MORAMBRO CREEK AND NYROCA CHANNEL PWCs AND MORAMBRO CREEK PSWA

Surface Water Status Report

2010-11

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

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PURPOSE AND CONTEXT

This status report provides a snapshot of the surface water resources in the Morambro Creek and Nyroca Channel Prescribed Watercourses (PWCs) including Cockatoo Lake and the Morambro Creek Prescribed Surface Water Area (PSWA) for the financial year 2010-11. Surface water status reports are limited to reporting on the 'hydrological status' of prescribed water resources. Available data on climate, streamflow and salinity is summarised and compared with recent and long-term data to provide an indication of the hydrological status of its water resources. Each element is discussed with reference to recent or more long-term trends where they are present in the data. These status reports seek to support informed management decisions by resource managers and those responsible for, or reliant on, the water resources.

Development of the Natural Resource Management (NRM) State and Condition Reporting Framework (Government of South Australia 2012) was identified as a priority in the State NRM Plan (Government of South Australia 2012a) to strengthen the NRM system. Implementation of the NRM State and Condition Reporting Framework seeks to include an assessment of state and condition of natural resources through the development of Report Cards. The Department of Environment, Water and Natural Resources (DEWNR) in consultation with key stakeholders, is developing the Report Card *"Trends in condition of rivers, streams, wetlands and drains"*, which assess resource condition and the Report Card "*Proportion of SA's water resources managed within sustainable limits*" which reports on management outcomes. For further information on the condition compared to status of water resources, visit the NR Connect site's NRM Reporting page: http://www.nrconnect.sa.gov.au/NRM-Reporting

MORAMBRO CREEK AND NYROCA CHANNEL PWCs AND MORAMBRO CREEK PSWA

The Morambro Creek and Nyroca Channel PWCs including Cockatoo Lake and the Morambro Creek PSWA (hereafter the PA (Prescribed Area)) are located approximately 280 km south-east of Adelaide (Figure 1). Surface water (including within the watercourse) was prescribed under the South Australia *Water Resources Act 1997*. The area was prescribed in response to an increase in demand for water for aquifer recharge schemes, to address the increasing salinity of the adjacent underground water resource in the Padthaway Prescribed Wells Area (SENRMB 2006). Following prescription, the Morambro Creek Water Allocation Plan (WAP) was developed by the South East NRM Board in 2006 to provide for the sustainable management of the water resource.

The PA is approximately 225 km^2 and includes 30 km of the Nyroca Channel. Towns within or near the region include Frances, Keppoch and Padthaway. The climate in the PA is typical of the South East and characterised by hot, dry summers and cool, wet winters with an average rainfall of 522 mm (1889–2010) recorded at Frances (rainfall station M026007, Figure 2). Average annual evaporation is estimated at 1480 mm (SENRMB 2006). Morambro Creek is an ephemeral stream, where 70-90% of the creeks streamflow originates from the catchment in western Victoria (SENRMB 2006). Morambro Creek flows into the Upper South East of South Australia near Frances, before flowing westerly along modified sections of the watercourse to Cockatoo Lake. Water flows along the Nyroca Channel when Cockatoo Lake fills and spills then eventually discharging into the Marcollat Watercourse. The characteristics of creek flows are influenced by the occurrence of dams, drainage wells and natural runaway holes that are likely to capture a significant portion of the surface water runoff in the catchment downstream of Frances (SENRMB 2006).

There is little licensed water use occurring in the PA with the majority of existing users diverting water from Morambro Creek or the Nyroca Channel. Others collect surface water runoff via dams or drainage wells. Use is primarily for aquifer recharge, stock, domestic, irrigation and recreational purposes (SENRMB 2006).

SUMMARY 2010-11

STATUS 2010-11  "no adverse hydrological trends, indicating a stable or improving situation"

This hydrological status for 2010-11 is supported by:

- above average rainfall
- above average streamflow
- average salinity levels.

Rainfall, streamflow, salinity and water usage can be highly variable from year to year. It is therefore important to acknowledge that hydrological trend, and therefore the hydrological status can also vary greatly from year to year. However this does not necessarily translate to the variability in the condition of water dependent ecosystems. On this matter, environmental water requirements and condition of water dependent ecosystems have not been considered when assigning the hydrological status for 2010-11. The section titled 'water dependent ecosystems' provides a brief overview of the water dependent ecosystems in the PA.

 (green) No adverse trends, indicating a stable or improving situation

Trends are either stable (no significant change), or have improved over the reporting period, indicating that there is insignificant risk of impact to the beneficial use of the resource.

 (yellow) Adverse trends indicating low risk to the resource in the short–term (1 to 3 years)

Observed adverse trends are gradual and if continued, are unlikely to lead to a change in the current beneficial uses of the surface water resource in the short–term.

 (amber) Adverse trends indicating medium risk to the resource eventuating in the short–term

Observed adverse trends are significant and if continued, moderately likely to lead to a change in the current beneficial uses of the surface water resource in the short–term.

 (red) Adverse trends indicating high risk to the resource within the short–term

Trends indicate degradation of the resource is occurring. Degradation will very likely result in a change in the beneficial use (e.g. reduced ability to access surface water entitlements and/or decline in the condition of environmental assets).

 (grey) Unclear

Trends are unable to be determined due to a lack of adequate information on which to base a sound judgement of status.

