Annual Water Outlook

30 November 2020

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Contents

Executive Summary

After above-average rainfall across large parts of northern Victoria in autumn 2020, inflows to all Goulburn-Murray Water (GMW) major storages were below average through winter before improving in mid spring. Reserves established in 2019/20, mainly after the final seasonal determination on 1 April 2020, contributed to opening seasonal determinations in the Murray, Goulburn, Campaspe, Broken and Loddon systems on 1 July 2020. Seasonal determinations in the Bullarook opened at 0 per cent of high-reliability water shares (HRWS).

At 16 November 2020, seasonal determinations had increased progressively with the Murray system on 81 per cent HRWS, the Goulburn, Campaspe and Loddon systems on 100 per cent HRWS and the Broken system at 100 per cent HRWS and 100 per cent low-reliability water share (LRWS). The Bullarook system seasonal determination reached 100 per cent HRWS and 100 per cent LRWS on 1 September 2020. A LRWS seasonal determination in the other systems in 2020/21 is unlikely.

The seasonal climate outlooks issued by the Bureau of Meteorology on 26 November 2020 indicate a 60 per cent to 75 per cent chance of exceeding median rainfall across the GMW region from December 2020 to February 2021.

Early reserves contributing to operating requirements in 2021/22 have been established in the Goulburn and Murray systems. Reserves for 2021/22 are being established in the Goulburn, Loddon and Campaspe systems, as the seasonal determination have reached 100 per cent of HRWS in all three systems. The Broken, Bullarook and Ovens systems are annual systems and water availability will depend on seasonal conditions and inflows closer to the start of 2021/22.

GMW, as Resource Manager for northern Victorian systems, will issue a detailed outlook for seasonal determinations in regulated systems on Monday 15 February 2021.

With relatively good catchment conditions and a better than 50 per cent chance of exceeding the median rainfall in the next three months, it is possible seasonal determinations in the Murray system will increase and further reserves for seasonal determinations in 2021/22 will be established.

Restrictions in many unregulated systems were lifted following rainfall in the 2020 autumn. Some unregulated systems remain on restrictions, mainly in the Campaspe and Loddon systems. Weather conditions in the coming months will determine the extent of restrictions across GMW's region. Restrictions in the larger streams are unlikely, while the smaller tributary streams may experience restrictions.

The majority of groundwater licence holders have access to 100 per cent of their entitlement. Groundwater licence holders in the Newlyn zone of the Loddon Highlands Water Supply Protection Area (WSPA) and the Barnadown zone of the Lower Campaspe WSPA both have a 75 per cent allocation for 2020/21. The allocation in the Katunga WSPA is 70 per cent. A final allocation announcement will be made for the Newlyn zone in mid-December 2020, but it is unlikely to increase.

The risk of water quality incidents occurring over the next 12 months that would impact on supply to customers/entitlement holders is considered low, although it is difficult to predict. The rainfall of the autumn-winter-spring period of 2020 has reduced the risk of hypoxic blackwater events occurring over summer and autumn 2020/21, although such events would not prevent the supply of water. The likely need to issue warnings due to high blue green algae levels cannot be predicted; however, such warnings would not normally prevent supply. Similarly, while impacts from last summer's bushfires are still occurring, they are unlikely to impact supply.

Introduction

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 outlook of water availability for the remaining months of 2020/21 and what conditions are possible at the start of the 2021/22 water year.

GMW's role is to efficiently manage, store and deliver water to more than 21,000 active customers involved in a diverse range of enterprises and interests across northern Victoria. Our customers include gravity irrigation, regulated and unregulated surface water diverters, groundwater, urban water corporations and environmental water holders. More information about GMW and its services are available on the GMW website, www.gmwater.com.au/about.

This water outlook covers the status and outlook for regulated, unregulated and groundwater sources as well as water quality.

Current climate and streamflow in the longer context

Victoria's climate has shown a warming and drying trend over recent decades, and this trend is expected to continue over the longer-term future. In comparison to historical conditions, the GMW region is already experiencing:

- Higher temperatures;
- Reductions in rainfall in late autumn and winter and, in some locations, some increases in rainfall during the warmer months; and,
- In many catchments, a shift in the streamflow response to rainfall, with less streamflow generated for the same amount of rain.

Some of the rainfall decline in late autumn and winter can be attributed to global warming and changes in the weather systems that deliver rainfall to Victoria. The cause of the reduction in streamflow response to rainfall is not yet fully known and is the subject of continuing research.

Over the longer term, the GMW region can expect:

- the rainfall reductions in winter to persist;
- possible increases in summer rainfall;
- increases in potential evapotranspiration due to higher temperature and lower relative humidity;
- reductions in streamflow because of less rainfall and higher potential evapotranspiration; and
- the streamflow response to rainfall to no longer remain the same, and generally decline.

