2017 Water Security Outlooks

South Gippsland Water

Annual Water Outlook

| Final

23 November 2017

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Revision	Date	Description	By	Review	Approved
Draft	30/10/17	Draft for SGW review	REB	REB	REB
Final	23/11/17	Final with updated data & DELWP feedback	REB	REB	REB

Contents

Executive Summary

South Gippsland Water (SGW) currently manages ten water supply systems to 21 individual towns. This document describes the expected outlook for these systems over the coming summer season, with the likelihood of restrictions in each system summarised in Table 1. In most instances, the forecasts below reflect the 12 month period from November 2017 to October 2018. The forecast period for run-of river systems is 3 months from November 2017 to January 2018, reflecting the period over which the forecast has the greatest skill.

Table 1 : Outlook summary

Supply Sources	Towns Supplied	Outlook Period	Likelihood of Restrictions
Little Bass Reservoir	Poowong, Loch, Nyora	1 Nov 2017 to 31 Oct 2018 (12 months)	Unlikely
Coalition Creek, Bellview Creek and Ness Gully Storages, Tarwin River West Branch and groundwater	Korumburra	1 Nov 2017 to 31 Oct 2018 (12 months)	Possible
Ruby Creek Reservoirs	Leongatha, Koonwarra	1 Nov 2017 to 31 Oct 2018 (12 months)	Unlikely
Lance Creek Reservoir and the Melbourne system	Wonthaggi, Cape Paterson, Inverloch	1 Nov 2017 to 31 Oct 2018 (12 months)	Very Rare
Tarwin River East Branch	Dumbalk	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare
Tarwin River	Meeniyan	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare
Deep Creek Reservoir and Foster Dam	Foster	1 Nov 2017 to 31 Oct 2018 (12 months)	Very Rare
Battery Creek Reservoir	Fish Creek	1 Nov 2017 to 31 Oct 2018 (12 months)	Unlikely
Cook's Dam (Agnes River)	Toora, Welshpool, Port Welshpool, Port Franklin, Barry Beach	1 Nov 2017 to 31 Oct 2018 (12 months)	Rare
Tarra River and groundwater	Yarram, Alberton, Port Albert	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare

1. Introduction

South Gippsland Water (SGW) currently manages ten water supply systems to 21 individual towns, listed in Table 1-1. A locality map of the towns supplied by SGW is shown in Figure 1-1.

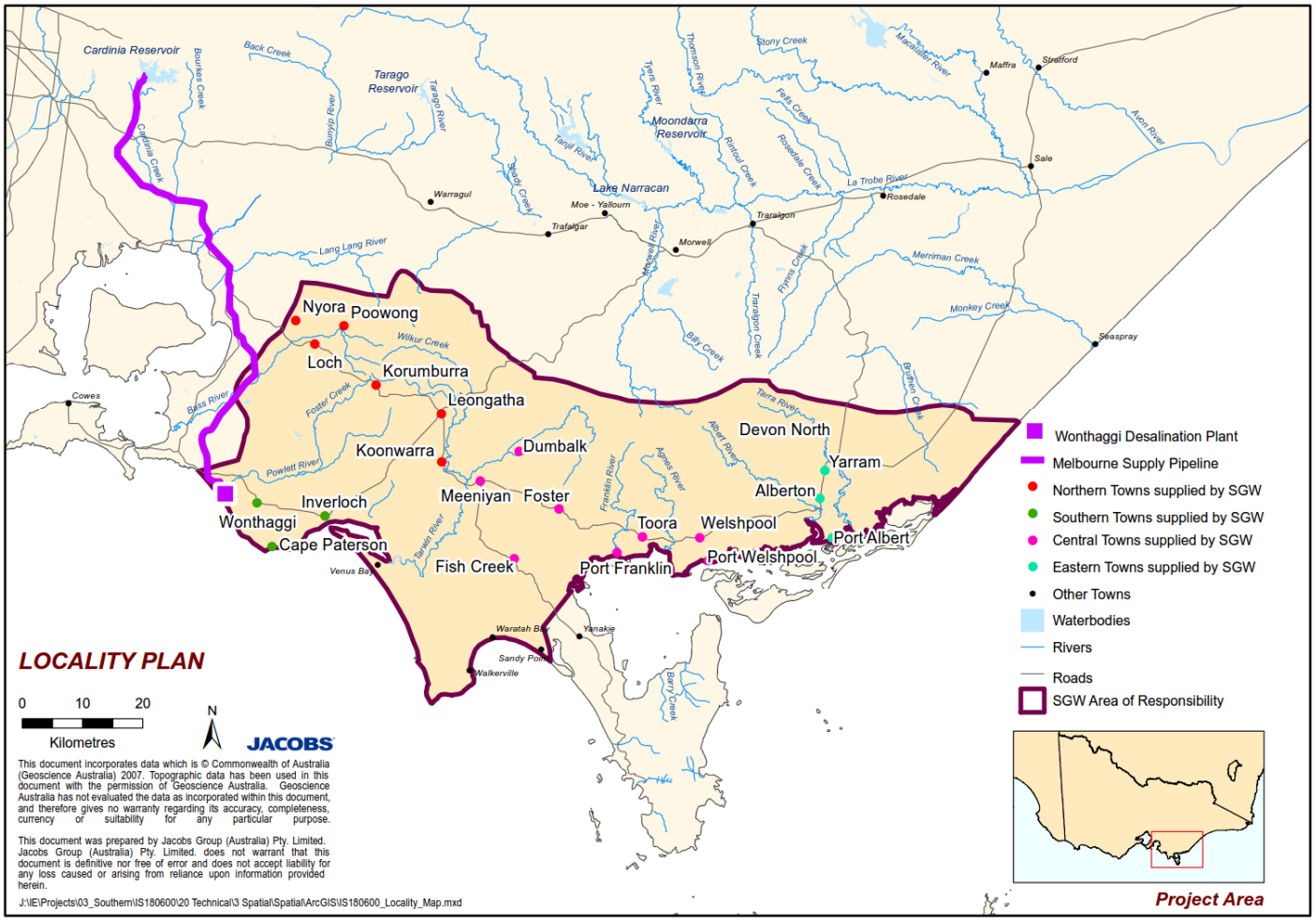
Current raw water demand is presented to indicate the relative size of each supply system. The towns of Poowong, Loch, Nyora, Korumburra, Leongatha and Koonwarra are referred to collectively as SGW's "northern towns" and Wonthaggi, Cape Paterson and Inverloch are referred to as SGW's "southern towns". Dumbalk, Meeniyan, Foster, Fish Creek, Toora, Welshpool, Port Welshpool, Port Franklin and Barry Beach are referred to as SGW's "central towns", whilst "Yarram, Alberton, Port Albert and Devon North are referred to as SGW's "eastern towns".

- **Table 1-1 Water Supply Systems Managed by SGW**

Supply System	Towns Supplied	Current average raw water demand (ML/year) (1)
Northern Towns		
Little Bass River	Poowong, Loch, Nyora	265
Coalition Creek	Korumburra	675
Ruby Creek	Leongatha, Koonwarra	1,639
Southern Towns		
Lance Creek	Wonthaggi, Cape Paterson, Inverloch	1,709
Central Towns		
Tarwin River East Branch	Dumbalk	14
Tarwin River	Meeniyan	66
Deep Creek/Foster Dam	Foster	177
Battery Creek	Fish Creek	124
Agnes River	Toora, Welshpool, Port Welshpool, Port Franklin, Barry Beach Port	518
Eastern Towns		
Tarra River	Yarram, Alberton, Port Albert, Devon North	448
TOTAL		5,635

(1) Taken from the UWS (2017), estimated at current level of population and industrial development over a long-term climate sequence (typically 40+ years) to account for differences in water demand in wet, average and dry years.

SGW prepared their most recent Urban Water Strategy earlier in 2017. This document, available on the SGW website (http://www.sgwater.com.au/about-us/water-supply-demand-strategy/), outlines SGW's long term plan to balance the supply of water to meet the region's residential, business and community water needs. The UWS has identified those systems where future water supplies may need to be enhanced in order to meet the growing demands and be resilient to potential climate change conditions. Details around potential augmentation options will continue to be developed by SGW in order to meet the augmentation timelines set out in the UWS. The UWS is complemented by a Drought Preparedness Plan (DPP) which provides SGW with a ready reference for operational guidance in times of drought. The DPP details the actions SGW will take in order to prepare for and to respond to periods of water scarcity. This Water Security Outlook is one such action.



- **Figure 1-1 Locality Map**

1.1 Climate Summary

1.1.1 Victoria's long term trends in climate and streamflow

Victoria's climate has shown a warming and drying trend over recent decades, and this trend is expected to continue. In comparison to historical conditions we are already experiencing:

- Higher temperatures, particularly during the warmer months of the year;
- Reductions in rainfall in autumn and early winter, and in some locations, increases in rainfall during the warmer months; and,

In some catchments, less streamflow is generated for the same amount of rain.

The decline in rainfall during autumn and early winter is associated with a southerly shift in rain bearing weather systems. Global warming is a contributor to this southerly shift, which means that the downward trend is likely to continue.

Over the longer term, modelling indicates that we can expect:

- the rainfall reductions in autumn and winter to remain, or become drier still;
- reductions in spring rainfall but possible increases in summer rainfall; and,
- overall reductions in streamflow.

Even if there is an increase in summer rainfall, it is unlikely to offset the streamflow impact of rainfall reductions in other seasons.

