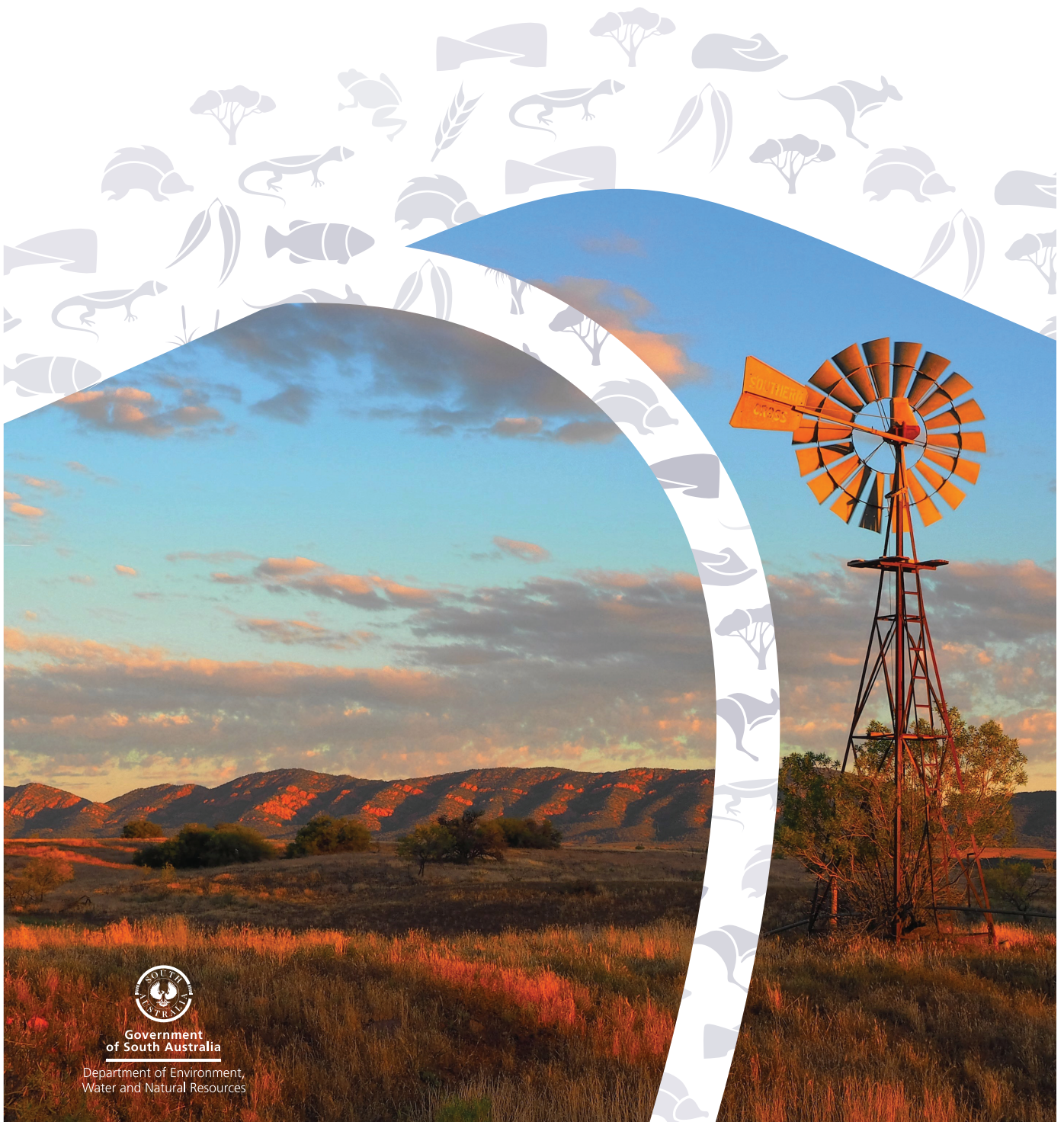


Marne Saunders PWRA

Murray Group Limestone aquifer

2016 Groundwater level and salinity status report



Government
of South Australia

Department of Environment,
Water and Natural Resources

Department of Environment, Water and Natural Resources
GPO Box 1047, Adelaide SA 5001

Telephone	National	(08) 8463 6946
	International	+61 8 8463 6946
Fax	National	(08) 8463 6999
	International	+61 8 8463 6999
Website	www.environment.sa.gov.au	

Disclaimer

The Department of Environment, Water and Natural Resources and its employees do not warrant or make any representation regarding the use, or results of the use, of the information contained herein as regards to its correctness, accuracy, reliability, currency or otherwise. The Department of Environment, Water and Natural Resources and its employees expressly disclaims all liability or responsibility to any person using the information or advice. Information contained in this document is correct at the time of writing.



This work is licensed under the Creative Commons Attribution 4.0 International License.