Even if there is an increase in summer rainfall, it is unlikely to offset the streamflow impact of rainfall reductions in winter because most of the runoff in Victorian catchments occurs over winter and spring. In the warmer months, rainfall is more likely to be absorbed by drier catchments, used by vegetation or evaporate.

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

More information on the observed changes and longer-term future climate and water projections can be found at 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.

Regulated Systems

Current seasonal conditions

The 2019/20 water year was drier than average, with storage inflows across GMW's catchments recording below the average annual volume (based on climate conditions observed since 1975). Inflows into Lake Eppalock were 43 per cent of the average volume, while Lake Nillahcootie received 48 per cent. Cairn Curran received 34 per cent of average inflows. Dartmouth Dam and Lake Eildon benefited from above-average inflows during autumn, which resulted in annual inflows being closer to average with 77 per cent and 92 per cent of average inflows respectively.

After a reasonably wet autumn, below average inflows were observed at most storages during winter and early spring. Rainfall across all of northern Victoria from July to October 2020 was mainly below average across the catchment areas (Figure 1) and this has contributed to below-average storage inflows (Table 1) over this period.

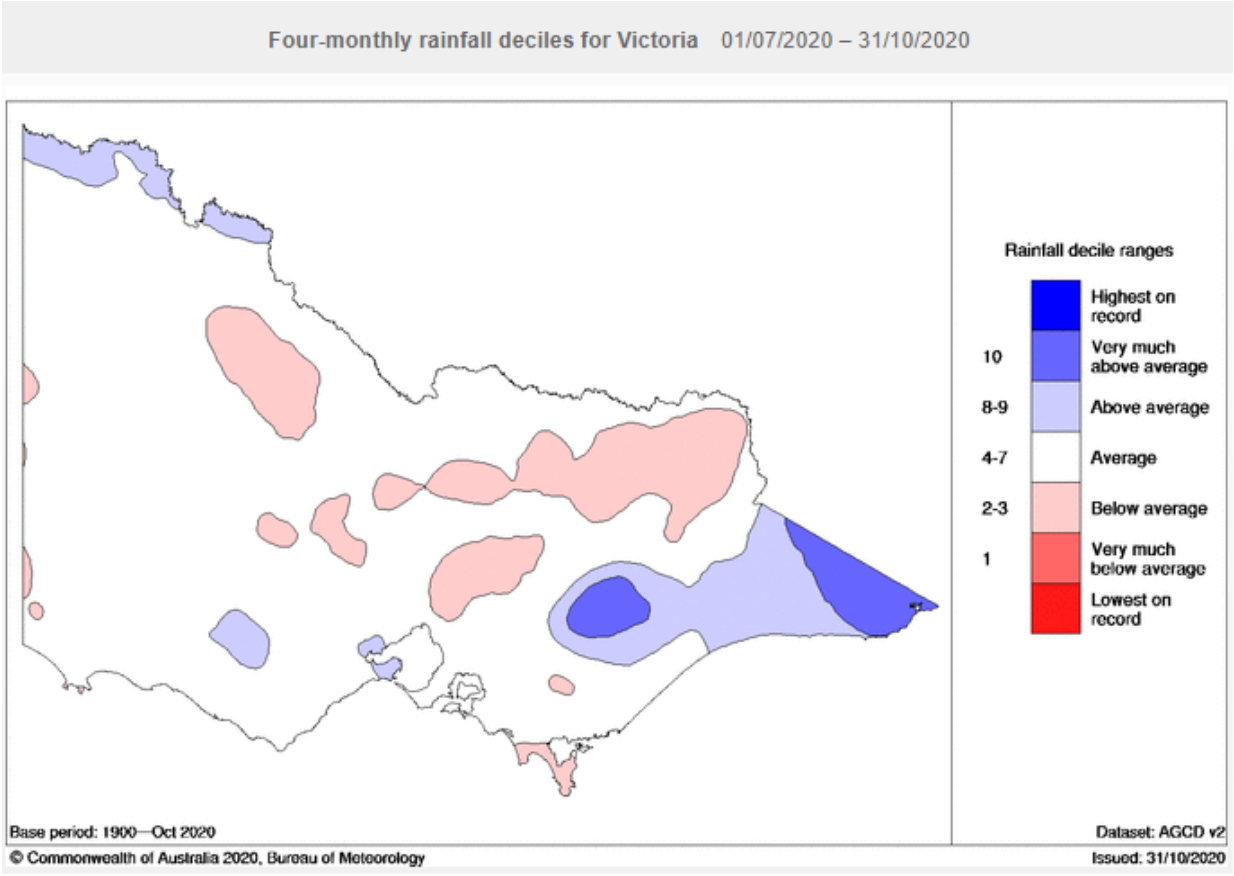

Figure 1. Rainfall deciles for 1 July to 31 October 2020

Table 1. July to October 2020 inflows to the major GMW storages

Storage	July – October inflow (GL)	Percent of average[2]	Chance of greater inflow[2]
Eildon	782.8	90%	53%
Goulburn Weir[1]	542.7	77%	57%
Hume[1]	1,093.2	74%	57%
Dartmouth	361.8	74%	63%
Buffalo	212.4	84%	54%
William Hovell	102.0	83%	59%
Nillahcootie	23.9	60%	61%
Eppalock	53.5	48%	61%
Cairn Curran	26.3	35%	71%
Tullaroop	9.1	26%	73%

[1] Natural inflows excluding releases from upstream storages

[2] Historical flow records that have been adjusted to match climate conditions observed since 1975

The conditions during winter and early spring limited the volume harvested into the major storages. However, inflow conditions improved from early October with above-average rainfall across most catchments contributing to above average inflows to all storages in October except for the Loddon storages. Table 2 outlines the change in storage volumes and percentages from July to mid-November. Demand for water early in the season was low and with inflows to most storages remaining steady through winter into spring, storage levels steadily increased. However demands increased with warmer and drier conditions from early November, which also saw inflows reduce across the storage, resulting in some storages starting to decline.

Lake Nillahcootie filled for the first time since 2017. It is also noted that Waranga Basin, an off-stream storage in the Goulburn system, filled to its operational capacity for the first time since 2016.