Although there will still be a lot of variability in Victoria's climate, the chances of experiencing cooler conditions and higher than average streamflow is lower now than it was in previous decades. Conversely, the chances of experiencing warmer conditions and less streamflow is now higher than in past decades.

The BOM seasonal climate outlooks build in the influence of changes in climate that have already occurred.

More information on the observed changes and longer-term future climate projections can be found at https://www.water.vic.gov.au/climate-change.

The Victorian Government is investing in further research to better understand how Victoria's climate is changing and the water resource implications, as part of implementing Water for Victoria.

1.1.2 Recent Climatic Conditions in South Gippsland

Over the past 12 months, rainfall across the South Gippsland Region has been close to average conditions. The west of the region, in the vicinity of Wonthaggi, Inverloch, Korumburra and Leongatha, has been slightly wetter than the east. However, in general, rainfall conditions have been between 80% - 125% of the long term average.

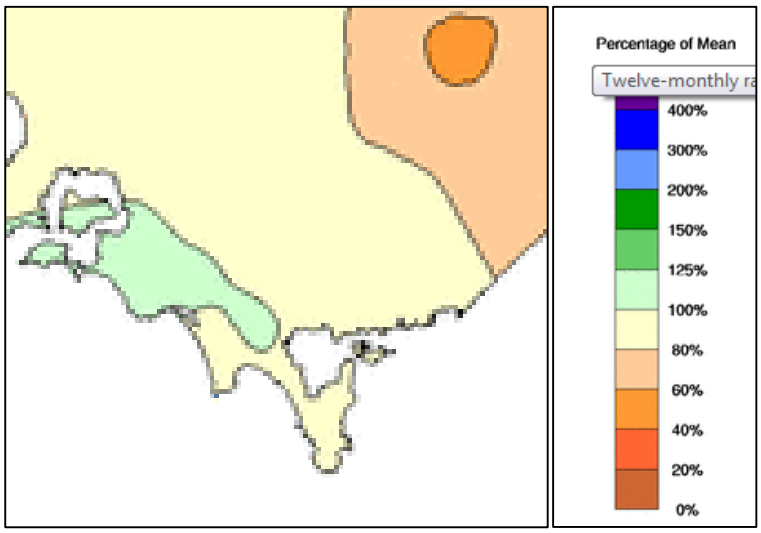


Figure 1.2 : Rainfall percentages relative to the mean over the period 1 October 2016 to 30 September 2017 (sourced from the Bureau of Meteorology's 12 monthly rainfall percentages for Victoria http://www.bom.gov.au/jsp/awap/rain/index.jsp?colour=colour&time=latest&step=0&map=percent&period=12month&area=vc).

Rainfall conditions across the SGW region are shown in Figure 1.3 for Korumburra and Yarram. This chart compares the recent rainfall to the long term monthly average rainfall and confirms the observations made for the region above. Over the past 12 months, rainfall has been generally close to average conditions. However, the observations for the most recent two months show that September 2017 rainfall was above the average monthly conditions in both locations whereas October 2017 rainfall was below average.

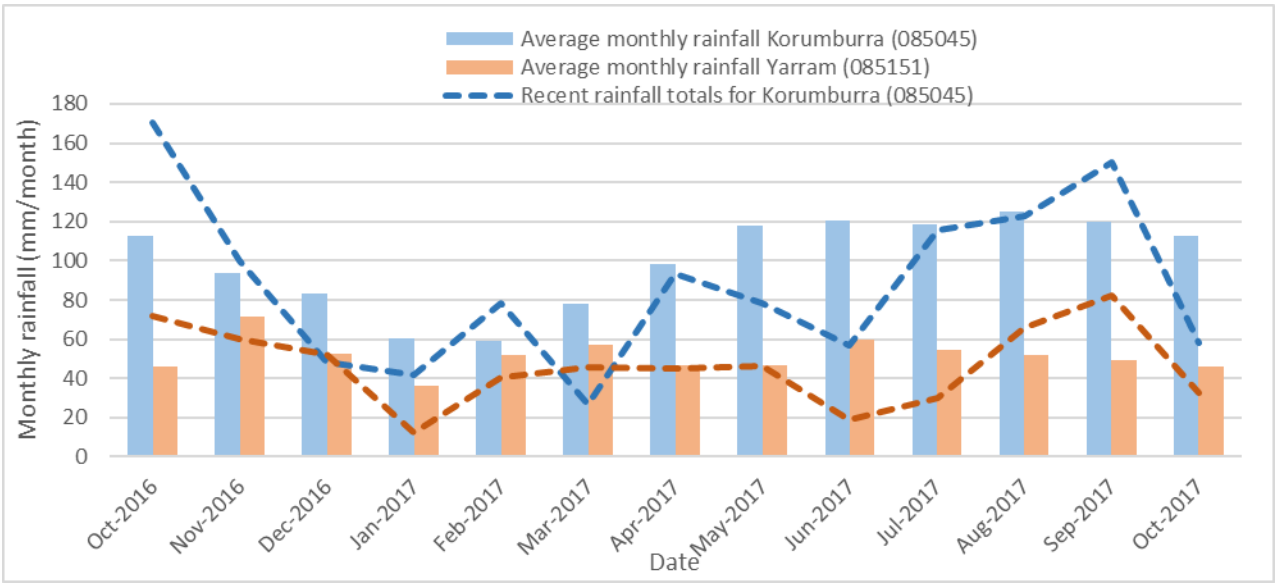


Figure 1.3 : Recent and long term average monthly rainfall in Korumburra and Yarram

1.1.3 Recent Streamflow Conditions in South Gippsland

Streamflow conditions across South Gippsland are summarised in Figure 1.4 for sites on the Tarwin River East Branch and Tarra River. These charts compare the recent streamflow observations with their long-term average monthly streamflow characteristics, and demonstrate that flow conditions have been well below the long term average at both these sites for long periods over the last 12 months. Similar observations can be made across

the whole region. Relatively high flow conditions were observed in October 2016, in response to the spring rainfalls in 2016. Since then, relatively low streamflow conditions have prevailed until September 2017 when an increase in flow was observed in response to the recent spring rainfalls. However, streamflows declined again in October 2017 to below average conditions.

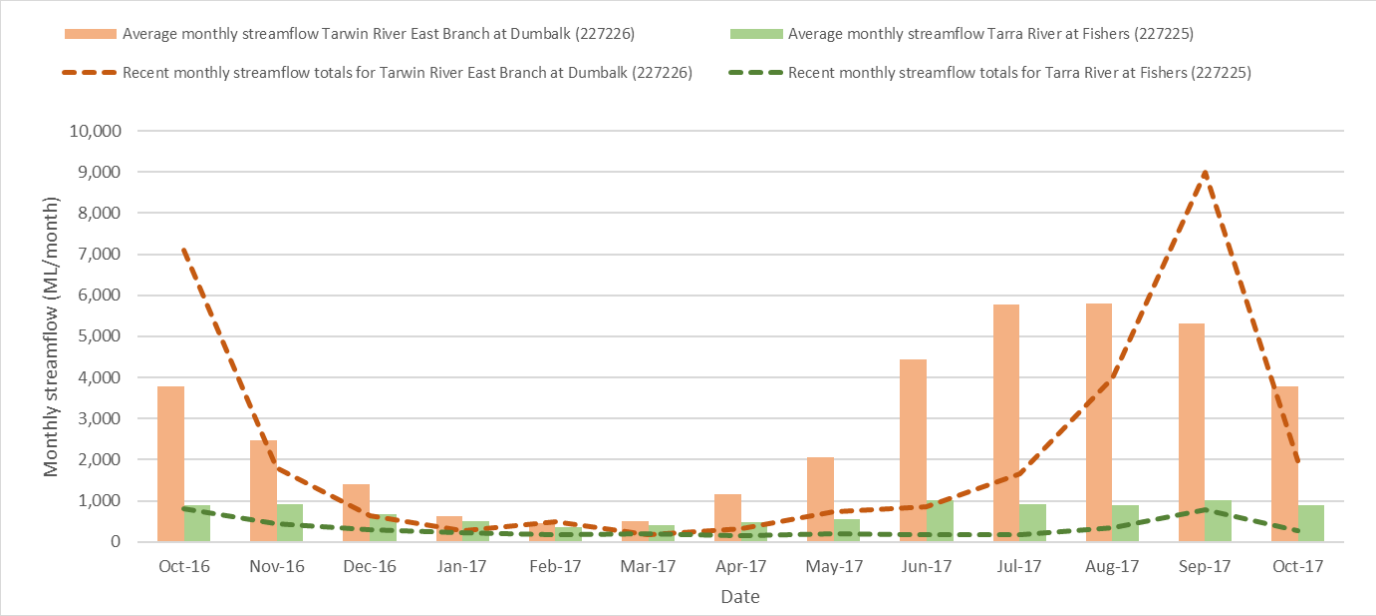


Figure 1.4 : Recent and long term average monthly streamflow for Tarwin River East Branch at Dumbalk (227226) and Tarra River at Fishers (227225)

2. Current Water Resource Position

This section provides a summary of the current position of SGW's water supply systems. Table 2.1 summarises each of SGW's systems, with information on the major customers and water sources. For completeness, this table provides a comprehensive list of all legal entitlements however it should be noted that not all of these water sources are actively used as they are temporary entitlements or require significant infrastructure upgrades. Full details of the legal entitlements to water are described in the UWS.