To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>

© Crown in right of the State of South Australia, through the Department of Environment, Water and Natural Resources 2017

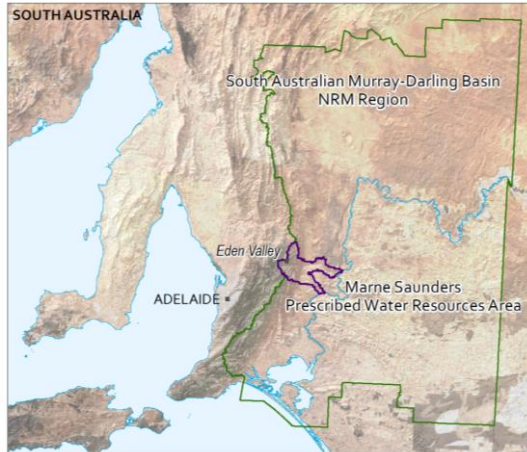
ISBN 978-1-925510-94-2

Preferred way to cite this publication

DEWNR (2017). *Marne Saunders PWRA Murray Group Limestone aquifer 2016 Groundwater level and salinity status report*, Government of South Australia, Department of Environment, Water and Natural Resources, Adelaide.

Download this document at www.waterconnect.sa.gov.au

Regional setting



The Marne Saunders Prescribed Water Resources Area (PWRA) is located on the eastern side of the Mount Lofty Ranges (MLR), approximately 60 km north-east of Adelaide in the South Australian Murray-Darling Basin Natural Resources Management Region. It is a regional-scale resource for which groundwater, surface water and watercourse water are prescribed under the *Natural Resources Management Act 2004* (SA). A water allocation plan provides for sustainable management of the water resources.

The Marne Saunders PWRA consists of two tributary catchments of the River Murray and can be divided into two distinct groundwater regions: the 'hills zone' to the west and the 'plains zone' in the east. The plains zone is underlain by unconsolidated sediments of the Murray Basin consisting of limestone, sand and clay layers up to 80 m thick. These sediments, which overlie

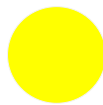
basement rocks that are exposed in the hills zone to the west, comprise four units: Quaternary sediments; the Murray Group Limestone (MGL); the Ettrick Formation; and the Renmark Group. In general, the MGL is overlain by Quaternary sediments and underlain by the Ettrick Formation and the Renmark Group.

The MGL aquifer is highly fossiliferous and sandy with solution cavities, and as it constitutes the main aquifer in the plains zone, it is the focus of this report. Adjacent to the hills zone in the west, the MGL aquifer is confined by the Quaternary-aged Pooraka Formation, but it becomes unconfined where the Pooraka Formation pinches out, to the east of Cambrai. Recharge to the MGL aquifer is via lateral throughflow from the adjacent basement rocks in the hills zone and, during periods of flood, vertical recharge is also sourced from streamflow in those locations where the aquifer is unconfined.

2016 Status

The MGL aquifer in the Marne Saunders Prescribed Water Resources Area has been assigned a yellow status for 2016:

2016 Status



Minor adverse trends have been observed over the past five years

The 2016 status for the Murray Group Limestone aquifer is based on:

- most monitoring wells (66%) show a five-year trend of declining groundwater levels
- water level resource condition limit is exceeded in Unconfined Zone 1 Groundwater Management Zone.

Despite the water level drop in majority of the wells, it should be noted that the median rate of decline across the PWRA is low (0.09 m/y). Furthermore, most monitoring wells (80%) recorded a stable trend in salinity in the five-year period (2012–16).

Rainfall

Rainfall is highest in the hills zone at the western edge of the PWRA, with a sharp gradient of declining rainfall towards the east due to the rain-shadow effect of the Mount Lofty Ranges (Fig. 1). In the 2015–16 water-use year, the Kongolia rainfall station (BoM Station 24513) recorded 264 mm of rainfall. This is 9% below the long-term annual average rainfall of 292 mm and 12% below the five-year average annual rainfall of 299 mm (Figs 1 and 2). In the 2015–16 water-use year, the months of September, October, December and February recorded monthly totals considerably lower than their respective long-term monthly average, while March and January recorded rainfall which is markedly greater than their respective long-term monthly average (Fig. 2). Across the region, particularly in the central and western parts of the PWRA, trends of declining rainfall are evident over the past five years and over the longer term (Figs 1 and 2).

Water use

Irrigation water in the plains zone is sourced from the MGL aquifer, predominantly along the Marne River valley. In 2015–16, metered extractions from the MGL aquifer totalled 1351 ML¹, which is 16% greater than the previous water-use year² of 1168 ML and 10% greater than the five-year annual average of 1225 ML. Extractions from the MGL aquifer account for 75% of the total 1566 ML of groundwater extracted from all aquifers across the Marne Saunders PWRA (Fig. 3).