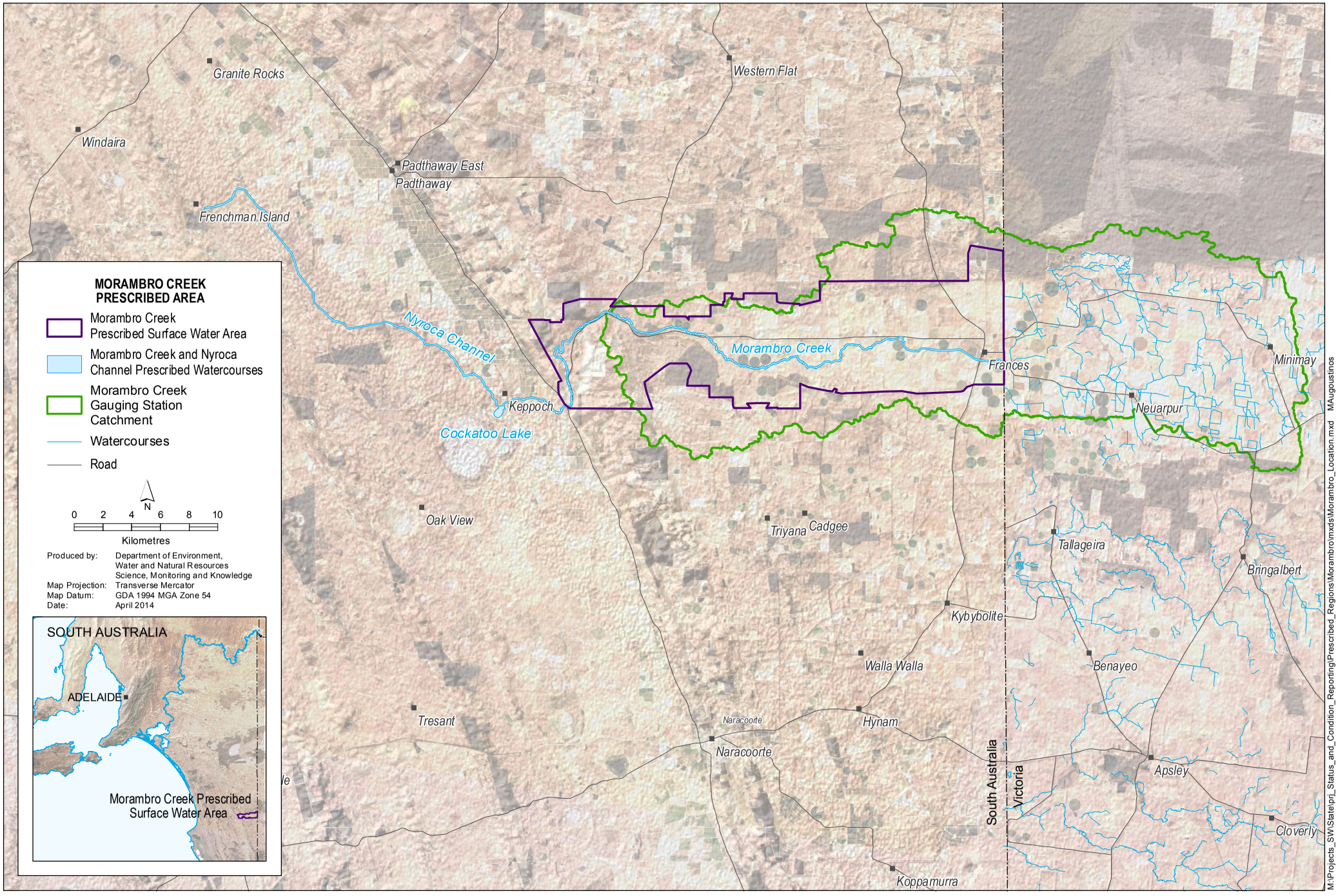

Figure 1. Location of the Morambro Creek and Nyroca Channel PWCs and Morambro Creek PSWA

RAINFALL

Status	Degree of confidence	Comments on recent historical context
Above average rainfall across most of the region	Fair: only one rainfall station within the PA, limiting regional variance	Second year in a row of above average rainfall recorded at Frances

Rainfall in the PA is typical of the South East, with hot, dry summers and cool, wet winters. There is only one BoM rainfall station located within the PA, Frances (M026007), and this station was used for analysis of rainfall trends. The long-term average annual rainfall (1889–2010) is 522 mm at Frances. Rainfall data have been sourced from SILO and are Patched Point Data. Further information on SILO climate data is available at: http://www.longpaddock.qld.gov.au/silo/index.html. It should be noted that the majority of streamflow in Morambro Creek is generated from rainfall runoff in the headwater catchments outside of South Australia.

RECENT RAINFALL

During 2010-11, large rainfall events were experienced during the months of August, December and January (Figure 2). The rainfall recorded in these months raised the rainfall total of 708 mm to well above the long-term average. Six months of the year received above average rainfall, including the warmer summer months from November to March (Figure 2).

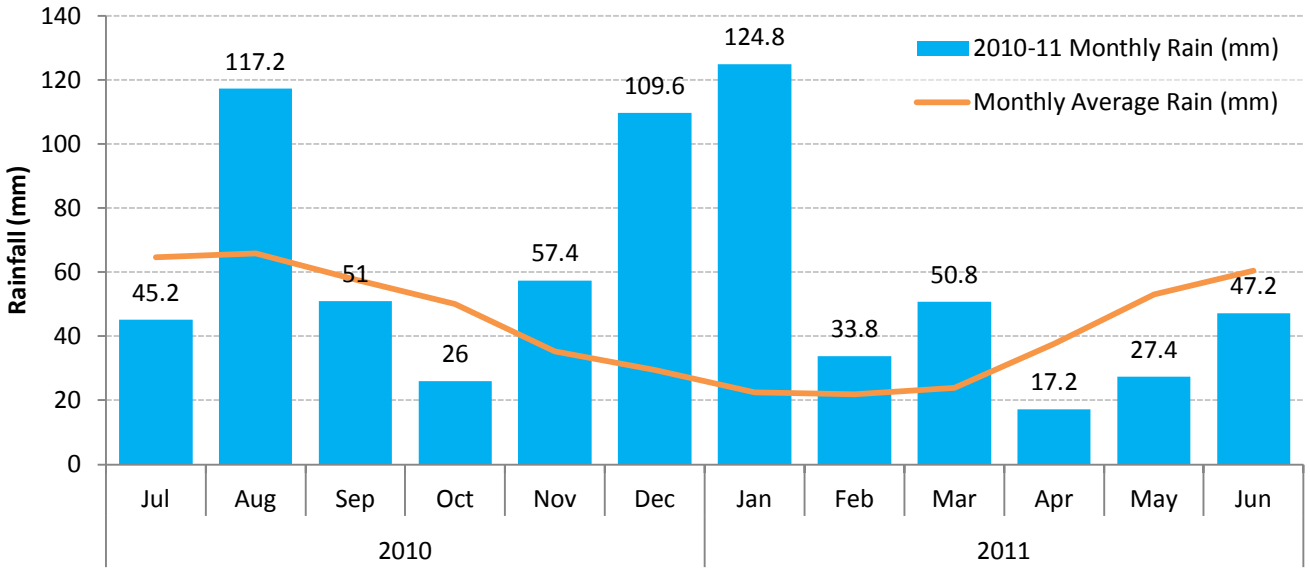

Figure 2. Monthly rainfall at Frances (M026007)

