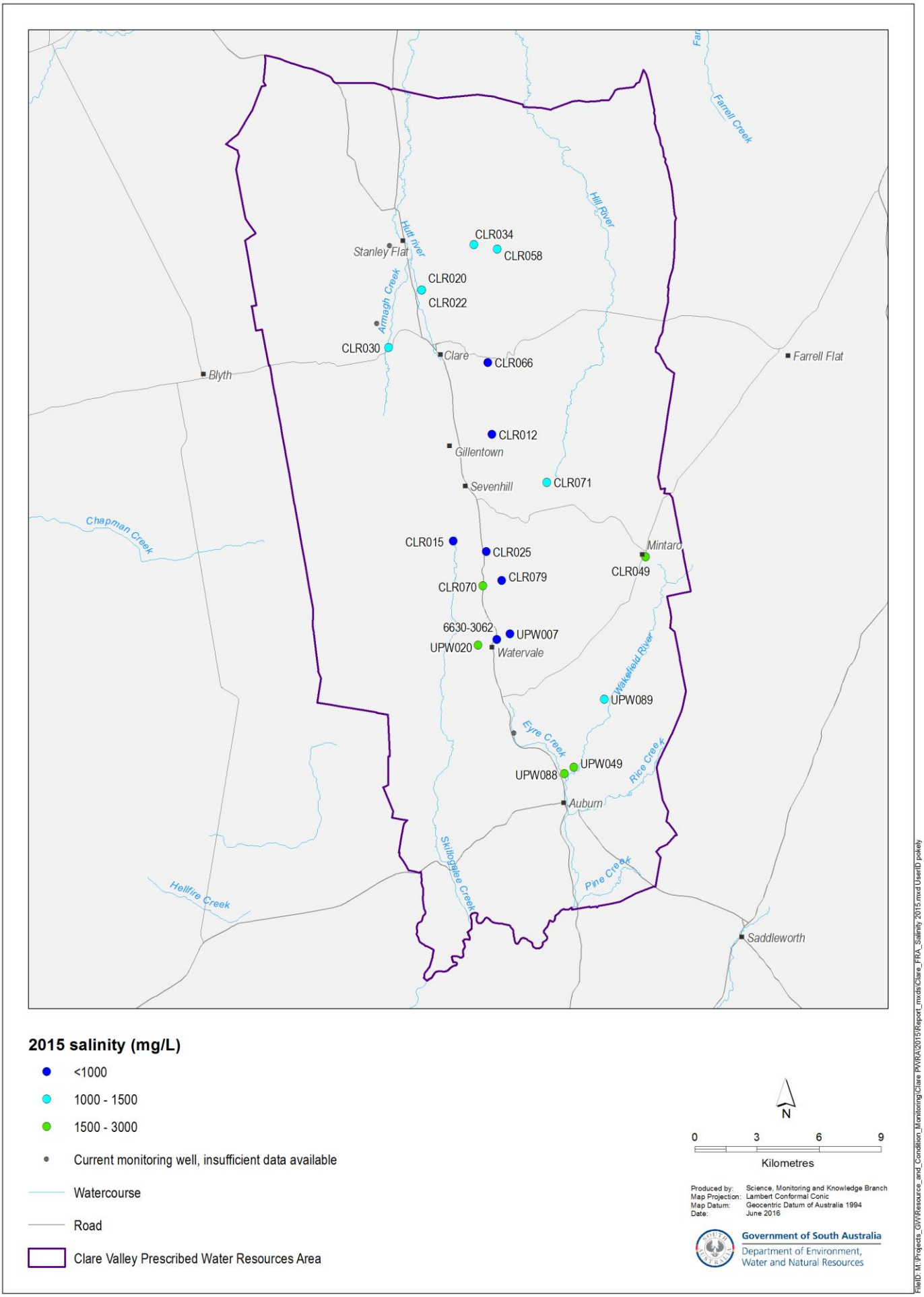


Figure 6. 2015 groundwater salinities in the fractured rock aquifer of the Clare Valley Prescribed Water Resources Area