Table 2. Storage volume changes from July to mid-November

Storage	1 July 2020 Volume (GL)	1 July 2020 Percentage full	15 November 2020 Volume (GL)	15 November 2020 Percentage full	Volume change (GL)	Percentage full change
Eildon	1,625	48.8%	2,312	69.3%	687	20.5%
Hume	1,154	38.4%	2,376	79.1%	1,222	40.7%
Dartmouth	2,005	52.0%	2,355	61.1%	350	9.1%
Buffalo	14.0	60.0%	20.4	86.7%	6.4	26.7%
William Hovell	14.0	102.2%	13.7	99.9%	-0.3	-2.3%
Nillahcootie	27.0	66.8%	40.2	99.5%	13.2	32.7%
Eppalock	115.1	37.8%	141.7	46.6%	26.6	8.8%
Cairn Curran	57.8	39.3%	73.4	49.9%	15.6	10.6%
Tullaroop	43.9	60.2%	44.4	60.9%	0.5	0.7%

Water availability in northern Victoria early in 2020/21 was assisted by the reserves established in 2019/20 after the final seasonal determination announcement on 1 April 2020, following above average rainfall during autumn across most catchments. This allowed an opening seasonal determination to be made on 1 July 2020 in all systems except the Bullarook system, which has smaller, annual storages (i.e. typically fill each year) compared to the other systems.

Seasonal determinations as at 16 November 2020 are shown in Table 3. All systems have reached 100 per cent HRWS so far this water year except for the Murray which is at 81 per cent HRWS. The Goulburn system and the Murray System early season reserves for 2021/22 have been established. The reserve volumes contribute to operating commitments for the following water year, aiming to

ensure that any water carried over by entitlement holders from the current water year can be delivered at the start of the irrigation season.

Table 3. Seasonal determinations as at 16 November 2020

Water System	High-Reliability Water Share	Low-Reliability Water Share
Murray	81%	0%
Broken	100%	100%
Goulburn	100%	0%
Campaspe	100%	0%
Loddon	100%	0%
Bullarook	100%	100%

Resource Availability

Murray System

The Murray system started 2020/21 with a seasonal determination of 8 per cent HRWS. Low but steady inflow conditions early in 2020/21 enabled seasonal determinations to increase in small increments. The seasonal determination had reached 81 per cent at 16 November 2020 following improved catchment inflow conditions during spring.

There have been no spills from Victoria's share of Lake Hume during the water year so far in 2020/21. A low risk of spill was declared on 10 November 2020 in the Murray system.

As specified in clause 10.5 of GMW's Murray bulk entitlement, water was borrowed from the Barmah-Millewa Forest Environmental Water Allocation at the start of the 2020/21 water year to support early seasonal determinations for high-reliability water shares. The water borrowed from the Barmah-Millewa Forest Environmental Water Allocation will start to be paid back once seasonal determination are 100 per cent HRWS, before further resource improvements are set aside for 2021/22.

Goulburn System

The reserves established in the Goulburn system from good inflows during autumn 2019/20 were enough for the system to commence the 2020/21 water year with a seasonal determination of 35 per cent HRWS.

