

# Katunga Water Supply Protection Area Groundwater Management Plan

Annual Report

For year ending 30 June 2020

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Excellence



Honesty



Accountability



Courage



Caring

# Document History and Distribution

## Versions

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Draft v1	12 August 2020	Suzanne Hayes	Document creation and drafting
Draft v2	24 August 2020	Andrew Harbour	Document review and edits
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## Distribution

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Final	Charmaine Quick Managing Director	23 September 2020	Review and approval
Final	The Hon. Lisa Neville MP Minister for Water	29 September 2020	
Final	Ms Chris Cumming Chief Executive Officer, Goulburn Broken Catchment Management Authority	29 September 2020	

# Foreword

Goulburn-Murray Water (GMW) is pleased to present the annual report for the *Groundwater Management Plan for the Katunga Water Supply Protection Area* (the Plan) for the 2019/20 water year.

GMW is responsible for implementation and administration of the Plan which was approved by the Minister administering the *Water Act 1989* on 24 July 2006.

This report has been prepared in accordance with section 32C of the *Water Act 1989*.

The report provides an overview of the groundwater management activities administered under the Plan, during the 2019/20 water year.

A copy of this report is available for inspection at the Tatura office of GMW, or for download from the GMW website.



Charmaine Quick

MANAGING DIRECTOR

Date: 25/09/2020

# Executive summary

The *Groundwater Management Plan for the Katunga Water Supply Protection Area* (the Plan) was approved on 24 July 2006 by the Minister for Water (the Minister).

In 2017, a consultative committee appointed by the Minister in accordance with section 32G of the *Water Act 1989* (the Act) recommended amendments to the Plan. The Minister approved the amendments on 22 August 2017, including a new method for determining restrictions, simplification of trading rules, salinity monitoring requirements and the establishment of a groundwater reference group.

For the third time since the Plan was implemented in 2006, licence holders had access to 100 per cent of their licensed volume in the 2019/20 water year. This is a result of the new restriction method in the amended version of the Plan.

Recorded use in the 2019/20 water year was 37,837.2 ML, or 63 per cent of the total licence entitlement volume, which is the second highest since the Plan was approved.

There was substantial trade activity in the WSPA during the 2019/20 water year; 40 temporary licence transfers totalling 5,194.2 ML and 16 permanent licence transfers totalling 3,923.8 ML/yr.

Groundwater monitoring and metering programmes continue to support the implementation of the Plan.

Groundwater monitoring shows that aquifer recovery levels rose several metres following the end of the extended dry period in 2009, however the levels are now on a declining trend.

The newly formed Katunga Groundwater Reference Group met for the second time in Cobram on the 19 November 2019.

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# 1 Introduction

## 1.1 Purpose

This report has been prepared to meet the requirements of Prescription 7 of the Groundwater Management Plan for the Katunga Water Supply Protection Area (DSE, 2006) (the Plan) and section 32C of the *Water Act 1989* (the Act).

This report provides an overview of groundwater resource status and summarises the groundwater management activities undertaken in accordance with the Plan during the 2019/20 water year (1 July 2019 to 30 June 2020).

## 1.2 Water Supply Protection Area

The Katunga Water Supply Protection Area (WSPA) is located in the Murray and Goulburn Valleys, extending from Yarrowonga in the east to Barmah in the west, and from the River Murray in the north down to Wunghnu in the south. The WSPA incorporates the townships of Numurkah, Cobram, Nathalia, Katunga and Katamatite.

The WSPA boundary has been set to manage groundwater resources at a depth of greater than 25 metres (m) below the ground surface. The overlying groundwater resources are managed in accordance with the *Shepparton Irrigation Region Groundwater Management Area Local Management Plan*.

There are 3 management zones in the WSPA: North Western Dryland Zone – 1061, Numurkah-Nathalia Zone – 1062 and Cobram Zone –1063, as shown in Figure 1.

## 1.3 Groundwater Management Plan

The Plan, which applies to the management of groundwater resources within the area of the WSPA, was approved on 24 July 2006 by the Minister for Water (the Minister), in accordance with section 32A(6) of the Act.