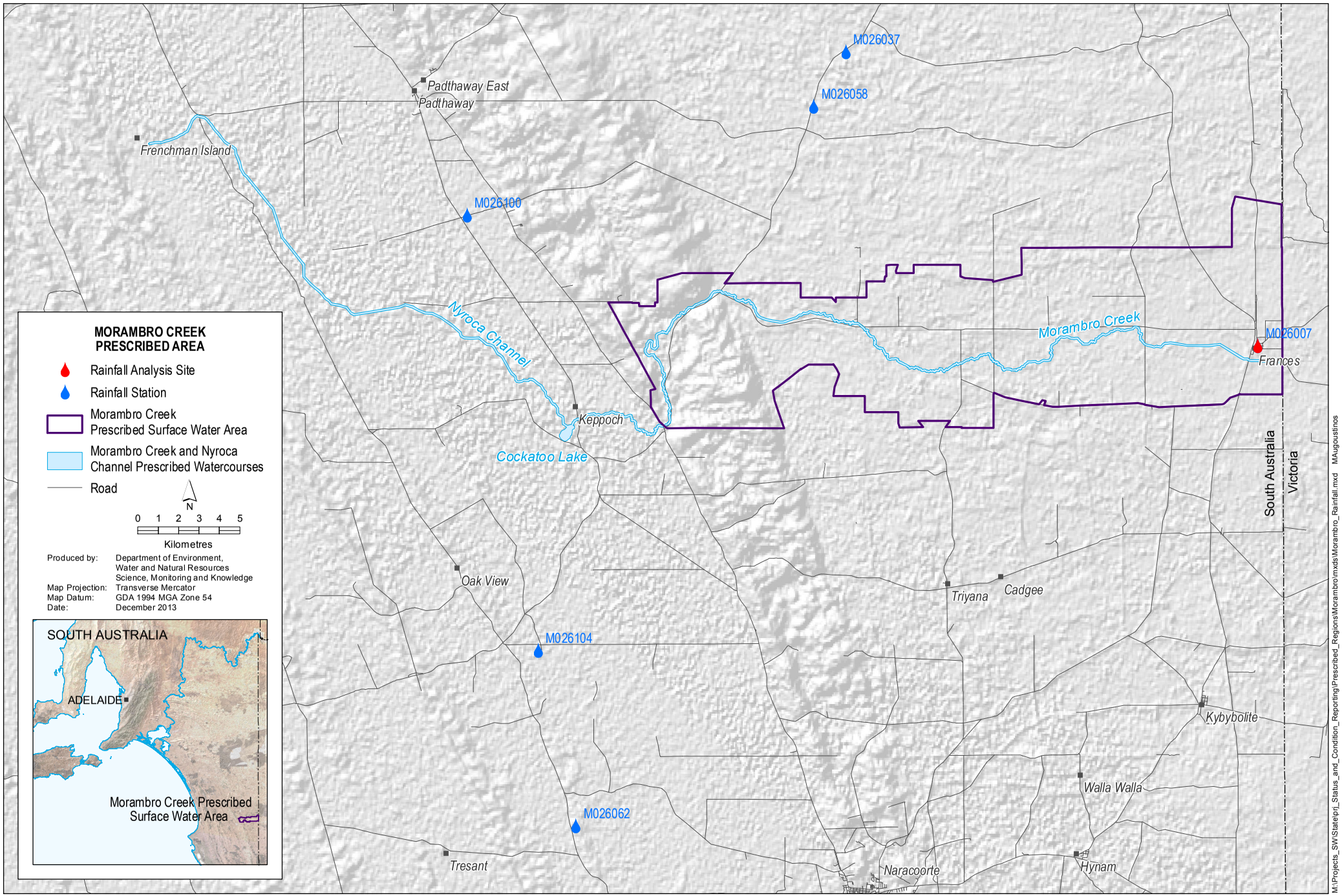

Figure 3. Location of rainfall monitoring sites in the area

LONG AND SHORT-TERM TRENDS

Figure 4 shows the spatial distribution of rainfall over the Morambro Creek PSWA for the:

1. long–term average annual rainfall from 1900–2010
2. short–term average of the previous 10 years (2001–10)
3. annual rainfall for 2010

The three panels of Figure 4 indicate that over much of the PSWA, rainfall for the year 2010 (Panel 3) was above the long and short- term averages (Panel 1 and Panel 2). Panel 2 shows the average rainfall for the years 2001–10 and this shows a drier rainfall pattern to the long–term average.

