Southern Basins PWA

Lincoln lenses A, B and C

2015 Groundwater level and salinity status report

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

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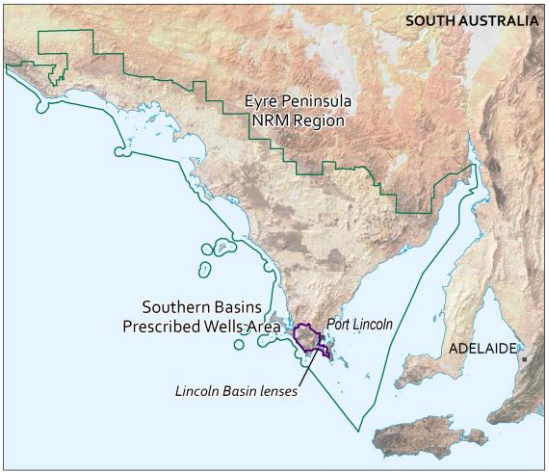
2015 Summary



The Southern Basins Prescribed Wells Area (PWA) is located at the southern-most part of the Eyre Peninsula, between Port Lincoln and Coffin Bay, 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 Lincoln Basin is located in the south-east of the Southern Basins PWA.

Within the Southern Basins PWA, there are two main sedimentary sequences containing groundwater that overlie basement rocks: the Quaternary limestone aquifer and underlying Tertiary sands aquifer (not assessed in this report). 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 delineated by groundwater salinity of less than 1000 mg/L, such as Lincoln Basin lenses A, B and C, 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 toward the nearest coastline.

Groundwater levels and salinities in the Southern Basins PWA are highly dependent on recharge from rainfall and any trends in groundwater level or salinity are primarily climate driven: below-average rainfall results in a reduction in recharge to the aquifers. Below-average summer rainfall can also result in increased extraction, and combined may cause groundwater levels to fall and salinities to increase. Conversely, above-average rainfall may result in increased recharge, decreased extraction and groundwater levels may rise and salinities stabilise or decline. Historical rainfall data indicate that trends of above or below-average rainfall can last for up to 25 years, and that high-intensity rainfall can result in greater and more-rapid water level (i.e. recharge) response.

The Westmere rainfall station (BoM Station 18137), located approximately 5 km west of Lincoln B lens, recorded 355 mm of rain in the 2014–15 water-use year, the fourth-lowest on record. This is 215 mm below the long-term average of 570 mm (1900–2015) and 195 mm below the five-year average of 550 mm (Figs. 1 and 2). Long-term seasonal rainfall patterns show generally higher rainfall during the winter months and lower rainfall over summer. Notable seasonal variations over the past five years include the unusually wet spring and summer of 2010–11, dry spring–summer of 2012–13 and wet summer of 2013–14. The 2014–15 water-use year was particularly dry, with most months receiving well below long-term monthly-average rainfall. A trend of declining rainfall is evident over the past five years, despite high rainfall in 2013–14 (Fig. 2).

Licensed groundwater extraction occurs predominantly from the fresh groundwater lenses within the Quaternary limestone aquifer. In 2014–15, metered extractions from the Lincoln Basin (lenses A, B and C) totalled 7.5 ML, which is a 275% increase from the previous water-use year, but is 95% less than the five-year average annual extraction (Fig. 3). This volume of extraction represents 1.2% of the total allocation limit of 625 ML for the Lincoln Basin and accounts for 0.14% of the total licensed extractions within the Southern Basins PWA for the 2014–15 water-use year.

Groundwater levels in the Lincoln Basin show a positive correlation with Westmere rainfall. Since the mid-1980s, groundwater levels have shown a declining trend, which is coincident with predominantly below-average rainfall; maximum declines of 2.5–3.0 m have been observed up to 2009. From 2008, recovery of groundwater levels is evident and this is likely due to substantial decreases in the rate of groundwater extraction and above-average rainfall since 2009. However, groundwater levels are still considerably lower than those observed prior to the 1980s.

In the five years to 2015, 86% of monitoring wells show a rising trend, particularly those located within and immediately outside the extents of Lincoln A and Lincoln C lenses (Fig. 4). The remaining 14% of (mainly Lincoln B lens) monitoring wells show stable levels.