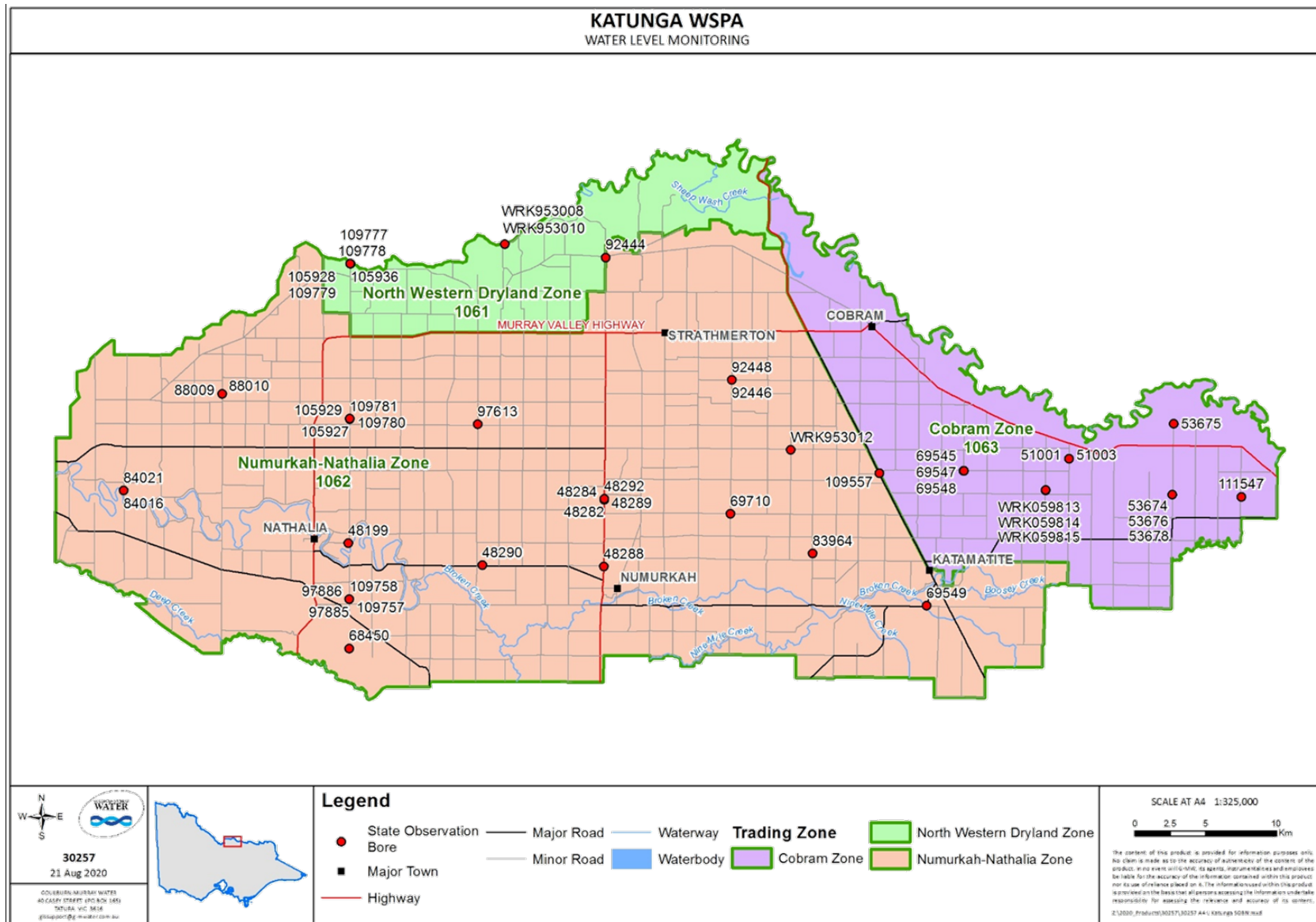
In 2017, a consultative committee appointed by the Minister in accordance with section 32G of the Act recommended amendments to the Plan. The Minister approved the amendments on 22 August 2017, including a new method for determining restrictions, simplification of trading rules, salinity monitoring requirements and establishment of a groundwater reference group.