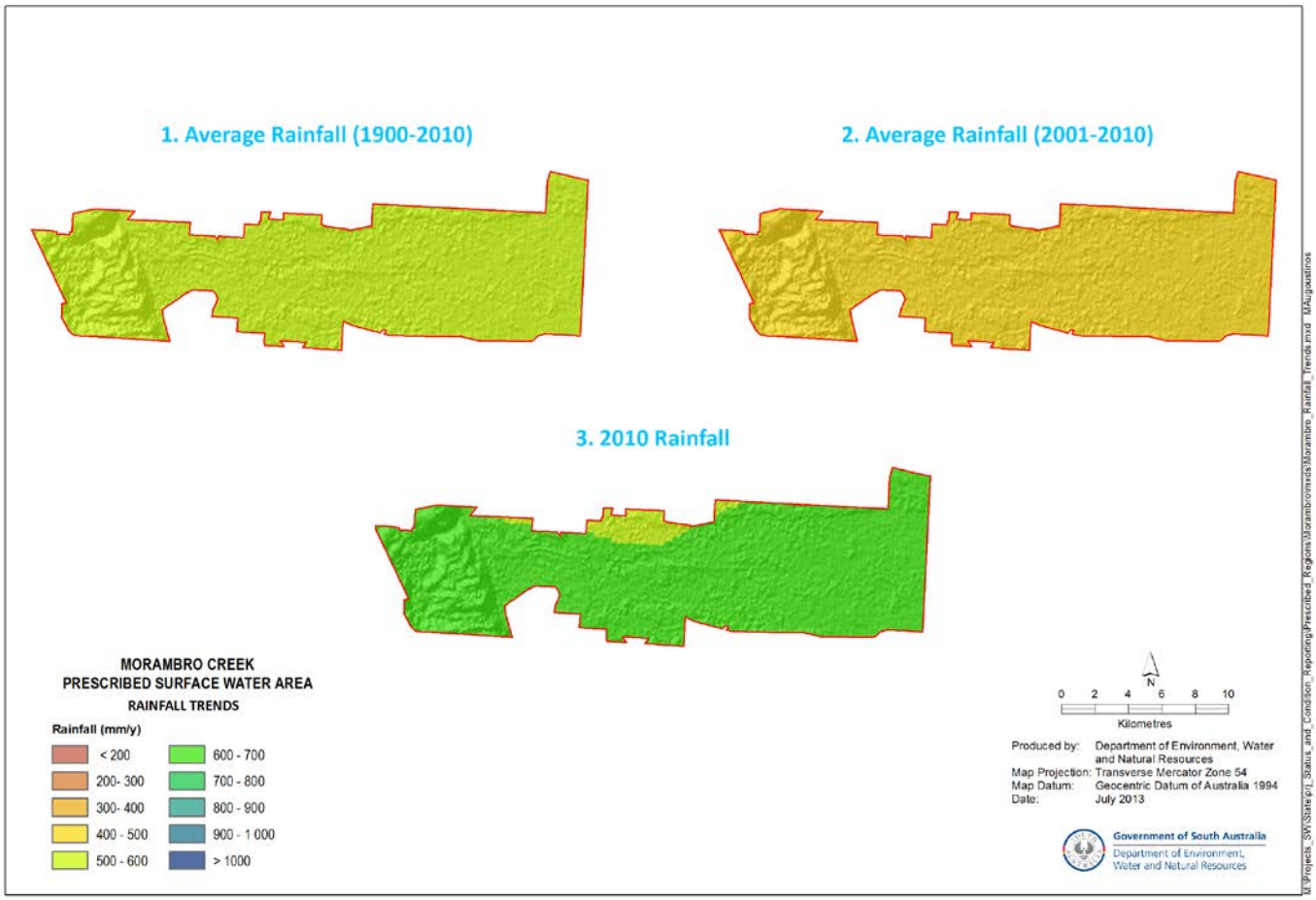

Figure 4. Annual rainfall distributions for the Morambro Creek PSWA

To identify periods of above or below average trends, the cumulative deviation from average annual rainfall (residual mass curve) is plotted in orange in Figure 5. An upward slope indicates a period of above average rainfall, while a downward slope indicates a period of below average rainfall.

Cumulative deviation data from Frances shows variable above and below average rainfall trends across the data period (Figure 5). After the highest rainfall year on record for Frances in 1889, the rainfall trend is predominantly declining to the mid 1920s, apart from a short period of inclining rainfall trend from the early 1900s. From the mid 1920s to the mid 1940s, the rainfall trend was

predominantly stable before an incline in the overall rainfall trend to the late 1970s. Another incline in the rainfall trend between the early 1980s to late 1990s has been followed by a sharp decline in rainfall trend from 2000-09.

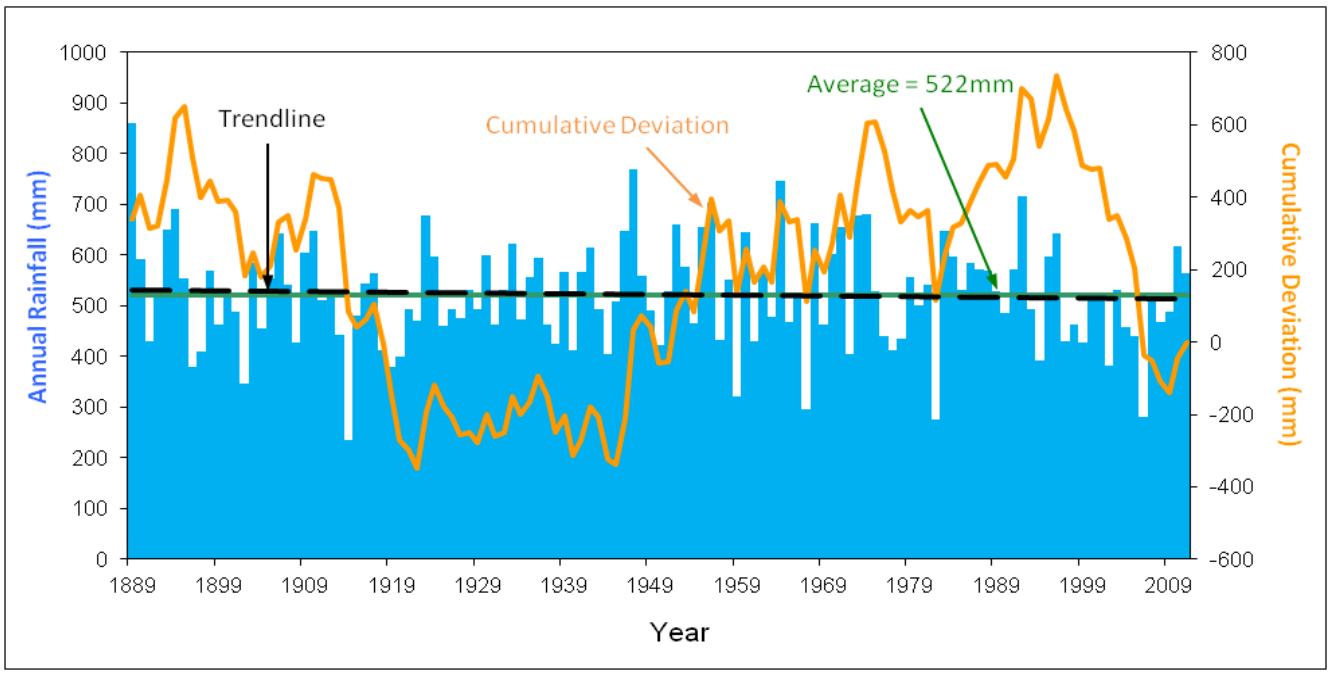

Figure 5. Frances annual rainfall showing long–term trend and cumulative deviation

STREAMFLOW

Status	Degree of confidence	Comments on recent historical context
Above average streamflow for Morambro Creek	Fair - Low: Only one primary flow gauging station representative of Morambro Creek	2010–11 is the first year of above average streamflow since 1996–97

The streamflow monitoring network for the PA is summarised in Tables 1 and 2 and shown in Figure 6. Parameters recorded at the monitoring stations include streamflow, salinity and water level. Cockatoo Lake is however a water level station only. Streamflow data are available via WaterConnect: http://www.waterconnect.sa.gov.au

There are two active monitoring stations within the PA, Morambro Creek at Bordertown-Naracoorte Road Bridge (A2390531) and Cockatoo Lake (A2391074). The period of record available at each site varies from 1979 at Morambro Creek, to the more recently established Cockatoo Lake station in 2006. Historic stations operated along Morambro Creek at The Gap (1971–75), Morambro Creek at Rangeview (1971–1985) and Morambro Creek at Frances (1974–1992). Morambro Creek, an ephemeral stream, flows from headwaters in western Victoria into the Upper South East of South Australia near Frances, before flowing westerly along modified sections of the watercourse to one of the few permanent inland water bodies in the South East, Cockatoo Lake (Figure 6). Water flows along the artificial flow path of Nyroca Channel when Cockatoo Lake fills and spills then eventually discharging into the Marcollat Watercourse.