While inflows during winter and early spring 2020 have been below average, they have been steady and responsive to rainfall. The Goulburn River below Goulburn Weir was operating under unregulated conditions for much of winter, with the volume in Waranga Basin following a target filling curve. The volume in Lake Eildon has steadily increased from early May 2020, even with a delivery to environmental water holders during spring 2020. Waranga Basin remained close to full (92 per cent) at 15 November 2020.

The seasonal determination in the Goulburn system has gradually increased from the start of the water year to reach 100 per cent HRWS on 16 November 2020. A low risk of spill was declared on 10 August 2020 in the Goulburn system.

Broken System

After multiple years of no opening seasonal determination, the Broken system opened the 2020/21 water year with a seasonal determination of 17 per cent HRWS.

Inflows to Lake Nillahcootie steadily increased through winter and early spring before reaching 100 per cent capacity during early October. The seasonal determinations steadily increased to reach 100 per cent HRWS and 100 per cent LRWS on 15 October 2020.

Campaspe System

The Campaspe system opened the 2020/21 water year with a seasonal determination of 32 per cent. The storage volume increased from early April to reach 46 per cent of capacity by mid-October, with levels dropping during a delivery to the environmental water holders in late September. These storage increases enabled the seasonal determination to increase to 100 per cent on 15 October 2020. A low risk of spill was declared on 10 October 2020 in the Campaspe system.

Loddon and Bullarook Systems

In accordance with the bulk entitlement rules, the Loddon system 2020/21 seasonal determination has increased in line with the Goulburn system from an opening seasonal determination of 35 per cent to 100 per cent at 16 November 2020. Reserves are being established for 2021/22 water requirements.

The Bullarook system is the smallest of the GMW systems with two relatively small annual storages. The Bullarook system opened with a 0 per cent HRWS seasonal determination on 1 July. Rainfall and inflow improvement during winter enabled a seasonal determination of 100 per cent HRWS and 100 per cent LRWS on 1 September 2020.

Ovens System

Despite entitlement holders 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.

Entitlement holders are currently not restricted, as inflows into the system filled Lake William Hovell and Lake Buffalo has been operating under a controlled filling regime. In November, Lake Buffalo gradually filled to capacity as inflows began to reduce. Entitlement holders the Ovens, Buffalo and King rivers currently have access to their spill-reliability entitlements. Access to the spill-reliability entitlements will cease later in the season once the storages commence regulated operations.

Outlook comparison

The outlook for seasonal determinations published on 15 July 2020 (

Table 4) indicated that with average inflows, 100 per cent HRWS was expected to be reached in the Murray, Goulburn, Broken and Loddon systems by mid-February. Based on the storage inflows outlined in Table 1, the seasonal determination increases to 15 October have followed the patterns suggested by the outlook. All systems except the Goulburn and Loddon systems have tracked close to or better than the average inflow scenarios to 15 October 2020. The Goulburn and Loddon systems have tracked between the average and dry scenarios.

Table 4. Outlook for seasonal determinations for 15 October 2020 as published on 15 July 2020

Water System	Inflow Scenario[1]		
	Wet	Average	Dry
Murray	95%	49%	35%
Broken	100%	100%	48%
Goulburn	100%	83%	50%
Campaspe	100%	100%	47%
Loddon	100%	83%	50%
Bullarook	100%	100%	27%

[1] 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

Outlook for remainder of 2020/21

The Bureau of Meteorology's three month outlook for December 2020 to February 2021, issued on 26 November 2020, indicated the chances of exceeding the median rainfall over most of GMW's region range from 60 to 75 per cent (Figure 2).