Table 2.1 : System summary

Supply System	Towns supplied	Number of connections	Major customers	Primary Bulk Entitlement			Supplementary water sources	
				Annual entitlement	Volume extracted 2017-18 YTD	Volume remaining 2017-18	Annual entitlement	Volume extracted 2017-18
Little Bass River	Poowong, Loch, Nyora	700	Poowong Abattoir and Burra Foods	420 ML	77 ML	343 ML		
Coalition Creek	Korumburra	2,200	Burra Foods	1,000 ML	229 ML	771 ML	• Share of 1800 ML from Tarwin River West Branch (Note 1), including up to 800 ML from lower Coalition Creek. • Share of 386.4 ML from groundwater	0 ML
Ruby Creek	Leongatha, Koonwarra	3,150	Murray Goulburn and Steam Generation Plant	2,476 ML	504 ML	1,972 ML	• Share of 1800 ML from Tarwin River West Branch (Note 1 and 2) • Share of 386.4 ML from groundwater (Note 3).	0 ML (Note 2)
Lance Creek	Wonthaggi, Cape Paterson, Inverloch	10,000	Tabro Meats	• 3,800 ML from Lance Creek Reservoir • 1,000 ML from the Melbourne system	• 491 ML from Lance Ck • 0 ML from Melbourne	• 3,309 ML from Lance Creek • 1,000 ML from Melbourne	1800 ML from Powlett River (Note 4)	N/A
Tarwin River East Branch	Dumbalk	100		100 ML	5 ML	95 ML		
Tarwin River	Meeniyan	250		200 ML	28 ML	172 ML		
Deep Creek / Foster Dam	Foster	850		326 ML	48 ML	278 ML		
Battery Creek	Fish Creek	200		251 ML	42 ML	209 ML		
Agnes River	Toora, Welshpool, Port Welshpool, Port Franklin, Barry Beach Port	1,100	Esso	1,617 ML	168 ML	1,449 ML		
Tarra River	Yarram, Alberton, Port Albert, Devon North	1,850		853 ML	129 ML	724 ML	214.2 ML from groundwater	2 ML

Table 2.1 Notes: (1) Only available until June 2020

(2) Supply from the Tarwin River West Branch to Leongatha utilises existing obsolete infrastructure that is complex and difficult to operate, and is currently not used.

(3) There are several groundwater bores within access of Korumburra and Leongatha, which are currently only used to supply Korumburra.

(4) The Powlett River entitlement is not currently used and the supply infrastructure has been 9ecommissioned

The volume in storage across the SGW systems is summarised in Table 2.2. All storages are currently full. The volume of water consumed over the year to date is compared to the average demand over the past five years for each system in Figure 2.1 to Figure 2.10. In most systems, recent water consumption has been close to the average water use. Consumption at Meeniyan is the notable exception to this, where recent demands are above average. The UWS provides further information on the expected growth in residential, stock and domestic, major industrial and other non-residential demands over the longer term planning horizon for a range of possible future climate scenarios.

Table 2.2 : Current Water Resource Position

Supply System	Storage	Storage capacity (ML)	Current storage volume (ML) at end October 2017	% Full Supply Volume
Little Bass	Little Bass Reservoir	218	218	100
Korumburra	Coalition Creek Reservoir	143	138	100
	Ness Gully Reservoir	73	49	100
	Bellview Creek Reservoir	359	356	100
Leongatha	Western Reservoir	1137	1118	100
	Hyland Reservoir	671	648	100
	No.2 Reservoir	84	76	100
	No.1 Reservoir	19	15	100
Lance Creek	Lance Creek Reservoir	4200	4153	100
Fish Creek	Battery Creek Reservoir	122	122	100
Foster	Deep Creek Reservoir	19	19	100
	Foster Dam	191	191	100
	Raw Water Basin	27	27	100
Agnes River	Cook’s Dam	58	58	100
Tarra River	Yarram Basin	31	31	100