Groundwater levels

In the Marne Saunders PWRA, fluctuations in groundwater levels in the MGL aquifer show a strong relationship with patterns of rainfall and streamflow, with groundwater levels responding rapidly to occasional floods in the Marne River³. Periods of below-average rainfall typically result in reduced streamflow and consequently recharge rates for the unconfined MGL aquifer (downstream of Cambrai) are likely to be low. Conversely, periods of above-average rainfall typically result in higher streamflows, which are likely to result in higher recharge rates.

In the five years to 2016, most monitoring wells (66%) show a trend of declining groundwater levels. In 2016, 13% of wells show their lowest level on record (Fig. 4). These wells show declines ranging between 0.02 and 0.65 m/y with a median of 0.09 m/y and are mainly located to the south and east of the town of Cambrai. Of the remaining wells, 27% show a rise in groundwater levels ranging from 0.06 to 0.32 m/y whilst 7% of wells show stable levels.

¹ The licensed groundwater extraction volume for the 2015–16 water-use year is based on the best data available as of March 2017 and may be subject to change, as some extraction volumes are in the process of being verified.

² As part of the ongoing process of updating DEWNR's monitoring network database, well construction details (e.g. screen interval and production zones) have been reviewed and some monitoring wells have been re-assigned to different aquifers. Consequently, 2014–15 licensed groundwater extraction volumes for the Murray Group Limestone aquifer have been re-calculated based on the updated aquifer assignments.

³ Surface Water Data for South Australia can be found online at WaterConnect <https://www.waterconnect.sa.gov.au/Water-Resources/Surface-Water/SitePages/Home.aspx>

Groundwater salinity

Each year since 2015, irrigators in the Marne Saunders PWRA have submitted groundwater samples from their irrigation wells to the Department of Environment, Water and Natural Resources for salinity testing. The increasing coverage of salinity measurements in the area will greatly assist in assessing long-term changes in groundwater salinity and its spatial distribution. To ensure these salinity data meet Quality Assurance standards, annual measurements over four to five years will be required from each well. Once validated, salinity data will be reported in groundwater level and salinity status reports⁴.

Increases in groundwater salinity can represent a risk to industries and communities that operate with and rely on the resource. In 2016, salinities range from 1239 to 2364 mg/L, with 18 wells (75%) showing salinities greater than 1500 mg/L (Fig. 5). In the five years to 2016, four monitoring wells (80%) show stable salinities and these are located within the unconfined zone of the MGL aquifer (east of Cambrai). The only well that shows a rise in salinity is located in the confined portion of MGL aquifer and the rate of increase is 64 mg/L/y which is probably caused by downward leakage from the overlying Quaternary aquifer (Fig. 6).

Resource condition indicators

The Water Allocation Plan for the Marne Saunders PWRA stipulates resource condition indicators that apply to the MGL aquifer in the Confined Zone A Groundwater Management Zone (located immediately west of Cambrai) and the Unconfined Zone 1 Groundwater Management Zone (located immediately east of Cambrai). These limits are designed to give early warning of trends in water (pressure) levels and salinity that may adversely impact users of the resource.

Confined Zone A: The water-pressure-level trigger is defined as a reversal of the pressure gradient between pumping seasons that would result in higher-salinity groundwater flowing into the area from the east. In the 2015–16 water-use year, during the non-irrigation season the pressure gradient maintained throughflow and as such, the resource conditions limit is not exceeded. The salinity trigger is defined as an increase in salinity of greater than 2% per year, averaged over the past 5 years, in greater than 50% of monitoring wells. In the 2015–16 water-use year, these threshold criteria have not been breached, therefore the resource condition limit is not exceeded.

Unconfined Zone 1: The water-level trigger is defined as a decline below the minimum water level experienced between 1998 and 2002, in any of the monitoring wells in the management zone. In the 2015–16 water-use year, water levels in three of the five monitoring wells show water levels below these minimum levels, thereby breaching the resource condition limit. The salinity trigger is defined as a long-term increase in salinity within the management zone. In the five years to 2016, salinity in three of the five monitoring wells has decreased by 8%, with a 4% of median decline, which is not a breach of the resource condition limit.

Investigations have shown that in Unconfined Zone 1, groundwater levels and salinity are strongly controlled by Marne River streamflow, particularly high-flow events. The evidence suggests that reduction in allocations alone is unlikely to result in any meaningful changes to declining trends in groundwater levels. Groundwater levels in the MGL aquifer declined during the dry period of 2006–08, and the opportunity for water levels to recover has been limited, with rainfall from only one year (2010) delivering above-average streamflow⁵.

⁴ The salinity data collected from irrigation wells can be viewed at [Groundwater Data](#) or via [WaterConnect](#).

⁵ Surface Water Data for South Australia can be found online at WaterConnect <https://www.waterconnect.sa.gov.au/Water-Resources/Surface-Water/SitePages/Home.aspx>

More information

To determine the status of the MGL aquifer for 2016, the trend in groundwater levels and salinities over the past five years (2012 to 2016, inclusive) were analysed, 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.

