Kangaroo Island
2018-19 water resources assessment

Department for Environment and Water
December 2020

DEW Technical report 2020/34

Government of South Australia
Department for Environment and Water

Department for Environment and Water

Government of South Australia

December 2020

81-95 Waymouth St, ADELAIDE SA 5000

Telephone +61 (8) 8463 6946

Facsimile +61 (8) 8463 6999

ABN 36702093234

www.environment.sa.gov.au

ISBN 978-1-925964-85-1

Preferred way to cite this publication

DEW (2020). *Kangaroo Island 2018-19 water resources assessment*, DEW Technical report 2020/34, Government of South Australia, Department for Environment and Water, Adelaide.

Download this document at https://www.waterconnect.sa.gov.au

Contents

1 Summary

Rainfall

- Annual rainfall on Kangaroo Island ranges between 400 and 900 mm with higher rainfall in the elevated, north-western areas of the island and lower rainfall areas in the east and south-east.
- Rainfall patterns across the island were varied in 2018–19. Flinders Chase and Parndana were higher than average in 2018–19 with 856 mm and 780 mm of rainfall measured respectively. However, rainfall at Kingscote measured 461 mm, which was lower than the average of 476 mm.
- Long-term data trends are also varied across the island with Flinders Chase indicating a stable trend, Parndana indicating a decreasing trend and Kingscote presenting an increasing trend in rainfall.
- Rainfall in early winter and spring of 2018 was below average and very dry conditions occurred in summer 2018–19.

Surface water

- The annual streamflow recorded at all three representative streamflow gauging stations in 2018–19 was ranked as 'average' based on the BoM classification used.
- Long-term data trends show a decline in streamflow in Rocky River. The short period of data availability does not allow for trend analysis for the Middle River and Cygnet River.
- Higher-than-average streamflow was recorded at all three representative streamflow gauging stations in August 2018. The remainder of the months in 2018–19 were average or below the average monthly streamflow. No streamflow was recorded between January and May 2019.
- A declining trend in streamflow is observed in the Rocky River catchment despite a lack of trend in total annual rainfall. Given the fact that it is an undeveloped catchment, the decline in streamflow could be attributed to a change in rainfall seasonality.
- The highest salinity at the Koala Lodge streamflow gauging station in the Cygnet River catchment was 12 331 mg/L in 2018–19. The 2018–19 values remain within historical ranges experienced at the site.

Groundwater

- Low-salinity groundwater is in short supply on the island with only localised occurrences of good quality groundwater. As a result, there has been limited development of the resource.
- Groundwater level observation networks have been established to monitor shallow watertables contributing to dryland salinity in various parts of the island.

Water use

- Surface water is the major water resource to the region and demand is for consumptive use, other public benefits and environmental requirements. Water is not prescribed and the use of water from farm dams, watercourse extractions and groundwater is therefore not licensed. As a result, minimal water use data is available.
- Extraction from Middle River Reservoir was 476 ML in 2018-19, slightly higher than the mean annual extraction of 459 ML.
- There are approximately 11 000 farm dams on Kangaroo Island with a total storage capacity of almost 20 000 ML.

1.1 Purpose

The Department for Environment and Water (DEW) has a key responsibility to monitor and report annually on the status of prescribed and other groundwater and surface water resources. To fulfil this, data on water resources are collected regularly and reported in a series of annual reports. Three reports are provided to suit a range of audiences and their needs for differing levels of information:

- **Technical Notes**: (these documents) build on the fact sheets to provide more comprehensive information for each resource area, helping to identify in further detail the resource condition;
- **Fact Sheets**: provide summary information for each resource area with an Annual Resource Status Overview;
- **State-wide summary**: this summarises information for all resources across all regions in a quick-reference format.

This document is the Technical Note for the Kangaroo Island non-prescribed water resources for 2018-19 and addresses rainfall, surface water and water use data collected between July 2018 and September 2019, and groundwater data collected up until December 2019.

1.2 Regional context

Kangaroo Island is Australia's third largest island with an area of 4370 km^2 and around 510 km of coastline. It stretches 155 km from east to west, with a highest altitude of approximately 310 m in the Flinders Chase National Park. Higher elevated areas are found in the northern and central parts of the region as well as around Penneshaw and Cape du Couedic. Lower elevated areas are in the south. The topography of the coastline is characterised by steep cliffs, gentle rises and low-lying salt marshes. The southern coastline is generally dominated by sand dunes and calcareous sediments. Inland topography is a dissected lateritic plateau from west to east with many incised valleys formed by watercourses flowing north-south (Nilsen 2006). The Landscape region for Kangaroo Island also takes in parts of the surrounding marine waters.

The Kangaroo Island climate is temperate with dry summers and cool wet winters and average rainfall decreases from west to east. Rainfall is generally between 600–900 mm in the west and 400–700mm in the east.

Streams tend to begin in the central part of the Island before flowing out to sea. Some of the larger watercourses (and catchment areas) include Cygnet River, Stunsail Boom River, Rocky River. Eleanor River, Harriet River and Middle River. Similar to other areas in South Australia, most watercourses on Kangaroo Island are ephemeral.

The occurrence of underground water on the island is strongly controlled by its geology. Groundwater resources are found within a variety of aquifers ranging from fractured rock aquifers to Tertiary limestones and river alluvium. Because occurrences of good quality groundwater are limited and localised, there is very little development of these resources.

The Middle River catchment includes the largest surface water reservoir on Kangaroo Island, which is operated by SA Water and is vital for supplying potable water to towns including Kingscote and Parndana. Some parts of the Kangaroo Island still rely on rainwater tanks and farm dams for potable and non-potable supply and are not connected to the water supply network. The majority of catchments have considerable dam development, with the exception of Breakneck and Rocky River catchments.

The Kangaroo Island Landscape Board is responsible under the Landscape South Australia Act 2019 for managing activities that may affect surface or groundwater resources. Whilst Kangaroo Island's water resources are not prescribed, the Kangaroo Island NRM Plan (KI NRM Plan; 2017) defines Water Take Limits as the volume of water that can be taken from the water resource for consumptive purposes, based on the total yield of surface water generated by rainfall over a given area of land.

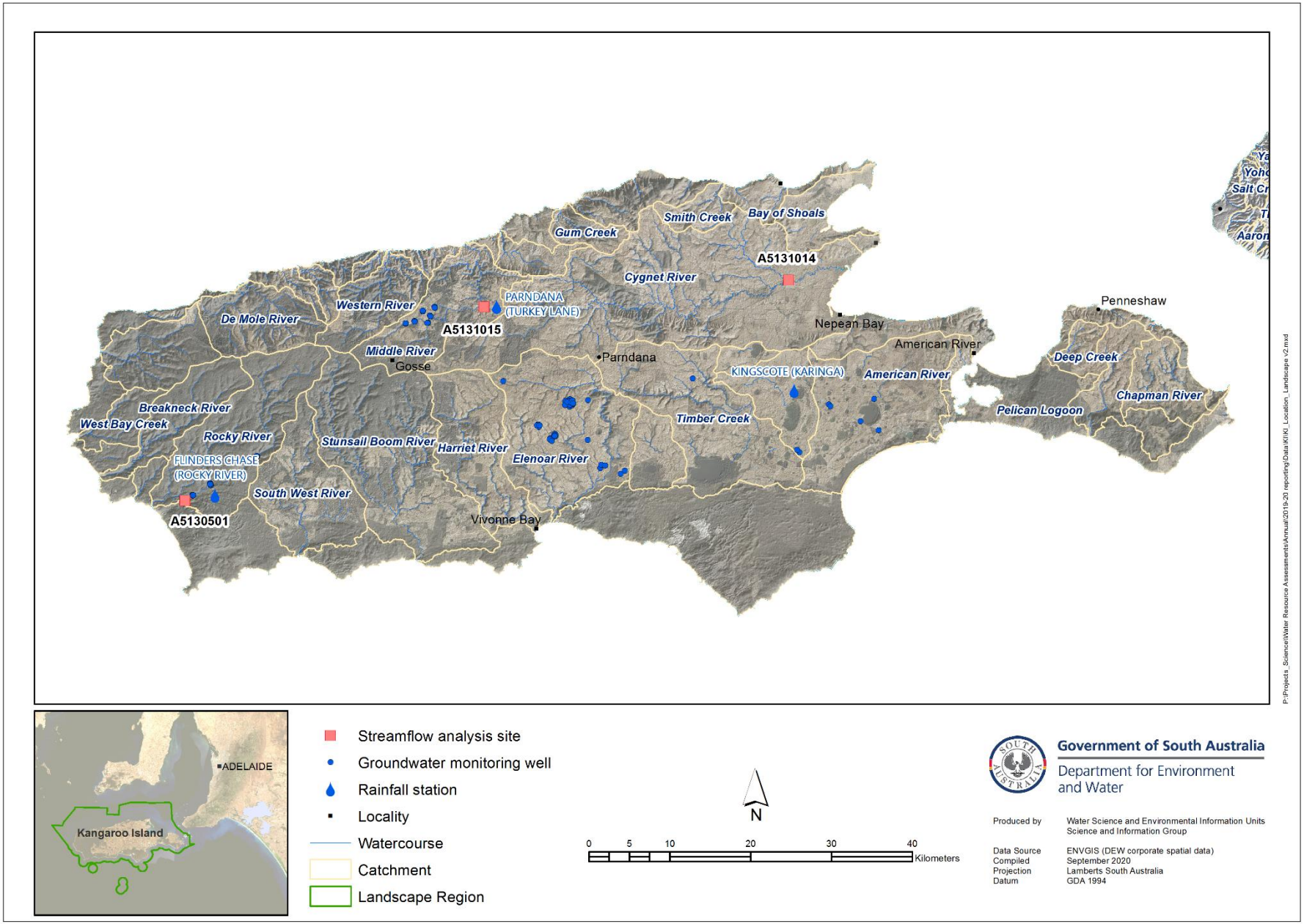


Figure 1.1. Location of Kangaroo Island

2 Methods and data

This section describes the source of rainfall, surface water, groundwater and water use data presented in this report and the methods used to analyse and present this data.

2.1 Rainfall

Daily rainfall observations were used from selected Bureau of Meteorology (BoM) stations in order to calculate monthly and annual totals. The data were obtained from the SILO Patched Point Dataset service provided by the Queensland Government, which provides interpolated values to fill gaps in observations (Figure 3.1 to Figure 3.6).

Rainfall maps were compiled using gridded datasets obtained from the BoM (Figure 3.7). The long-term annual rainfall map (1986-2015 average) was obtained from Climate Data Online. The map of total rainfall in 2018–19 was compiled from monthly rainfall grids obtained for the months between July 2018 and June 2019 from the Australian Landscape Water Balance website.

2.2 Surface water

2.2.1 Annual streamflow

The status of each of the streamflow gauging stations is determined by expressing the annual streamflow for the applicable year as a percentile[1] of the total period of data availability. The period of data availability for the Rocky River streamflow gauging stations is 1974–75 to 2018–19, 2013–14 to 2018–19 for the Middle River streamflow gauging station and 2003–04 to 2018–19 for the Cygnet River streamflow gauging station. Streamflow data were then given a description based on their percentile and decile[1] (Table 2.1).

Table 2.1. Percentile/decile descriptions*

Decile	Percentile	Description	Colour
N/A	100	Highest on record	
10	90 to 100	Very much above average	
8 and 9	70 to 90	Above average	
4, 5, 6, and 7	30 to 70	Average	
2 and 3	10 to 30	Below average	
1	0 to 10	Very much below average	
N/A	0	Lowest on record	

* Deciles and descriptions as defined by the BoM[2]

Annual streamflow data (Figure 4.2, Figure 4.4 and Figure 4.6) is presented as the deviation of each year's streamflow from the long-term average with the bars shaded using the BoM classification shown in Table 2.1.