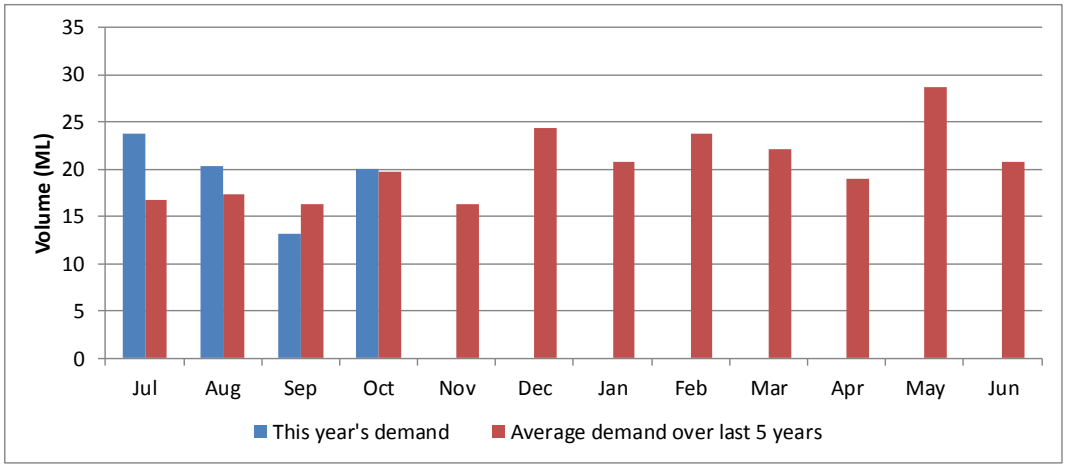


Figure 2.1 : Water consumption in the Little Bass System

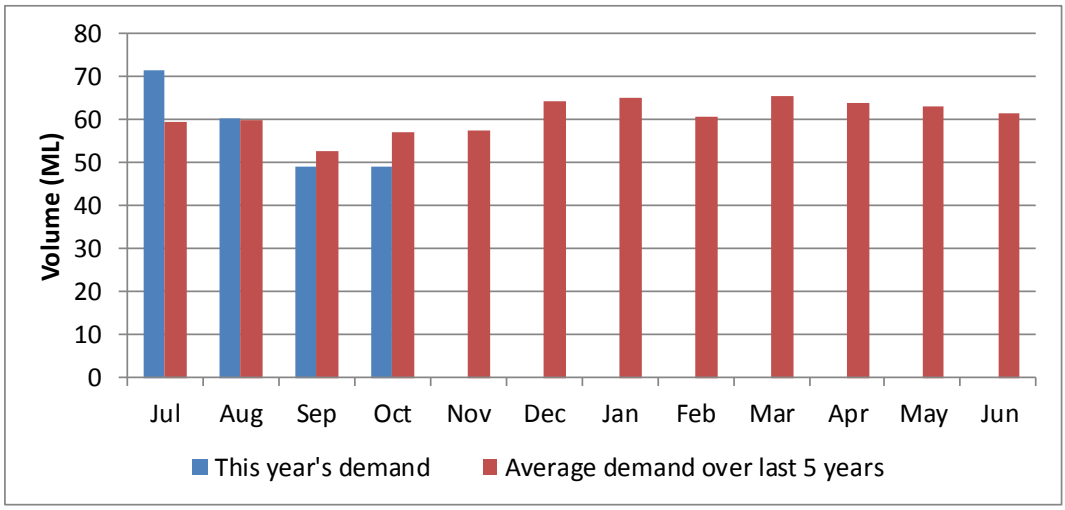


Figure 2.2 : Water consumption in the Coalition Creek System

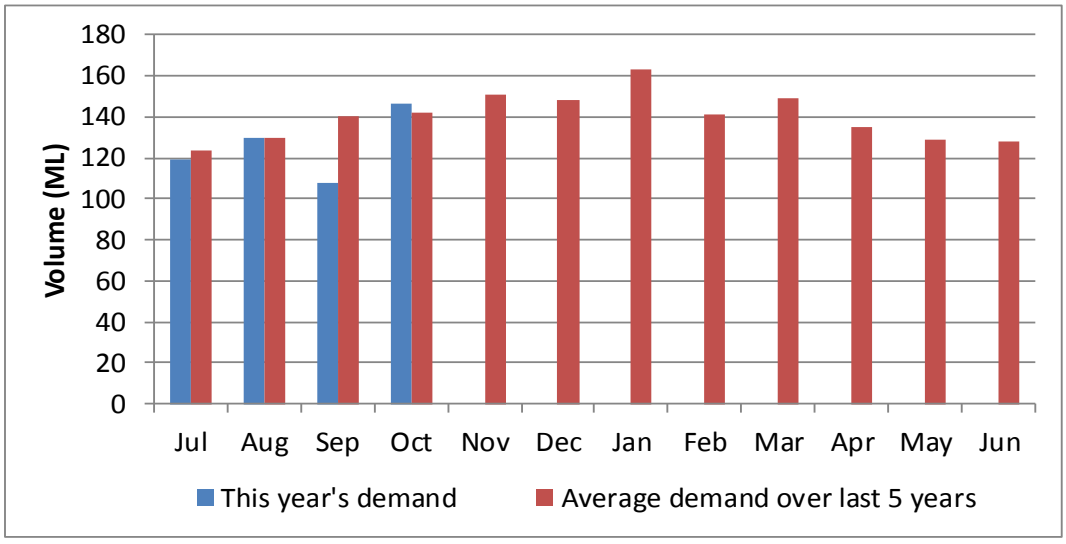


Figure 2.3 : Water consumption in the Ruby Creek System

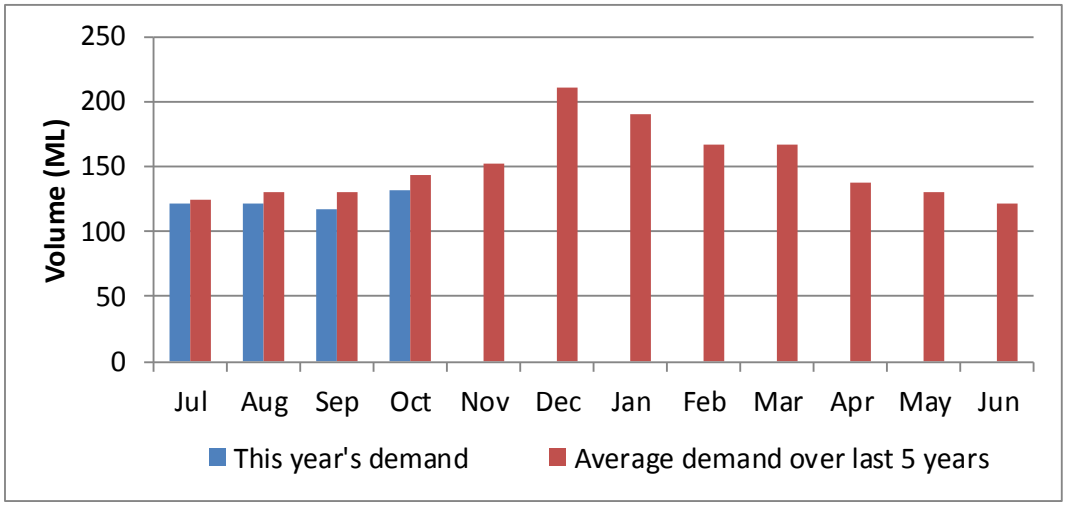


Figure 2.4 : Water consumption in the Lance Creek System

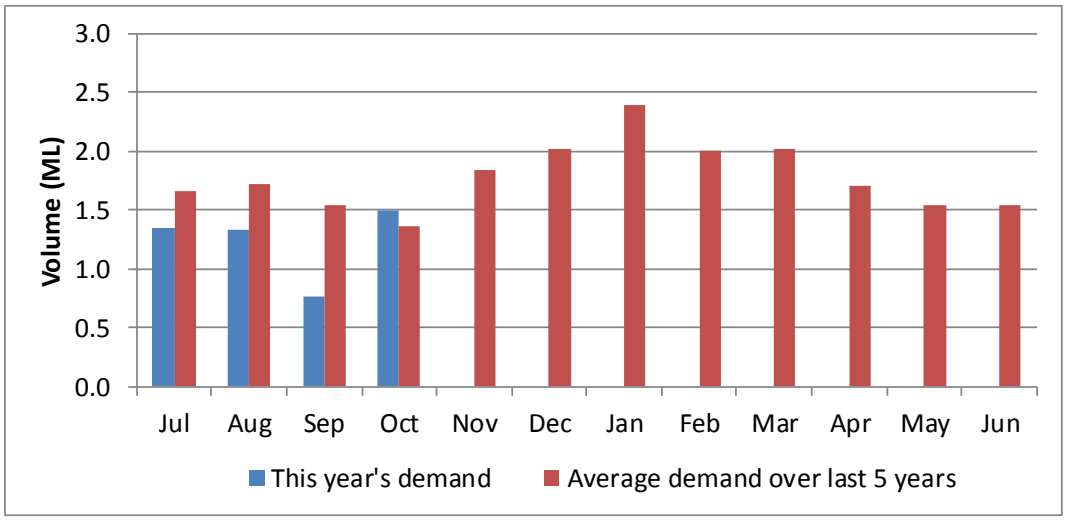


Figure 2.5 : Water consumption in the Dumbalk System

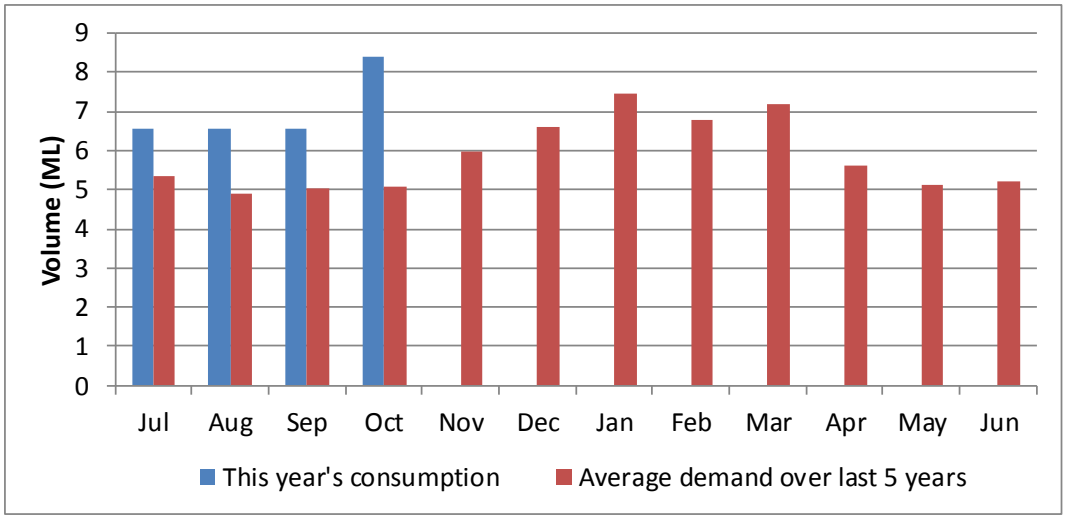


Figure 2.6 : Water consumption in the Meeniyan System

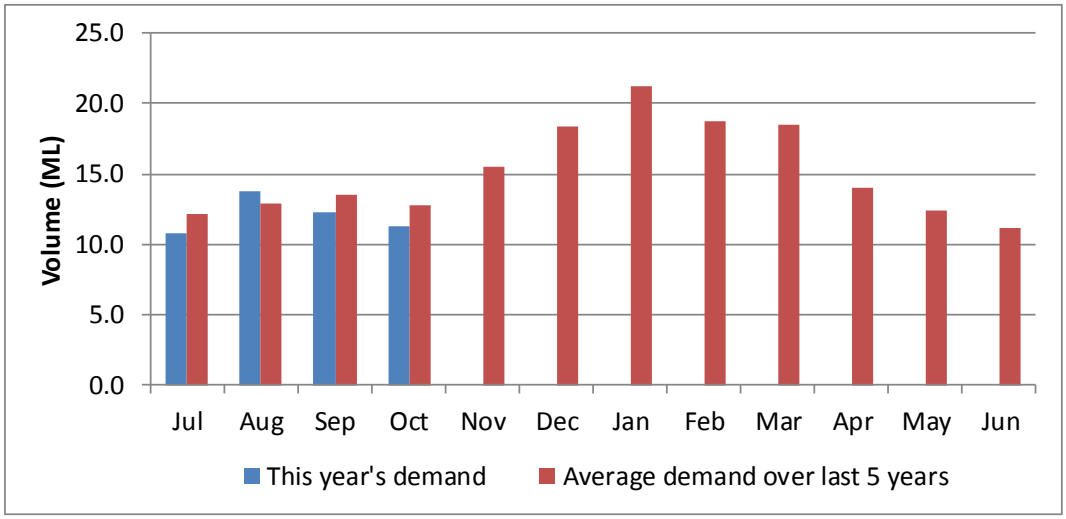


Figure 2.7 : Water consumption in the Deep Creek System

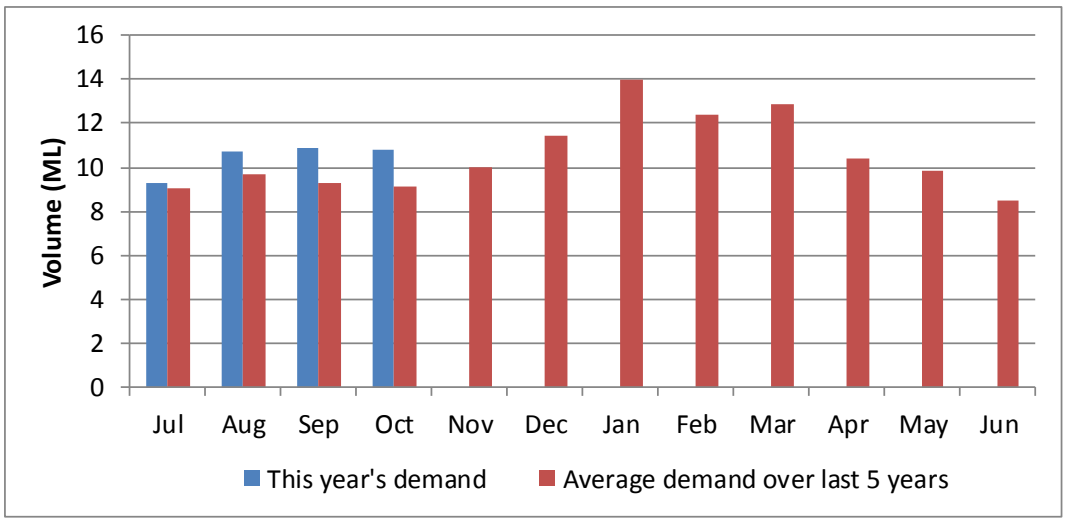


Figure 2.8 : Water consumption in the Battery Creek System

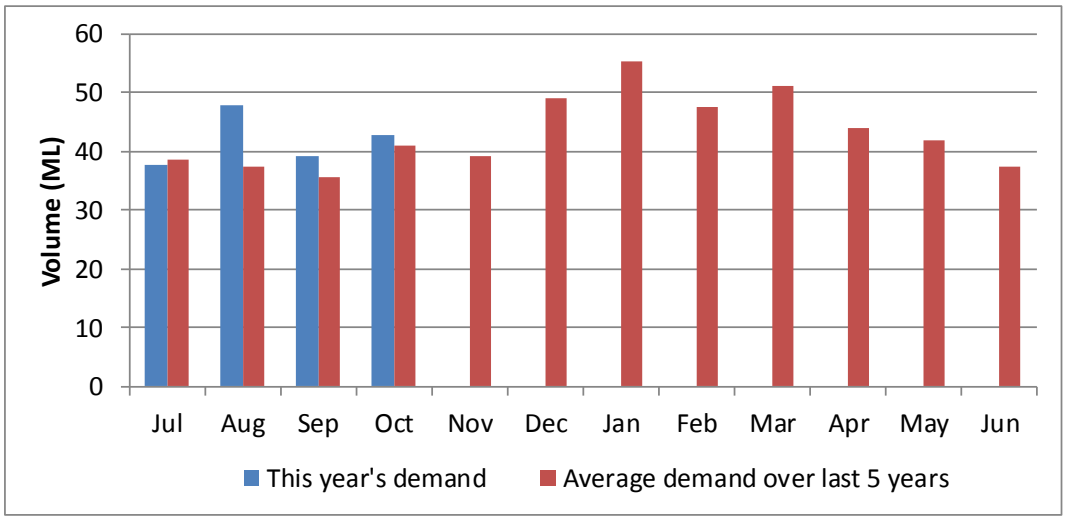


Figure 2.9 : Water consumption in the Agnes River System

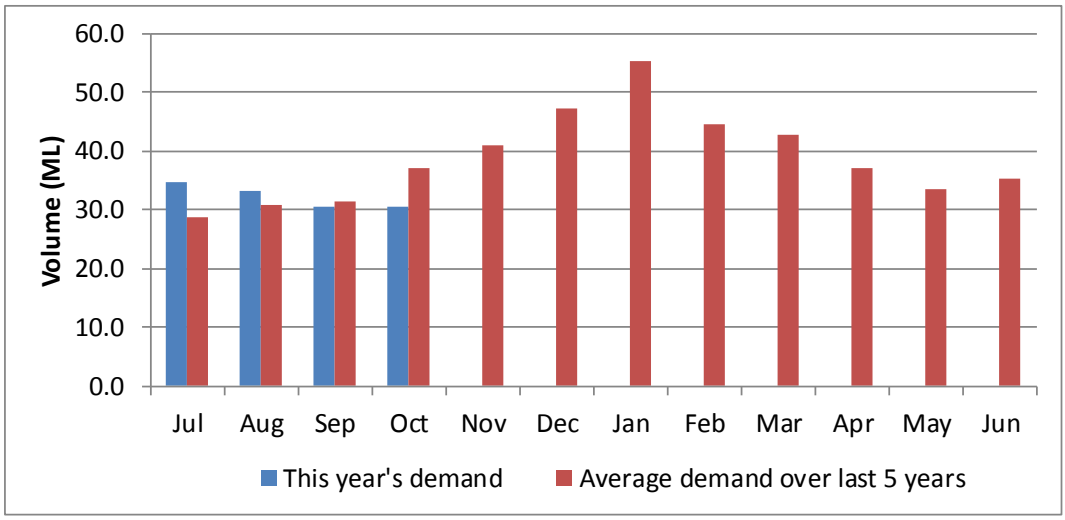


Figure 2.10 : Water consumption in the Tarra River System

3. Climate Outlook

