



# Annual Water Outlook

1 December 2016

# Contents

Document History and Distribution .....	<b>Error! Bookmark not defined.</b>
Version(s) .....	<b>Error! Bookmark not defined.</b>
Distribution .....	<b>Error! Bookmark not defined.</b>
Executive Summary .....	3
Background Information .....	4
Regulated Systems .....	4
Current seasonal conditions.....	4
Outlook for remainder of 2016/17 .....	7
Outlook for 2017/18.....	9
Unregulated Systems.....	10
Current seasonal conditions.....	10
Outlook for remainder of 2016/17 .....	10
Outlook for 2017/18.....	11
Groundwater .....	12
Current seasonal conditions.....	12
Outlook for 2017/18.....	12
Water Quality .....	13
Current seasonal conditions.....	13
Outlook for 2017/18.....	13

# Executive Summary

The 2016/17 water year began in July 2016 with wetter conditions providing some resource improvement after a long period of very low rainfall. Prior to this, with catchments still mostly dry, limited aquifer recharge and storages at their lowest levels since the Millennium Drought, Goulburn-Murray Water (GMW) entitlement holders faced the poorest water outlook in over six years.

Above-average rainfall during winter and spring caused a rapid recovery of storage levels and recharged groundwater levels as streams began flowing across the GMW region. The seasonal determinations in all six regulated systems reached 100% of high-reliability water shares by mid-October 2016, which represented a significant change from the scarcity forecast in May 2016 under continued dry conditions. Seasonal determinations against low-reliability water shares, which were not contemplated at the start of 2016/17, were fully available in the Broken, Campaspe and Bullarook systems. GMW is now building reserves for operating requirements and seasonal determinations in 2016/17 and providing greater certainty for regulated system deliveries in 2017/18.

The seasonal climate outlooks issued by the Bureau of Meteorology indicate a 30% to 50% chance of exceeding median rainfall across the GMW region December 2016 to February 2017. The catchments in the eastern part of GMW—the upper Murray, Ovens and Broken—are expected to experience much drier conditions compared to the first half of this water year. Together with an outlook of a 60% to 70% chance much of northern Victoria exceeding the median maximum daily temperature, the rest of 2016/17 is likely to be relatively dry and cause increased water use and lower catchment inflows.

GMW, delegated Resource Manager for northern Victorian systems, will issue a detailed outlook for seasonal determinations in regulated systems on 15 February 2017.

The return of wet conditions this year also allowed the lifting of restrictions from all unregulated streams. Weather conditions in the coming months will determine if and where restrictions are needed again this year. The seasonal rainfall and temperature outlooks suggest unregulated stream customers should anticipate some level of restriction in the second half of 2016/17. Availability into 2017/18 is difficult to forecast at this early stage, but will be driven by rainfall through winter and spring in 2017.

Groundwater resources also recovered quickly this year. While some limits applied in the Loddon Highlands Water Supply Protection Area early this year, recharge events that occurred with the above-average rainfall during winter and spring now allow all customers, bar those of the Newlyn zone, to access 100% of their entitlement. The current outlooks and longer-term resilience of groundwater aquifers across northern Victorian suggest customers can expect similar availability during 2017/18.

To the extent it can be predicted, the risk of water quality incidents occurring over the next 12 months that would impact on supply to customers/entitlement holders is considered very low.

# Background Information

Part 4-2 of the Statement of Obligations (General) 2015 requires water corporations to prepare an Annual Water Outlook by 1 December each year. This document provides information in accordance with this obligation and will assist the development of the Water Outlook for Victoria.

The purpose of the Annual Water Outlook is to provide an initial outlook of water availability for the remaining months of 2016/17 and what conditions are possible at the start of the 2017/18 water year.

Goulburn-Murray Water (GMW) supplies water to customers who access water from regulated, unregulated or groundwater sources. This water outlook covers the status and outlook for all three water sources.

## Regulated Systems

### Current seasonal conditions

The 2015/16 season was one of the driest on record. Seasonal determinations in all GMW systems, bar the Murray system, did not reach 100% of high-reliability water shares (HRWS) for the year. As a result, reserves to operate the regulated systems and to make opening seasonal determinations to high-reliability water share holders for the 2016/17 season were very limited.