[1] The nth percentile of a set of data is the value at which n% of the data is below it. For example, if the 75th percentile annual flow is 100 ML, 75% of the years on record had annual flow of less than 100 ML. Median streamflow: 50% of the records were above this value and 50% below. Decile: a division of a ranked set of data into ten groups with an equal number of values. In this case e.g. the first decile contains those values below the 10th percentile.

[2] Bureau of Meteorology Annual climate statement 2019

2.2.2 Monthly streamflow

Monthly streamflow for the applicable year is assessed alongside the long-term monthly streamflow (Figure 4.3A, Figure 4.5A and Figure 4.7A) for the period of data availability for each streamflow gauging station and long-term monthly statistics including (a) high flows (25th percentile), (b) median flows (50th percentile) and low flows (75th percentile).

2.2.3 Daily streamflow

Daily streamflow is presented to show the detailed variability throughout the applicable year (Figure 4.3B, Figure 4.5B and Figure 4.7B).

2.2.4 Salinity

Box plots on a monthly basis are used to assess surface water salinity (Figure 4.8). This enables the salinity (TDS; total dissolved solids in mg/L) for the applicable year to be presented against long-term salinity statistics (maximum, 75th percentile, median or 50th percentile, 25th percentile and minimum).

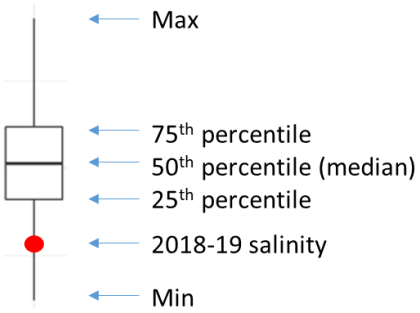


Figure 2.1. Box and whisker plot

2.3 Water use

Kangaroo Island is a non-prescribed area and as a result water resources are not licensed. There is limited data available for surface water use, except for extraction data from Middle River reservoir that is presented in Figure 6.1. There have been no estimates made of the very limited use of groundwater and as a result no data is presented.

Farm dam information for the Middle River and Cygnet River catchments has been collated as part of recent surface water catchment modelling. Futher information on the number, type and distribution of farm dams for these catchment is provided in Section 7.3 and presented in Figure 6.2 and Figure 6.3. Dam capacity estimates are undertaken using different methods with data derived from aerial surveys one of the primary sources.

2.4 Further information

Both surface water and groundwater data can be viewed and downloaded using the *Surface Water Data* and *Groundwater Data* pages under the Data Systems tab on WaterConnect. For additional information related to groundwater monitoring well nomenclature, please refer to the Well Details page on WaterConnect.

Other important sources of information on water resources for Kangaroo Island are:

- Non-prescribed area summary reports on the surface water and groundwater resources of the Kangaroo Island (DEWNR 2013, Alcoe and Berens 2012).
- Whiting J. and Green D. (2015) presents hydrological investigations to inform surface water use limits and generalised environmental water requirements for key ecological assets on Kangaroo Island.
- At the time of writing, rainfall runoff models for the Cygnet River catchment and Middle River catchment, developed in the eWater Source package, were undergoing stakeholder review. These models are intended to provide the ability to estimate changes to the flow regime under different management scenarios and therefore are anticipated to provide more precise input data for ecological modelling (DEW 2020a, b draft).
- Shand et al. (2006) provide a hydrogeochemical assessment of the quality of surface and groundwater in selected catchments on Kangaroo Island, with an emphasis on the relationships between groundwater and surface water.

3 Rainfall

The Kangaroo Island climate is temperate, with dry warm summers and cool wet winters. Higher annual rainfall is recorded in the elevated, north-western areas of the island and is generally between 600–900 mm. The eastern and south-eastern areas of the island are drier, averaging between 400–700 mm rainfall per year.

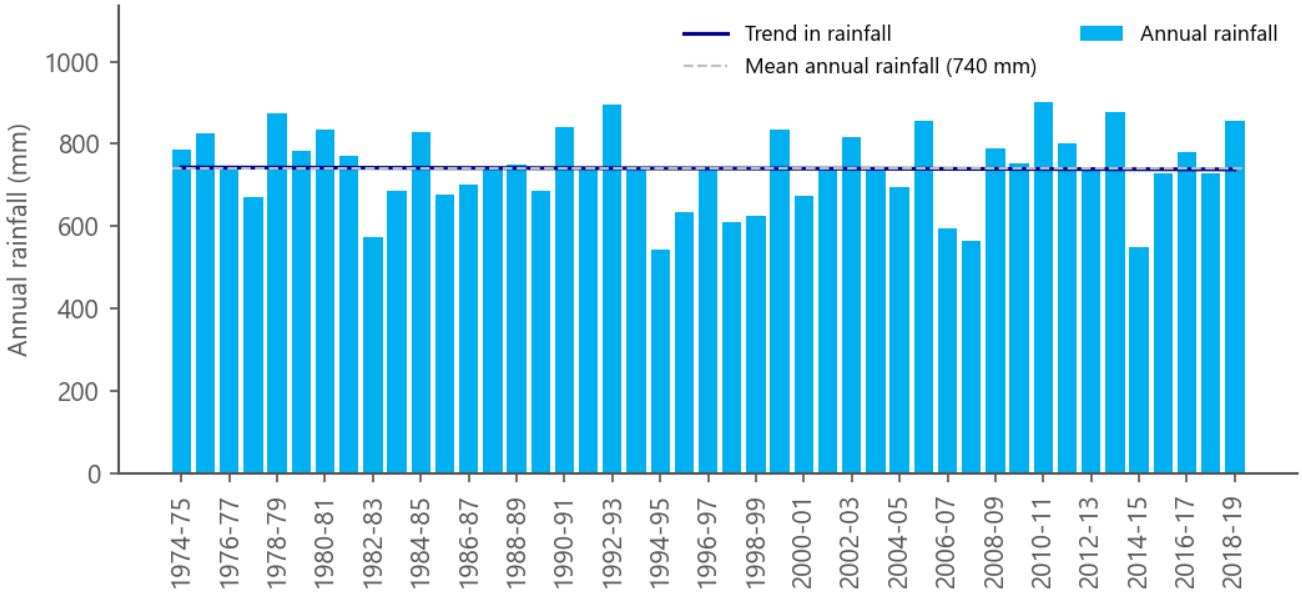


Figure 3.1. Annual rainfall for 1974–75 to 2018–19 at the Flinders Chase (Rocky River) rainfall station (22817)

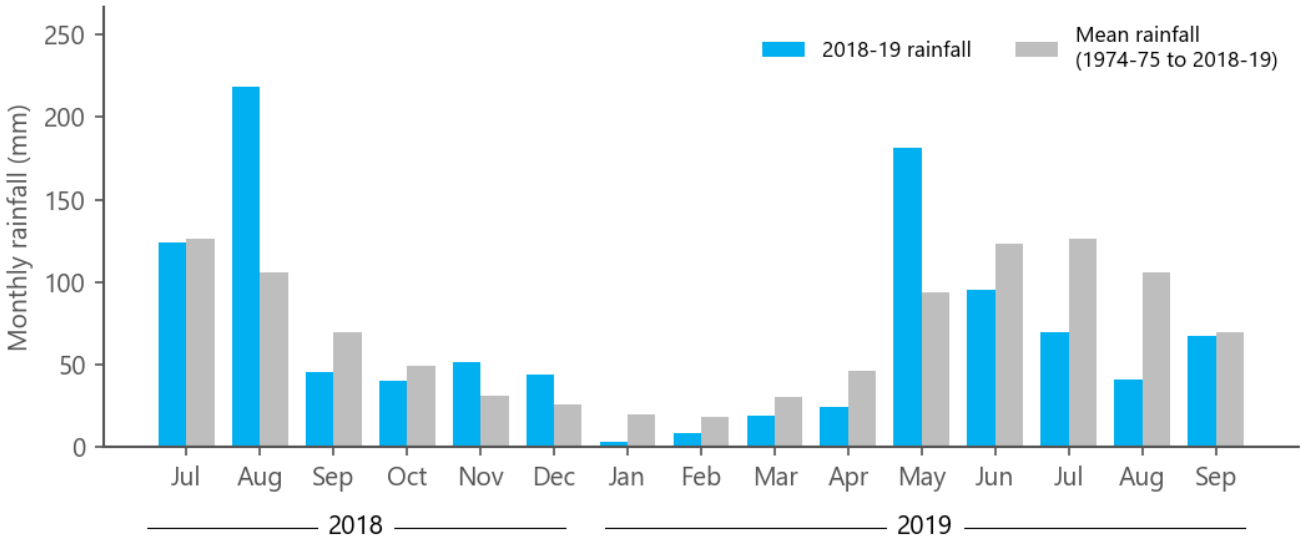


Figure 3.2. Monthly rainfall between July 2018 and September 2019, Flinders Chase (Rocky River) rainfall station (22817)

- Flinders Chase rainfall station (BoM station 22817) represents the rainfall in the Rocky River catchment. The annual total recorded for 2018–19 was 856 mm (Figure 3.1). This was 116 mm higher than the average annual rainfall of 740 mm (1974–5 to 2018–19). The station has a stable long-term trend.

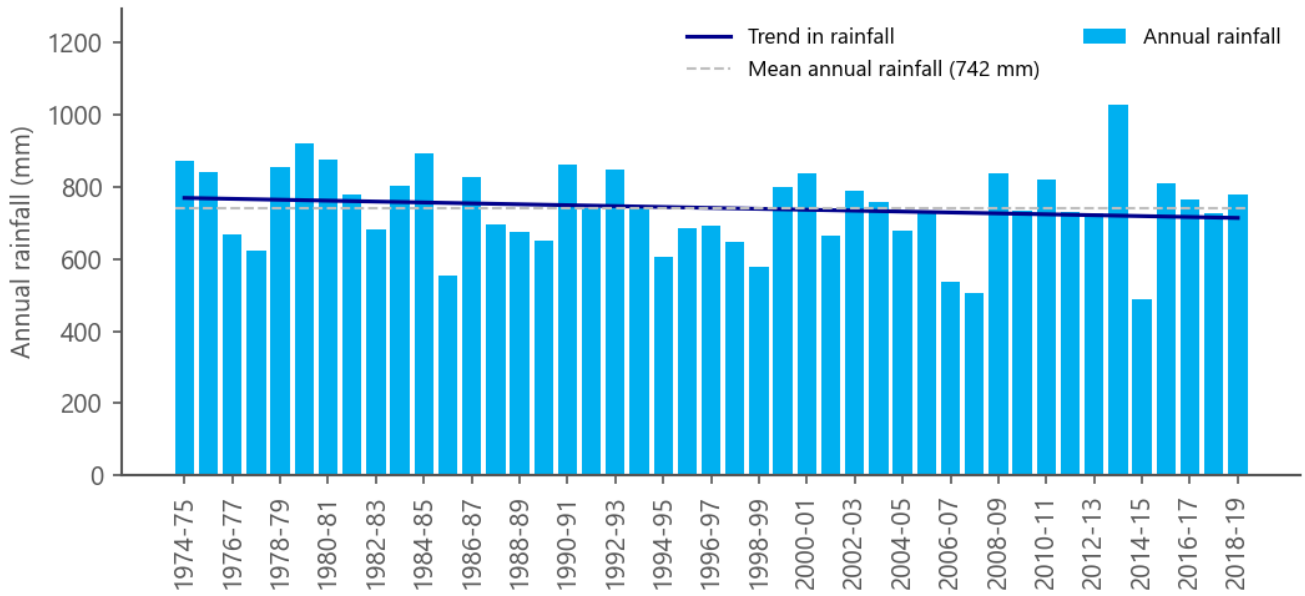


Figure 3.3. Annual rainfall for 1974–75 to 2018–19 at the Parndana (Turkey Lane) rainfall station (22835)