Morambro Creek at Bordertown-Naracoorte Road Bridge has a gauging station catchment area of 1169 km^2 and a mean annual flow of 3170 ML for the period 1979–2010. The monitoring station at Cockatoo Lake is approximately 15 km downstream of the Morambro Creek station and monitors water level only. The estimated base level of the Lake is 36.16 m AHD with a spill level of 39.15 m AHD. Spill from Cockatoo Lake flows along Nyroca Channel for approximately 30 km and ultimately discharges into the Marcollat Watercourse. Cockatoo Lake exceeded capacity for 302 days (83% of total days) during 2010-11, but failed to reach the spill level from July 2006 to August 2010 due to reduced streamflow in Morambro Creek.

Marcollat Watercourse at Ballater (Jip Jip Weir A2391023) is located at the downstream end of the Marcollat Watercourse, downstream of a regulator for the Marcollat system (Figure 6). This surface water monitoring site is located outside of the PA and is not used to determine the surface water status, however, flows recorded at Jip Jip Weir affect the taking of water from the PA. Jip Jip Weir has not recorded any significant streamflow since 1996–97 and no streamflow since 2003–04.

Table 1. Summary of gauging stations

Gauging station	Station No.	Period of Streamflow	Average annual streamflow	
			ML	mm
Morambro Creek @ Bordertown-Naracoorte Road Bridge	A2390531	1979-2010	3170	2.7
Jip Jip Weir	A2391023	1993-2010	*	*

* Jip Jip Weir has only recorded two significant flow events since 1993 so no reliable average can be provided.

Table 2. Cockatoo Lake monitoring station

Monitoring Station	Station No.	Period of record	Days exceeding storage capacity
Cockatoo Lake	A2391074	2006-2011	302

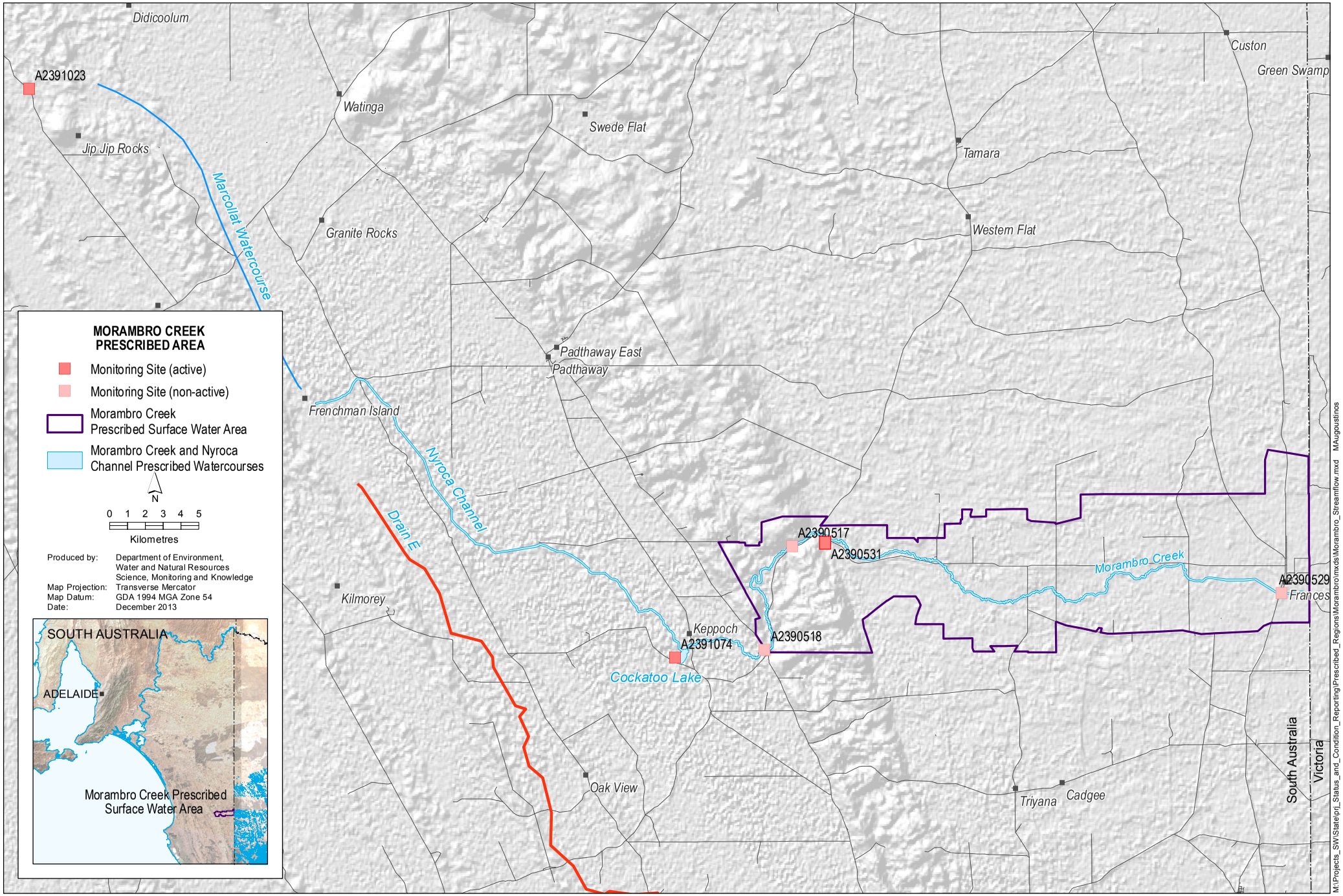

Figure 6. Location of streamflow monitoring sites in the area

STREAMFLOW DATA – MORAMBRO CREEK AT BORDERTOWN-NARACOORTE ROAD BRIDGE

Morambro Creek experienced an above average streamflow for 2010-11, as highlighted in green in Figure 7. The 12 380 ML total was almost 400% higher than the 3170 ML long-term average. Prior to above average flows in 2010–11, Morambro Creek experienced significantly below average streamflow since 1997–98, including five years that recorded no flow. During the 32 year period since 1979–80, 11 years have been above the long-term average. The Morambro Creek WAP (SENRMB 2006) estimated approximately 35% of total streamflow in the Marcollat Watercourse is contributed by Morambro Creek.

The monthly breakdown of streamflow for 2010–11 (Figure 8) highlights that the majority of flow occurred during August, September, December and January. September contributed 30% of the annual total, while January contributed 34% of the annual total. The months of July, November, May and June recorded no streamflow.