To view descriptions for all status symbols, please visit the *Water Resource Assessments* page on [WaterConnect](#).

To view the *Marne Saunders PWRA Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit the *Water Resource Assessments* page on [WaterConnect](#).

To view or download groundwater level and salinity data from observation wells within the Marne Saunders PWRA, please visit [Groundwater Data](#) on WaterConnect.

For further information about the Marne Saunders PWRA, please see *The Water Allocation Plan for the Marne Saunders Prescribed Water Resources Area* on the Natural Resources SA Murray-Darling Basin [website](#).

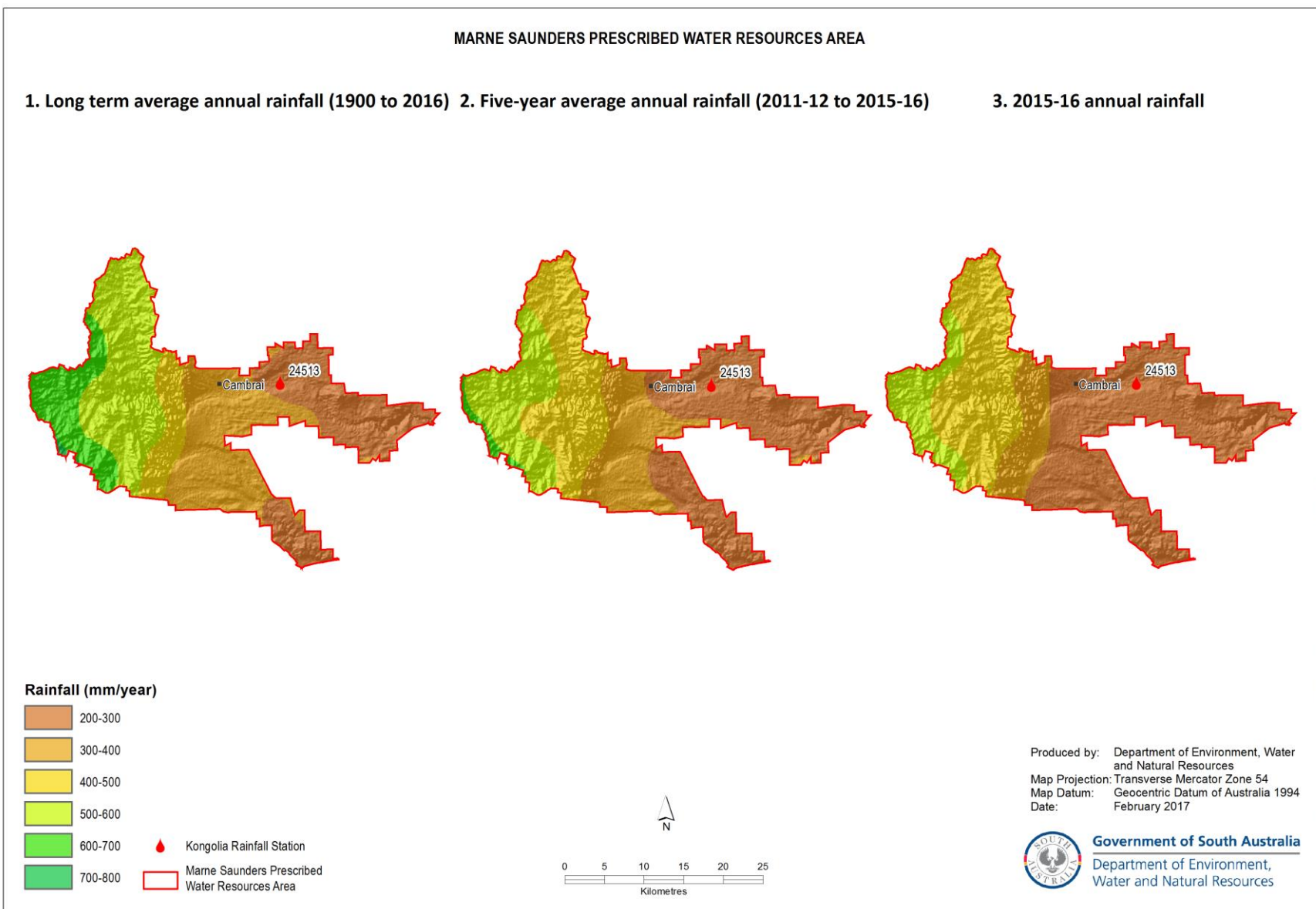


Figure 1. (1) Long-term and (2) five-year average annual rainfall and (3) annual rainfall for the 2015–16 water-use year in the Marne Saunders PWRA⁶

⁶ 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.