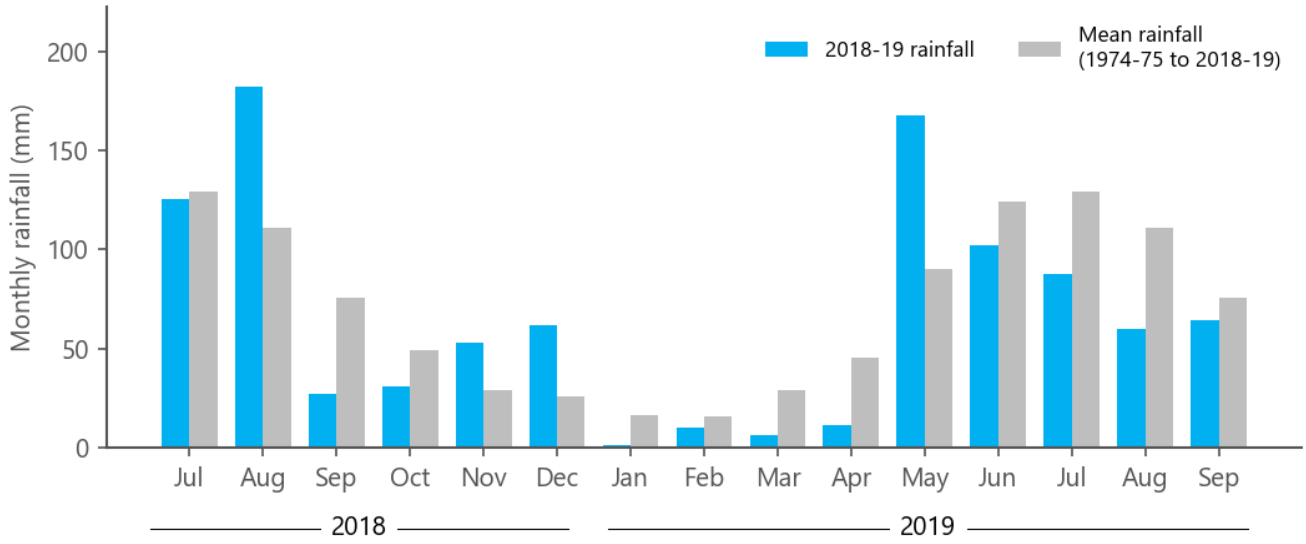


Figure 3.4. Monthly rainfall between July 2018 and September 2019, Parndana (Turkey Lane) rainfall station (22835)

- Parndana (Turkey Lane) rainfall station (BoM station 22835) represents the Middle River catchment and the western extent of the Cygnet River catchment. The annual rainfall total recorded for 2018–19 was 780 mm (Figure 3.3). This was 38 mm higher than the average annual rainfall of 742 mm (1974–5 to 2018–19). The station has a long-term decreasing trend.

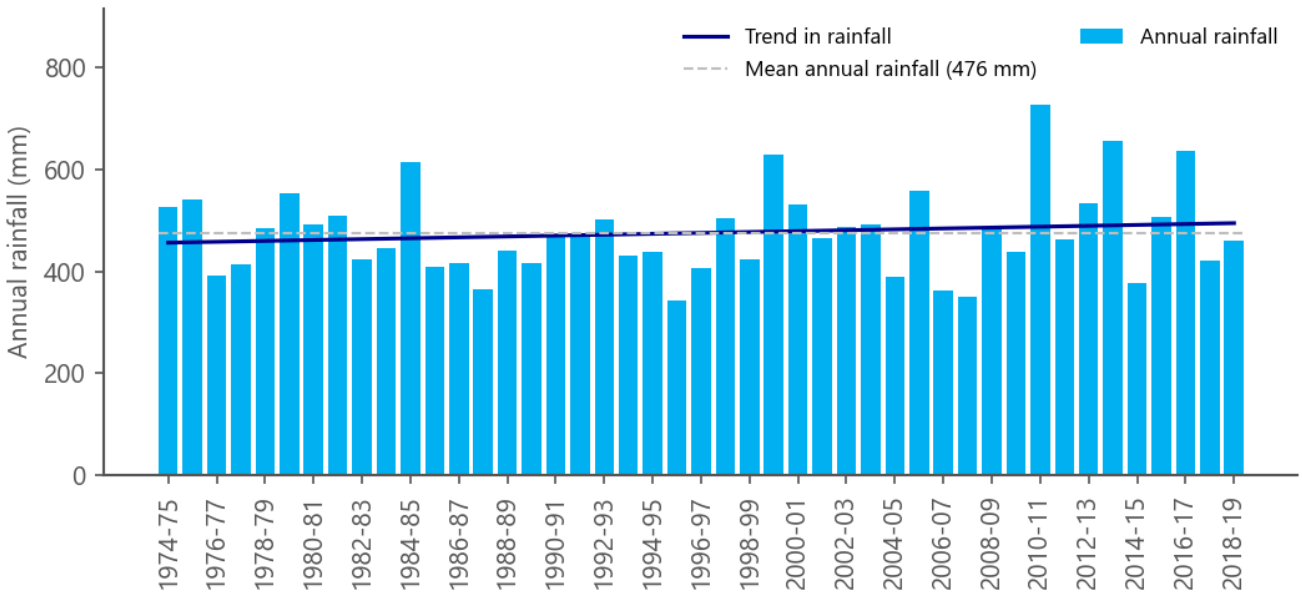


Figure 3.5. Annual rainfall for 1974–75 to 2018–19 at the Kingscote (Karinga) rainfall station (22808)

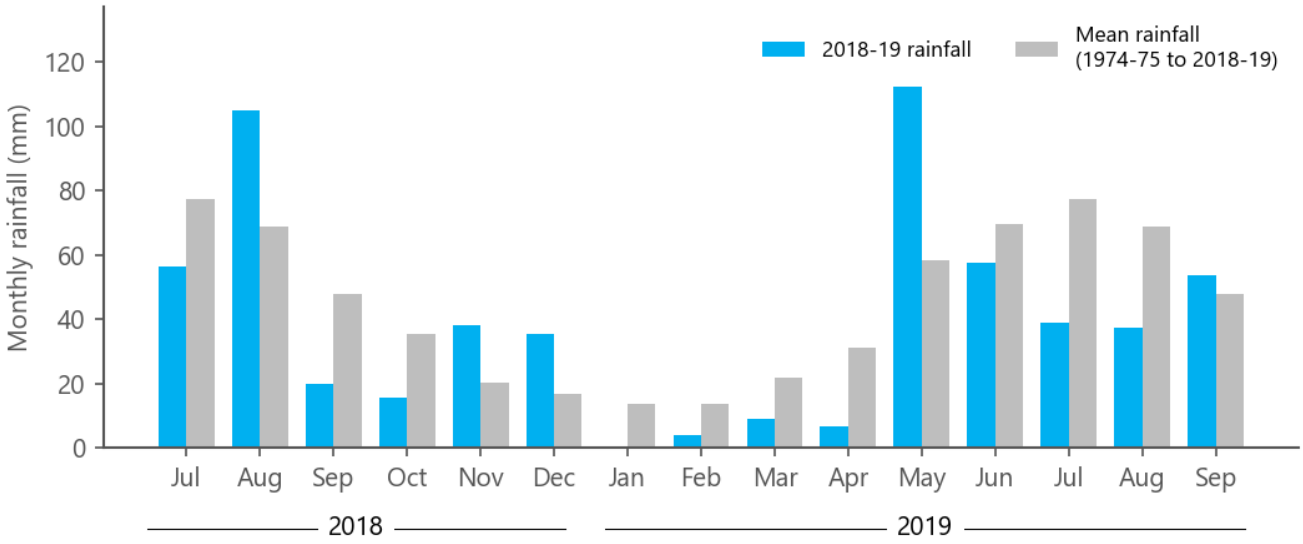


Figure 3.6. Monthly rainfall between July 2018 and September 2019, Kingscote (Karinga) rainfall station (22808)

- Kingscote (Karinga) rainfall station (BoM station 22808) represents the eastern extent of the Cygnet River catchment. The annual rainfall total recorded for 2018–19 was 461 mm (Figure 3.5). This was 15 mm lower than the average annual rainfall of 476 mm (1974–5 to 2018–19). The station has a long-term increasing trend.

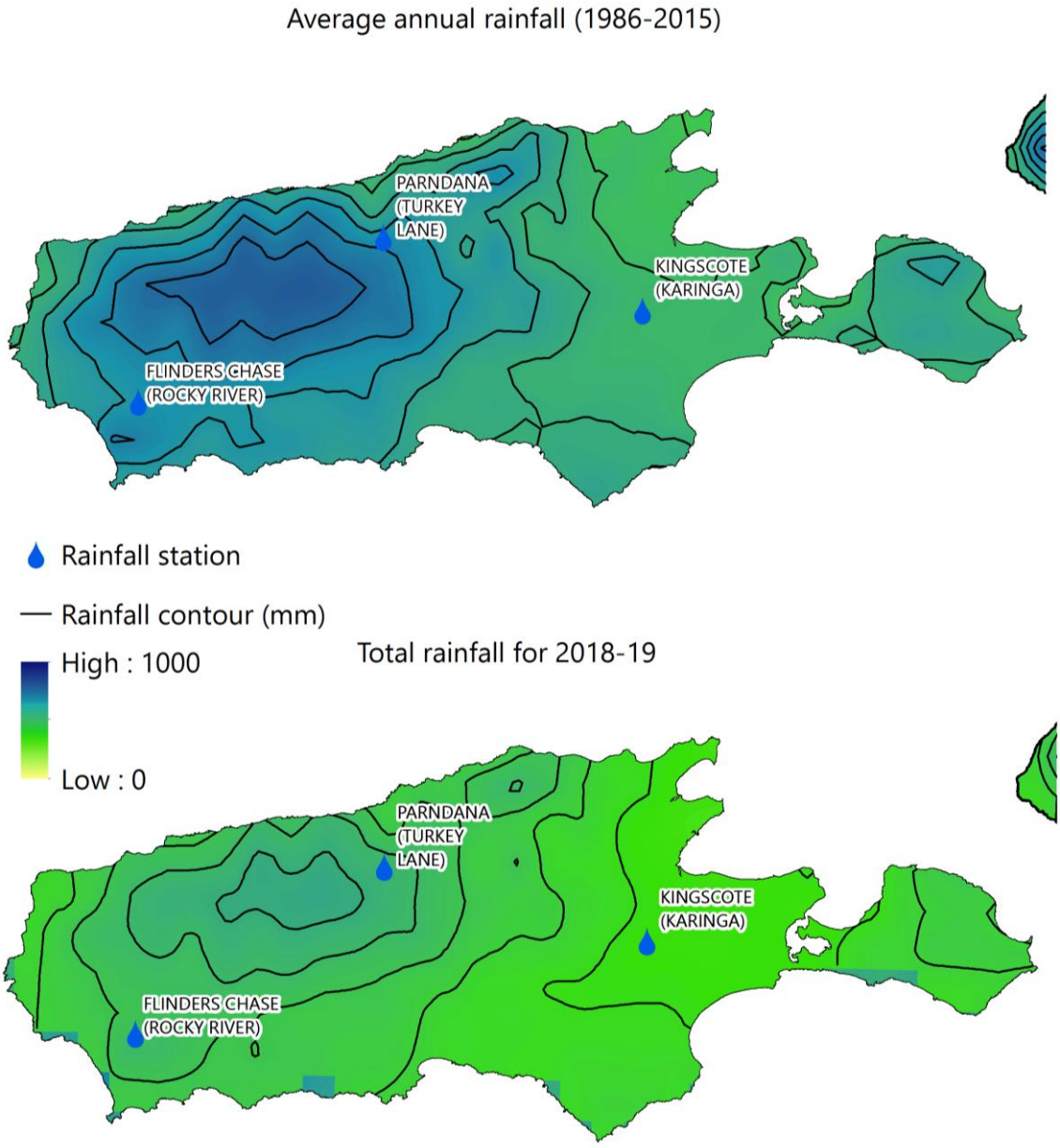


Figure 3.7. Rainfall on Kangaroo Island for 2018–19 compared to the standard 30-year climatological average (1986-2015)

- While all stations recorded wetter-than-average break of season (May), the rest of the year recorded below-average monthly rainfall in 2019 (Figure 3.2, Figure 3.4 and Figure 3.6).
- Spatial rainfall patterns are varied across the Island. Figure 3.7 shows that the long-term-average annual rainfall has higher rainfall when compared to the rainfall on Kangaroo Island in 2018–19. Both spatial rainfall maps show higher rainfall in the higher elevations of the western and central parts of the island[3].