The 2016/17 water year began with seasonal determinations available only in the Murray (1% HRWS) and Goulburn systems (8% HRWS). The Campaspe, Loddon, Broken and Bullarook systems started on 0% HRWS due to limited volumes in storage.

Inflows into the major storages started to increase in May and June 2016 after above-average rainfall occurred in both months. Figure 1 shows the areas of Victoria that received above-average rainfall from May to October 2016. This rainfall not only wet the catchments throughout the autumn and winter of 2016, but also translated into useful storage inflows in all regulated systems.

Table 1 shows the total inflow into the major storages from July to October 2016. All storages received greater than average inflows over the period; the Campaspe and Loddon systems received more than double the long-term average.

**Table 1. July to October inflows into the major storages**

Storage	July – October inflow (GL)	Percent of average	Probability of Exceedance
Eildon	1,418.3	144%	19%
Goulburn Weir	887.5	105%	40%
Hume	3,384.3	216%	7%
Dartmouth	1,081.0	200%	<5%
Buffalo	571.7	214%	<5%
William Hovell	233.5	187%	<5%
Nillahcootie	84.1	191%	14%
Eppalock	299.9	255%	10%
Cairn Curran	214.2	258%	7%
Tullaroop	107.0	274%	<5%

Victorian Rainfall Deciles 1 May to 31 October 2016  
 Distribution Based on Gridded Data  
 Australian Bureau of Meteorology