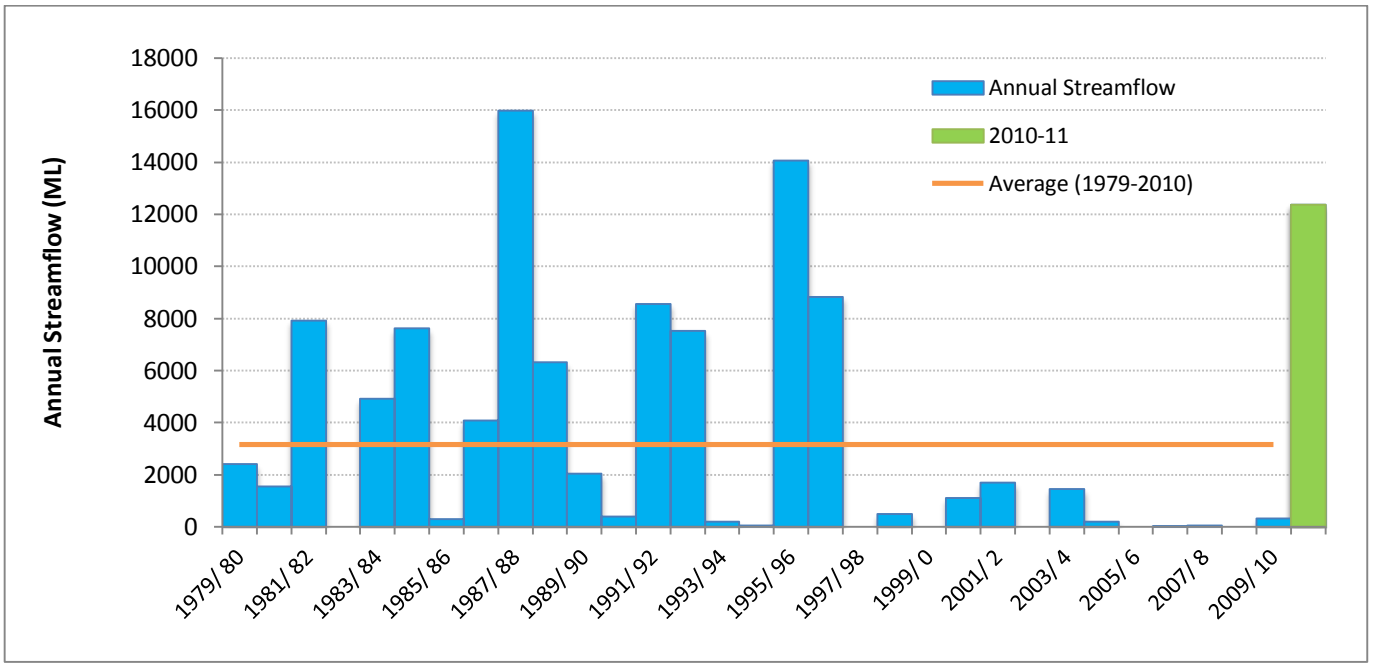

Figure 7. Morambro Creek @ Bordertown-Naracoorte Road Bridge annual streamflow (ML)

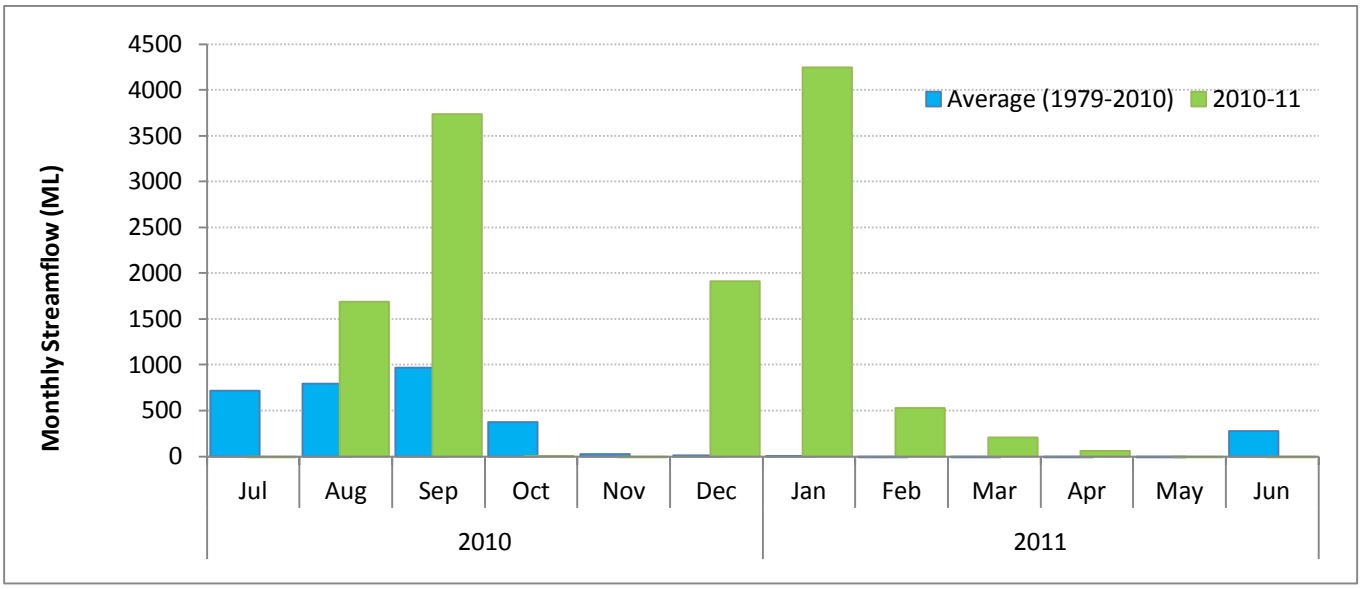

Figure 8. Morambro Creek @ Bordertown-Naracoorte Road Bridge monthly streamflow (ML)

WATER LEVEL DATA – COCKATOO LAKE

Cockatoo Lake filled and spilled into the Nyroca Channel in 2010-11 as result of above average streamflow in Morambro Creek. Prior to 2010–11, water level in Cockatoo Lake remained at low levels as a result of receiving below average streamflow from Morambro Creek. Cockatoo Lake was at or above 100% capacity for 302 days between September 2010 and June 2011.