[3] Some differences may be noticeable between the spatial rainfall maps and the annual rainfall from individual stations. This is due to the use of different data sources and time periods and further detail is provided in Section 2.1.

4 Surface water

4.1 Streamflow

Some of the larger watercourses (and catchment areas) on Kangaroo Island include Cygnet River, Stunsail Boom River, Rocky River, Eleanor River, Harriet River and Middle River. Most watercourses in the region are ephemeral and tend to begin in the central part of the island before flowing out to sea. Trends in streamflow and salinity are primarily rainfall driven, i.e. lower than average winter rainfall will result in reduced annual streamflow volumes. Conversely, higher rainfall will result in increased surface water availability. Prolonged drier-than-average rainfall years, combined with hotter and drier conditions associated with the changing climate, is expected to have direct implications to management of water resources on Kangaroo Island.

The spatial variability in hydrological behaviour of the surface water catchments within Kangaroo Island makes it challenging when assigning a single representative streamflow gauging station for the region. Therefore multiple streamflow gauging stations were used for the analysis (Figure 1.1). The following stations were chosen to be representative of the island:

- Undeveloped catchment predominantly covered with native vegetation: Rocky River (A5130501)
- Water supply catchment: Middle River upstream of the reservoir (A5131015)
- Largest surface water catchment: Cygnet River at Koala Lodge (A5131014).

The streamflow data availability period for each gauging station is detailed in the following sections. Further detail on analysis methodologies used can be found in Section 2. Despite recording lower-than-average streamflow in all three of the representative streamflow gauging stations in 2018–19 (Figure 4.1), the annual totals are ranked as 'average' based on the BoM classification (Table 2.1).

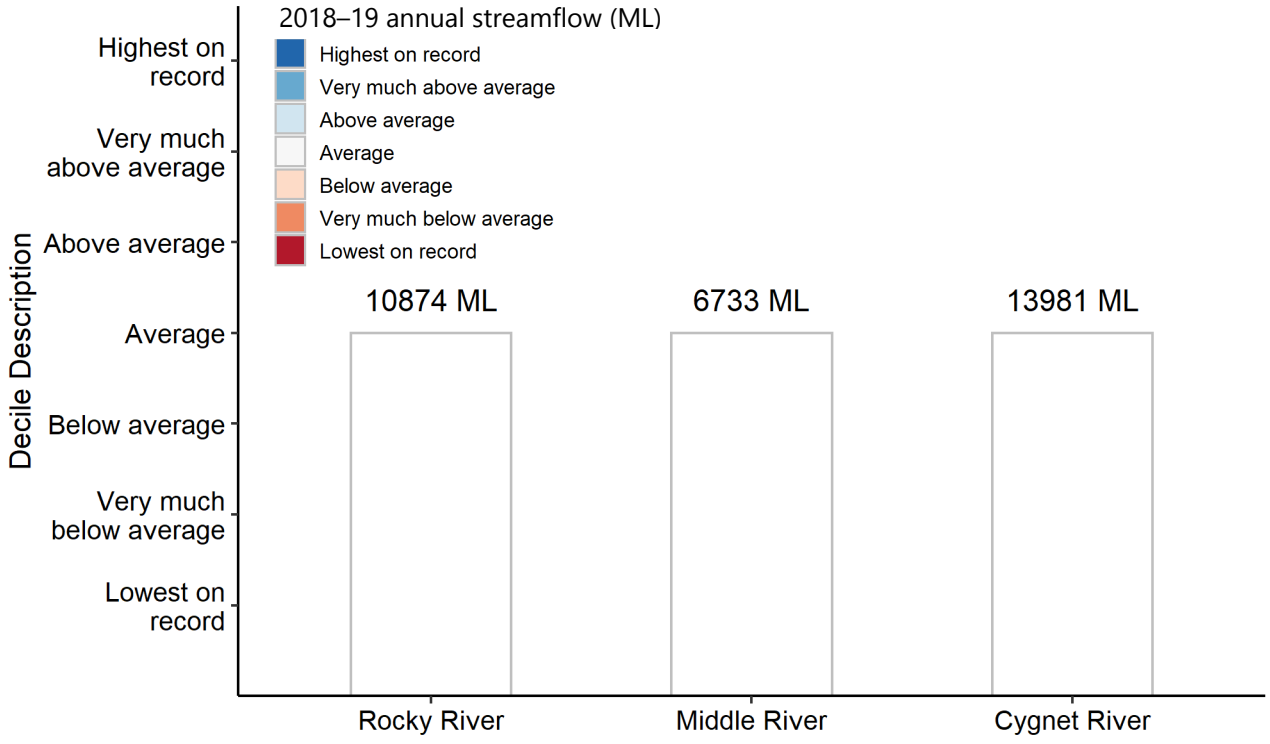


Figure 4.1. Kangaroo Island annual streamflow summary 2018–19

4.1.1 Rocky River (A5130501)

The Rocky River catchment (215 km^2) is located 100 km west of Penneshaw and flows in a south-westerly direction to discharge into the Southern Ocean at Maupertuis Bay. The Rocky River is one of the few undisturbed catchments in the state, being predominantly covered by native vegetation and not subject to land clearing. There is one active streamflow gauging station in the catchment upstream of Gorge Falls (A5130501) which has an upstream catchment area of 189 km^2.

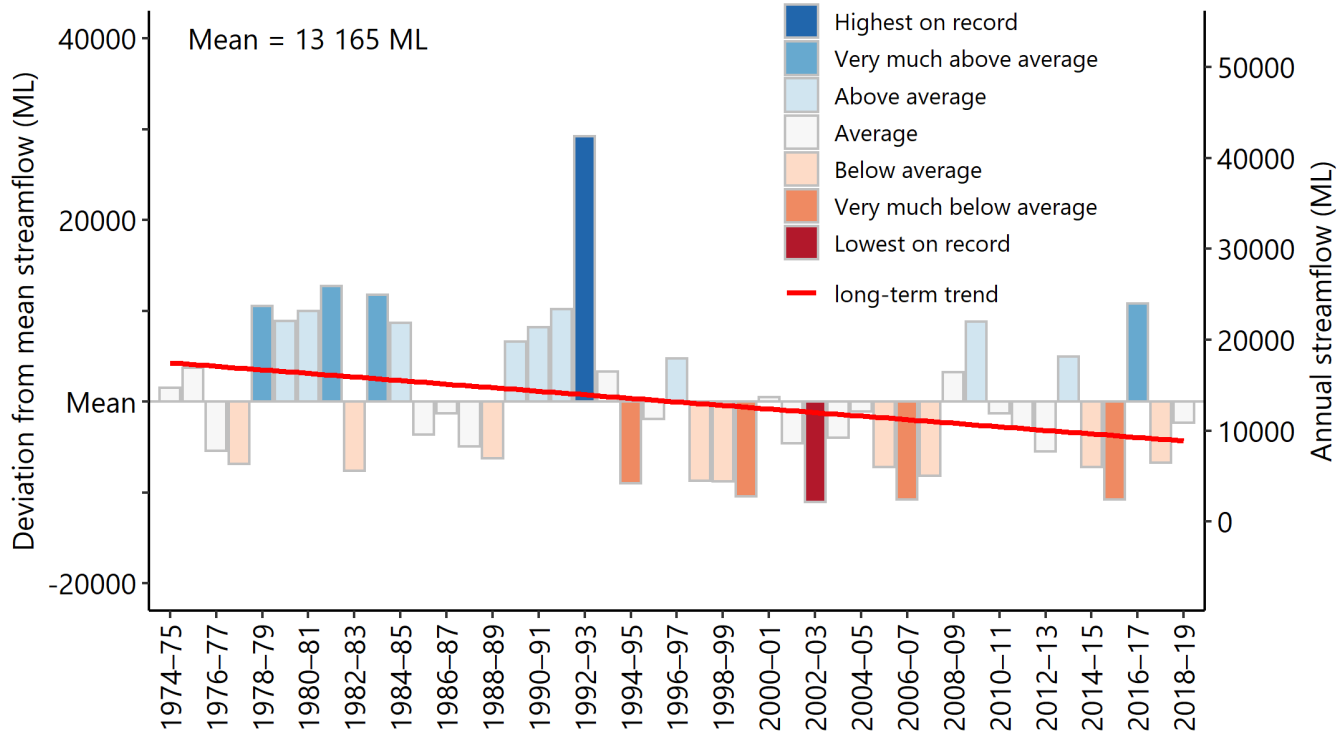


Figure 4.2. Annual deviation from mean streamflow in the Rocky River (1974-75 to 2018–19)

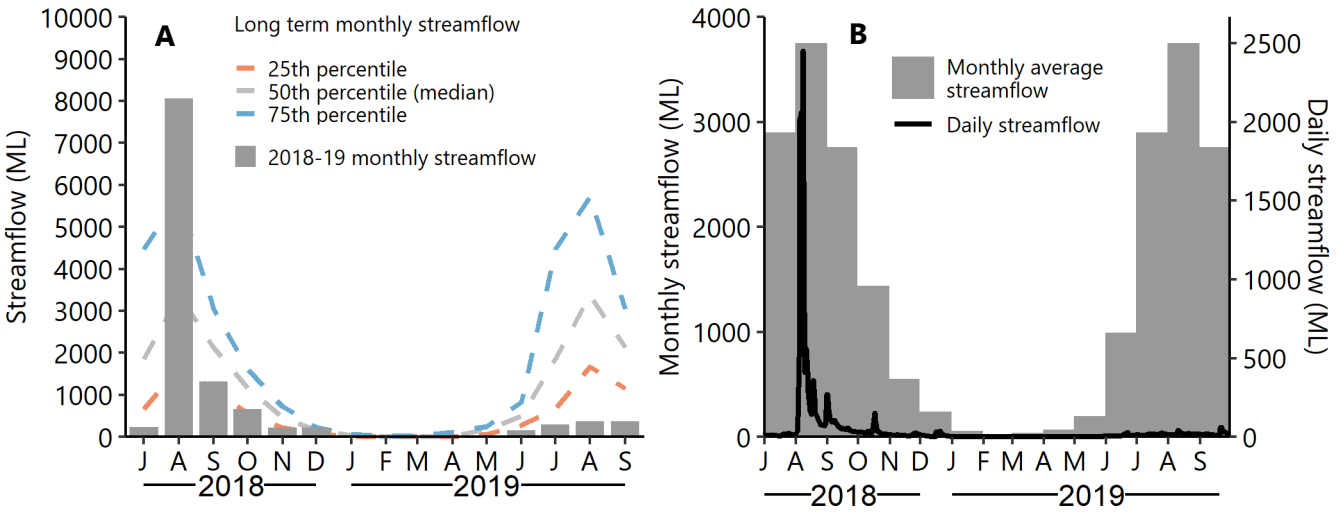


Figure 4.3. (A) Long term monthly statistics and 2018–19 monthly streamflow in the Rocky River; (B) Long term average monthly streamflow and 2018–19 daily streamflow in the Rocky River

The deviation of each individual year's streamflow from the long-term average is shown in Figure 4.2. The annual streamflow in the Rocky River was 10 874 ML for 2018–19, which was 2291 ML (17%) below the long-term average annual streamflow of 13 165 ML (1974–75 to 2018–19).