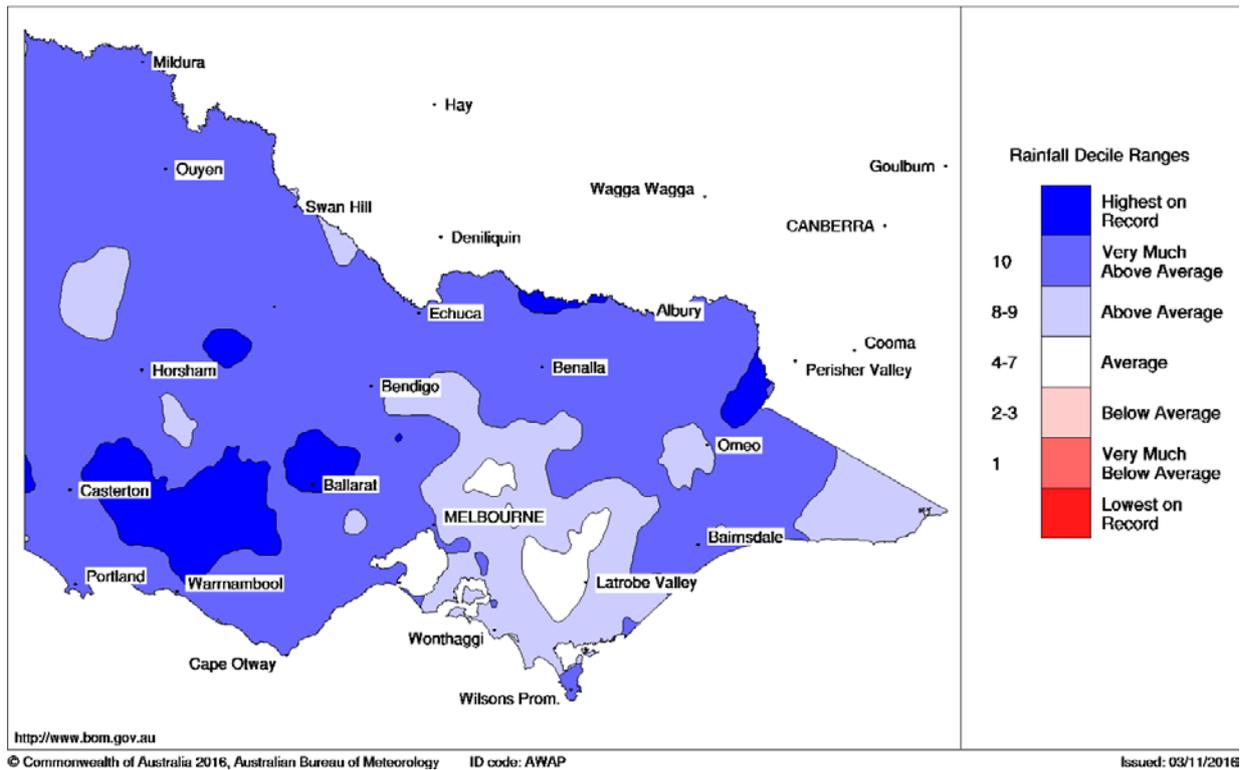


Figure 1. May to October Victorian rainfall deciles

The inflows produced a significant response in storage levels. Only two of the major storages, Dartmouth and Eildon, failed to fill to capacity between the start of July and the start of November (Table 2). This performance is a function of storage size relative to catchment yield, rather than a failure of inflow performance.

Table 2. Storage volume changes from July to the start of November

Storage	1 July 2016 Volume (GL)	1 July 2016 Percentage full	1 November 2016 Volume (GL)	1 November 2016 Percentage full	Volume change (GL)	Percentage full change
Eildon	1,191	35.7%	2,613	78.4%	1,422	42.7%
Hume	1,181	39.3%	2,978	99.1%	1,797	59.8%
Dartmouth	1,805	46.8%	2,886	74.8%	1,081	28.0%
Buffalo	14.9	63.9%	14.5	62.3%	-0.4	-1.6%
William Hovell	14	101.9%	13.8	100.5%	-0.2	-1.4%
Nillahcootie	12.2	30.2%	40.5	100.4%	28.3	70.2%
Eppalock	65.9	21.6%	308.9	101.4%	243.0	79.8%
Cairn Curran	17.3	11.8%	144.7	98.4%	127.4	86.6%
Tullaroop	15.5	21.2%	73.5	100.8%	58.0	79.6%

Murray System

The Murray system started 2016/17 with a seasonal determination of 1% HRWS. Very wet winter and spring conditions saw Lake Hume move from 36% of capacity in July 2016 to requiring pre-releases in August 2016 (effectively full and spilling). Seasonal determinations increased quickly and reached 100% HRWS on 3 October 2016.

The volume of water that spilled from Victoria's share of Lake Hume exceeded the volume held in spillable water accounts. As a result, all the water held in spillable water accounts was deducted.

#### *Goulburn System*

The Goulburn system started the 2016/17 season with an opening seasonal determination of 8% HRWS. The Goulburn system's early reserve policy allowed water to be set aside in 2015/16 to contribute to operational requirements for 2016/17. This, combined with inflow received in May and June, made an opening seasonal determination possible.

As a percentage of the long-term average, Lake Eildon has received lower inflows than all the other major storages in GMW's region for the year to date. This is predominantly due to lower rainfall in the Lake Eildon catchment. If Lake Eildon had received the same inflows as Lake Hume as a percentage of the long-term average (i.e. 216%), Lake Eildon would have filled in early November. Lake Eildon reached approximately 80% of capacity in mid-November.

Seasonal determinations increased from 8% HRWS in July 2016 to 100% HRWS by 17 October 2016, more slowly than the rate of increase in other systems.

#### *Broken System*

The Broken system was particularly dry in 2015/16. Inflows into Lake Nillahcootie were only about 13% of the long-term average. The Broken system seasonal determination only reached 26% HRWS last year and an opening seasonal determination on 1 July 2016 was not possible.

Inflows started to increase in June after above average rainfall. Lake Nillahcootie increased from 21% in May to full and spilling by the end of August.

Seasonal determinations increased from 20% HRWS on 1 August 2016 to 100% HRWS by 1 September 2016. There has been enough water available to make a 100% low-reliability water shares (LRWS) seasonal determination for the Broken system.

#### *Campaspe System*

The Campaspe system received less than 5% of its long-term average inflows during 2015/16. There was very limited operational water available at the start of 2016/17, which posed a risk to the delivery of carried over allocation. However, the extremely wet winter and spring saw Lake Eppalock receive 255% of average inflows between July and October 2016. Lake Eppalock increased from a low of 21% of capacity in June 2016 to full and spilling at the start of October 2016. Seasonal determinations increased from 0% on 1 July 2016 to 100% by 15 September 2016. There has also been enough water to announce a 100% seasonal determination for LRWS on 17 October 2016.