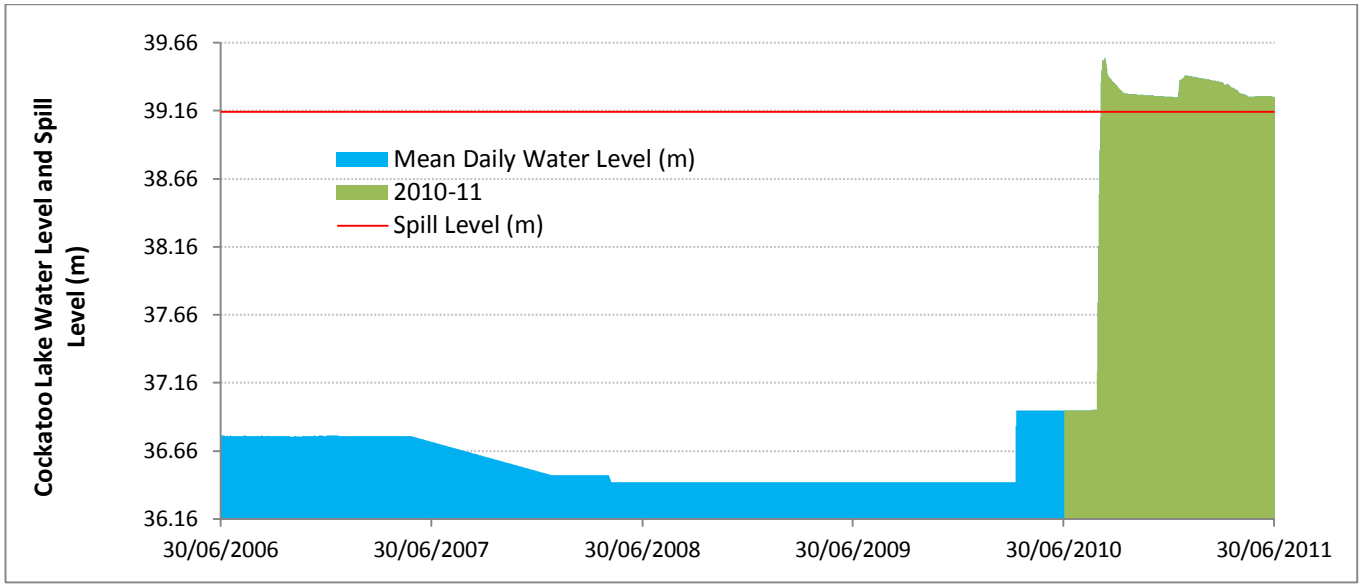

Figure 9. Cockatoo Lake water level and spill level (m)

STREAMFLOW DATA – MARCOLLAT WATERCOURSE AT BALLATER (JIP JIP WEIR)

Jip Jip Weir recorded no streamflow for 2010-11 and this trend has been persistent since its last flow recording of 24 ML in 2003-04. The last significant flow recorded at Jip Jip was 16 526 ML in 1996-97. Although streamflow from the Marcollat Watercourse passing Jip Jip Weir is inclusive of flow from Naracoorte Creek via Drain E and its own local catchment, 1996-97 was also the last year Morambro Creek recorded above average streamflow.

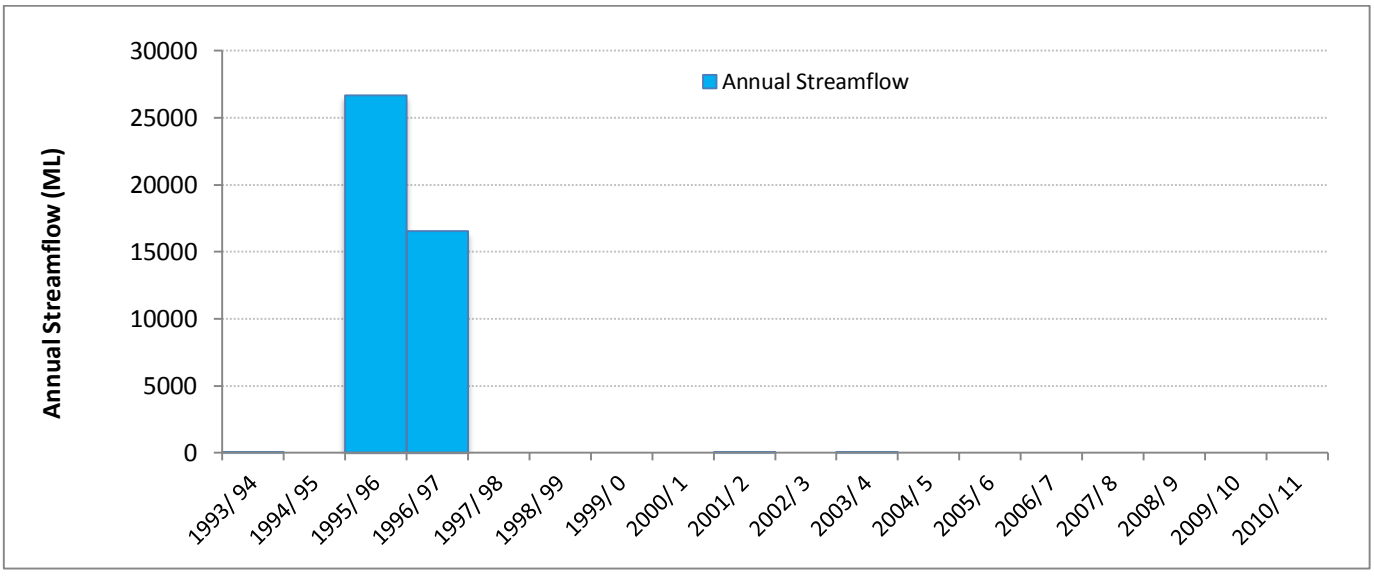

Figure 10. Jip Jip Weir annual streamflow (ML)

SALINITY

Status	Degree of confidence	Comments on recent historical context
Average (very fresh)	Fair–Low: Only one primary monitoring site representing Morambro Creek	Salinity data is limited due to the ephemeral nature of Morambro Creek. Data from 2007–2011 shows that streamflow is very fresh

MORAMBRO CREEK AT BORDERTOWN-NARACOORTE ROAD BRIDGE

Salinity data have been recorded at Morambro Creek at the Bordertown-Naracoorte Road Bridge gauging station since 2007 and are available via WaterConnect: http://www.waterconnect.sa.gov.au. Due to the ephemeral nature of Morambro Creek, streamflow is generated in response to heavy rainfall and is short lived, resulting in large data gaps when the stream is dry. Prior to archiving in Hydstra, DEWNR's surface water archive, data is coded according to the relative quality of the time series data. For this station, 54% of the recorded data is rated as good or fair quality and 46% as either missing or outside the recordable range. Data rated as missing or outside the recordable range includes low or cease-to-flow periods where the salinity probe is above the height of water and unable to register a measurement. As salinity is expected to be higher during reduced streamflow events, the ability to monitor potentially higher salinities is reduced.