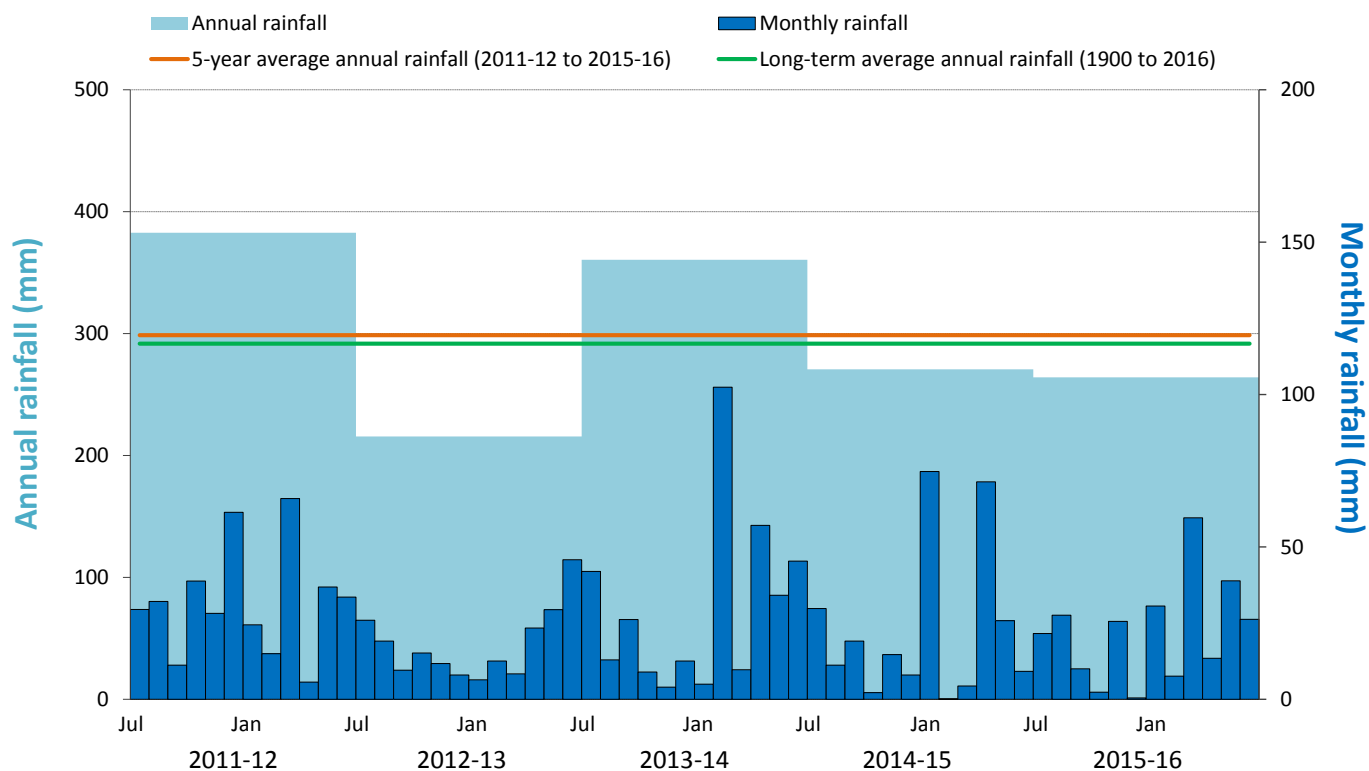


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Kongolia (BoM Station 24513)⁷

