Musgrave PWA

Polda lens

2014 Groundwater level and salinity status report

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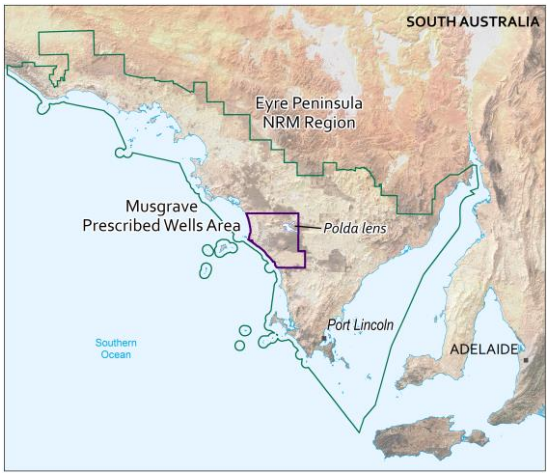
ISBN 978-1-922255-72-3

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

2014 Summary



The Musgrave Prescribed Wells Area (PWA) is situated in central Eyre Peninsula, approximately 120 km north-west of Port Lincoln in the Eyre Peninsula NRM Region. It is prescribed under South Australia's *Natural Resources Management Act 2004* and a water allocation plan provides for the sustainable use of the groundwater resources. The Polda lens is situated in the north-east of the Musgrave PWA.

Within the Musgrave PWA there are three main sedimentary sequences containing groundwater that overlie basement rocks: the Quaternary limestone aquifer, the underlying Tertiary sands aquifer, and deeper Jurassic sediments within the Polda Trough. The Quaternary limestone aquifer comprises a generally thin veneer of aeolianite sediments of the Bridgewater Formation and is continuous across the PWA. Areas within the Quaternary limestone aquifer defined by salinity of less than 1000 mg/L, such as the Polda lens, are described as fresh groundwater lenses in the current water allocation plan. The main source of recharge to the Quaternary limestone aquifer is the direct infiltration of rainfall and groundwater flow is predominantly in a westerly to south-westerly direction towards the Southern Ocean.

The condition of the groundwater resources in the Musgrave PWA is highly dependent on recharge from rainfall, with trends in groundwater levels and salinity 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. Historical rainfall data have indicated that trends of above or below-average rainfall can last for up to 25 years, and that greater recharge responses have been observed when rainfall occurs in high-intensity events.

The Lock (Terrah Winds) rainfall station (number 18165) is located around 15 km south-east of the Polda lens and recorded 476 mm of rain in 2014. This is only 6 mm less than the long-term average annual rainfall for that station; however, 2014 was characterised by well above-average rainfall in February, May and June (more than double the average monthly average) and considerably below-average rainfall between August and November (Fig. 1).

Licensed groundwater extractions occur predominantly from the fresh groundwater lenses within the Quaternary limestone aquifer and the Polda lens has provided groundwater for the Eyre Peninsula reticulated water supply system since 1963. Prior to 2000, this contribution averaged about 15% of the total supply. The Polda lens is no longer used for reticulated water supply due to continued low effective recharge and increasing groundwater salinity. A Notice of Prohibition was enforced in November 2008 by the Minister of Environment and Conservation and has been been extended until January 2017 unless varied or revoked. The Notice of Prohibition does not allow SA Water to extract groundwater for public water supply purposes and restricts extraction by other licence holders. Stock and domestic use is allowed under the Notice of Prohibition. Metered extractions from the Polda lens in 2013–14 totalled 613 kL, the same as the previous water-use year (Fig. 2). This volume of extraction equates to 32% of the allocation volume allowed under the Notice of Prohibition and accounts for less than 1% of the total licensed extractions within the Musgrave PWA for 2013–14.

A long-term decline in groundwater levels of up to 3 m has been recorded in the Polda lens from 1980 to 2009. This decline has a very close correlation with below-average rainfall recorded in the region during this period. Higher rainfall in 2009 and 2010 corresponded with an increase in groundwater levels throughout most of the lens, and increases and declines in groundwater levels since this time reflect the influence of wetter or dryer than average rainfall conditions. The significant reduction in groundwater extractions since the enforcement of the Notice of Prohibition is also likely to be a factor in the overall recovery trend.