The objective of the Plan is to make sure the groundwater resources within the WSPA are managed in an equitable and sustainable manner. When allocations are made under the Plan, all groundwater licence holders in the WSPA are treated in the same manner.

The Plan enables annual allocations to be set to manage groundwater extraction. The intent of the annual allocation process is to maintain groundwater access for groundwater users.

GMW is responsible for the implementation, administration and enforcement of the Plan. An assessment summary of GMW's activities in accordance with Plan prescriptions is presented in Appendix A.

A copy of the Plan can be downloaded from the GMW website: [www.gmwater.com.au](http://www.gmwater.com.au)



**Figure 1 Katunga Water Supply Protection Area**

## 2 Groundwater Management

### 2.1 Licence entitlement volume

The Minister declared a permissible consumptive volume of 60,577 megalitres per year (ML/yr) for the WSPA in March 2013 (Victorian Government, 2013).

At 30 June 2020 the total licence entitlement volume in the WSPA was 60,202.9 ML/yr. This has remained unchanged since 30 June 2019. The number of licences in each management zone is summarised in Table 1, as well as the total number of licensed bores and the total licence entitlement volume.

**Table 1 Groundwater licences in the Katunga WSPA in 2019/20**

Management zone	Licences	Licensed bores	Licence entitlement volume (ML/yr)
North Western Dryland Zone – 1061	21	23	5,024.2
Numurkah-Nathalia Zone – 1062	176	197	34,138.7
Cobram Zone – 1063	68	82	21,040.0
<b>Total</b>	<b>265</b>	<b>302</b>	<b>60,202.9</b>

Note: Data extracted from the Victorian Water Register on 1 July 2020.