Despite recording lower-than-average streamflow, the annual total is ranked as 'average' assessed for the period 1974–75 to 2018–19 based on the BoM classification (Table 2.1). Annual streamflow in the Rocky River indicates a long-term declining trend and 4 of the last 5 years have been below the long-term average annual streamflow (Figure 4.2).

Figure 4.3A shows the monthly streamflow for 2018–19 (grey bars) relative to the long-term monthly streamflow (1974–75 to 2018–19) for (a) low flows (25th percentile), (b) median flows (50th percentile) and high flows (75th percentile). August 2018 was the only month where streamflow was greater than the long-term monthly average and was above the 75th percentile flow. The remainder of the months were similar to the median (50th percentile) flows or below. No streamflow was recorded between January and May 2019. The higher rainfall recorded in May 2019 (Figure 3.2) did not result in increased streamflow in the Rocky River. This could be attributed to the interception of rainfall by the catchment vegetation or the infiltration into the ground, which may have been dry following the summer. Typically, the majority of the streamflow occurs between July and October in the Rocky River and accounts for 83% of the total annual flow in any given year.

Figure 4.3B presents the long-term average monthly streamflow (1974–75 to 2018–19) and the daily flows for 2018–19. Maximum daily flows were recorded in August 2018. There were 138 zero flow days experienced in 2018–19 (January to May 2019) due to the ephemerality of the system.

Analysis of hydrological data for the catchment indicates that, despite a lack of trend in total annual rainfall (Figure 3.1), there appears to be a clear declining trend in total annual streamflow (Figure 4.2). Change in rainfall seasonality is one possible reason that could be contributing to this declining trend given that there is minimal (or no) surface water extraction in the catchment.

4.1.2 Middle River (A5131015)

Middle River is a key surface water catchment on Kangaroo Island covering 145 km^2. It includes a diverse land use including agricultural areas, and prior to the recent bushfires supported significant areas of natural vegetation and plantation forestry. The catchment also includes the largest surface water reservoir on the island, which is operated by SA Water and supplies water to towns such as Kingscote and Parndana. One of the principal streamflow gauging stations is just upstream of the reservoir and has an upstream catchment area of 87 km^2, data for which is presented below.

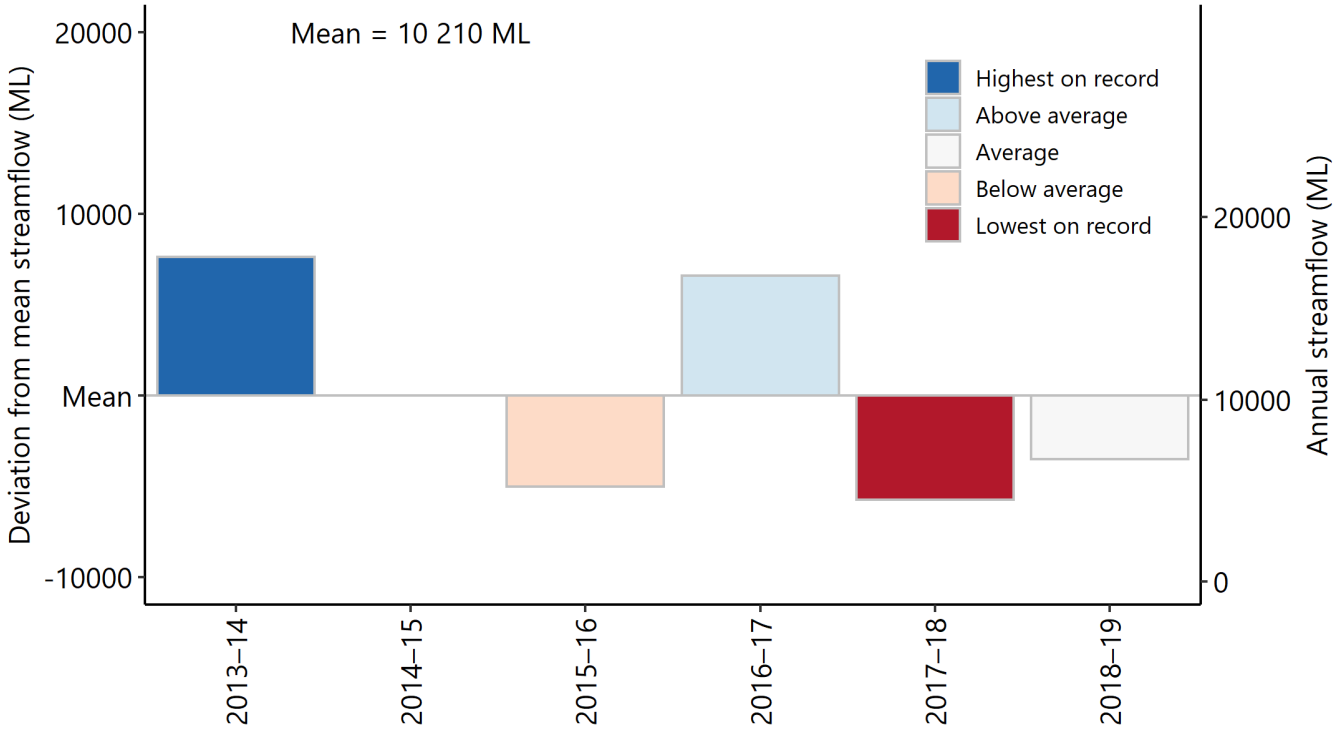


Figure 4.4. Annual deviation from mean streamflow in the Middle River (2013-14 to 2018–19)

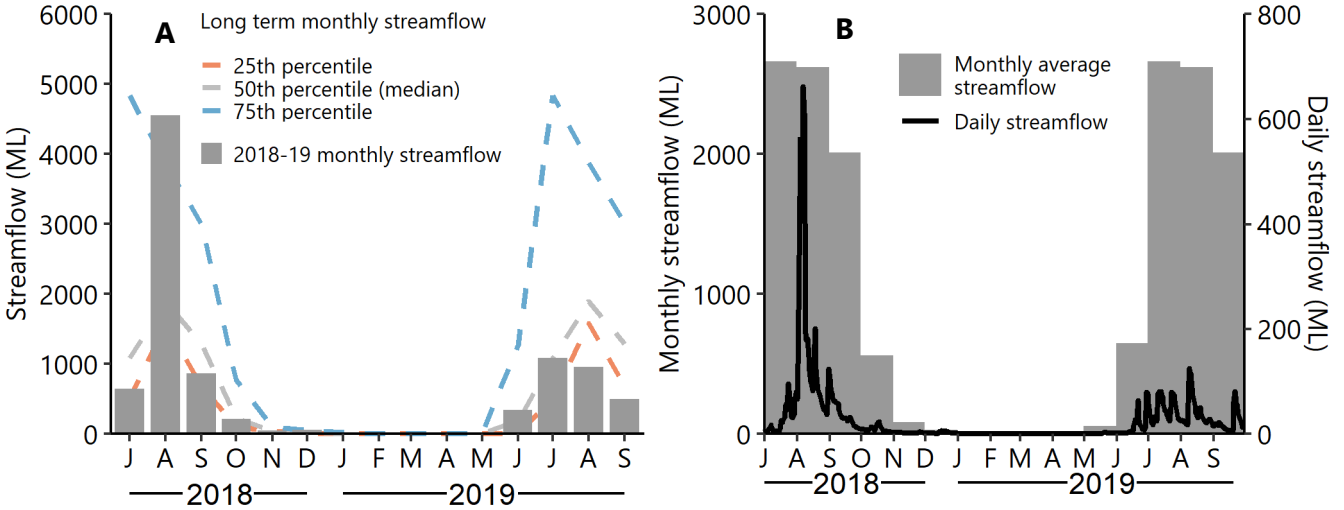


Figure 4.5. (A) Long term monthly statistics and 2018–19 monthly streamflow in the Middle River; (B) Long term average monthly streamflow and 2018–19 daily streamflow in the Middle River

The deviation of each individual year's streamflow from the long-term average is shown in Figure 4.4. The annual streamflow in the Middle River was 6733 ML for 2018–19, which was 3477 ML (34%) below the long-term average annual streamflow of 10 210 ML (2013–14 to 2018–19). There is missing data in 2015 (January to May) and therefore the remaining data for 2014–15 has been removed from the analysis.

Despite recording lower-than-average streamflow, the annual total is ranked as 'average' assessed for the period 2013–14 to 2018–19 based on the BoM classification (Table 2.1). Trend analysis has not been undertaken due to the short period of data availability. However, 3 of the last 4 years have been below the long-term average annual streamflow (Figure 4.4).

Figure 4.5A shows the monthly streamflow for 2018–19 (grey bars) relative to the long-term monthly streamflow (2003–04 to 2018–19) for (a) low flows (25th percentile), (b) median flows (50th percentile) and high flows (75th percentile). August and December 2018 were the only month where flows were greater than the long-term monthly average. The remainder of the months were similar to the median (50th percentile) flows or below. No streamflow was recorded between January and April 2019. Similarly to the Rocky River catchment, the Middle River did not show increased streamflow in May 2019 following the high rainfall recorded (Figure 3.3). However, higher streamflow was recorded between June and September 2019 than was recorded at Rocky River. Typically, the majority of the streamflow occurs between July and October in the Cygnet River and accounts for 90% of the total annual flow in any given year.

Figure 4.5B presents the long-term average monthly streamflow (2013–14 to 2018–19) and the daily flows for 2018–19. Maximum daily flows were recorded in August 2018. There were 110 zero flow days experienced in 2018–19 (January to April 2019) due to the ephemerality of the system.

4.1.1 Cygnet River (A5131014)

The Cygnet River catchment is the largest surface water catchment (606 km^2) draining approximately 14% of Kangaroo Island. The main watercourse is an ephemeral system, which commences in the higher elevation area in the west of the catchment. It then flows east for over 60 km before discharging into Nepean Bay, to the south of Kingscote, to a major tidal estuary system. One of the principal long-term streamflow gauging stations is at Koala Lodge and has an upstream catchment area of 480 km^2.