Groundwater salinity of the Quaternary limestone aquifer in and around Lincoln A lens showed a steady rising trend for the period 1959–2008 but since 2008, salinity levels have been stable. Groundwater salinities in and around Lincoln Basin B lens have also shown a rising trend; furthermore, some salinity monitoring wells have shown occasional evidence of intrusion of higher-salinity groundwater from the underlying Tertiary sands aquifer (a process called 'up-coning'), due to the high rate of groundwater extraction and the thinness of the freshwater lens. Increases in salinity due to the process of up-coning are reversible by reducing the rate of (or ceasing) extraction, or by increasing the number and spatial distribution of wells (i.e. increasing the area) from which

groundwater is extracted. Extraction for public water supply has substantially reduced since 2013, which is now allowing for groundwater salinities to decrease. Groundwater salinity in and around Lincoln C lens has been stable since 2008.

The groundwater salinity distribution for 2015 is shown in Figure 5. Salinity was not measured in the Lincoln B lens due to issues around access to salinity monitoring wells and technical difficulties. In the Lincoln A and Lincoln C lenses, salinities typically ranged between 720 and 1290 mg/L, although one near-coastal well located south of Tulka West shows salinity of 7592 mg/L. In the five years to 2015, Lincoln Basins salinity monitoring wells have shown a trend of stable or decreasing salinity (Fig. 6).

To determine the status of the Lincoln Basin for 2015, the trends in groundwater level and salinity 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 a detailed explanation of the new method of status assessment.

The Lincoln lenses A, B and C of the Southern Basins PWA have been assigned a green status for 2015:

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

The 2015 status of the Lincoln lenses A, B and C is based on:

- all monitoring wells show a five-year trend of stable or rising groundwater levels
- all monitoring wells show a five-year trend of stable or decreasing salinity levels.

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

To view the *Southern Basins Prescribed Wells Area Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, location of rainfall stations and relevant groundwater-dependent ecosystems, please visit the *Water Resource Assessments* page on WaterConnect.

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

For further details about the Southern Basins PWA, please see the *Water Allocation Plan for the Southern Basins Prescribed Wells Area* on the Natural Resources Eyre Peninsula website.