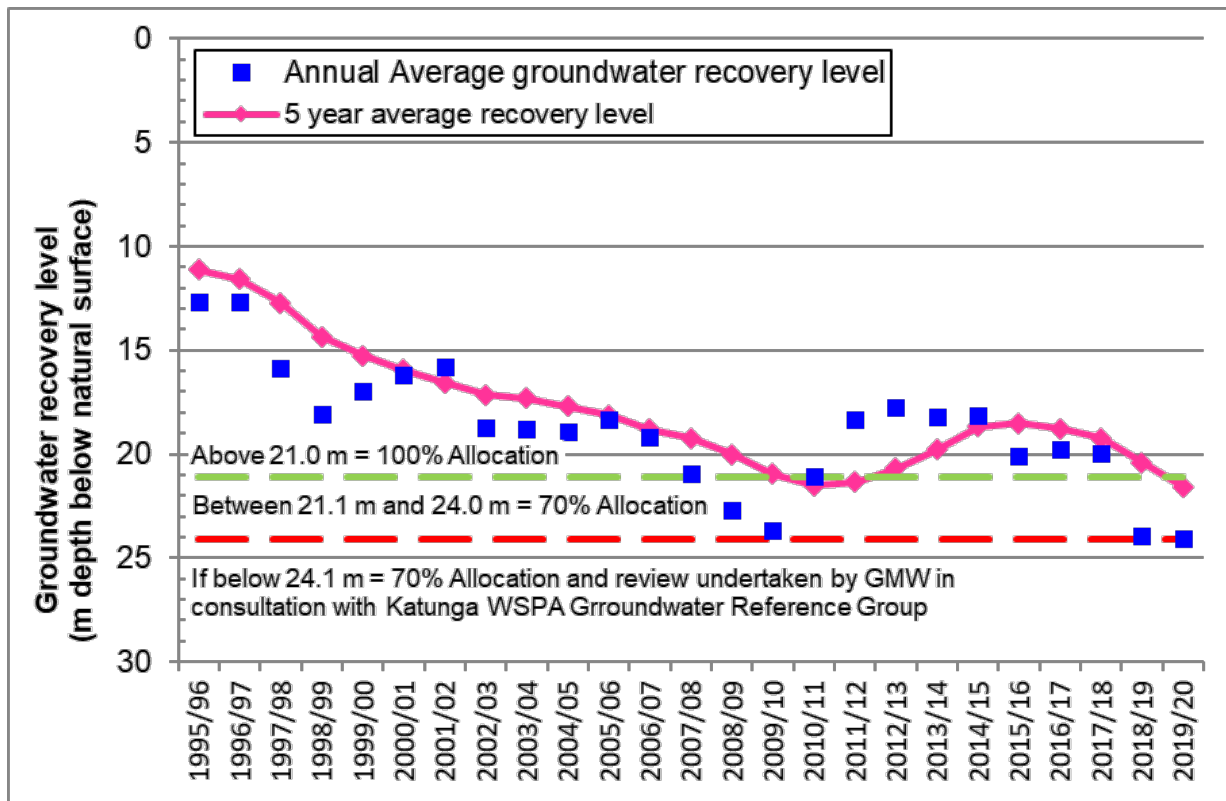
### 2.2 Groundwater allocations

Following amendments to the Plan in 2017, the method for determining annual groundwater allocations was revised – refer Prescription 2 of the Plan. Allocations are now assessed by calculating the average of annual maximum groundwater recovery levels for 7 key monitoring bores (listed in Schedule 1 of the Plan), from the previous 5 water years (i.e. a 5-year rolling average). The allocation is determined by comparing the 5-year rolling average of recovery levels to the trigger levels listed in Table 2, and illustrated on Figure 2.

**Table 2 Trigger levels to determined annual allocations in the Katunga WSPA**

Trigger level, depth below natural surface (m)	Allocation
21.0 and above	100%
21.1 to 24.0	70%
Below 24.1	70%, and review undertaken by GMW, in consultation with Katunga Groundwater Reference Group





**Figure 2 Trigger levels to determine allocations in the Katunga WSPA**

Table 3 presents the maximum recovery levels of each of the 7 key monitoring bores over the last 6 water years, the average of those maximum levels for each water year, and the 5-year average for 2018/19 and 2019/20 which were used to determine the allocations for 2019/20 and 2020/21 water years, respectively.

All monitoring records for these 7 bores are provided in Appendix B.

**Table 3 Calculation of 5-year rolling averages from maximum recovery levels for key monitoring bores in the Katunga WSPA**

Bore ID	Bore screen depth (m)	Maximum recovery level by water year; depth below natural surface (m)					
		2014/15	2015/16	2016/18	2017/18	2018/19	2019/20
48282	118-133	13.71	19.78	21.34	20.47	20.55	22.74
51001	100-118	20.00	21.41	20.17	20.41	28.53	27.18
69545	109-111	18.06	19.18	18.36	19.50	24.26	23.34
69710	122-124	18.63	19.89	19.43	19.64	23.96	24.05
83964	112-114	20.47	21.94	21.21	21.38	25.24	24.57
92446	134-135	18.68	20.15	19.50	19.92	23.83	24.09
97613	177-137	17.31	18.50	18.50	18.60	21.39	22.30
<b>Average of maximum recovery levels:</b>		<b>18.12</b>	<b>20.12</b>	<b>19.79</b>	<b>19.99</b>	<b>23.97</b>	<b>24.04</b>
<b>5-year rolling average of maximum recovery levels:</b>						<b>20.40</b>	<b>21.58</b>

### 2019/20 allocation

GMW determined an allocation of 100 per cent for the 2019/20 water year, as the average of annual recovery levels for the previous 5 years (2014/15 to 2018/19) was 20.40 m (depth below natural surface) which was above the 21.0 m trigger level as shown in Figure 2 and Table 3.