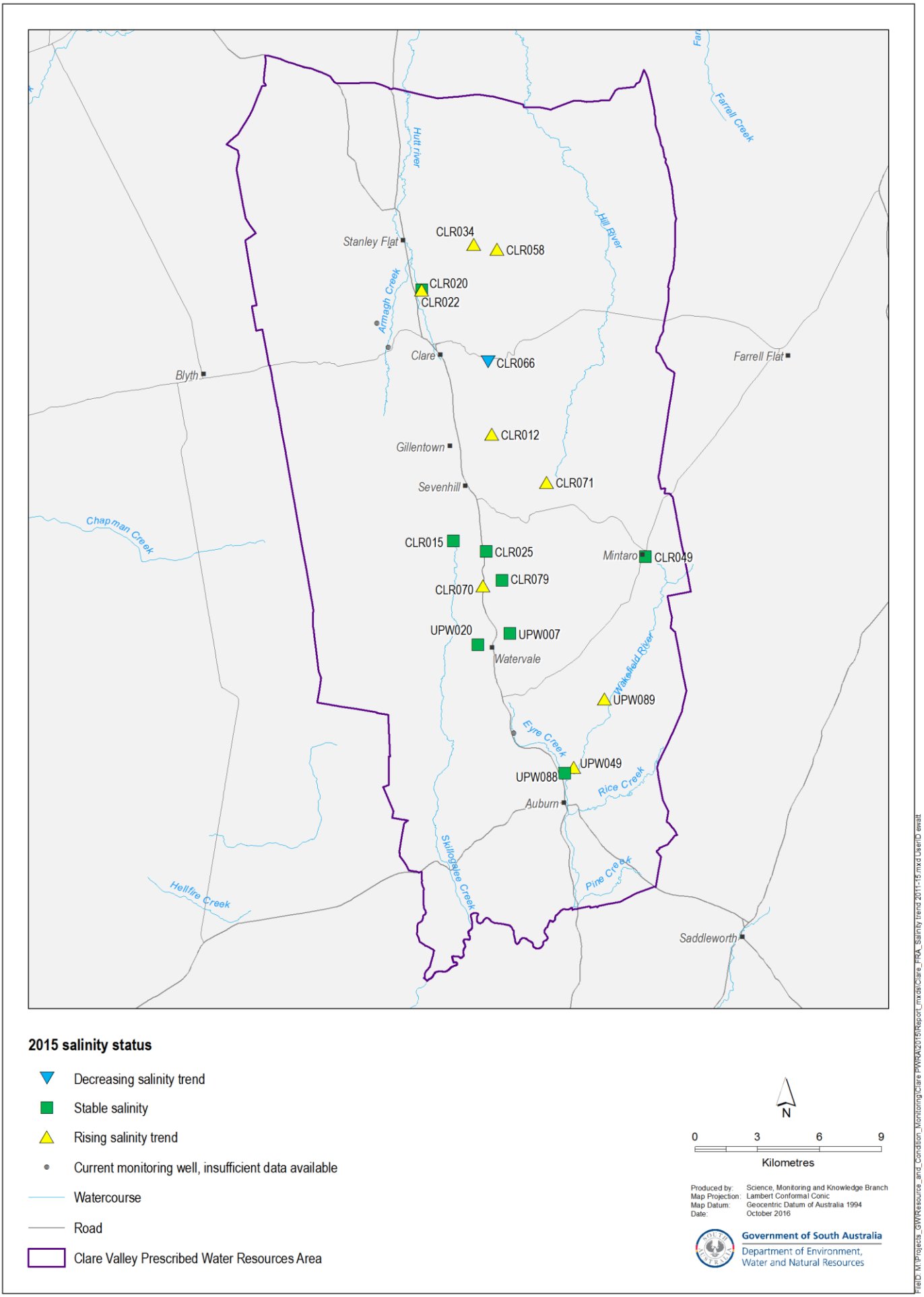


Figure 7. 2015 status of groundwater salinity in the fractured rock aquifer of the Clare Valley Prescribed Water Resources Area, based on the five-year trend from 2011 to 2015

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