Salinity data suggests that streamflow is consistently very fresh, with all data less than 250 mg/L Total Dissolved Solids (Figure 11). The Morambro Creek WAP states salinity over the past 25 years has generally been between 0–200mg/L in Morambro Creek (SENRMB 2006). The record for 2010-11 is largely confined to this range and is therefore considered average.

Fresh water outflows from Morambro Creek are essential to the flow requirements on the Marcollat Watercourse, both in terms of flow contribution and in providing fresh water flows to an otherwise predominantly brackish system (SENRMB 2006).

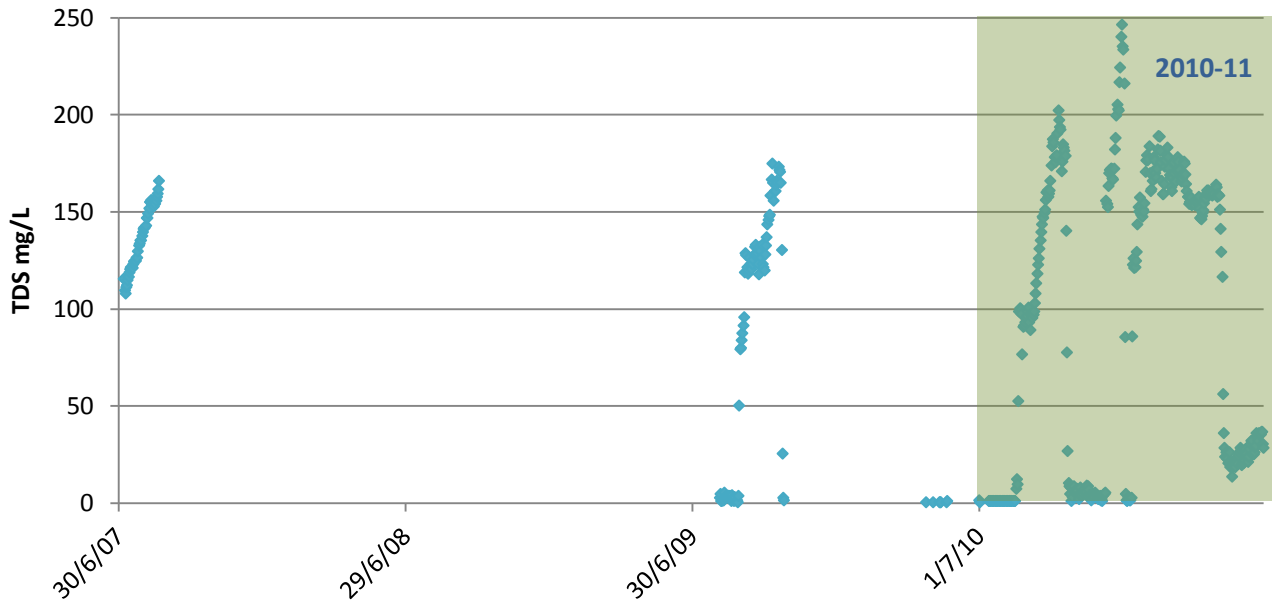

Figure 11. Salinity data at Morambro Creek @ Bordertown-Naracoorte Road Bridge from 2007-11

SURFACE WATER USE

Status	Degree of confidence	Comments on recent historical context
Surface water usage data are not sufficient to make an assessment	N/A	N/A

There are only four licensed users in the PA with only one of these nominating that water use occurred during this reporting timeframe. Therefore, there are insufficient water usage data available to make an assessment of surface water use.

Following is a summary from the Morambro Creek WAP (SENRMB 2006) of water demand in the PA. The WAP was reviewed in January 2011 and deemed to not require amendment.

Aquifer recharge of water diverted from the PA represents the largest demand for water. Approximately 100 drainage wells in the PA discharge water to the unconfined aquifer, equating to approximately 200 ML/y. There are approximately 70 farm dams that divert water from the PA that are used for stock and domestic purposes, but no estimates of the storage or use volumes are available. Existing users have been licensed, however, due to the unreliability of permanent water flows, little use has occurred.

Most water used for irrigation is by licensed extractions from the unconfined aquifer and outside the scope of this surface water status report.

WATER DEPENDENT ECOSYSTEMS

The status of water dependent ecosystems has not been addressed in this assessment of the surface water status of the Morambro Creek and Nyroca Channel PWCs and Morambro Creek PSWA. It is however, important to note that significant aquatic ecosystems are present in the area (SENRMB 2006). Morambro Creek receives the majority of inflows from its headwaters in Victoria and generally flows in three out of every five years (REM 2003). Ecosystems associated with Morambro Creek are typically ephemeral vegetation with limited aquatic fauna (SENRMB 2006).

Aquatic vegetation of the PA is similar to that of other watercourses in the South East of South Australia (SENRMB 2006). At the time of the last survey, undertaken in 2003, the understory was a mixture of terrestrial grasses, sedges and rushes (REM 2006). The overstorey was largely river red gums.

There has been no known survey of the macroinvertebrate community in the area. However, the presence of limited submerged vegetation would likely provide habitat for aquatic macroinvertebrates and obligate aquatic macroinvertebrates would likely be able to persist in Cockatoo Lake (REM 2003).

Previous fish surveys in the area (2002) have identified two native fish species (Flathead Gudgeon and Western Carp Gudgeon) and three exotic fish species (Tench, Redfin Perch and Mosquito Fish) (BDBSA 2013). The permanent water in Cockatoo Lake provides a refuge for fish during times of no flow, however, Western Carp Gudgeon were not found in the lake during the 2002 survey, only in the Morambro Creek watercourse (BDBSA 2013). Given the extended period of drought preceding the 2010-11 rainfall events, there may have been reductions or losses of Western Carp Gudgeon from the system. Previous surveys (1974) have also revealed that an extremely rare species of fish, the Tasmanian mudfish *Neochanna cleaver,* is present in a neighbouring drainage channel (Drain M). However, despite considerable fish monitoring and assessment in Morambro Creek over the years, the presence of this species is yet to be documented (Hammer *et al*. 2009). The possibility of this species being present in the Morambro Creek system would be valuable for driving an assessment of the conservation status of biota in the system to better support water resource assessments and risks in the future.

Threats to the aquatic ecosystems in the PA include extended periods of no flow and reductions in permanent water within the PWCs through extractions, encroachment of terrestrial vegetation and exotic species of fish (SENRMB 2006).

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SENRMB – see South East Natural Resources Management Board

South East Natural Resources Management Board, 2006, '*Water allocation plan for the Morambro Creek and Nyroca Channel Prescribed Watercourses including Cockatoo Lake and the Prescribed Surface Water Area*'. Government of South Australia, through the South East Natural Resources Management Board, Mt Gambier, South Australia.