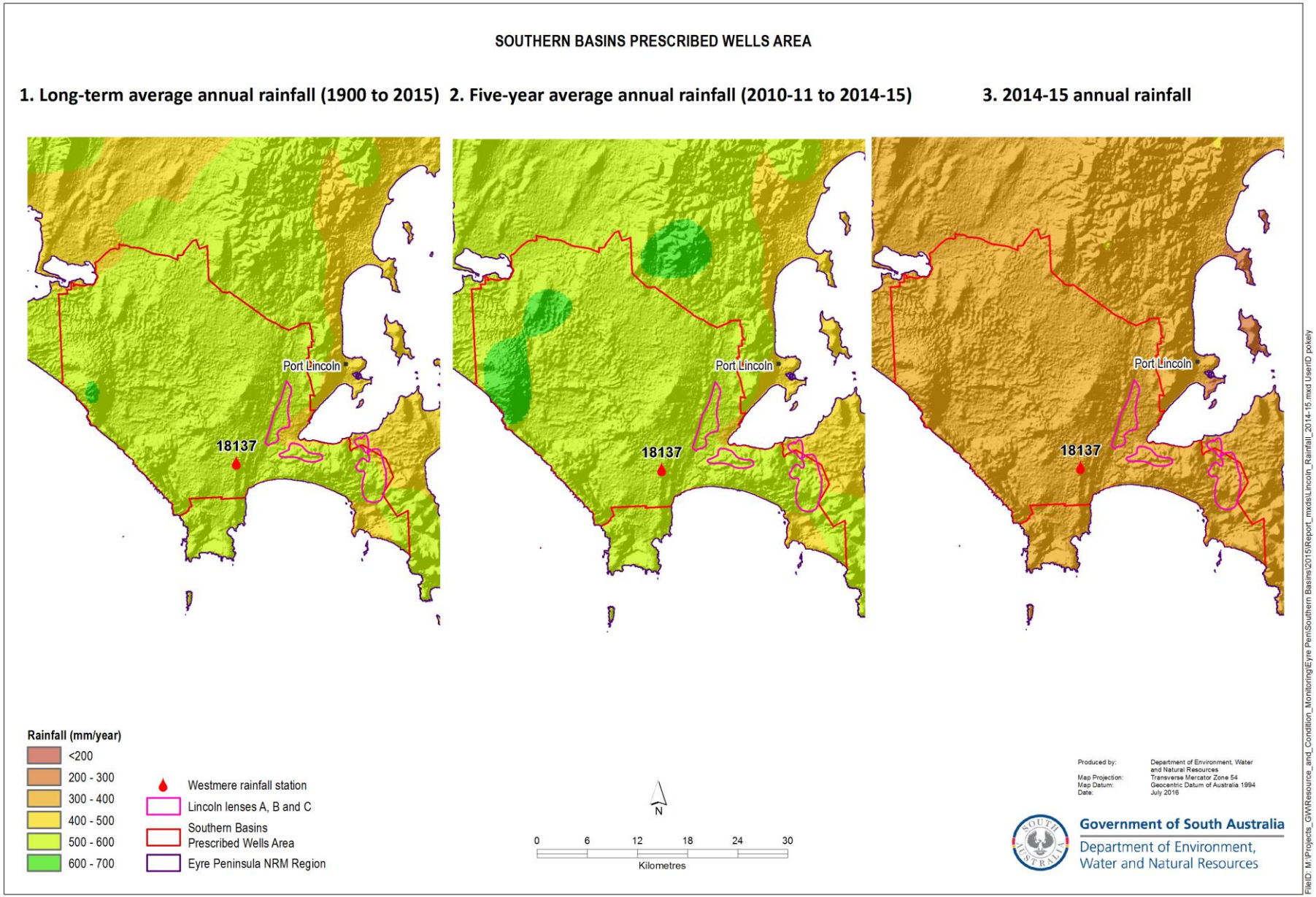


Figure 1. (1) Long-term and (2) five-year average annual rainfall, and (3) annual rainfall for the 2014–15 water-use year in the Southern Basins Prescribed Wells Area[1]

[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.