The Bureau of Meteorology's seasonal climate forecasts have been obtained for the November to January 3-month period.

Across the region, rainfall is anticipated to be slightly above average, with most systems forecast to have a 55-60% chance of exceeding median rainfall conditions during November to January. That is, there is a near equal chance of wetter or drier three months for most of SGW's systems. Eastern Victoria, including the Tarra River system, is forecast to be wetter than average. Figure 3.1 presents the Bureau outlook for the region.

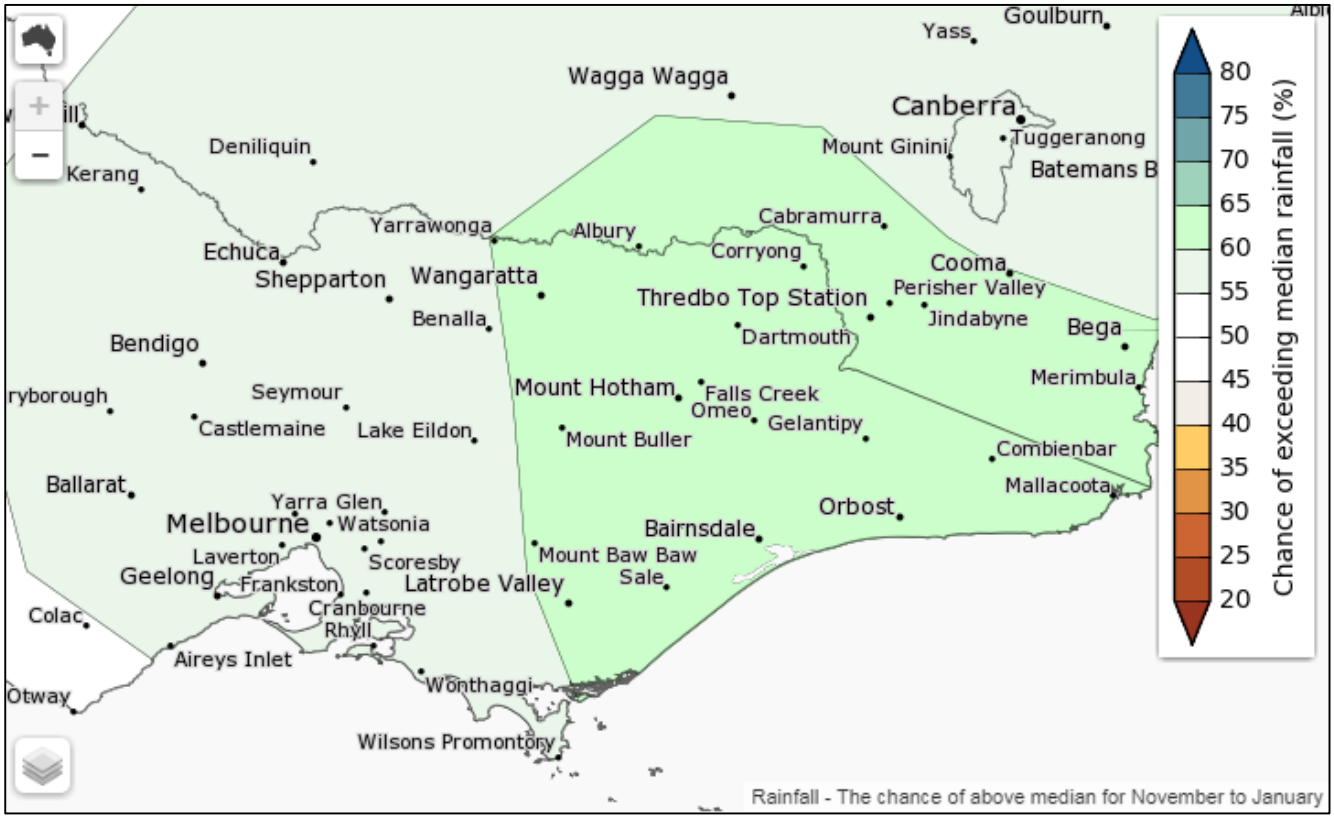


Figure 3.1 : The chance of above median rainfall for November to January (sourced from the Bureau of Meteorology: http://www.bom.gov.au/climate/outlooks/#/rainfall/median/seasonal/0)

The daytime temperature for the coming three months is forecast to be above the average across the region. The Bureau outlook indicates an increased likelihood of warm daytime temperatures in the southern coastal towns of the region (Figure 3.2