Lake Eppalock commenced spilling in early October. Similar to the Murray, all the water held in spillable water accounts has been debited. The main difference with the Murray is that all the water that could transfer into spillable water accounts has occurred (given 100% LRWS has been allocated).

#### *Loddon and Bullarook Systems*

The Loddon and Bullarook storages received little inflows in the 2015/16 season. For example, Cairn Curran Reservoir only received about 3.9 GL during 2015/16, with 1.6 GL of this received in June 2016. The Loddon and Bullarook systems reached 84% HRWS and 8% HRWS respectively last season and had no opening seasonal determinations on 1 July 2016. The risk of not being able to deliver the water that was carried over was high in the Loddon and Bullarook systems.

These systems received between two and three times the average inflows between July and October 2016.

Seasonal determinations increased from a 0% on 1 July 2016 to 100% HRWS and 100% LRWS on 15 August 2016 in the Bullarook system. Seasonal determinations in the Loddon system followed the Goulburn system once resources had improved sufficiently, as the Loddon system seasonal determination is linked to the Goulburn system.

#### *Ovens System*

The Ovens system was not as dry in 2015/16 as other northern Victorian systems. There were no restrictions applied to the licensed customers during that time. The storages in the Ovens system received around 200% of average inflows from July to October 2016. Note that Lake Buffalo has been operated with the spillway gates out of the water and will be filled to capacity later in the season.

Despite customers having water shares, the Ovens system does not receive seasonal determinations like the six other regulated systems operated by GMW. The system is managed similarly to an unregulated stream because of the high volume of inflows relative to storage size. Entitlement holders are restricted if the inflows into the system and the volumes held in Lake Buffalo and Lake William Hovell are insufficient to meet all the demand in the system. With storages effectively full and high flows into the system, entitlement holders are not restricted and have had access to their spill-reliability entitlements.

#### *Outlook comparison*

The outlook for seasonal determinations published on 1 July 2016 (Table 3) indicated that above-average inflows were needed for seasonal determinations to reach 100% HRWS. Table 3 highlights the challenges that would have been faced if inflows as expected in a dry scenario were received (note dry conditions are defined as inflow volumes to major storages that are greater in 90 years out of 100, average conditions are inflow volumes to major storages that are greater in 50 years out of 100 and wet conditions are inflow volumes to major storages that are greater in 10 years out of 100). The increases in seasonal determinations have followed the patterns suggested by the outlook as inflows have been between the average and wet scenarios.

**Table 3. Outlook for seasonal determinations for 17 October 2016 as published on 1 July 2016**

Water System	Inflow Scenario		
	Wet	Average	Dry
Murray	100%	61%	38%
Broken	100%	100%	0%
Goulburn	100%	92%	41%
Campaspe	100%	100%	3%
Loddon	100%	92%	7%
Bullarook	100%	100%	0%

### **Outlook for remainder of 2016/17**

The Bureau of Meteorology's three month outlook for December 2016 to February 2017, issued on 24 November 2016, indicates the chances of exceeding the median rainfall over most of GMW's region are less than 40%. Rainfall is likely to be below average in most of eastern Australia and above average in northwest Western Australia. The December outlook indicates drier conditions across most of the country are most likely.

Along with drier conditions over next three months, temperatures are expected to be above average. From west to east across the GMW region, there is 60% to 70% chance of exceeding the average

maximum temperature and a 45 to 60% chance of exceeding the average minimum temperatures over the summer months.

The outlook is strongly influenced by a climate driver called the Southern Annular Mode (also known as SAM). It is expected to be in a negative phase in December. When this happens in summertime, weather systems are further north than usual, meaning Australia experiences higher pressures than normal. This is typically associated with reduced rainfall and higher temperatures.

As the historical peak inflow period has passed, inflows are not expected to increase significantly unless passing severe weather systems bring heavy rain to the catchments.