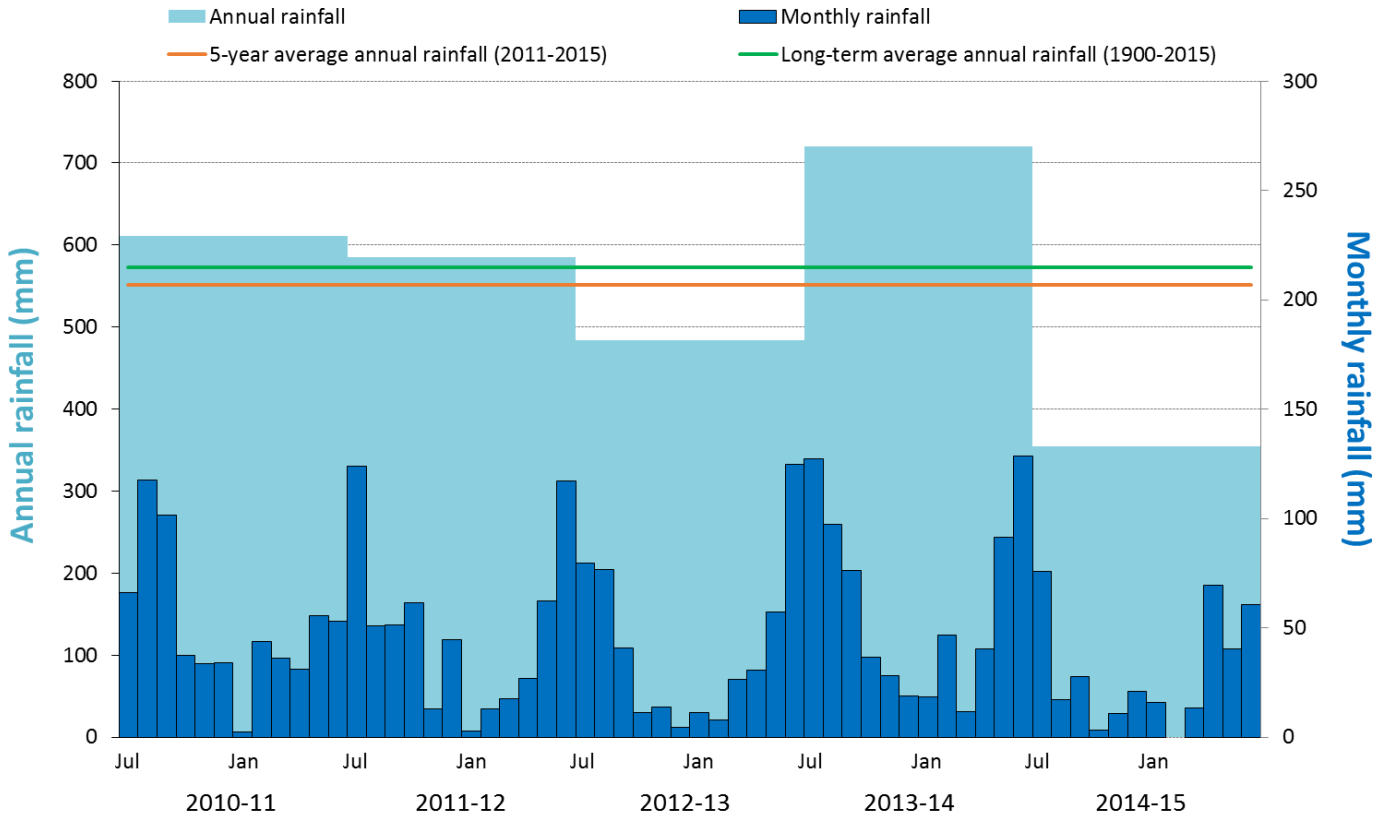


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Westmere (BoM Station 18137)[2]

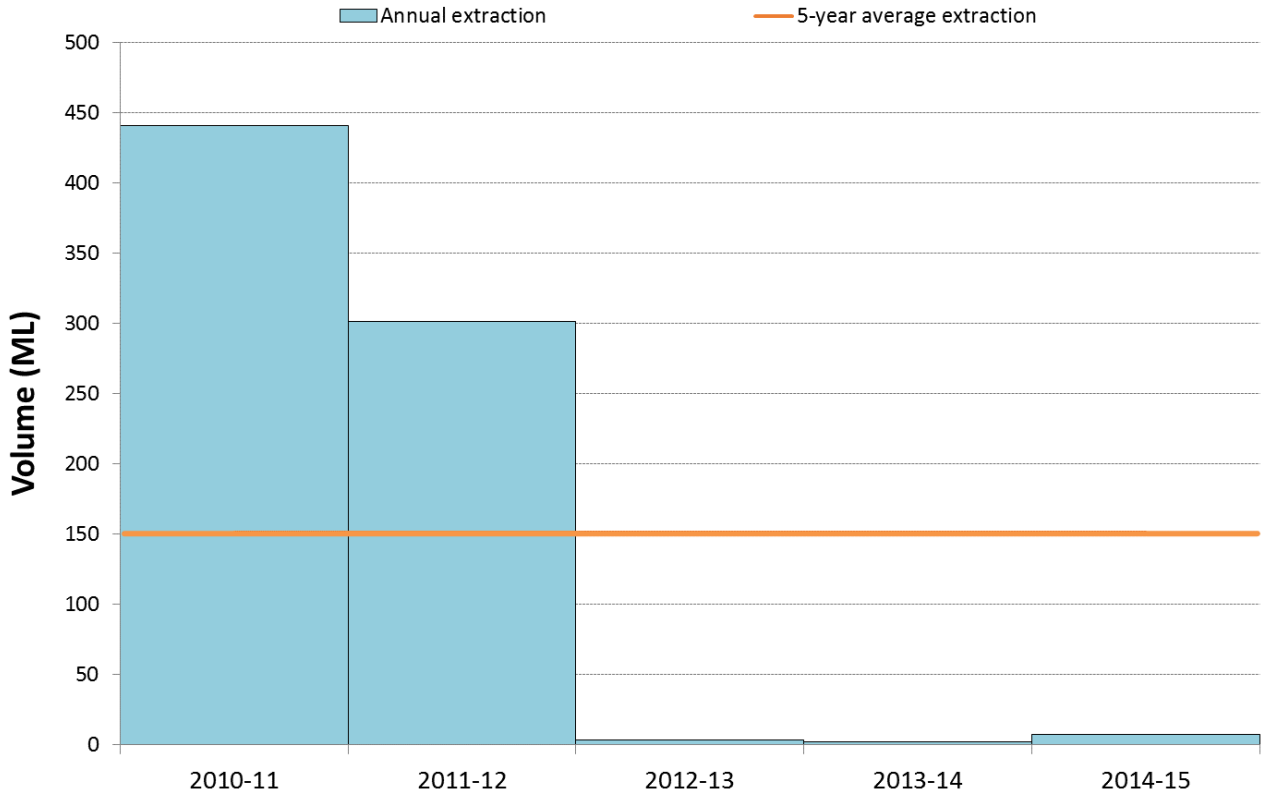


Figure 3. Licensed groundwater extraction volumes for the past five water-use years, for the Lincoln Basin lenses in the Southern Basins Prescribed Wells Area

[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.