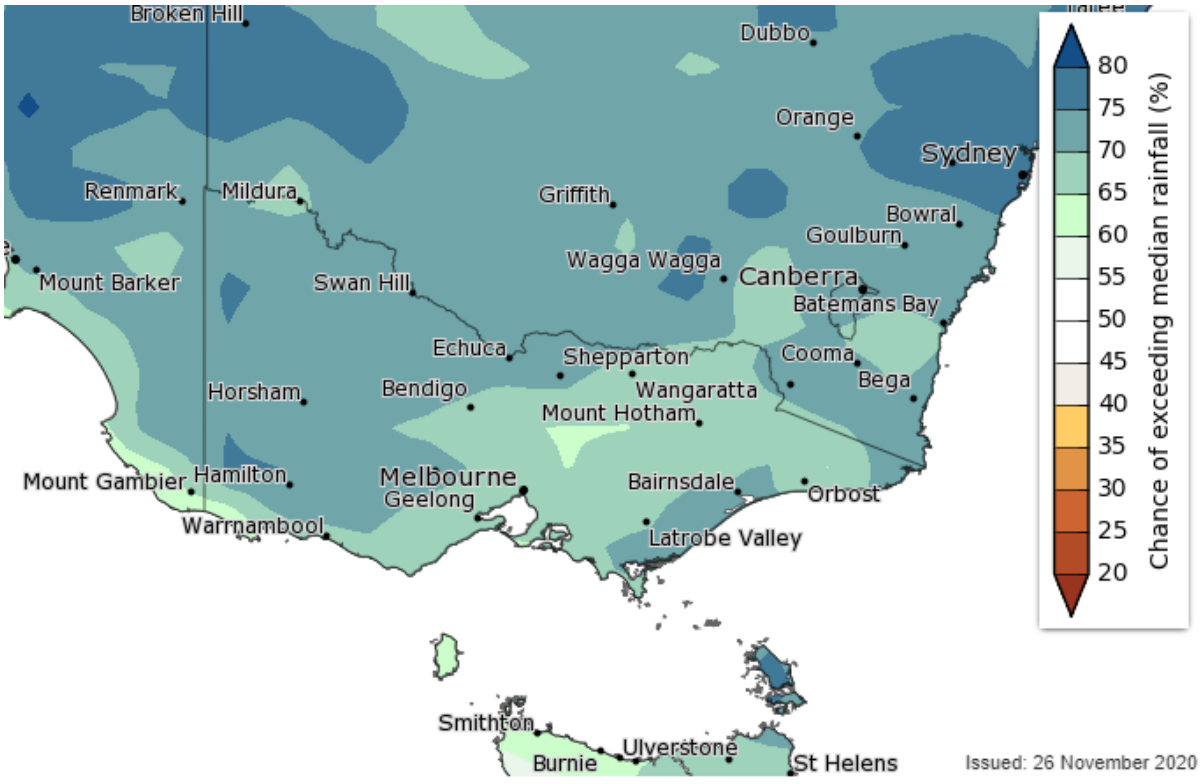

Figure 2. Chance of exceeding median rainfall for the period December 2020 to February 2021 (Source Bureau of Meteorology).

The Bureau of Meteorology's Climate Driver update issued on 24 November said that La Niña conditions continue in the tropical Pacific and international climate models suggest it is likely to continue to at least February 2021.

Temperature and rainfall outlook updates are available from the Bureau of Meteorology website (www.bom.gov.au/climate/ahead/).

Although the historical peak inflow period has passed, catchments remain responsive to rainfall in mid-November, despite showing signs of drying. With the chance of above-average rainfall greater than 50 per cent over summer, further increases in storage levels are possible but storage levels started to decline in November.

Resource improvements in the Murray system will contribute to seasonal determination increases until seasonal determinations reach 100 per cent HRWS. If inflows follow the average outlook scenario, seasonal determinations in the Murray system is expected to reach 100 per cent HRWS by mid-February 2021, at which point further reserves for 2021/22 will be established.

As the seasonal determination in the Goulburn, Campaspe and Loddon systems is 100 per cent HRWS, all resource improvements for the remainder of 2020/21 will go towards establishing reserves for 2021/22. Only when sufficient reserves enable a 100 per cent HRWS seasonal determination in 2021/22 will a seasonal determination against LRWS be made.

Bullarook and Broken entitlement holders have their maximum seasonal determination and will not see any water availability changes for the remaining months of 2020/21.

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 HRWS 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 water year start to be established. After HRWS in the following water year are secured with assumed inflows with a probability of exceedance of 99 per cent, any available water is allocated to low-reliability entitlements.

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

In the Goulburn and Murray systems, the necessary reserves for HRWS in 2021/22 are yet to be established. It is unlikely that a LRWS seasonal determination will be announced in the Murray system or the Goulburn system in 2020/21.

Entitlement holders in the Ovens system may experience restricted diversion access this water year if storage inflows reduce and water from the storages is needed to meet demand before the end of December. History indicates that restrictions are not needed to manage demand when the storages are still at capacity in January.

Irrigation deliveries in the first three months of the 2020/21 irrigation season have been very similar to the same time in 2019/20, which are well below the 10-year average. Weather conditions in the remaining months of the season, as well as any further increases in the Murray seasonal determination and trade opportunities, will dictate how much water is used in 2020/21 and how much is carried over into 2021/22.

Outlook for 2021/22

Reliable long-term weather outlooks for the start of 2021/22 are not available as the Bureau of Meteorology rainfall outlooks only extend for three months. GMW, as Northern Victoria Resource Manager, will release a detailed first outlook for the 2021/22 water year on 15 February 2021 based on historical inflows and update the outlook on 17 May 2021.

Resource improvements in the Goulburn, Campaspe and Loddon systems in the remaining months of 2020/21 will contribute to reserves for 2021/22. Reserves in the Murray will depend on the seasonal determination and if any additional reserves can be established earlier than the last seasonal

determination on 1 April 2021. Low flow contingency measures may only be required for the 2021/22 season in the Bullarook system if conditions turn dry.