The above-average, high-intensity rainfall recorded in the first half of 2014 has resulted in a significant increase in groundwater levels across the Polda lens—all 35 wells with data which could be compared with 2013 showed an increase in groundwater level (Fig. 3). Groundwater level increases ranged between 0.06 and 0.6 m, with a median rise of 0.25 m.

The majority of observation wells show a rise in salinity between previous measurements collected in the mid- to late-1990s to the resumption of salinity measurements in 2005. Salinity increases continued to be observed, coinciding with a prolonged period of below-average rainfall, reduced recharge and declining groundwater levels. Salinities peaked in mid-2009, shortly after several months of above-average rainfall, possibly as a result of concentration of salt by evapotranspiration during several years of below-average rainfall and a thinning of the freshwater lens. Since 2010, observation wells within the Polda lens reveal signs of freshening occurring, which appear to be in response to the increased recharge caused by above-average rainfall received from 2009 to 2011.

In recent years, salinities have shown a close correlation with extended periods of above- or below-average rainfall.

The above-average rainfall conditions in the first half of 2014 have led to an overall decrease in salinities across the Polda lens. A total of 24 (80%) of the 30 wells with data from both 2013 and 2014 show a decrease in salinity, with decreases ranging up to 32%. Overall, there has been a median decrease in salinity of 5% in 2014; however, several wells clustered near the central-west edge of the Polda lens have shown increases in salinity of up to 20%, with a median increase of 6%. A total of 23 (53%) of the 32 wells with data for 2014 have a salinity of less than 1000 mg/L (Fig. 4).

The Polda lens of the Musgrave PWA has been assigned a yellow status for 2014:

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

This means that gradual adverse changes in the resource status have been observed over the reporting period. Continuation of these changes is unlikely to negatively impact the beneficial use of the resource for at least 15 years. The 2014 status for the Polda lens is supported by:

- groundwater levels remain 2 to 3 m below historic (pre-extraction) levels despite a lens-wide increase in groundwater levels between 2013 and 2014
- a localised area of increasing salinity despite an overall decrease in salinity within the broader lens.

To view descriptions for all status symbols, please visit WaterConnect.

To view the *Musgrave PWA Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit the *Water Resources* page on WaterConnect.

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

For further details about the Polda lens, please see the *Water Allocation Plan for the Musgrave Prescribed Wells Area* on the Natural Resources Eyre Peninsula website.