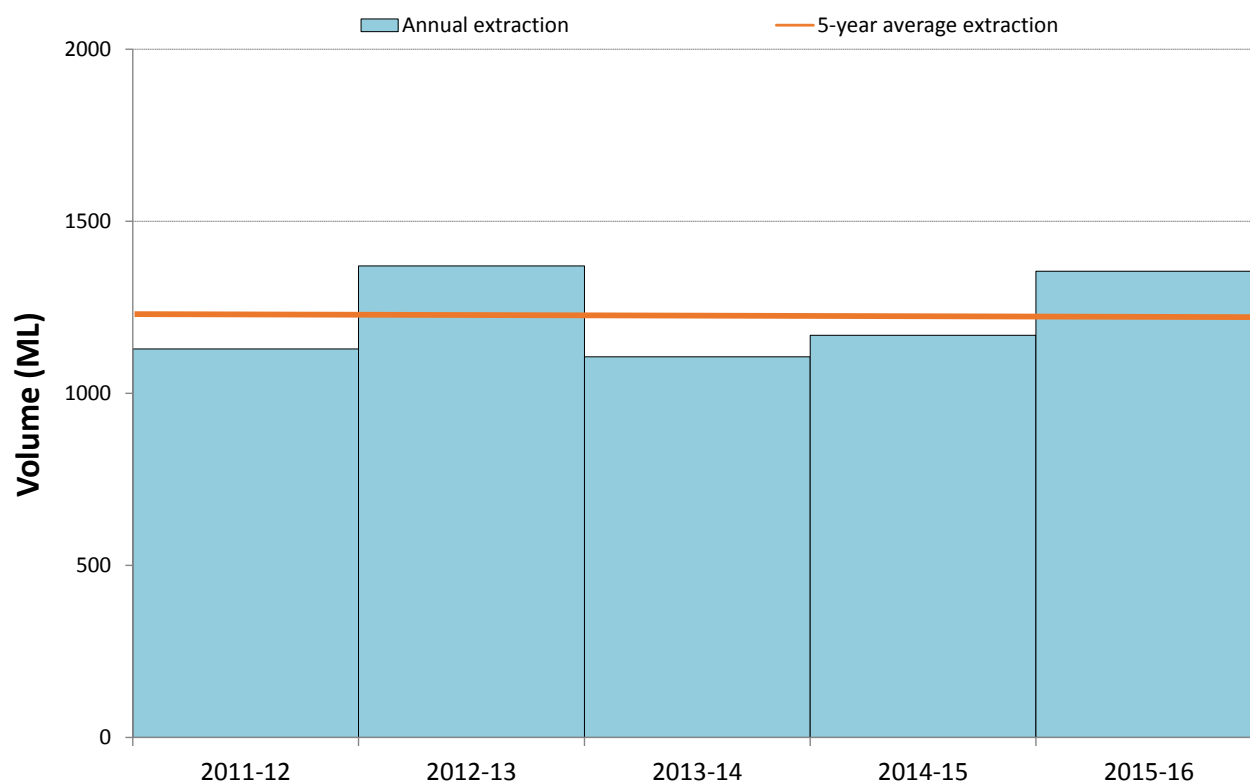


Figure 3. Licensed groundwater extraction volumes⁸ for the past five water-use years, for the Murray Group Limestone aquifer in the Marne Saunders PWRA

⁷ 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.

⁸ The licensed groundwater extraction volume for the 2015–16 water-use year is based on the best data available as of March 2017 and may be subject to change, as some extraction volumes are yet to be validated.