The seasonal determinations as announced on 15 November 2016 for the 2016/17 season are presented in Table 4.

**Table 4. Seasonal determinations as at 15 November 2016**

<b>Water System</b>	<b>High-Reliability Water Share</b>	<b>Low-Reliability Water Share</b>
Murray	100%	0%
Broken	100%	100%
Goulburn	100%	0%
Campaspe	100%	100%
Loddon	100%	0%
Bullarook	100%	100%

All regulated systems have 100% HRWS available for the 2016/17 season.

Broken, Campaspe and Bullarook entitlement holders have their maximum volume available and will not see any changes for the remaining months of 2016/17.

GMW's seasonal determination policy describes how available water is distributed to entitlement holders. In the Murray, Goulburn, Campaspe and Loddon systems, available water is allocated progressively to high-reliability water shares once all system operating requirements can be met. Once HRWS are fully available, reserves (in addition to the early reserve in the Murray and Goulburn systems) to support HRWS in the following season start to be established. After HRWS in the following season are secured, assumed inflows with a probability of exceedance of 99% are received, any available water is allocated to low-reliability entitlements.

In the Broken and Bullarook systems, available water is allocated progressively to high-reliability water shares once all system operating requirements can be met. Once seasonal determinations reach 100% HRWS, any available water is allocated to low-reliability entitlements.

Further inflows are needed for LRWS seasonal determinations to be announced in the Murray and Goulburn systems. The return of the Menindee Lakes system to Murray-Darling Basin Authority control during late October increases the chances of the Murray system receiving a LRWS seasonal determination in 2016/17. Other factors, such as lower than planned system losses, can also add to the reserves needed to secure 2017/18 operations before LRWS seasonal determinations can be announced in the Murray and Goulburn systems.

The linkage of the Loddon system to the Goulburn systems means it will not receive a LRWS seasonal determination until there is a LRWS seasonal determination available in the Goulburn system.

Entitlement holders in the Ovens system are unlikely to go onto restrictions this season as the storages are expected to remain full into early 2017. History indicates that restrictions are not needed to manage demand when the storages are still at capacity in January.

Demand for water in the first three months of the irrigation season has been the lowest since 2010 due to the wet conditions across most of the GMW region. Weather conditions in the remaining months of the season will dictate how much water is used in 2016/17 and how much is carried over into 2017/18.

## Outlook for 2017/18

Long-term weather outlooks for the start of 2017/18 are not available as the Bureau of Meteorology rainfall outlook only extends for three months. GMW, as the delegated Northern Victoria Resource Manager, will release a detailed first outlook for the 2017/18 water year on 15 February 2017 based on historical inflows and follow up with another detailed outlook on 15 May 2017. It is not expected that any dry inflow contingency measures will be required in 2017/18 in any regulated systems.

### *Murray*

With seasonal determinations in the Murray system at 100% HRWS, reserves additional to the early season reserve are being established. As reserves are already available for 2017/18, the likelihood of seasonal determinations being very low next season is remote. Average inflow conditions should allow seasonal determinations to reach 100% HRWS during the spring. Seasonal determinations will be available under dry inflow conditions, but may not reach 100% HRWS.

### *Goulburn System*

Similar to the Murray system, seasonal determinations in the Goulburn system are 100% HRWS and reserves in addition to the early season reserve are being established. Average inflow conditions should allow seasonal determinations to reach 100% HRWS during the spring. Seasonal determinations will be available under dry inflow conditions, but may not reach 100% HRWS.

### *Campaspe System*

In accordance with the GMW seasonal determination policy, the availability of LRWS seasonal determination in 2016/17 indicates Lake Eppalock contains enough water to make a seasonal determination of 100% HRWS on 1 July 2017 under all climatic conditions.

### *Loddon System*

Similarly to the Campaspe system, there is sufficient resource available in storage to supply all HRWS entitlements in 2017/18. Seasonal determinations in the Loddon system will be the same as the Goulburn system in 2017/18.

### *Broken and Bullarook Systems*

The Broken and Bullarook systems are annual systems, so 2017/18 reserves for these systems will depend on how much water is utilised this season and the inflows during the traditional inflow months in 2017. With the storages in both systems filling to capacity this year, GMW expects the systems will start 2017/18 with relatively strong operating positions.