### 2020/21 allocation

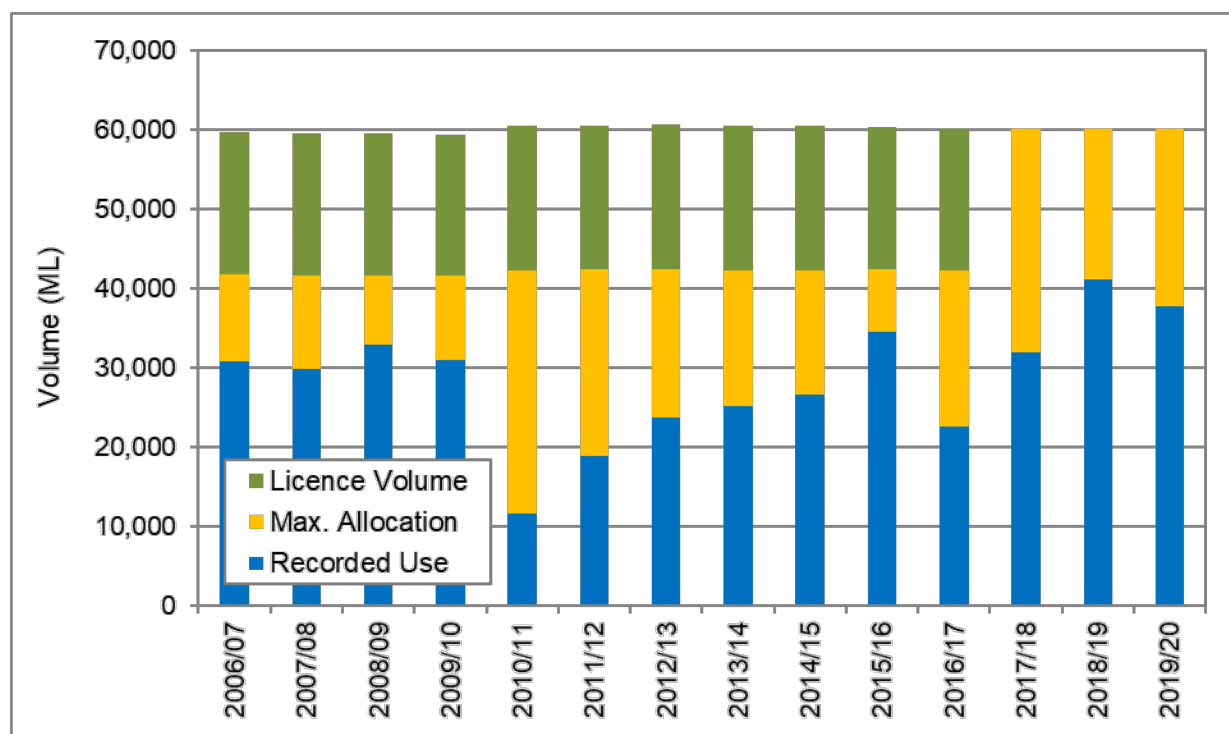
GMW determined an allocation of 70 per cent for the 2020/21 water year in the WSPA. The allocation was formally announced on 23 June 2020 by publication on GMW's website, advertisement in local newspapers (*Shepparton News* and *Country News*), and sending letters to licence holders in the WSPA.

The 5-year rolling average of maximum recovery levels for the 7 key monitoring bores was 21.58 m (depth below natural surface) in the 2019/20 water year, which is above the 24.0 m trigger level but below the 21.0 m trigger level. This is a 1.18 m decrease since 2018/19.

## 2.3 Groundwater use

Total recorded use in the WSPA in 2019/20 was 37,837.2 ML, or 63 per cent of the total licence entitlement volume (Figure 3). This is a 5 per cent decrease on the volume used in 2018/19. The small decrease in use compared to 2018/19 is likely due to increased rainfall received in March and April 2020.

Note: recorded use refers to metered and deemed use.



**Figure 3 Total licence entitlement volume, allocation and recorded use in the Katunga WSPA**

Recorded use by management zone is provided in Table 4. Recorded use as a percentage of total licence entitlement volume was greatest in the Numurkah-Nathalia Zone (65 per cent) and lowest in the North Western Dryland Zone (48 per cent).