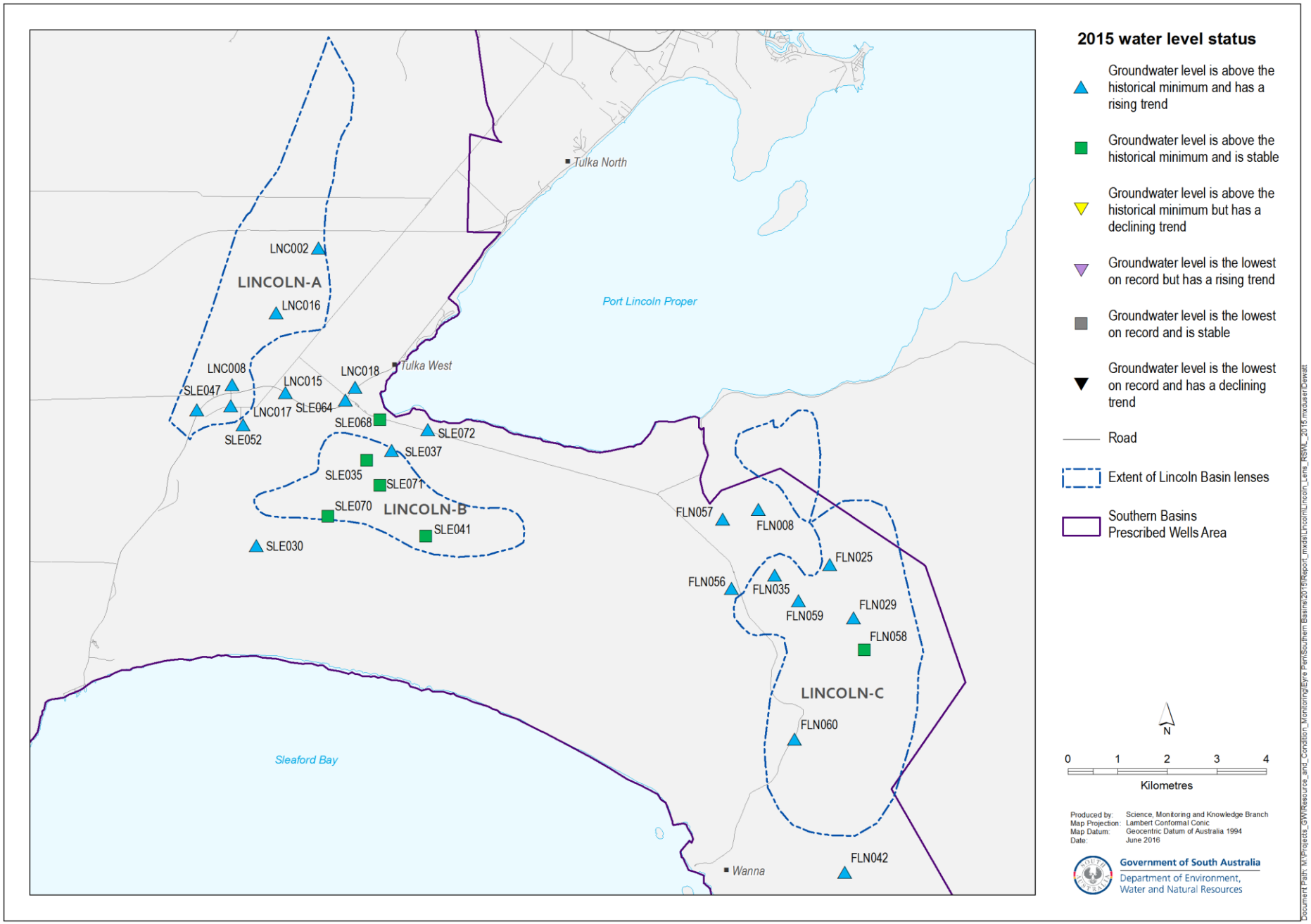


Figure 4. 2015 status of groundwater level in the Quaternary aquifer of the Lincoln Basin (Southern Basins Prescribed Wells Area) based on the five-year trend from 2011 to 2015