### *Ovens System*

Water availability in the Ovens system depends on weather and streamflows, so it is difficult to determine what water availability will look like in 2017/18. Restrictions are unlikely under wet and average inflow conditions, but remain possible under drier scenarios.

# Unregulated Systems

## Current seasonal conditions

With above average winter and spring rainfall across the GMW region, all unregulated streams managed under Local Management Rules (LMR) are free from any form of demand restriction or suspension. Streamflows will be actively monitored and managed in accordance with their associated LMR.

## Outlook for remainder of 2016/17

The Bureau of Meteorology current seasonal streamflow forecast predicts a 65% to 85% chance of above-median flows occurring in streams across the GMW region. With above-average rainfall occurring throughout winter and spring, baseflows in the unregulated systems should be maintained into early 2017. Flows during summer will reflect the weather conditions and the seasonal outlook is comparable to years with high winter rainfall. The reliability of streamflow in GMW increases from the western catchments to the eastern catchments.

### *Upper Murray Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Upper Murray catchment.
- 2016/17 flows are comparable to 2012/13; no restrictions are forecast for the main stem of the Murray River and the Mitta Mitta River above Lake Hume.
- Tributaries may experience restrictions.

### *Kiewa Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Kiewa catchment.
- 2016/17 flows are comparable to 2012/13; no restrictions are forecast for the Kiewa main stem or Running Creek.
- Yackandandah Creek may go onto low level restriction.

### *Ovens Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Ovens catchment.
- 2016/17 flows are comparable to 2013/14; no restrictions are expected for the main stem of the Ovens River upstream of Myrtleford or for the Buffalo River upstream of Lake Buffalo.
- Some tributaries may experience restrictions or suspension during summer.

### *King Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the King catchment.
- 2016/17 flows are comparable to 2013/14; no restrictions are forecast for the regulated main stem of the King River.
- Minor tributaries may experience restrictions.

### *Goulburn Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Goulburn catchment.

- 2016/17 flows are comparable to 2013/14; minor restrictions are forecast for the Goulburn River tributaries upstream of Seymour.
- Tributaries that enter the Goulburn River downstream of Seymour may experience restrictions and suspensions.

#### *Broken Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Broken catchment.
- 2016/17 flows are comparable to 2013/14; minor restrictions are forecast for the larger tributaries of the Broken River.
- Minor tributaries may experience restrictions and suspensions.

#### *Campaspe Catchment*

- Higher than median flow and median rainfall is predicted for the next three months in the Campaspe catchment.
- 2016/17 flows are comparable to 2011/12; minor restrictions are forecast for the Campaspe and Coliban Rivers upstream of Lake Eppalock.
- All minor tributaries may experience restrictions and suspension.

#### *Loddon Catchment*

- Higher than median flow and higher median rainfall is predicted for the next three months in the Loddon catchment.
- 2016/17 flows are comparable to 2012/13; restrictions are forecast for the Loddon River upstream of Cairn Curran Reservoir.
- Most tributaries are expected to experience restrictions or suspension.

## Outlook for 2017/18

Access to unregulated systems in 2017/18 will depend on weather conditions. The GMW region can be broken up into western, central and eastern areas when considering the impact of weather on streamflows, with the western region having a higher level of restrictions in comparison to the eastern region (Table 5).

**Table 5. Unregulated systems outlook for 2017/18**

<b>Region</b>	<b>Worst on record weather conditions (5<sup>th</sup> percentile)</b>	<b>Dry weather conditions (25<sup>th</sup> percentile)</b>	<b>Average weather conditions (50<sup>th</sup> percentile)</b>
<b>Western (Loddon and Campaspe Basins)</b>	All streams on suspension	All streams on suspension	Minor tributaries will be on restriction or suspension. Upper Loddon and Campaspe will be on restrictions
<b>Central (Goulburn Broken Basins)</b>	All minor tributaries on suspension. All major Goulburn tributaries will be on restriction if not suspension	All minor tributaries on suspension. All major Goulburn tributaries will be on restriction	All minor tributaries on restriction or suspension. Major tributaries of the Goulburn River will not have restrictions
<b>Eastern (Ovens, Kiewa and Upper Murray Basins)</b>	All minor tributaries on suspension. Upper Ovens, Kiewa and Upper Murray River will be on restriction	All minor tributaries on suspension. Upper Ovens, Kiewa and Upper Murray River will be on restriction	All minor tributaries on restrictions. Upper Ovens, Kiewa and Upper Murray River main stems will not have restrictions