Murray System

The seasonal determination in the Murray system is greater than 44 per cent HRWS and the 2021/22 early reserve has been secured. This volume contributes to system operating requirements in 2021/22 to enable delivery of carryover from the start of the season. If average inflow conditions persist into summer, 100 per cent HRWS will be reached by 15 February 2021, enabling an opportunity to establish further reserves for 2021/22. Seasonal determinations in 2021/22 will be available under dry inflow conditions, but are unlikely to reach 100 per cent HRWS. Average inflow conditions should allow seasonal determinations to reach 100 per cent HRWS during spring 2021.

Goulburn System

The 2020/21 seasonal determination in the Goulburn system is greater than 50 per cent HRWS and the 2021/22 early reserve has been secured. With the seasonal determination reaching 100 per cent HRWS, all further resource improvements will go towards 2021/22 water requirements until these are secure, Seasonal determinations in 2021/22 will be available under dry inflow conditions, but are unlikely to reach 100 per cent HRWS. Similar to the Murray system, seasonal determinations could be low if inflows are low but if average inflows are received, seasonal determinations are likely to reach 100 per cent HRWS during spring 2021.

Campaspe System

With the seasonal determination reaching 100 per cent HRWS on 15 October 2020, all further resource improvements will go towards HRWS seasonal determinations for 2021/22 until these are established. With current catchment conditions and the three month climate outlooks, sufficient reserves to operate the system are likely to be established meaning an opening seasonal determination on 1 July 2021 is likely.

Loddon System

About 31 GL has been reserved for operating commitments in 2021/22. If conditions allow, seasonal determinations in the Loddon system will be the same as the Goulburn system in 2021/22. If inflows are insufficient in the Loddon system to maintain the same seasonal determination as the Goulburn system, the Loddon system seasonal determination will be lower than the Goulburn system. Schedule 3 of the Loddon bulk entitlement outlines the relationship between the seasonal determinations in the Goulburn and Loddon systems.

Broken System

The Broken system is an annual system, so 2021/22 reserves will depend on how much water is used this water year and the inflows during the traditional inflow months in winter and spring 2021. Lake Nillahcootie is full and is expected to keep spilling into November. There is currently about 1.4 GL available to support system operations in 2021/22.

Bullarook System

Like the Broken, the Bullarook system is an annual system, so 2021/22 reserves will depend on how much water is used this water year and the inflows during the traditional inflow months in 2021. There is currently about 1,200 ML available to support system operations in 2021/22.

Ovens System

Water availability in the Ovens system depends on weather and streamflows, so it is difficult to determine what water availability will be in 2021/22. Restrictions are unlikely under wet and average inflow conditions, but remain possible under drier scenarios.

Unregulated Systems

Current seasonal conditions

Unregulated streams are monitored in accordance with relevant Local Management Rules (LMRs). Minimum streamflow requirements are outlined in LMRs. A minimum flow requirement of 3 ML/day is applied to streams that do not have a LMR.

If minimum flow requirements are not met, restrictions are put in place (Table 5). Restrictions range from Stage 1 Roster (access to 10 per cent of entitlement every 10 days) to Stage 5 suspension (only diversion for domestic and stock use is permitted). LMRs and the details of rosters and restrictions are available online at www.gmwater.com.au/water-resources/diversions.

Table 5. Current Stage 5 Suspensions on unregulated streams (as at 27 November 2020)

Catchment	Stream	Suspension start date
Broken	Boosey Creek	13 January 2017
Kiewa	None	
Murray Tributaries	Black Dog Creek (Upper) Indigo Creek	26 November 2020 26 November 2020
Mitta Mitta	None	
King	None	
Ovens	None	
Goulburn	None	
Campaspe	Wanalta Creek Cornella Creek Axe Creek Emu Creek McIvor Creek Mt Ida Creek Sheep Wash Creek Stony Creek Sweenies Creek	8 November 2016 21 September 2017 19 November 2020 19 November 2020 18 November 2020 18 November 2020 19 November 2020 24 November 2020 19 November 2020
Loddon	Bet Bet Creek Lake Meran Lawrence Creek Muckleford Creek Yandoit Creek Barkers Creek Coghills Creek Joyces Creek Langdons Creek McCallums Creek	28 October 2019 8 March 2019 16 December 2019 20 November 2020 2 December 2019 20 November 2020 20 November 2020 20 November 2020 20 November 2020 20 November 2020

Outlook for remainder of 2020/21

The Bureau of Meteorology current seasonal streamflow forecast predicts near median streamflows for November to January across the GMW region (www.bom.gov.au/water/ssf/).

The most likely scenario is that the larger streams will not experience restrictions, while smaller tributary streams may experience restrictions.