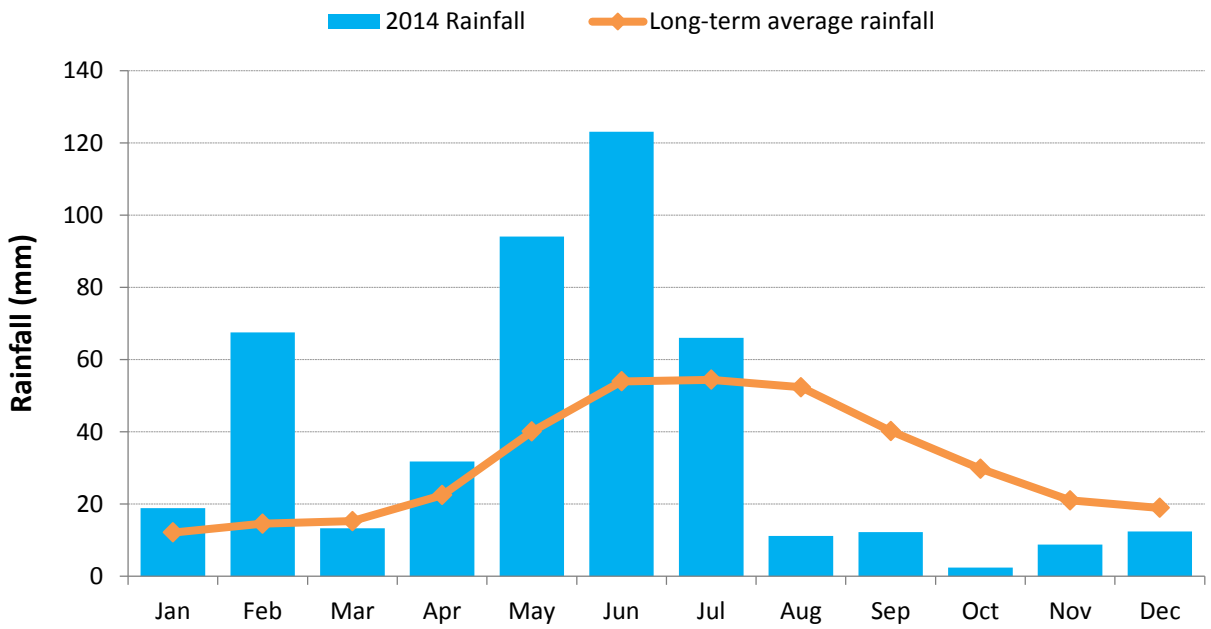


Figure 1. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Lock (Terrah Winds) rainfall station[1] (number 18165) in the Musgrave Prescribed Wells Area

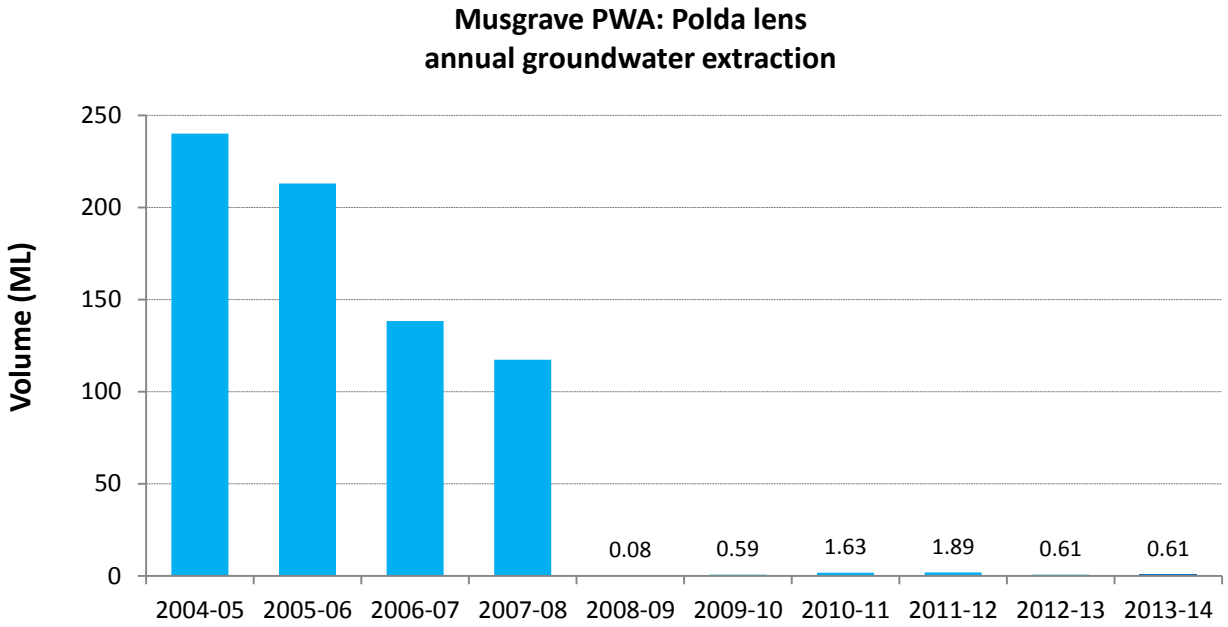


Figure 2. Historical licensed groundwater use for the Polda lens of the Musgrave Prescribed Wells Area

[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.