# Groundwater

## Current seasonal conditions

Most GMW groundwater systems are holding up well and indicating a strong recovery due to above-average spring rainfall recharging the aquifers.

In the riverine plain, the large sedimentary aquifers typically provide a buffer against dry seasonal conditions. These aquifers (such as Katunga, Lower Campaspe Valley and Mid Loddon) are highly transmissive and recover strongly between seasons. The restriction rationale applied in the Lower Campaspe Valley Water Supply Protection Area (WSPA) and Mid-Loddon Groundwater Management Area (GMA) is based on a three-year rolling average of groundwater recovery levels. This lessens the impact of inter-year seasonal conditions and gives licence holders greater certainty around allocations.

In comparison, the fractured rock aquifers of the upper catchments are not as transmissive and slower to recover. This means that groundwater levels do not fully recover between seasons in areas of intensive groundwater use, such as Newlyn and Ascot in the Loddon Highlands WSPA.

A final allocation announcement for 2016/17 will be made for the Newlyn Zone in late November 2016 (Table 6).

**Table 6. Groundwater allocation for 2016/17**

<b>Groundwater Management Unit</b>	<b>2016/17 Allocations (%)</b>
Barnawartha GMA	100%
Central Victorian Mineral Springs GMA	100%
Katunga WSPA	70%
Kiewa GMA	100%
Loddon Highlands WSPA	100% (75% in Newlyn Zone)
Lower Campaspe Valley WSPA	100%
Lower Ovens GMA	100%
Mid Goulburn GMA	100%
Mid Loddon GMA	100%
Shepparton Irrigation GMA	100%
Strathbogie GMA	100%
Unincorporated GMU	100%
Upper Goulburn GMA	100%
Upper Murray GMA	100%

## Outlook for 2017/18

### ***Goulburn/Broken catchment outlook***

- Groundwater levels in the Upper Goulburn GMA are likely to remain stable as is groundwater use. The Upper Goulburn GMA Local Management Plan does not include a mechanism for restricting groundwater extraction through seasonal allocations.
- Groundwater levels in the deep lead in the Mid Goulburn GMA may decline slightly. The Mid Goulburn GMA Local Management Plan does not include a mechanism for restricting groundwater extraction through seasonal allocations, but groundwater use is expected to remain stable and will not be impacted.
- Groundwater levels in the shallow Shepparton Formation recovered slightly in late 2016 following higher than average spring rainfall. Despite this, groundwater levels are likely to

decline over the next 12 months due to decreased rainfall recharge. The Shepparton Irrigation Region GMA Local Management Plan does not include a mechanism for restricting groundwater extraction through allocations.

- Groundwater levels in the Katunga WSPA recovered slightly higher at the end of 2015/16 than the previous season despite the highest groundwater use in the area since 2002/03. This is attributed to above average spring rainfall. Allocations for 2016/17 are set at 70%, the maximum allowable under the Katunga WSPA groundwater management plan. Allocations for 2017/18 are likely to remain at 70%; however, this may change dependent on recommendations that the Katunga Consultative Committee make to the Minister for Water about amendments to the Katunga WSPA management Plan.

### ***Northeast catchment outlook***

- Shallow alluvial and bedrock groundwater systems in the Lower and Upper Ovens Valley have remained relatively stable since 2012 (no observable decline).
- In the Lower Ovens Valley, recharge to the deep lead system has seen an increase to recovery levels compared to the past few years. There is no risk of less than 100% annual allocations occurring in next few years.
- Kiewa Valley alluvial and bedrock aquifers have been stable since 2011 (no decline). Seasonal allocations will remain at 100% of entitlement in 2017/18.
- Within the Upper Murray GMA recharge of the alluvial and bedrock systems has seen groundwater levels rise since 2011. Seasonal allocations will remain at 100% of entitlement in 2016/17.