Upper Murray Catchment

- The Bureau of Meteorology predicts that flows are likely to be near-median and a 70 per cent chance of exceeding median rainfall in the Upper Murray catchment.
- No restrictions are forecast for the main stem of the unregulated Murray River and the Mitta Mitta River above Lake Hume.
- Tributaries may experience restrictions.

Kiewa Catchment

- The Bureau of Meteorology predicts a median flow and around a 65 per cent chance of exceeding median rainfall in the Kiewa catchment.
- Although no restrictions are forecast for the Kiewa main stem, a number of smaller tributaries may experience restrictions

Ovens Catchment

- The Bureau of Meteorology predicts above median flow and around a 65 per cent chance of exceeding median rainfall in the Ovens catchment.
- Restrictions are not likely for the main stem of the Ovens River upstream of Myrtleford
- Restrictions on irrigation is likely for smaller tributaries.

Goulburn Catchment

- The Bureau of Meteorology predicts above median flow and around a 65 to 70 per cent chance of exceeding median rainfall in the Goulburn catchment.
- Tributaries may experience restrictions.

Broken Catchment

- The Bureau of Meteorology predicts above median flow and around 65 per cent chance of exceeding median rainfall in the upper parts of the Broken catchment.
- The Upper Broken River and all tributaries may experience restrictions.

Campaspe Catchment

- The Bureau of Meteorology predicts above median flow and a 65 to 70 per cent chance of exceeding median rainfall in the Campaspe catchment.
- The Upper Campaspe, Coliban and all tributaries are likely to experience restrictions.

Loddon Catchment

- The Bureau of Meteorology predicts a median flow and a 65 to 70 per cent chance of exceeding median rainfall in the Loddon catchment.
- The Loddon River upstream of Cairn Curran Reservoir and most tributaries are expected to experience restrictions.

Outlook for 2021/22

Access to unregulated systems in 2021/22 will depend on weather conditions (Table 6).

Table 6. Unregulated systems outlook for 2021/22

Catchment	Worst on record weather conditions (greater for 95 of 100 years)	Dry weather conditions (greater for 75 out of 100 years)	Average weather conditions (greater for 50 out of 100 years)
Loddon	All streams on suspension	All streams on suspension	All tributaries and the Upper Loddon on restriction or suspension.
Campaspe	All streams on suspension	All streams on suspension	All tributaries and the Upper Campaspe on restriction or suspension.
Goulburn	All minor and major tributaries on restriction or suspension.	All minor tributaries on suspension. All major Goulburn tributaries on restriction	Most minor tributaries on restriction or suspension.
Broken	All streams on suspension.	All minor tributaries on suspension.	All minor tributaries on restriction or suspension.
Ovens	All minor tributaries on suspension. Upper Ovens River and larger tributaries on restriction	All minor tributaries on suspension. Upper Ovens River and major tributaries on restriction	All minor tributaries on restrictions. Tributaries of the Upper Ovens to be on the same level of restriction as the Ovens main stem above Myrtleford. Several smaller tributaries on suspension.
Kiewa	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on restrictions.
Upper Murray	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on restrictions.

Note: worst conditions on record are defined as instream flows that are in 95 years out of 100, dry conditions are greater 75 out of 100 years, 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).

Groundwater

Current seasonal conditions

Currently, groundwater licence holders the Katunga WSPA are on 70 per cent allocation, 75 per cent in the Lower Campaspe WSPA and the Newlyn Zone of the Loddon Highland WSPA are on 75 per cent. The remaining Groundwater Management Units have access to 100 per cent of their entitlement (Table 7).

Table 7. Groundwater allocation for 2020/21

Groundwater Management Unit (GMU)	2020/21 Allocations (% Licensed Volume)
Barnawartha GMA	100%
Broken GMA	100%
Central Victorian Mineral Springs GMA	100%

Eildon GMA	100%
Katunga WSPA	70%
Kiewa GMA	100%
Loddon Highlands WSPA	100% (75% in Newlyn zone)
Lower Campaspe Valley WSPA	75%
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%
Upper Ovens WSPA	100%
West Goulburn GMA	100%

*WSPA = Water Supply Protection Area; GMA = Groundwater Management Area

Outlook for remainder of 2020/21

Allocations for the Newlyn zone of the Loddon Highlands WSPA will be reviewed in mid-December 2020, but it is unlikely that the allocations will increase.

Groundwater use and trading activity is likely to be average in 2020/21 due to the chance of above average rainfall greater than 50 per cent.

Outlook for 2021/22

Groundwater recovery and drawdown levels in northern Victoria are dependent on rainfall recharge and groundwater extraction. Above-average groundwater use in 2019/20, coupled with continued dry conditions in 2019, have resulted in declining groundwater levels in the Loddon and Campaspe catchments, as well as the Katunga WSPA. Groundwater levels in other areas in northern Victoria are stable.