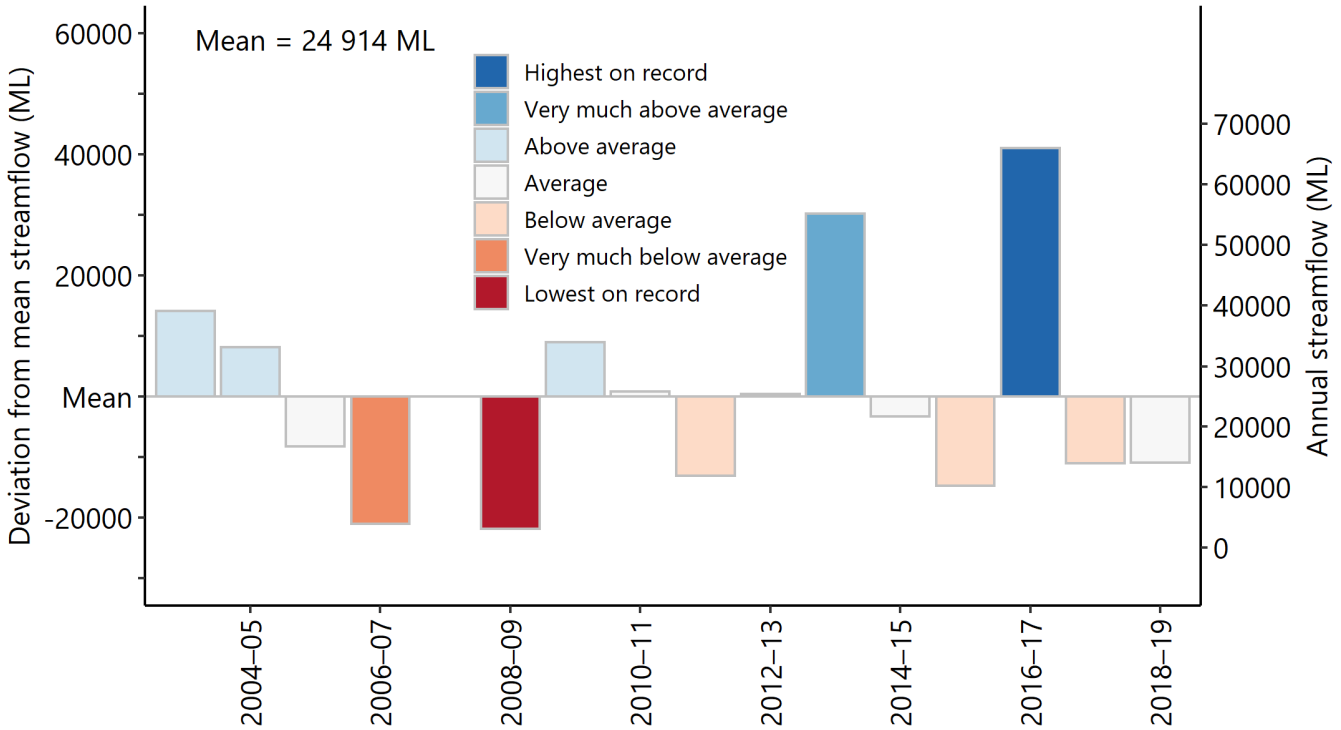


Figure 4.6. Annual deviation from mean streamflow in the Cygnet River at Koala Lodge (2003–04 to 2018–19)

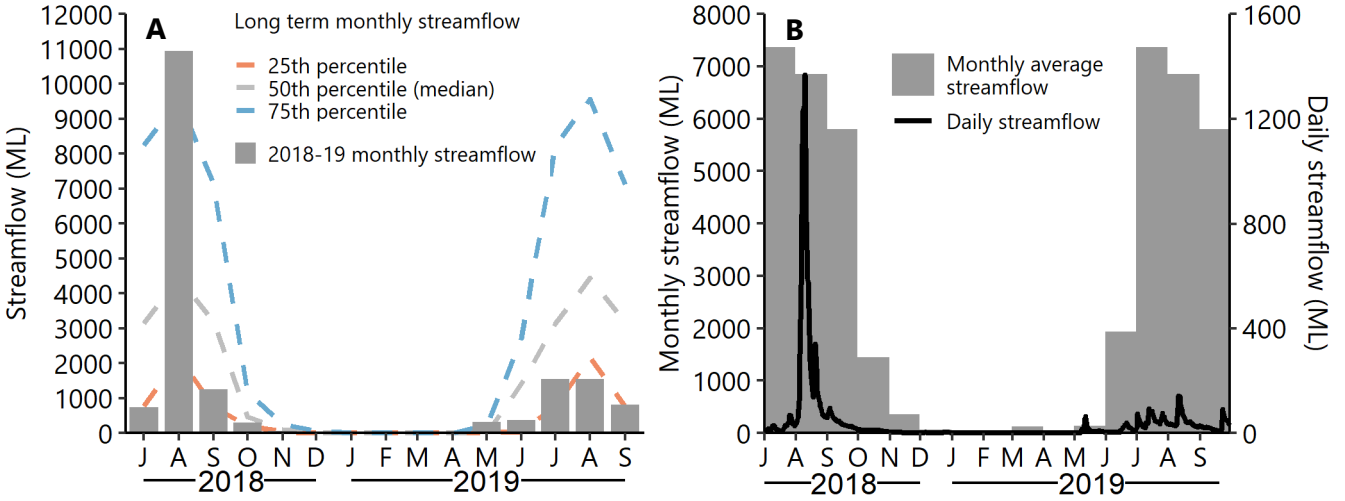


Figure 4.7. (A) Long-term monthly statistics and 2018–19 monthly streamflow in the Cygnet River; (B) Long-term average monthly streamflow and 2018–19 daily streamflow in the Cygnet River

The deviation of each individual year's streamflow from the long-term average is shown in Figure 4.6. The annual streamflow in the Cygnet River was 13 981 ML for 2018–19, which was 10 933 ML (44%) below the long-term average annual streamflow of 24 914 ML (2003–04 to 2018–19). There is missing data in 2008 (January to early-August) and therefore the remaining data for 2007–08 has been removed from the analysis.

Despite recording lower-than-average streamflow, the annual total is ranked as 'average' assessed for the period 2003–04 to 2018–19 based on the BoM classification (Table 2.1). Trend analysis has not been undertaken due to the short period of data availability. However, 4 of the last 5 years have been below the long-term average annual streamflow (Figure 4.6).

Figure 4.7A shows the monthly streamflow for 2018–19 (grey bars) relative to the long-term monthly streamflow (2003–04 to 2018–19) for (a) low flows (25th percentile), (b) median flows (50th percentile) and high flows (75th percentile). August 2018 was the only month where flows were greater than the long-term monthly average. The remainder of the months were similar to the median (50th percentile) flows or below. No streamflow was recorded between January and April 2019. Typically, the majority of the streamflow occurs between July and October in the Cygnet River and accounts for 90% of the total annual flow in any given year.

Figure 4.7B presents the long-term average monthly streamflow (2003–04 to 2018–19) and the daily flows for 2018–19. Maximum daily flows were recorded in August 2018. There were 114 zero flow days experienced in 2018–19 (January to April 2019) due to the ephemerality of the system.

4.2 Salinity

Below-average summer rainfall can result in increased irrigation extractions. This can cause salinities to increase by reducing the amount of streamflow available to dilute salts. Conversely, higher rainfall will result in increased surface water availability and decreased irrigation extractions, resulting in a reduction or stabilisation of salinity.

Salinity is recorded at Koala Lodge streamflow gauging station (A5131014) in the Cygnet River catchment, with data available from 2003. Figure 4.8 shows the long-term monthly salinity statistics for the period of data availability and median monthly values for 2018–19 (red dots).

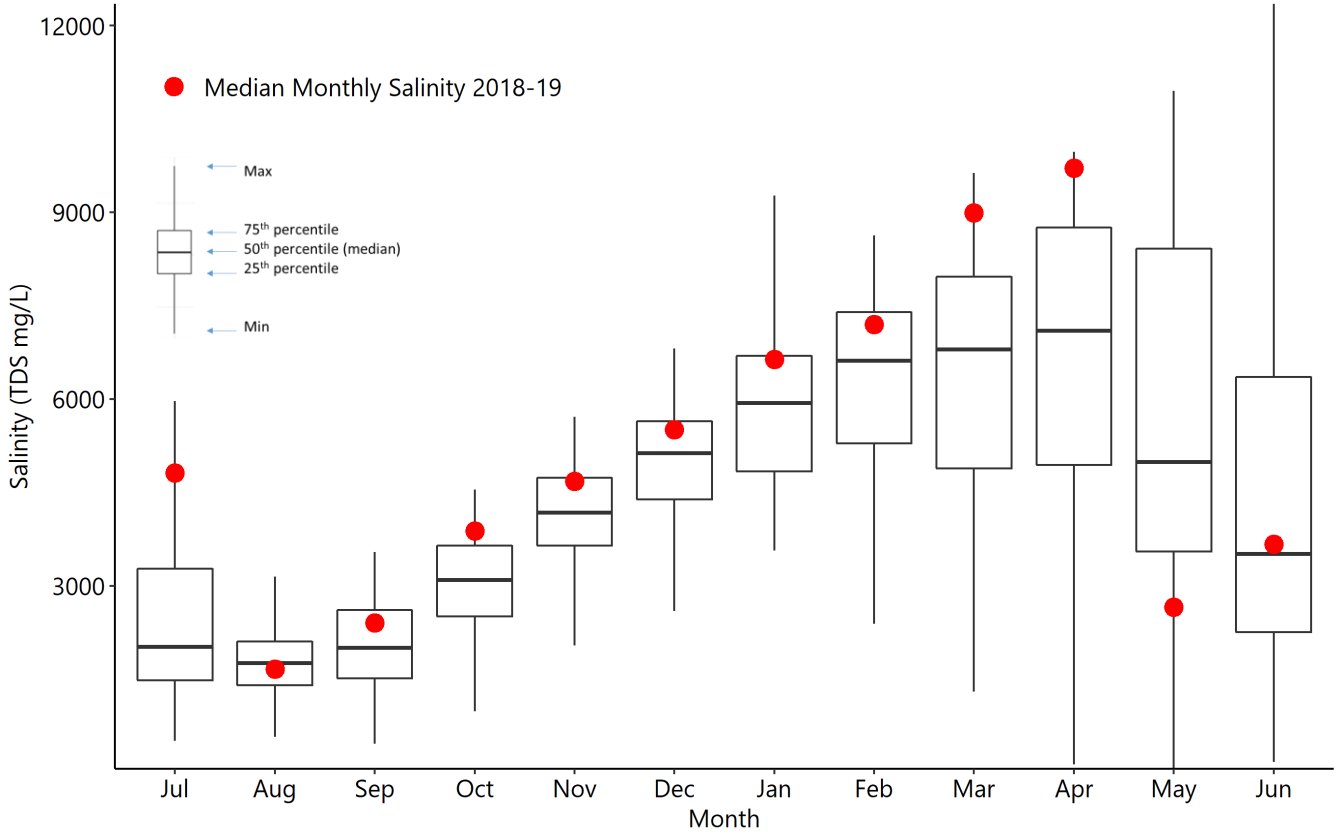


Figure 4.8. Long-term (2013-19) and 2018–19 monthly salinity at the Cygnet River (Koala Lodge) streamflow gauging station (A5131014)

The median long-term salinity observed in the Cygnet River is 4000 mg/L. The long-term monthly data indicates a high variability in salinity in the autumn and winter months compared to the spring and summer months, which is indicated by the greater range between the minimum and maximum values. The median monthly salinity values for 2018–19 can also be seen in Figure 4.8 (red dots). While the majority of the 2018–19 values are above the median long-term median monthly values, they remain within the historical ranges recorded each month. The highest salinity recorded in the Cygnet River in 2018–19 was 12 331 mg/L. The median monthly salinity for May 2019 is well below the 25th percentile due to higher-than-average rainfall (Figure 3.6) and streamflow during the month.

5 Groundwater

5.1 Hydrogeology

Groundwater resources are found within Cambrian fractured rock aquifers, Permian glacial sediments, Tertiary limestone and sandstone, consolidated Quaternary aeolianite and river alluvium. Occurrences of good quality groundwater are limited and localised. There is very little development of these resources, however groundwater provides baseflow in the upper reaches of the Cygnet and Rocky Rivers and supports permanent pools. Most groundwater is brackish to saline (> 2000 mg/L) and wells are generally low yielding (< 1 L/s) (Alcoe and Berens 2012). Due to the very low usage of groundwater, there are no management regimes in place.

5.2 Water level

Because of the limited development of groundwater, there is no groundwater level or salinity monitoring for resource condition.

However observation networks have been established to monitor shallow watertables which contribute to dryland salinity in various parts of the island. Figure 5.1 shows a typical hydrograph from a monitoring well in the Eleanor River dryland salinity monitoring network in the central part of Kangaroo Island. The water level trends are largely controlled by land use and rainfall patterns, with a declining trend over the last 30 years.