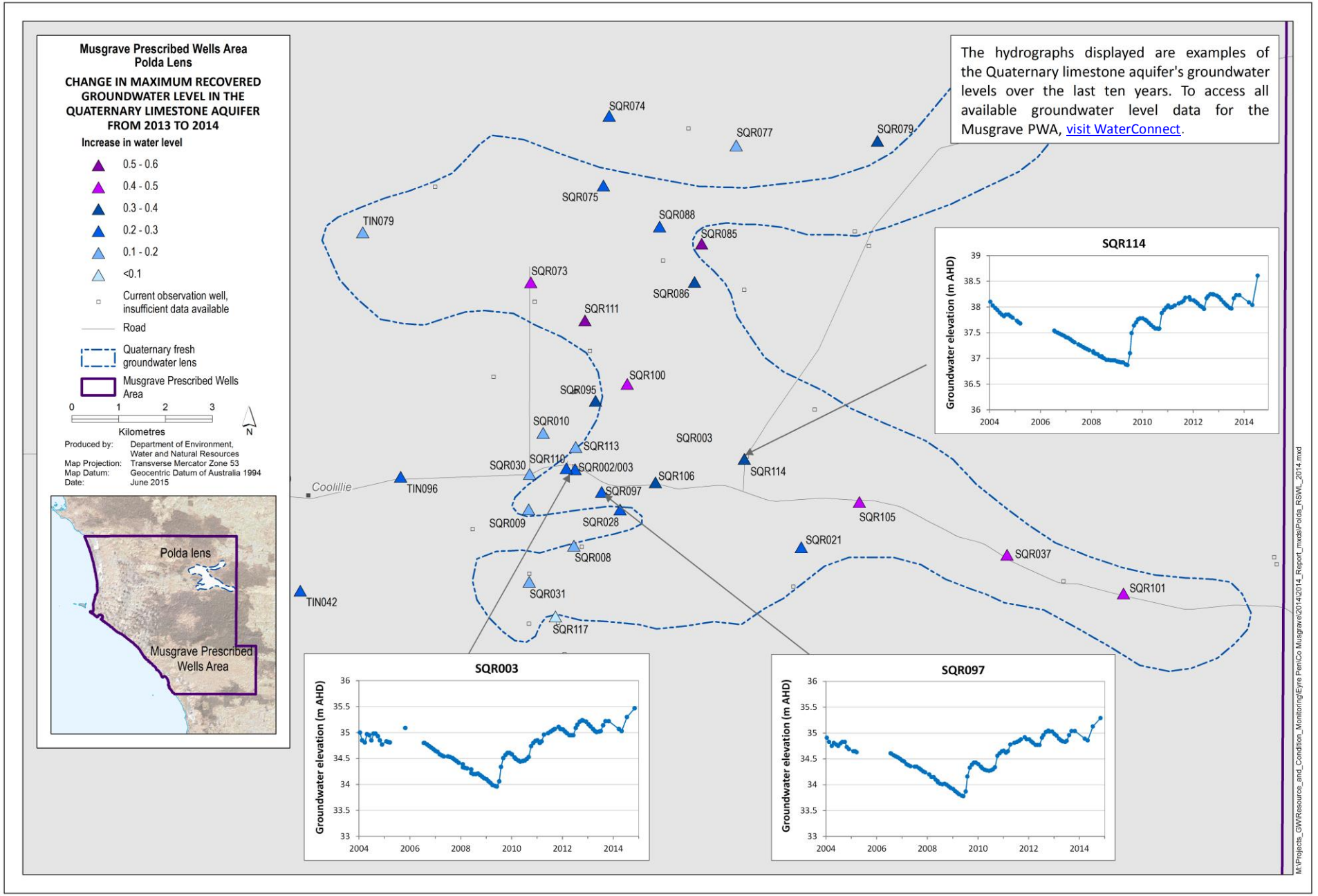


Figure 3. Overall changes in maximum recovered groundwater levels in the Polda lens of the Musgrave Prescribed Wells Area from 2013 to 2014