Groundwater levels are likely to stabilise in 2020/21 with the predicted above-median rainfall associated with La Niña providing increased recharge to the aquifers and reduced groundwater extraction. Groundwater levels in the Lower Campaspe Valley WSPA and Katunga WSPA will be closely monitored with the impact of allocations on the resource (Table 8).

Table 8. Groundwater outlook for 2021/22

Catchments	Groundwater Management Unit	Groundwater level outlook	Allocations outlook
Loddon/ Campaspe	Central Victorian Mineral Springs GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Mid Loddon GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Loddon Highlands WSPA	Seasonal drawdown and recovery likely to remain stable	Remain at 100% except in Newlyn zone – 75%;
	Lower Campaspe Valley WSPA	Seasonal drawdown and recovery likely to stabilise	75% allocation for all zones
Goulburn/ Broken/ Mid Murray	Broken GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Eildon GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Katunga WSPA	Seasonal drawdown and recovery likely to stabilise	Remain at 70%
	Mid Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%

	Shepparton Irrigation GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Strathbogie GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	West Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
Kiewa/ Ovens/ Upper Murray	Barnawartha GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Kiewa GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Lower Ovens GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Murray GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Ovens WSPA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%

Surface Water Quality

Current seasonal conditions

During the winter-spring period of 2020, there have been impacts from bushfires on surface water quality and several blue green algae blooms in the GMW region. Two blue green algae blooms resulted in recreational warnings being issued in July 2020 at Tullaroop Reservoir and Lake Eildon. Both warnings were issued due to the presence of widespread scums, although of different species. This is unusual for Lake Eildon, which has had few algae warnings previously (the last in 2011/12). Tullaroop on the other hand regularly experiences algal blooms. A blue green algae warning issued for Lake Eppalock in December 2019 also persisted into winter, but was removed in August 2020. Blue green algae levels in most other storages were very low over winter and remained low into spring.

Widespread bushfires occurred in the north east of Victoria in early 2020 and subsequent rainfall events caused very poor water quality in many streams, with high turbidity and sediment movement being the main impacts observed. Fortunately dissolved oxygen levels were not impaired to any great extent. By the time winter arrived the catchments had started to revegetate and adverse impacts from the fire were reducing. However, significant sediment movement is still being observed when intense rainfall events occur.

Outlook for 2020/21

It is difficult to estimate the likelihood of adverse water quality events occurring over the next 12 months, as there are a range of influential factors and many are weather-dependent. GMW's region also consists of open catchments where a variety of land uses and activities occur around waterways and storages, which have the potential to impact water quality at any time.

Water storage levels currently range between 40 per cent and 100 per cent of full capacity and are not expected to fall to levels low enough to cause any water quality problems prior to winter 2021.

While the GMW region generally experienced below-average winter rainfall in 2020, autumn was much wetter than average and spring rainfall has been variable, so the risk of hypoxic blackwater events occurring over summer and autumn 2020/21 is not considered high.

The likelihood of blue green algae reaching levels that warrant the issuing of recreational warnings cannot be predicted. Elevated blue green algae levels have occurred under a range of weather, storage

level and stream flow scenarios. A number of reservoirs have experienced algae warnings in summer, autumn and winter, and also over a wide range of storage levels. The moderate storage inflows experienced to date in 2020 would have mobilised nutrients from land and sediment, which could in turn promote algal blooms. On the other hand, the chance of higher than average rainfall and runoff due to La Niña could suppress bloom formation.

The occurrence of elevated blue green algae or hypoxic blackwater events is unlikely to affect GMW's supply to rural customers, as the phenomena are not considered harmful to irrigated agriculture (although the impact on stock is unknown). However, both events can impact aquatic life and recreational use of water bodies. Current blue green algae warnings in GMW systems can always be found on our website www.gmwater.com.au/news/bga along with links to further information.

Urban water corporations are generally able to treat water affected by blue green algae to provide safe drinking water, although some types of algae present greater challenges than others.

The impact of the 2020 bushfires in northeast Victoria is expected to continue into 2020/21, in particular the movement of sediment along waterways. While this is not likely to affect storage or channel operations in the short term, it may impact assets such as diverters' pumps and stream gauging sites.

High salinity in water systems is unlikely to occur under the current and expected water resource position.

Information Updates

GMW will update seasonal determinations on the 1st and 15th of each month, or next business day, until all seasonal determination are 100 per cent HRWS. Seasonal determinations will then be updated on the 15th of each month, or next business day.

The first outlook for 2021/22 seasonal determinations will be issued on 15 February 2021. All resource management updates can be located on the Northern Victoria Resource Manager website at www.nvrm.net.au.