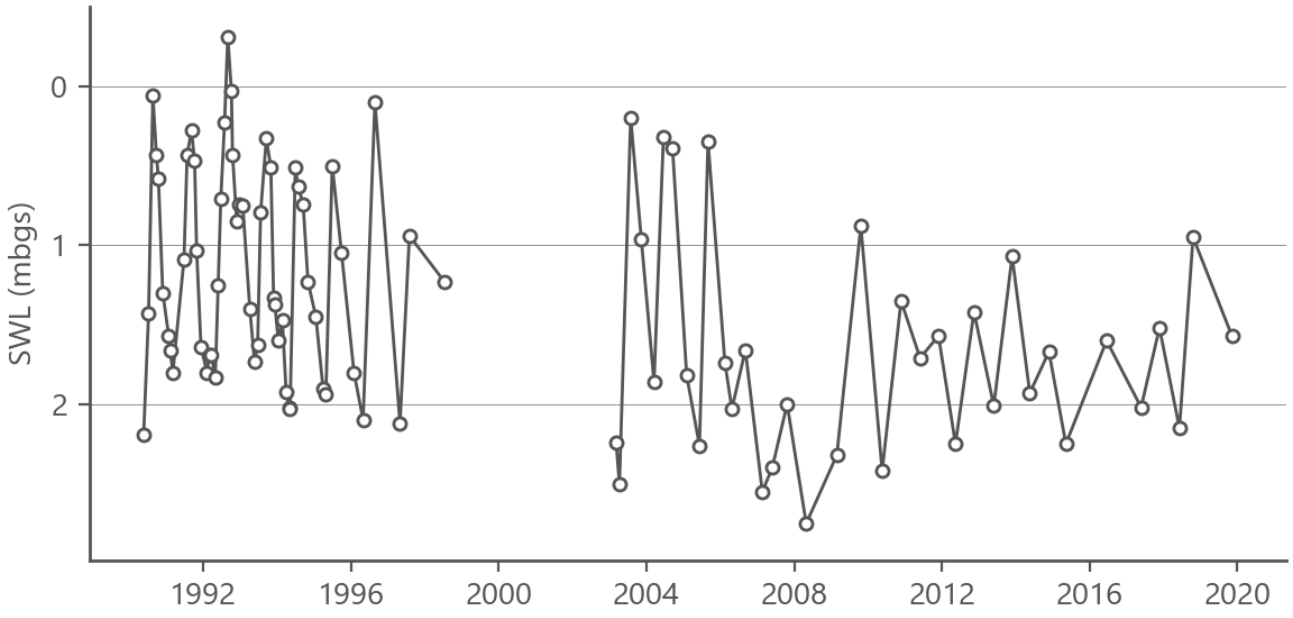


Figure 5.1. Depth to groundwater in the shallow monitoring well SED002 at Eleanor River (SWL is measured in metres below ground surface)

5.3 Salinity

Due to limited development and monitoring of groundwater resources, there is no groundwater salinity monitoring data available.

6 Water use

Surface water is the major water resource to the region. Demand for water on Kangaroo Island can be broadly divided into consumptive use, other public benefits (Indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values) and environmental requirements. The consumptive uses on Kangaroo Island are non-licensed (stock and domestic uses), agriculture, forestry, town supply. As water on Kangaroo Island is not prescribed, the use of water from farm dams, watercourse extractions and groundwater is therefore not licenced. As a result, limited metered water use data is available.

6.1 Surface water use

Middle River Reservoir is the major water storage on Kangaroo Island and is operated by SA Water. The Middle River water treatment plant (WTP) is a critical supply of potable water to a number of towns (including Kingscote, Parndana and Brownlow) and surrounding rural areas. Extraction data from the Middle River reservoir is presented in Figure 6.1 for the period 2010–11 to 2018–19. 476 ML was extracted in 2018–19 which was 17 ML higher than the mean annual extraction of 459 ML (2010–11 to 2018–19). When compared to the annual rainfall shown in Figure 3.3, typically greater extraction from Middle River Reservoir occurs when rainfall is lower.

Penneshaw Water Supply Scheme (WSS) supplies water to the township of Penneshaw with water sourced from a sea water desalination plant. The desalination plant was commissioned in 1999 and produces up to 100 ML per year. Prior to this, water for Penneshaw's WSS was sourced from privately owned farm dams. Many households on Kangaroo Island are not connected to the WSS's and rely on other means such as rainwater tanks and farm dams for potable and non-potable water supply. Sources of non-potable water in the region include farm dams, stormwater harvesting and wastewater reuse that is used for applications such as stock watering or irrigation of parks and gardens (DEWNR 2013). Agriculture and forestry are also two of the largest users of surface water on the Island. Farm dams are the primary means of intercepting runoff and storing water for stock, domestic and irrigation purposes and are prominent across the region in all areas except conservation and national parks. Farm dams are discussed below in Section 7.2. Plantation and farm forestry has become established generally on the western side of the Island and the forests intercept rainfall and therefore reduce runoff.

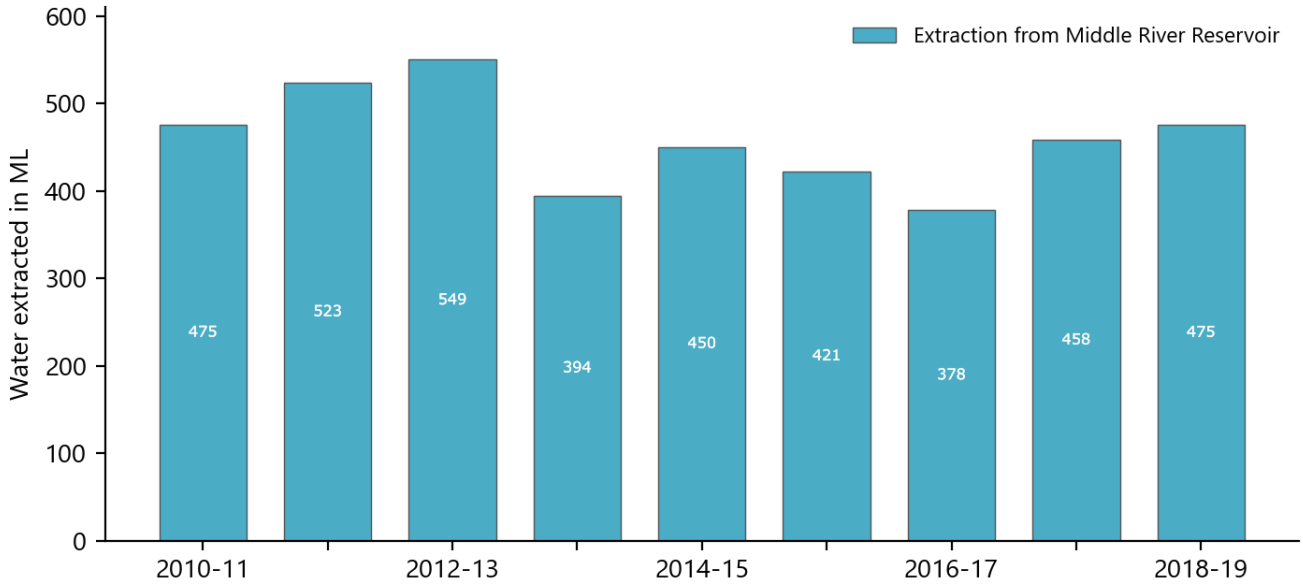


Figure 6.1. Water extracted from Middle River reservoir from 2010–11 to 2018–19

6.2 Farm dams

There are approximately 11 000 farm dams on Kangaroo Island with a total storage capacity of almost 20 000 ML (KI NRMB 2017a, b). More detail on the farm dams in the Cygnet and Middle River catchments are provided below and this analysis is based on recent detailed assessment and modelling.

6.2.1 Cygnet River

Detailed analysis of the farm dams in the Cygnet River catchment (Figure 6.2) shows that there are 2429 farm dams within the catchment with a total storage capacity of 4571 ML (DEW 2020a draft). This is in addition to the 88 dams identified as aquaculture dams, which are classified as off-stream storages. Across the Cygnet catchment, smaller dams (capacity less than 5 ML) account for the majority of the number of dams (96%), but represent 52% of the total storage capacity of dams. Larger dams (5 ML or greater capacity) make up only 4% of the total dam count but contribute to 48% of the total storage capacity.

The average farm dam density of the Cygnet River catchment is 7 ML/km^2. The density of farm dam development at the sub-catchment scale varies from 1.4–35 ML/km^2 across the catchment, with a tendency for headwater (higher elevation) sub-catchments to have higher density of farm dam development in comparison to downstream receiving areas. This is comparable to some of the highly developed catchments in the Mount Lofty Ranges (Figure 6.2).

6.2.2 Middle River

Detailed analysis of the farm dams in the Middle River catchment (Figure 6.3) shows that there are 469 farm dams within the catchment with a total storage capacity of 733 ML (DEW 2020b draft), In addition to these, 129 aquaculture ponds were identified by the Kangaroo Island Landscape Board (with a total storage capacity of 148 ML).

Across the Middle River catchment, smaller dams (capacity less than 5 ML) account for the majority of the number of dams (97%), but represent 68% of the total storage capacity of dams. Larger dams (5 ML or greater capacity) make up only 3% of the total dam count but contribute to 32% of the total storage capacity ().

The average farm dam density of the Middle River catchment is 4 ML/km^2. The density of farm dam development at the sub-catchment scale varies from 0.4–8.9 ML/km^2 across the catchment, with a tendency for headwater (higher elevation) sub-catchments to have higher density of farm dam development in comparison to downstream receiving areas. This is comparable to some of the highly developed catchments in the Mount Lofty Ranges (Figure 6.3).

6.3 Groundwater use

There have been no estimates made of the very limited use of groundwater.

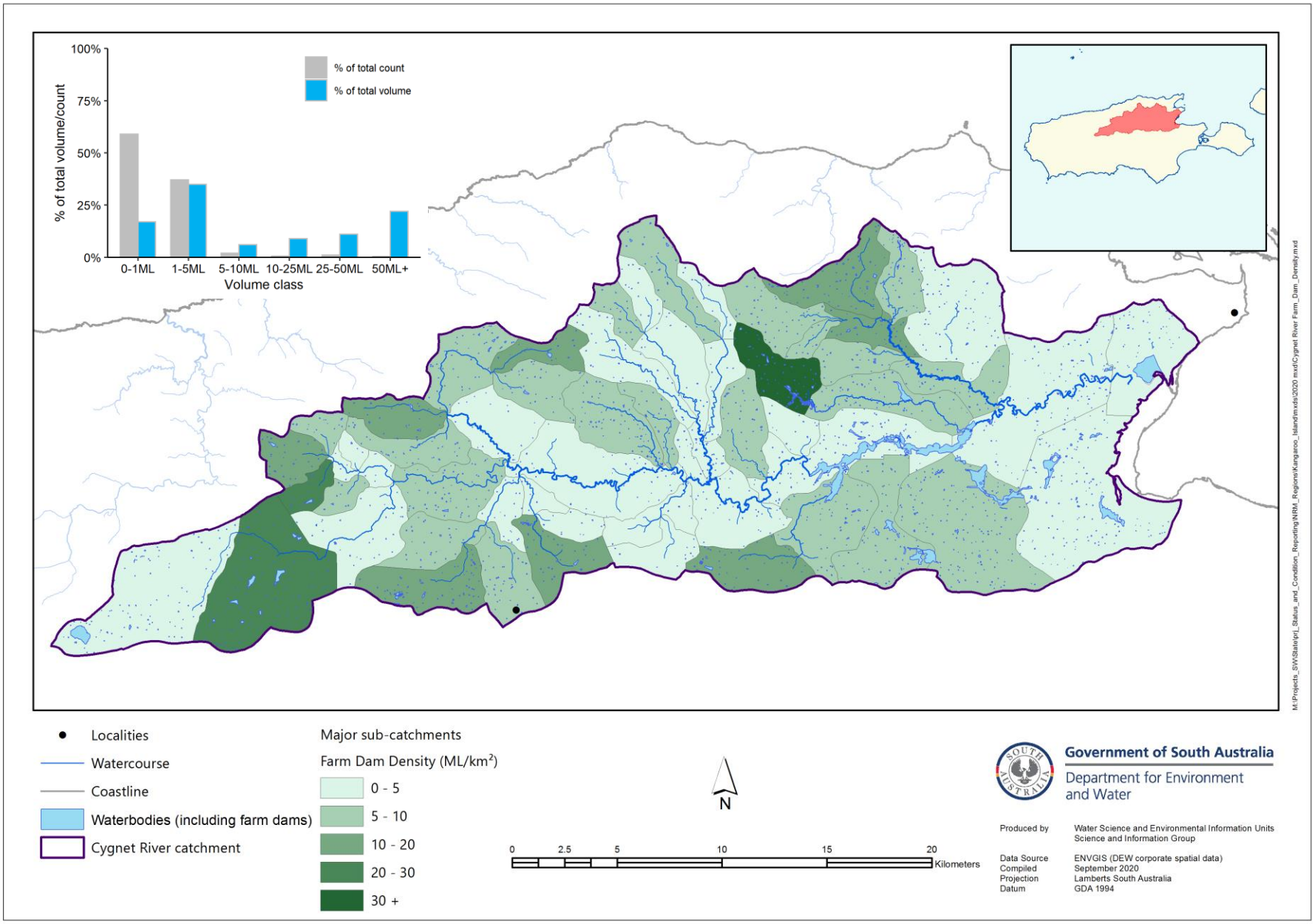


Figure 6.2. Farm dam volume, count analysis, and density in Cygnet River catchment