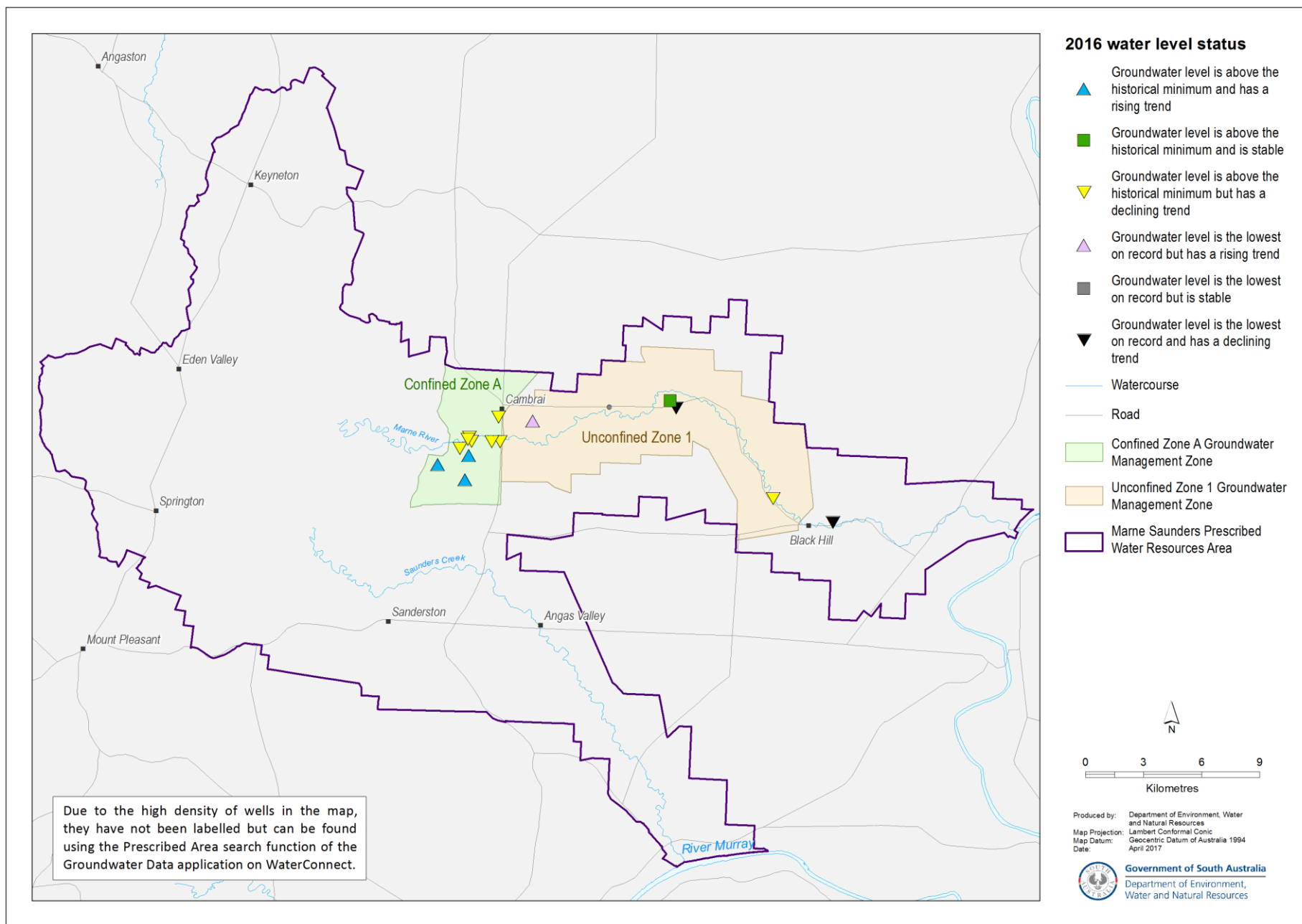


Figure 4. 2016 status of groundwater level in the Murray Group Limestone aquifer (Marne Saunders PWRA), based on five-year trends from 2012 to 2016

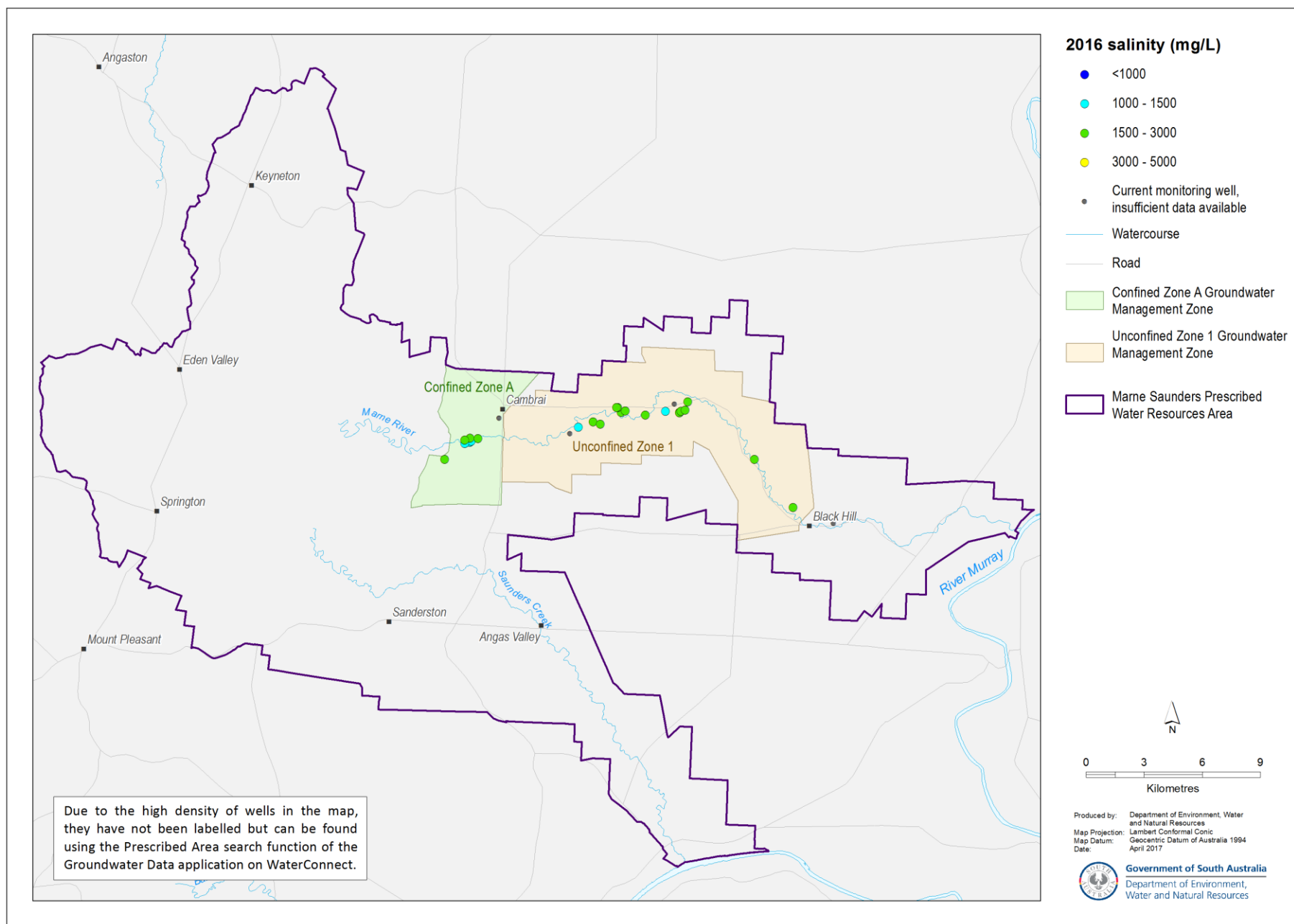


Figure 5. 2016 groundwater salinity of the Murray Group Limestone aquifer (Marne Saunders PWRA)