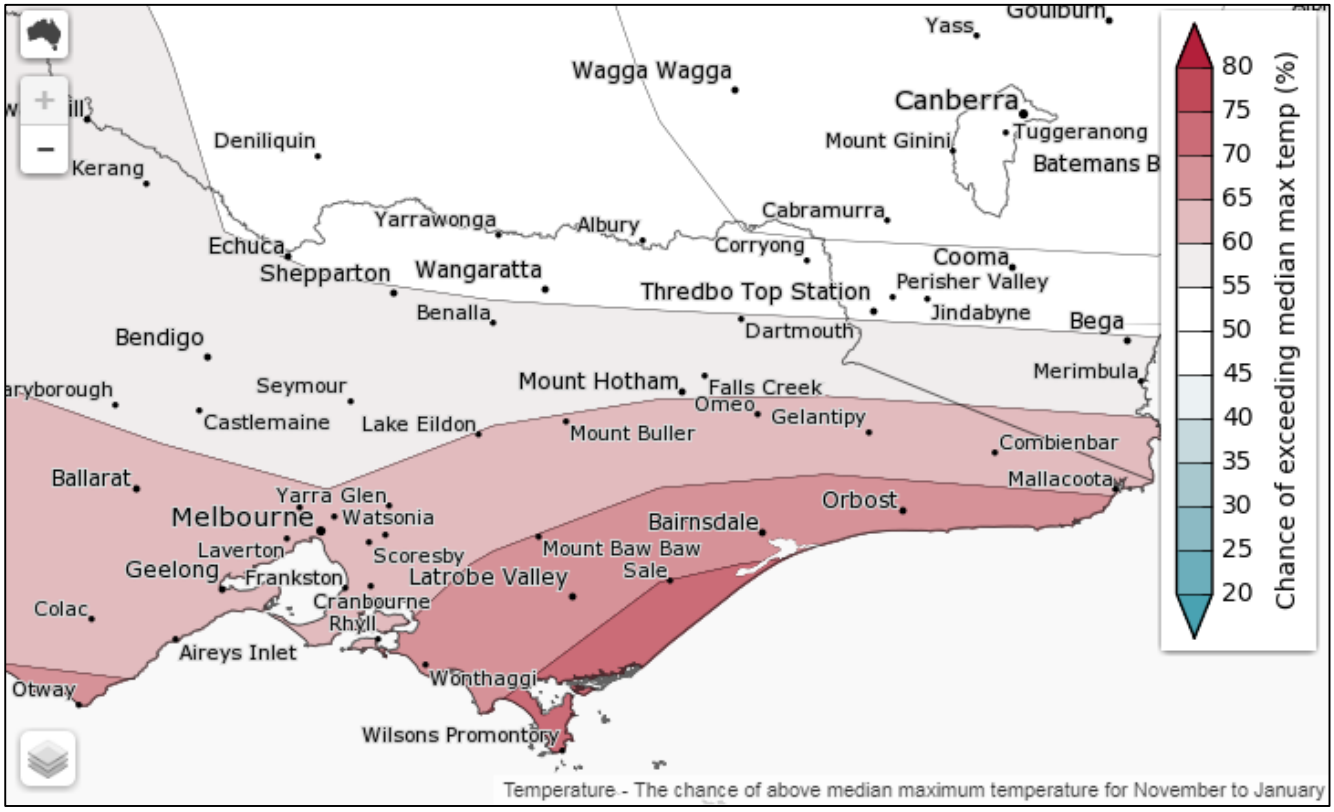


Figure 3.2 : The chance of above median maximum temperature for November to January (sourced from the Bureau of Meteorology: http://www.bom.gov.au/climate/outlooks/#/temperature/maximum/median/seasonal/0)

The forecast climate conditions for SGW's systems have been developed based on the Bureau's forecast for the region and the local climate conditions in the year to date. Table 3.1 summarises the climate outlook across SGW's systems and specifies the scenario assumed for the Water Security Outlook for each system, based on the assumption that:

- Wet conditions have ≥90% chance of exceeding median rainfall
- Average conditions that have >10% to <90% chance of exceeding median rainfall
- Dry conditions that have ≤10% chance of exceeding median rainfall

Table 3.1 : Climate Outlook across SGW's systems

Supply System	Towns supplied	Bureau of Meteorology Forecast		Winter and spring rainfall for 2017-18 YTD	Likely Outlook Scenario
		Chance of exceeding median rainfall	Chance of exceeding median maximum temperature		
Little Bass River	Poowong, Loch, Nyora	55-60%	65-70%	Average	Average
Coalition Creek	Korumburra	55-60%	65-70%	Average	Average
Ruby Creek	Leongatha, Koonwarra	55-60%	65-70%	Average	Average
Lance Creek	Wonthaggi, Cape Paterson, Inverloch	55-60%	65-70%	Average	Average
Tarwin River East Branch	Dumbalk	55-60%	65-70%	Average	Average
Tarwin River	Meeniyan	55-60%	65-70%	Average	Average
Deep Creek / Foster Dam	Foster	55-60%	65-70%	Average	Average
Battery Creek	Fish Creek	50-55%	65-70%	Average	Average
Agnes River	Toora, Welshpool, Port Welshpool, Port Franklin, Barry Beach Port	50-55%	70-75%	Average	Average
Tarra River	Yarram, Alberton, Port Albert, Devon North	60-65%	70-75%	Average	Average

4. Forward Outlook

The urban water restrictions outlook for SGW's systems are based on consideration of the information presented in each of the previous sections, in combination with an assessment of the expected storage over the coming year based on modelled information. For run of river systems, streamflows are forecast over the coming three months.

Table 4.1 summarises SGW's assessment of the likelihood of water restrictions for each of its supply systems over the outlook period specified in the Annual Water Security Outlook. The outlook period is 3 months for run-of-river systems, and 12 months for systems with available storage. A shorter outlook period applies for run-of-river systems, reflecting the period over which the forecast has the greatest skill. As such, the likelihood of restrictions for Dumbalk, Meeniyan and Yarram will be reviewed throughout the year. The assessment presented in Table 4.1 utilises the DELWP rating system (Table 4.2) that is drawn from the Guidelines for the Development of Urban Water Strategies and the Melbourne System Strategy (DELWP, 2016).

Table 4.1 : Risk Assessment Likelihood Rating for Water Restrictions over the 2017 Outlook Period

Supply Sources	Towns Supplied	Outlook Period	Likelihood of Restrictions
Little Bass Reservoir	Poowong, Loch, Nyora	1 Nov 2017 to 31 Oct 2018 (12 months)	Possible
Coalition Creek, Bellview Creek and Ness Gully Storages, Tarwin River West Branch and groundwater	Korumburra	1 Nov 2017 to 31 Oct 2018 (12 months)	Likely
Ruby Creek Reservoirs	Leongatha, Koonwarra	1 Nov 2017 to 31 Oct 2018 (12 months)	Unlikely
Lance Creek Reservoir and the Melbourne system	Wonthaggi, Cape Paterson, Inverloch	1 Nov 2017 to 31 Oct 2018 (12 months)	Very Rare
Tarwin River East Branch	Dumbalk	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare
Tarwin River	Meeniyan	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare
Deep Creek Reservoir and Foster Dam	Foster	1 Nov 2017 to 31 Oct 2018 (12 months)	Very Rare
Battery Creek Reservoir	Fish Creek	1 Nov 2017 to 31 Oct 2018 (12 months)	Possible
Cook's Dam (Agnes River)	Toora, Welshpool, Port Welshpool, Port Franklin, Barry Beach	1 Nov 2017 to 31 Oct 2018 (12 months)	Rare
Tarra River and groundwater	Yarram, Alberton, Port Albert	1 Nov 2017 to 31 Jan 2018 (3 months)	Rare

The following general statements can be made on the SGW systems:

- Run of river systems have been assigned a likelihood of rare, rather than very rare, due to the inability to forecast beyond three months, even though the likelihood of restrictions over the 3 month forecast period is very rare.
- For the Battery Creek and Little Bass Reservoir systems, restrictions are unlikely, but could occur if extremely dry conditions were to eventuate over summer/autumn, despite Bureau seasonal climate outlooks suggesting otherwise.

- For the Coalition Creek system, restrictions are not expected under the anticipated average climate scenario, but could still be possible if a drier than expected outlook eventuates, even if supplementary supply sources are used.
- For the Ruby Creek system, restrictions are not forecast over the coming 12 months for the expected climate outlook. However, this system already required the development of supplementary options due to reduced storage levels in June 2017. Longer-term modelling suggests that severe restrictions may eventuate under the worst drought scenario. As such, this system has been assigned a likelihood rating of unlikely rather than rare.
- For all other systems, the likelihood of restrictions is estimated to be rare to very rare over the outlook period.

Table 4.2 : Risk Assessment Likelihood Rating

Likelihood Rating	%	Description
1 Very Rare	< 1	Event may occur only in extraordinary circumstances
2 Rare	1-4	Event may occur only in exceptional circumstances
3 Unlikely	5-19	Event could occur at some time There is little opportunity, reason or means to occur
4 Possible	20-49	Event might occur There is some opportunity, reason or means to occur
5 Likely	50-79	The event is likely to occur in most circumstances There is considerable opportunity, reason or means for the event to occur
6 Almost Certain	80-100	Event is expected to occur in most circumstances There is great opportunity, reason or means to occur

Further details on the outlook for each system are provided in Figure 4.1 to Figure 4.10.