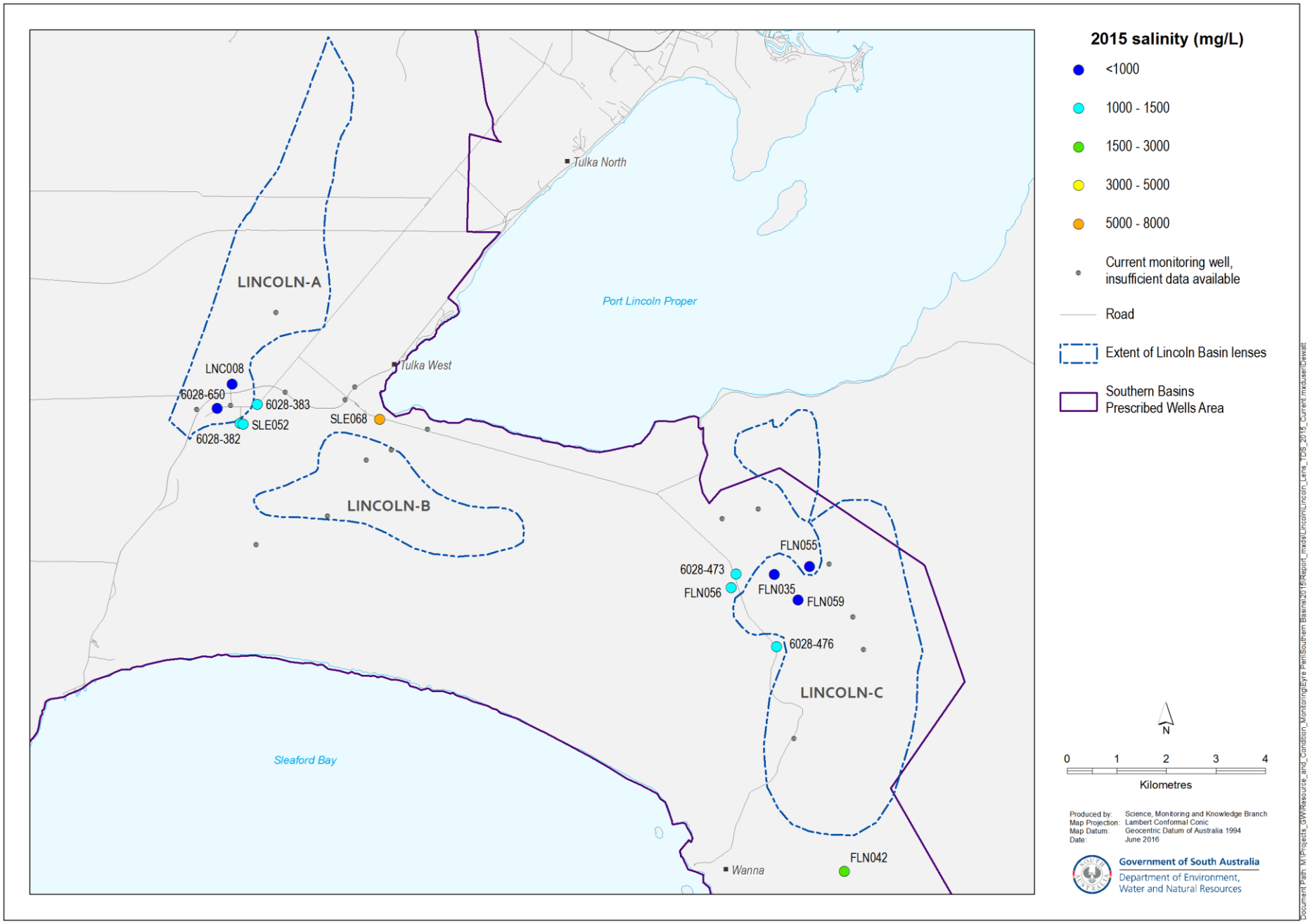


Figure 5. 2015 groundwater salinity of the Quaternary aquifer in the Lincoln Basin (Southern Basins Prescribed Wells Area)