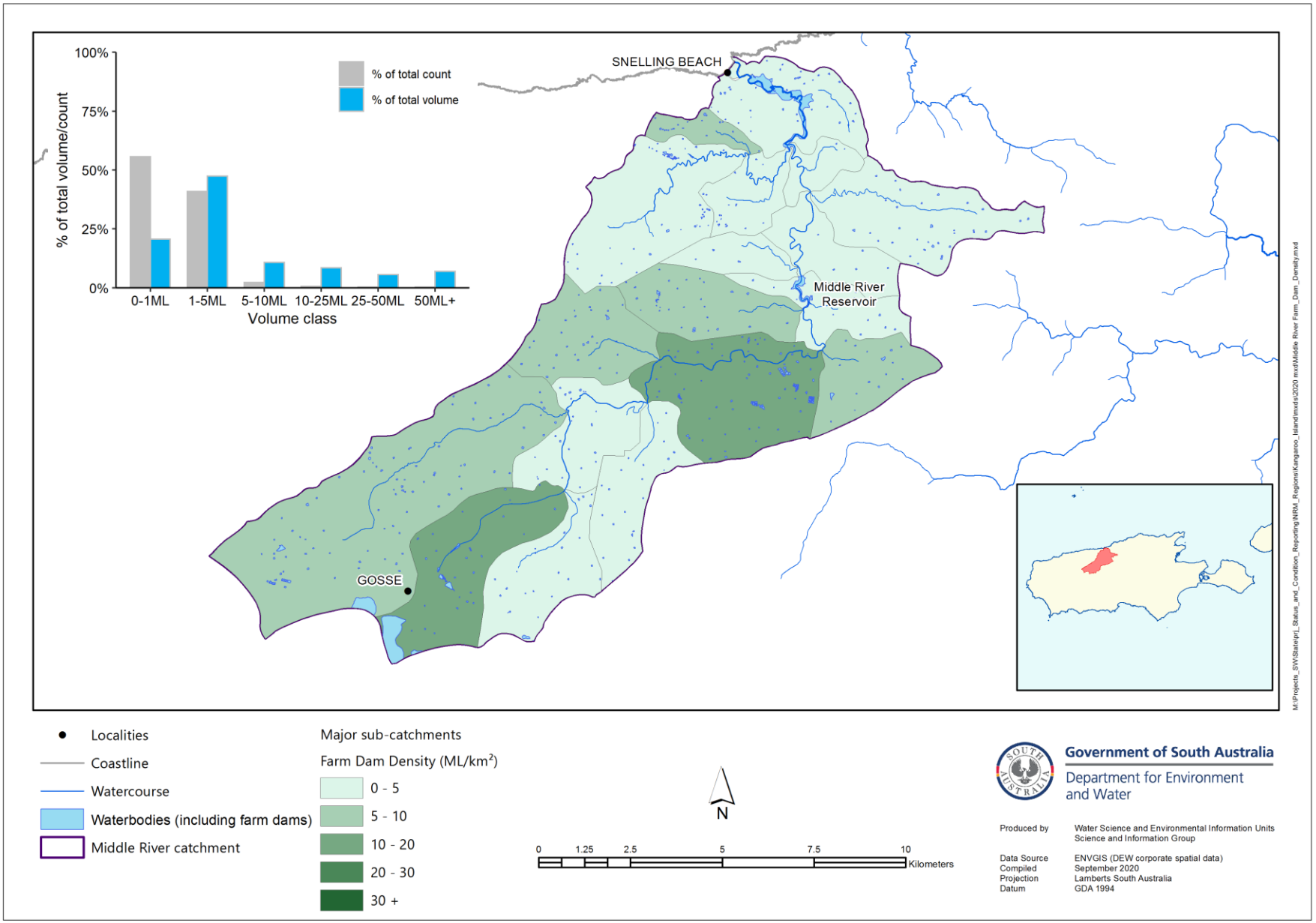


Figure 6.3. Farm dam volume, count analysis, and density in Middle River catchment

7 References

Alcoe DW and Berens V (2012). Non-prescribed groundwater resources assessment – Kangaroo Island Natural Resources Management Region. Phase 1 - Literature and Data Review, DFW Technical Report 2012/02, Government of South Australia, through Department for Water, Adelaide.

Aryal SK (2011) Independent scientific review of the Kangaroo Island Natural Resources Management Plan Water Resources Management Policy - A report to the Kangaroo Island Natural Resources Management Board, CSIRO: Water for a Healthy Country National Research Flagship, Australia.

DEW (2020a). Development and calibration of a surface water model for Cygnet River, Kangaroo Island, DEW Technical report: Draft, Government of South Australia, Department for Environment and Water, Adelaide.

DEW (2020b). Development and calibration of a surface water model for Middle River, Kangaroo Island, DEW Technical report: Draft, Government of South Australia, Department for Environment and Water, Adelaide.

DEWNR (2013). Non-prescribed Surface Water Resources Assessment – Kangaroo Island Natural Resources Management Region, DEWNR Technical report: 2013/07, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide.

Kangaroo Island Natural Resources Management Board (2009a). Kangaroo Island Natural Resources Management Plan, Government of South Australia, Kangaroo Island Natural Resources Management Board, Kingscote SA.

Kangaroo Island Natural Resources Management Board (2009b). Kangaroo Island NRM Plan, Volume 1: State of the Region 2009, Government of South Australia, Kangaroo Island Natural Resources Management Board, Kingscote, SA.

Kangaroo Island Natural Resources Management Board (2017a). Kangaroo Island Natural Resources Management Plan: Volume A – Strategic Plan 2017-2027, Kangaroo Island Natural Resources Management Board, SA.

Kangaroo Island Natural Resources Management Board (2017b). Kangaroo Island Water Resources Management Policy: Water Affecting Activities, Kangaroo Island Natural Resources Management Board, SA.

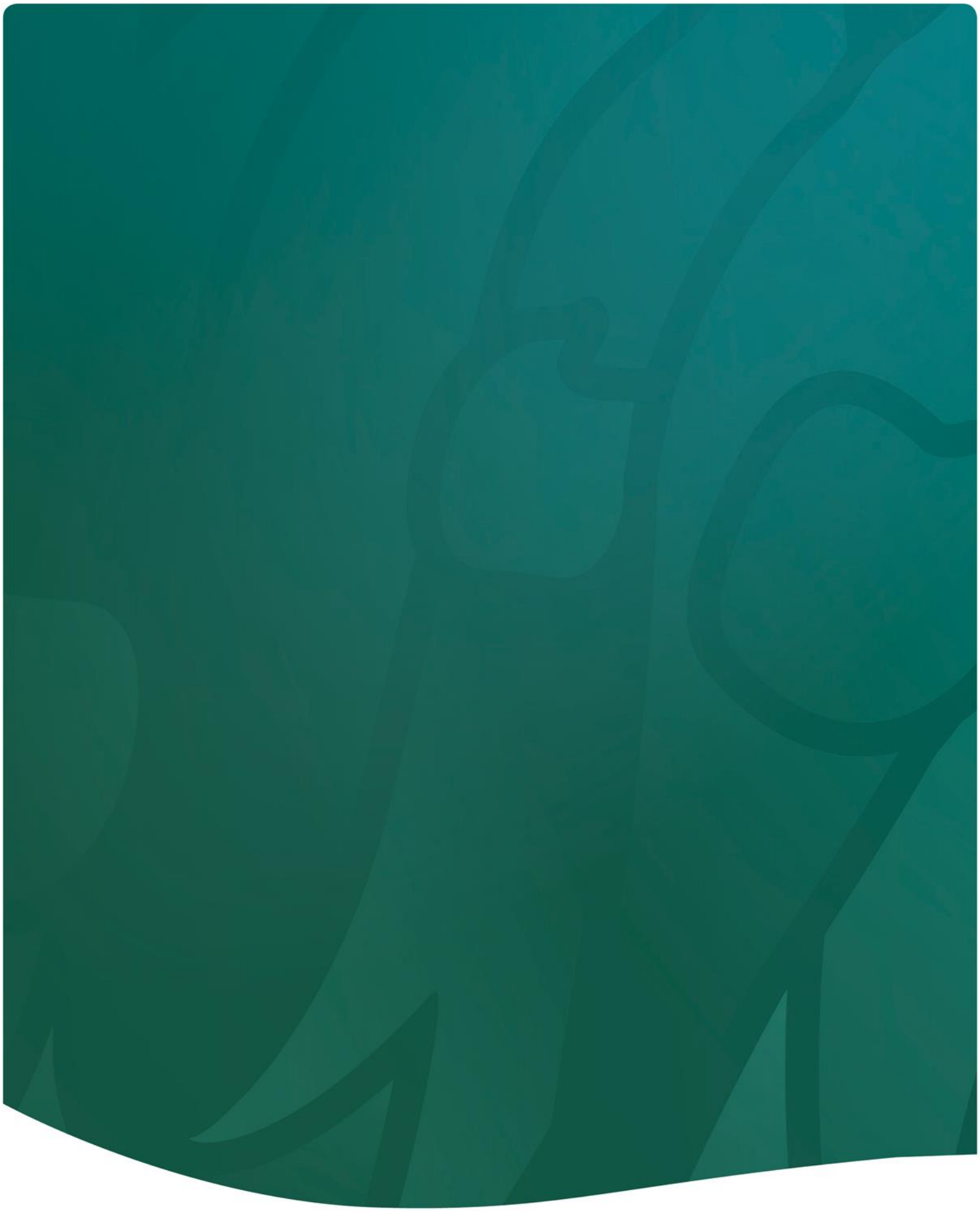
Kangaroo Island Landscape Board (2020). Kangaroo Island Landscape Board Business Plan 2020–21. An initial business plan under the *Landscape South Australia Act 2019*.

Kangaroo Island Landscape Board (2020). Water Affecting Activity Control Policy Kangaroo Island.

Nilsen T (2006), Technical Background to Water Management Planning on Kangaroo Island, South Australia, Technical report produced for the Kangaroo Island Natural Resources Management Board. Kangaroo Island, SA.

Shand, P, James-Smith, J, Love, AJ, Nilsen T and Thomas D (2006). Hydrogeochemistry of surface waters and groundwaters, Kangaroo Island, DWLBC Report 2007/18, Government of South Australia, through Department of Water, Land and Biodiversity Conservation, Adelaide.

Whiting J and Green D (2015). Hydrological investigations to inform surface water use limits and generalised environmental water requirements for key ecological assets on Kangaroo Island, DEWNR Technical Report 2015/07, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide



Government
of South Australia

Department for
Environment and Water