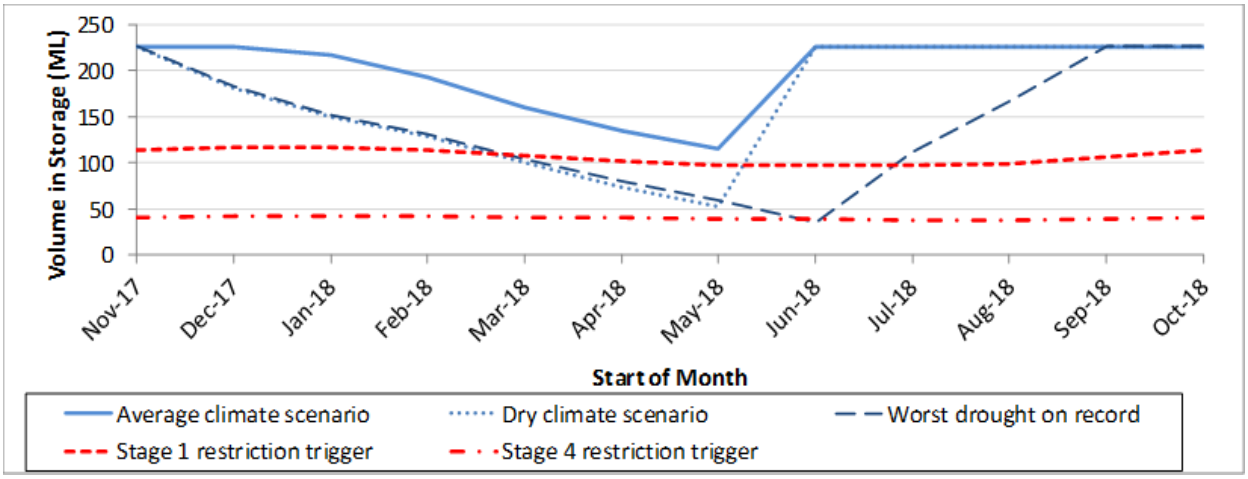


Figure 4.1 : Urban water restrictions outlook for the Little Bass system

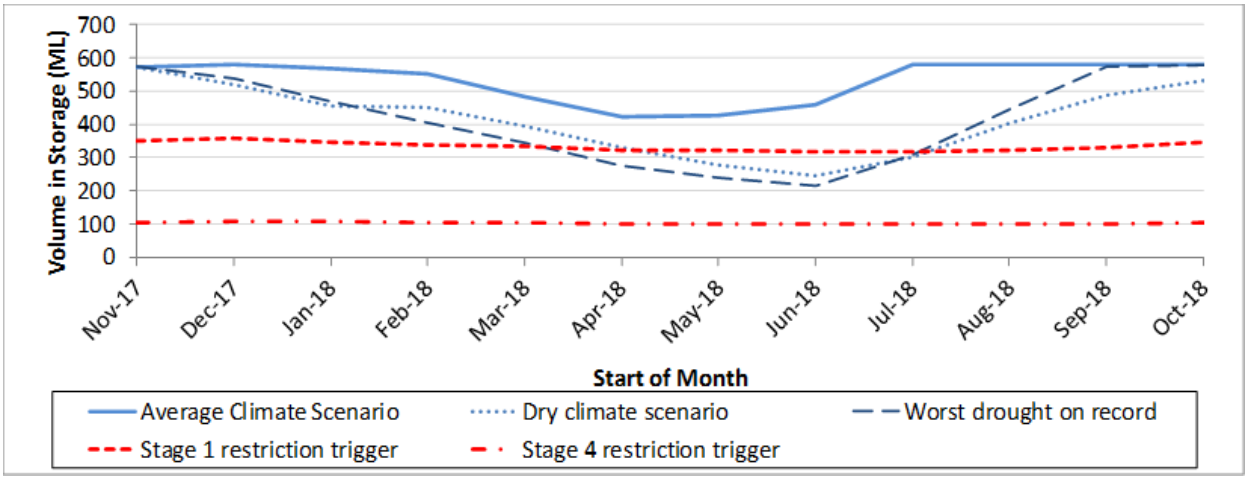


Figure 4.2 : Urban water restrictions outlook for the Coalition Creek system

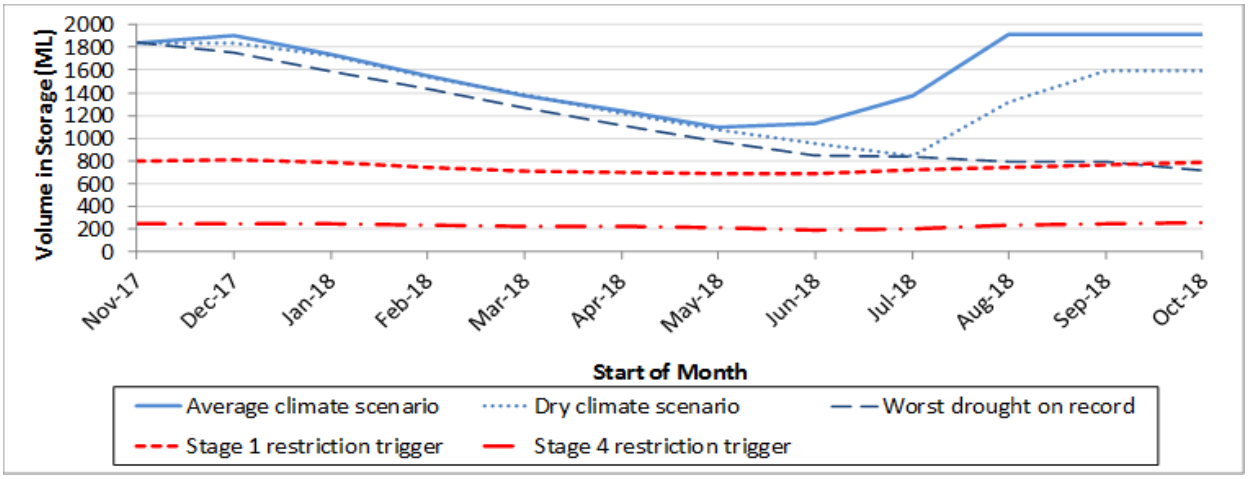


Figure 4.3 : Urban water restrictions outlook for the Ruby Creek system

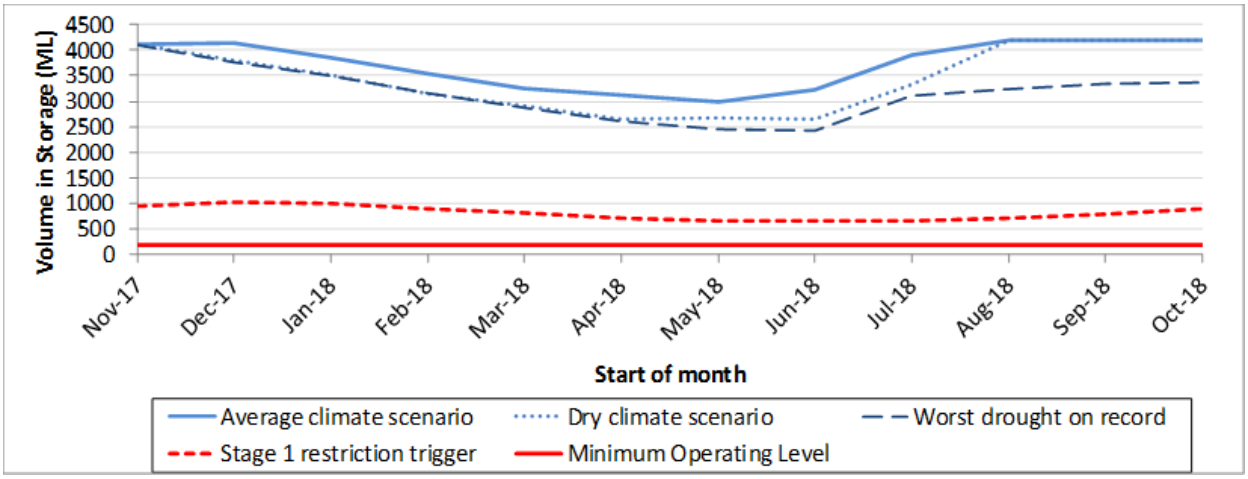


Figure 4.4 : Urban water restrictions outlook for the Lance Creek system

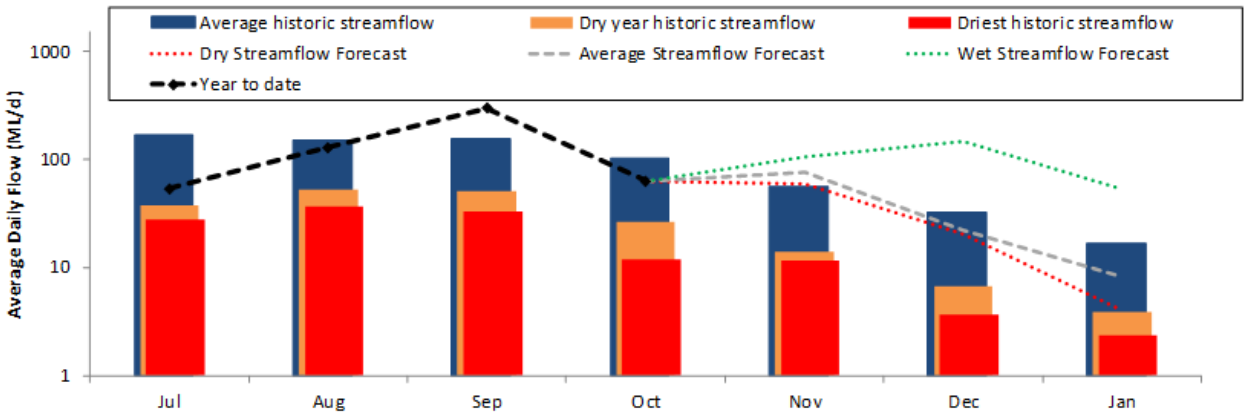


Figure 4.5 : Streamflow outlook for the Dumbalk system

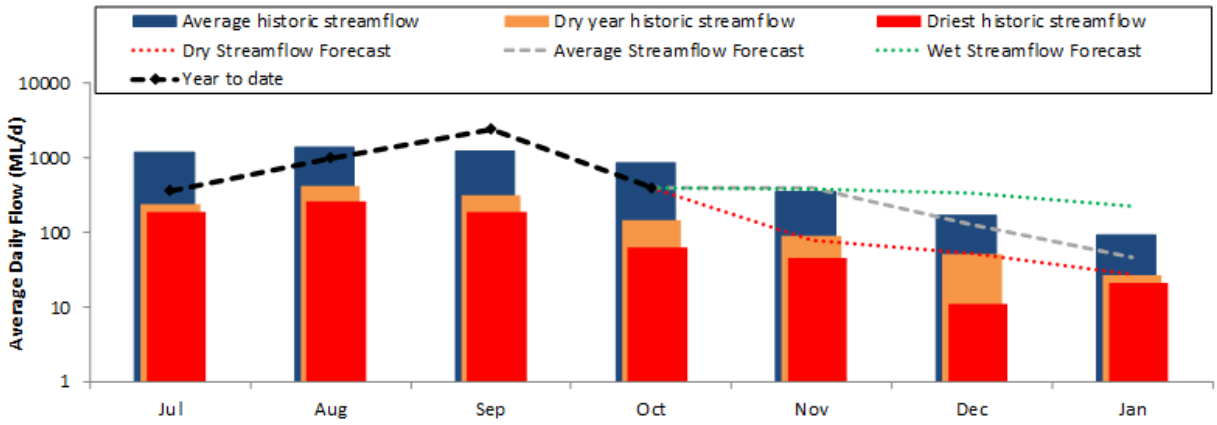


Figure 4.6 : Streamflow outlook for the Meeniyan system

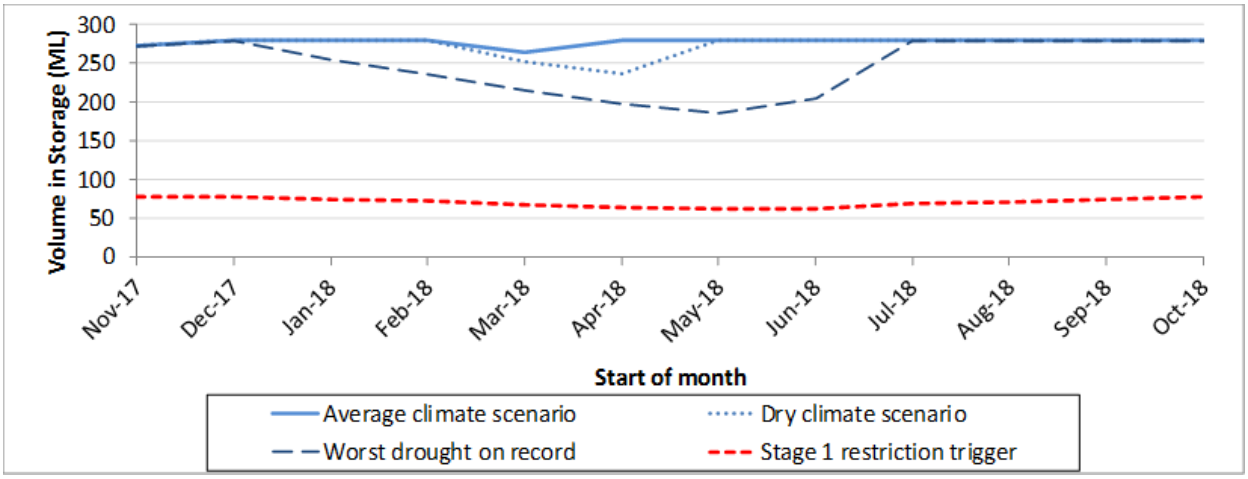


Figure 4.7 : Urban water restrictions outlook for the Deep Creek system

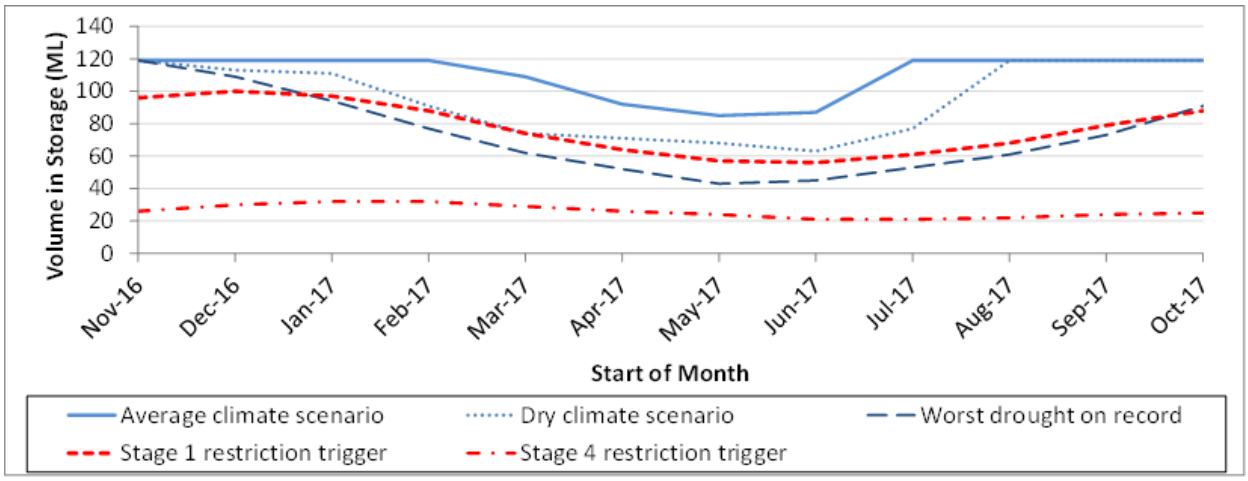


Figure 4.8 : Urban water restrictions outlook for the Battery Creek system