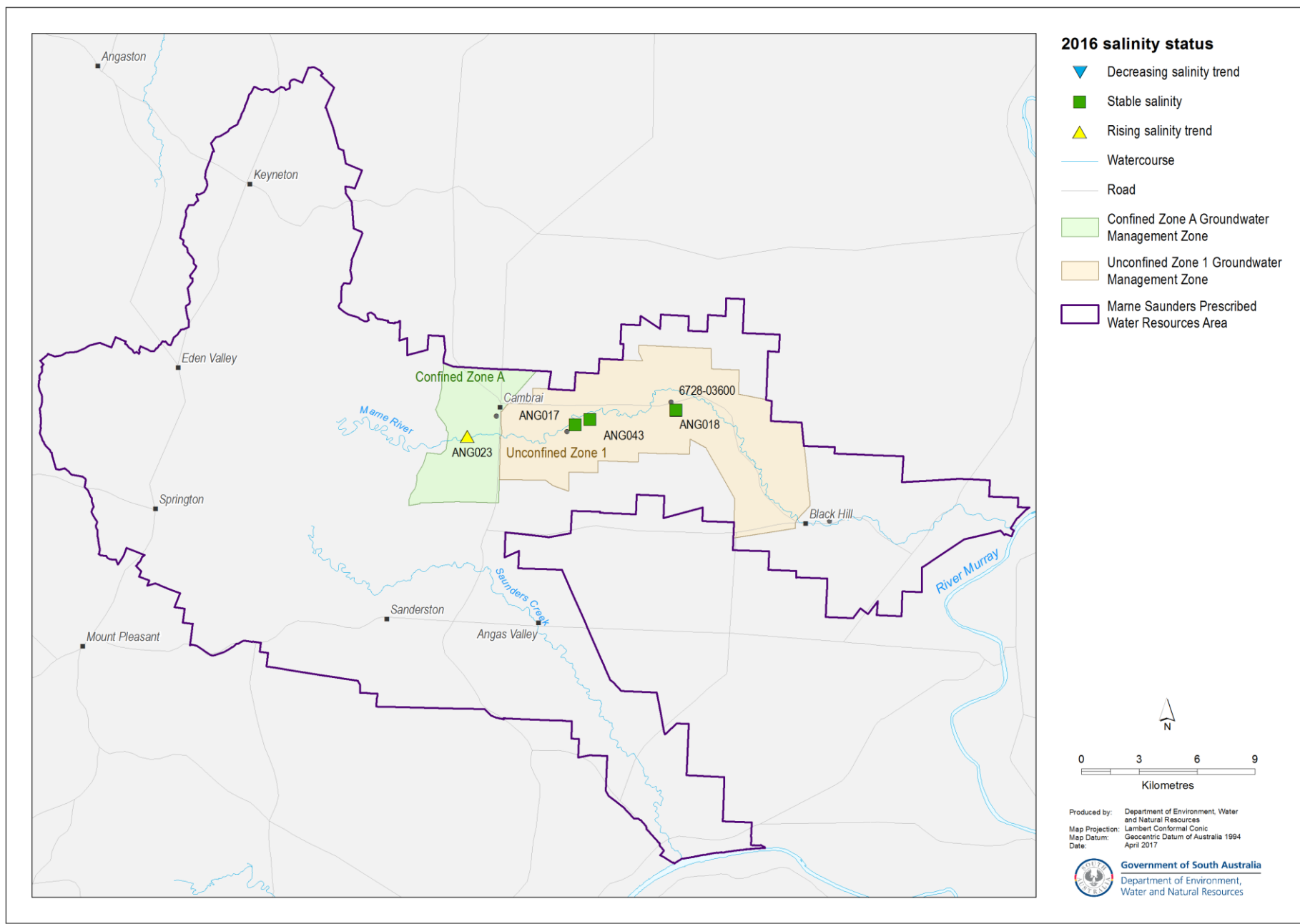


Figure 6. 2016 status of salinity in the Murray Group Limestone aquifer (Marne Saunders PWRA), based on five-year trends from 2012 to 2016



**Government
of South Australia**

Department of Environment,
Water and Natural Resources

Front Cover © Graham Green, Principal Hydrogeologist, DEWNR

2017 © Department of Environment, Water and Natural Resources

Published 2017 | FIS 94502

www.environment.sa.gov.au