Eastern Mount Lofty Ranges PWRA Fractured rock aquifers

2016 Groundwater level and salinity status report



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Regional setting



The Eastern Mount Lofty Ranges (EMLR) Prescribed Water Resources Area (PWRA) lies within the South Australian Murray-Darling Basin Natural Resources Management Region and is located about 50 km east of Adelaide. It is a regional-scale resource for which groundwater, surface water and watercourse water are prescribed under South Australia's *Natural Resources Management Act 2004* and a water allocation plan provides for the sustainable use of the region's water resources. The Angas Bremer Prescribed Wells Area (PWA) is located within the boundaries of the EMLR PWRA and a stand-alone groundwater level and salinity status report has been prepared for this PWA (please visit the *Water Resource Assessments* page on <u>WaterConnect</u>).

The EMLR PWRA is characterised by fractured rock and sedimentary aquifers that are of varying age, water quality and yields. The fractured rock aquifers

(FRAs), where groundwater is stored and moves through joints and fractures in the basement rocks, form the ranges that occur in the west of the PWRA. Sedimentary aquifers, where groundwater flows through the pore spaces within the sediments, occur in the valleys and plains to the east. Recharge to these aquifers occurs directly from local rainfall that percolates down to the water table through the soil profile. Recharge to the confined sedimentary aquifers occurs indirectly by throughflow from adjacent aquifers.

The FRAs in the EMLR PWRA are the focus of this report – they comprise four geological units: the Barossa Complex, the Adelaidean Sedimentary Rocks, the Normanville Group and the Kanmantoo Group. Generally, the Adelaidean Sedimentary Rocks show greater rates of recharge, higher yields and lower salinity relative to the Barossa Complex and Kanmantoo Group FRAs. The water table generally follows the topography, with groundwater flowing from higher points in the landscape towards lower areas where it typically discharges into rivers and streams or sedimentary aquifers in the valleys below. The regional flow direction within the FRAs is from north-west to south-east.

Trends in groundwater levels and salinity in the FRAs of the EMLR are primarily climate driven: below-average rainfall can result 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 may cause salinity to increase. Conversely, above-average rainfall may result in increased recharge and decreased irrigation extraction. This may cause groundwater levels to rise and salinity may stabilise or decline.

2016 Status

The fractured rock aquifers of the Eastern Mount Lofty Ranges PWRA have been assigned a green status for 2016:



Positive trends have been observed over the past five years

The 2016 status for the fractured rock aquifers is based on:

• most monitoring wells (65%) show a five-year trend of rising or stable groundwater levels.

Although a green status has been assigned, it is acknowledged that there is a trend of increasing salinity in isolated areas, and some groundwater levels have fallen to their lowest on record (although some of these wells have a relatively short monitoring period).

Rainfall

Due to the spatial extent of fractured rock aquifers throughout the EMLR PWRA, the rainfall analysis comprises data from two weather stations: Mount Barker (BoM Station 23733) and Ashbourne (BoM Station 23701) (Fig. 1). The Mount Barker station was chosen because groundwater levels in this area are strongly correlated with rainfall, and are also impacted by local extraction throughout summer. Rainfall at Mount Barker totalled 633 mm in the 2015–16 water-use year, 17% below the long-term annual average rainfall of 760 mm (1900–2016) and 11% less than the five-year average annual rainfall of 711 mm (2011–16) (Figs 1 and 2). The Ashbourne totalled 480 mm, which is 26% below the long-term annual average rainfall of 648 mm (1900–2016) and 15% less than the five-year average annual rainfall of 648 mm (1900–2016) and 15% less than the five-year average rainfall of 648 mm (1900–2016) and 15% less than the five-year average rainfall of 648 mm (1900–2016) and 15% less than the five-year average rainfall of 648 mm (1900–2016) and 15% less than the five-year average rainfall of 648 mm (1900–2016) and 15% less than the five-year average rainfall of 648 mm (1900–2016) and 15% less than the five-year average annual rainfall of 563 mm (2011–16) (Figs 1 and 3). Across the PWRA, trends of declining rainfall are evident over the past five years and also over the longer term (Fig. 1).

Water use

The Eastern Mound Lofty Ranges PWRA has a total extraction limit of 36 323 ML across all aquifers, of which 31 207 ML has been allocated. In previous years, water use was estimated based on land-use surveys of irrigated properties and the theoretical irrigation requirements for various crops. Due to uncertainties in these estimates, a time-series analysis of water use has been omitted from this report. More recently, changes in the way water is managed across the region have required licensed water users to measure their water use. By 2015–16, 60% of water licensees had installed water meters and submitted water usage data. Metered extractions from the FRAs management zones totalled 3497 ML¹ and this represents 13% of the extraction limit of 26 487 ML for these FRAs management zones.

Groundwater levels

In the five years to 2016, 16 of 32 monitoring wells (50%) show a trend of rising groundwater levels and five wells (15%) show stable levels (Fig. 4). Rates of rise in groundwater levels range between 0.01 and 1.17 m/y with a median of 0.14 m/y. The remaining 11 wells (35%) show a declining trend in groundwater levels at rates that range between 0.02 and 1.54 m/y with a median of 0.06 m/y. In 2016, 22% of monitoring wells shown their lowest water level on record.

Groundwater salinity

Each year since 2015, irrigators in the EMLR 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 reports².

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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; installation of water meters by licensed users is still in progress across the EMLR PWRA.

² The salinity data collected from irrigation wells can be viewed at Groundwater Data or via WaterConnect.

In 2016, most monitoring wells (56%) show salinities between 1000 and 1500 mg/L with a median of 1064 mg/L (Fig. 5). In the five years to 2016, of the three salinity monitoring wells that have sufficient data for analysis, two wells show salinity increases at rates of 34 and 46 mg/L/y, while the third well shows stable salinity (Fig. 6).

More information

To determine the status of the fractured rock aquifers of the Eastern Mount Lofty PWRA for 2016, the trends in groundwater levels and salinities over the past five years (2012 to 2016, 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 <u>Frequently Asked Questions</u> 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 *Eastern Mount Lofty Ranges 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 <u>WaterConnect</u>.

To view or download groundwater level and salinity data from monitoring wells within the Eastern Mount Lofty Ranges PWRA, please visit <u>Groundwater Data</u> on WaterConnect.

For further details about the Eastern Mount Lofty Ranges PWRA, please see the *Water Allocation Plan for the Eastern Mount Lofty Ranges* on the Natural Resources South Australian Murray-Darling Basin <u>website</u>.



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 Eastern Mount Lofty Ranges PWRA³

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 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 Angaston (BoM Station 23300)⁴



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 Asbourne (BoM Station 23701)²

⁴ 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 <u>www.longpaddock.qld.gov.au/silo</u>

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Figure 4. 2016 status of groundwater levels in the fractured rock aquifers (Eastern Mount Lofty Ranges PWRA), based on the fiveyear trends from 2012 to 2016



Figure 5. 2016 groundwater salinity of the fractured rock aquifers (Eastern Mount Lofty Ranges PWRA)



Figure 6. 2016 status of the groundwater salinity in the fractured rock aquifers (Eastern Mount Lofty Ranges PWRA), based on the five-year trends from 2012 to 2016



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