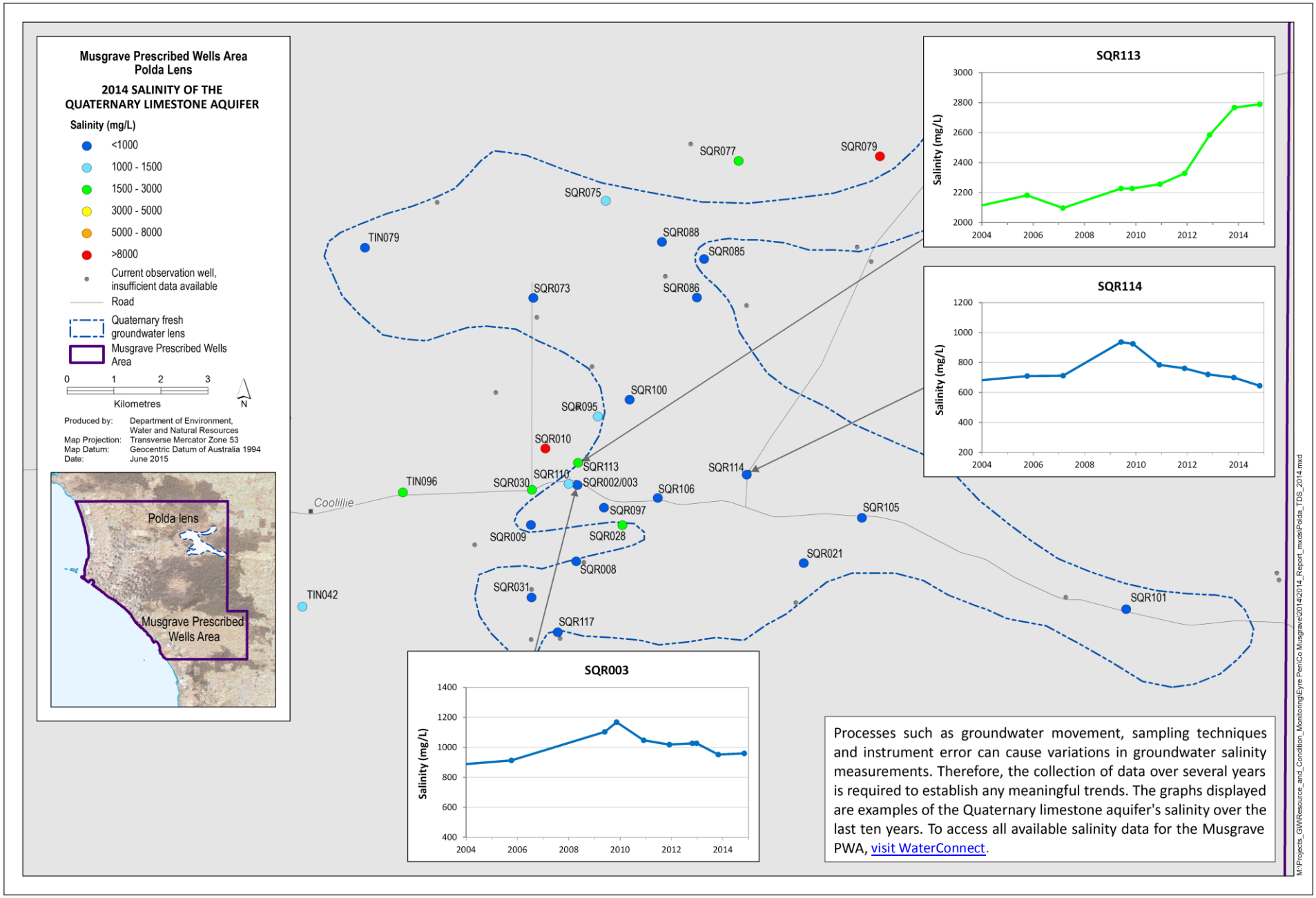


Figure 4. Groundwater salinity of the Polda lens in the Musgrave Prescribed Wells Area in 2014