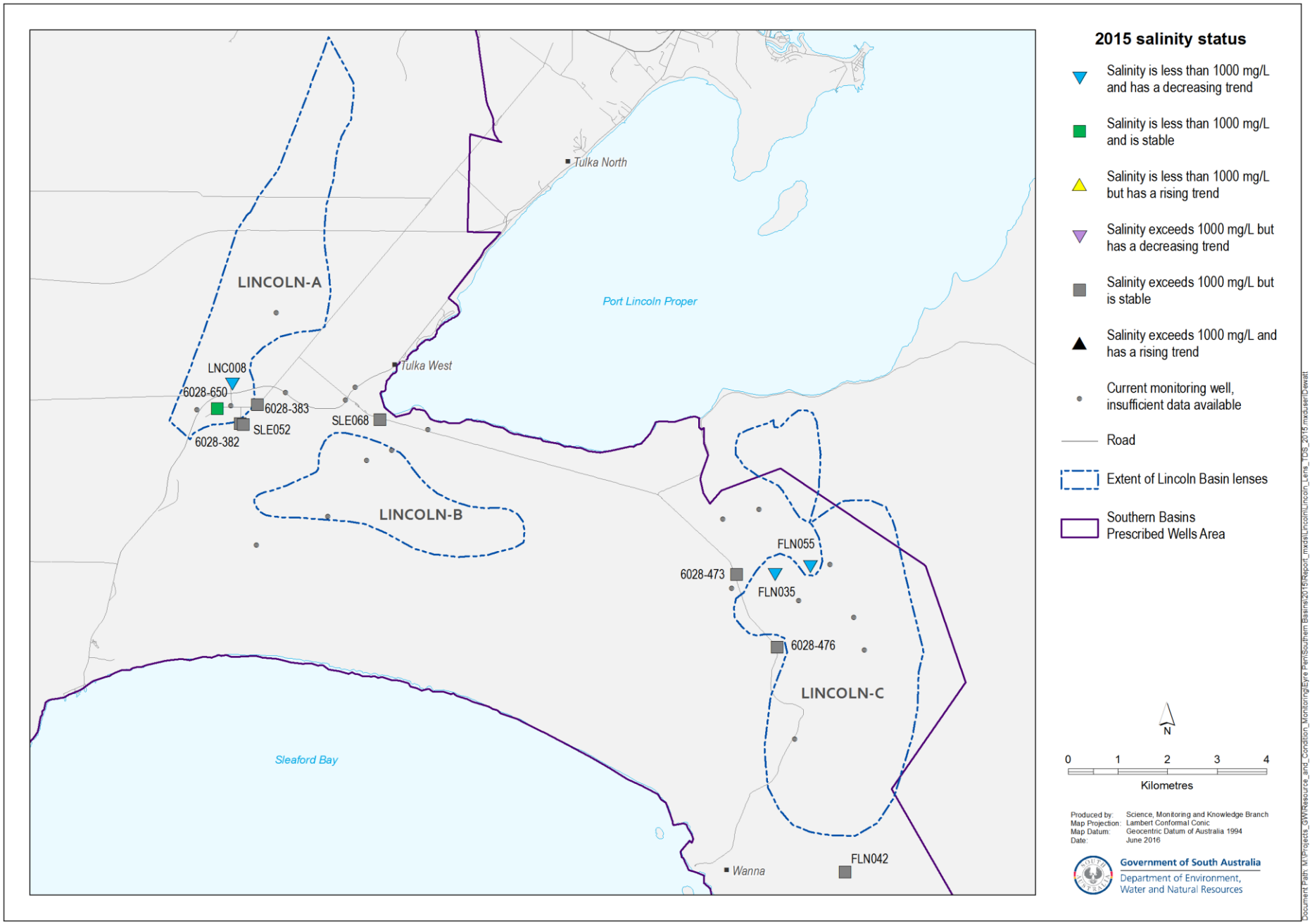


Figure 6. 2015 status of groundwater salinity in the Quaternary aquifer of the Lincoln Basin (Southern Basins Prescribed Wells Area) based on the 5-year trend from 2011 to 2015

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