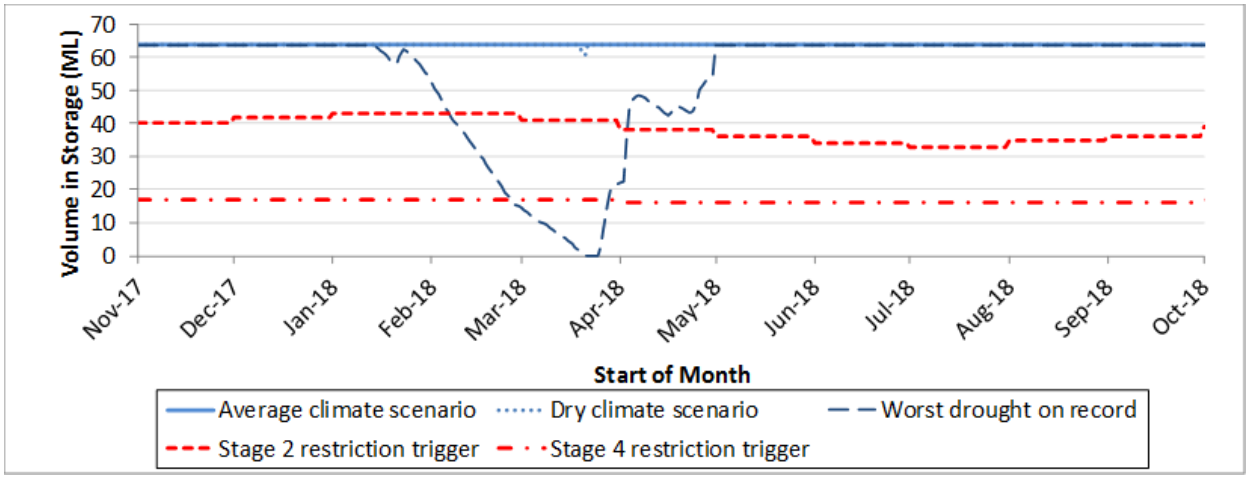


Figure 4.9 : Urban water restrictions outlook for the Agnes River system

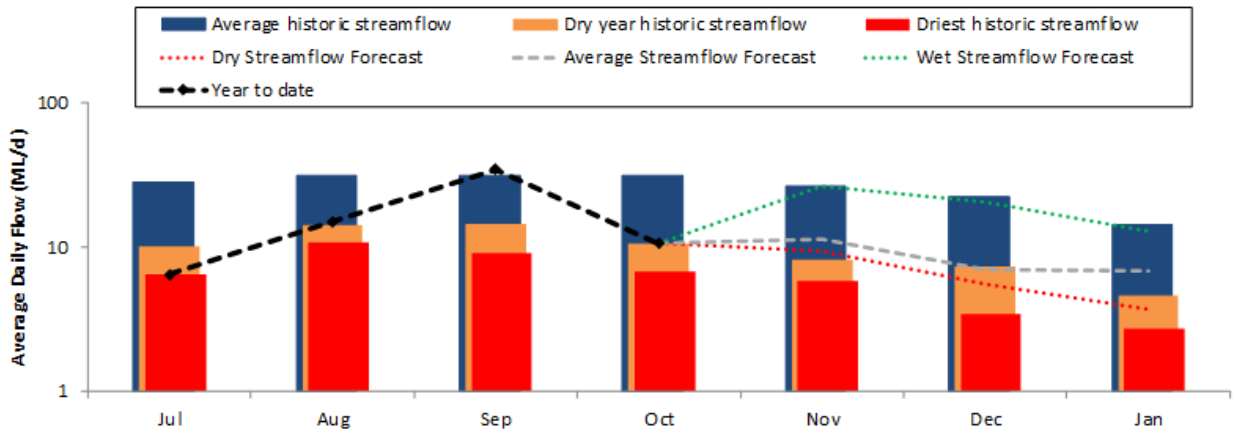


Figure 4.10 : Streamflow outlook for the Tarra River system

5. Short-term Action Plan

A list of priority actions for each of SGW's supply systems is provided in Table 5.1. Further information on these activities can be found in the recent UWS and DPP.

Table 5.1 : Action plan

System	Action	Timing
All	Demand management	Ongoing
	Reduce leaks and wastage	Ongoing
	Update water security outlooks	Every November
Little Bass River	Pipeline connection to Lance Creek system	Expected completion mid-2019
Coalition Creek	Pipeline connection to Lance Creek system	Expected completion mid-2019
Ruby Creek	Planning for long term options as per Urban Water Strategy	2017-2019
Tarra River	Continue to purchase groundwater licences as required	Ongoing