### ***Loddon/Campaspe catchments outlook***

- Allocations in the Lower Campaspe Valley WSPA are expected to be 100% in all management zones in 2017/18.
- Allocations are expected to be 100% in all management zones in the Mid-Loddon GMA in 2017/18.
- In the Central Victorian Mineral Springs GMA, allocations are expected to be 100% in all management zones in 2017/18.

## **Water Quality**

### **Current seasonal conditions**

The return of wetter conditions increased the potential for short-term water quality degradation across the GMW region. Flooding along the River Murray and the lower Broken Creek lowered dissolved oxygen (DO) concentrations as organic material flushed from the floodplains broke down, causing 'blackwater' events. GMW reported few impacts from blackwater in the River Murray and Broken Creek, although the presence of low DO water in the Torrumbarry Irrigation Area due to flooding from the Loddon River system..

### **Outlook for 2017/18**

To the extent that it can be predicted, the risk of water quality incidents occurring over the next 12 months that would impact supply to entitlement holders is considered very low. The good winter and spring inflows and floods that replenished water storages also reduced the likelihood of poor water

quality events, such as high salinity or low dissolved oxygen (DO), occurring through the remainder of this year and into 2017/18.

The possibility of future blue green algae (BGA) blooms is much harder to predict. BGA blooms can and do occur under a range of weather conditions and a range of storage levels and river flows. The bloom in the River Murray earlier this year happened despite very high regulated flows, which had historically been thought to reduce the risk.

The occurrence of BGA blooms or low DO is unlikely to affect GMW's supply to rural customers, as the phenomena are not considered harmful to agricultural production. However, both can impact aquatic life and recreational use of water bodies.

High salinity in water systems is unlikely but manageable through operational changes.

### ***BGA Blooms***

Most of the GMW major storages are expected to end 2016 close to full, which tends to lower the risk of BGA outbreaks. However, the large inflows during winter and spring mobilised organic matter and sediments that contain nutrients which aid BGA growth. The presence of BGA blooms in storages and waterways does not stop deliveries to rural customers and irrigation is manageable with appropriate precautions and monitoring. A toxic BGA bloom may pose a risk to stock, but there is no definitive guidance about safe toxicity levels.

Urban water corporations are able to treat affected water with powdered activated carbon to provide safe drinking water.

Focussing on the two main systems:

- a. Murray system: The 2016 bloom occurred with high River Murray flows and an uncommon BGA species dominating. Lake Hume was fairly low (approximately 35% at the start of the event and falling) and it is not likely to fall to that level again in autumn 2017 (approximately 50% expected), but that will depend on MDBA operations. In November 2015 Hume was around 45% of full capacity, whereas at the same time this year it was 100% full.
- b. Goulburn system: Previous Lake Eildon blooms have occurred at both high and low storage levels. The bloom in late 2004 occurred when the storage was around 40% of capacity. The early 2011 bloom occurred at a high lake level (greater than 75%). A bloom in late 2011 occurred when levels were even higher (greater 95%). A common factor is that blooms occurred after good winter-spring inflow. BGA has never been detected at high levels downstream, as the outlet location is deep in the storage where BGA does not thrive.

### ***Low Dissolved Oxygen and Blackwater***

Low DO and blackwater is not a risk to rural customers, but it can cause taste, colour or odour issues for drinking water suppliers. It is considered to have a low risk of another occurrence in the next 12 months because of recent flood and blackwater events, the improved resource position, and the availability of environmental flows to assist in most systems. GMW will continue to work with catchment management authorities to monitor and respond to risks, especially the Goulburn Broken Catchment Management Authority for the lower Broken Creek.

### ***High Salinity***

High levels of salinity are a low risk occurrence in the GMW area, with storages expected to be at medium to high levels throughout 2016/17. Salinity tends to rise as storage levels get very low, particularly in the Loddon and Campaspe catchments, but this is not likely to happen before 2018 (and then only under a dry scenario).