**Table 4 Recorded use in the Katunga WSPA in 2019/20**

Management zone	Licensed volume (ML/yr)	Recorded use (ML)	Proportion of total licensed volume used
North Western Dryland Zone – 1061	5,024.2	2,400.3	48%
Numurkah-Nathalia Zone – 1062	34,138.7	22,071.1	65%
Cobram Zone – 1063	21,040.0	13,365.8	64%
<b>Total</b>	<b>60,202.9</b>	<b>37,837.2</b>	<b>63%</b>

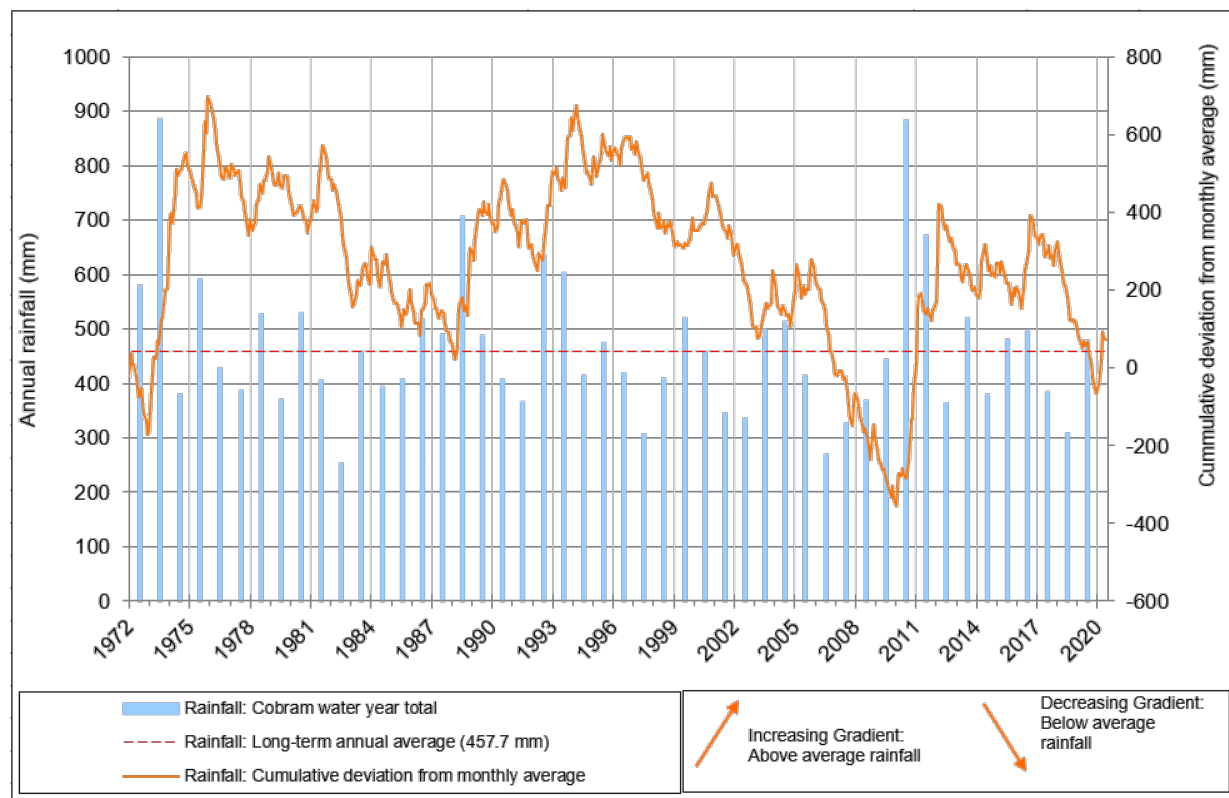
Note: Data extracted from Irrigation Planning Module on 30 July 2020.

Groundwater use in the WSPA is heavily influenced by weather, as well as the availability and price of surface water, particularly in the Goulburn and Murray Declared Water Systems. Groundwater use increases during extended periods of dry weather and when surface water allocations are low.

## 2.4 Rainfall

Historical rainfall data, sourced from the Bureau of Meteorology weather station at Cobram (BOM, 2020), is presented in Figure 4 as an indicator of trends across the WSPA.

The data show that 2019/20 rainfall in the WSPA was slightly above the long-term average of 468.8 mm. Notably, rainfall from January to April 2020 (inclusive) was well above average.

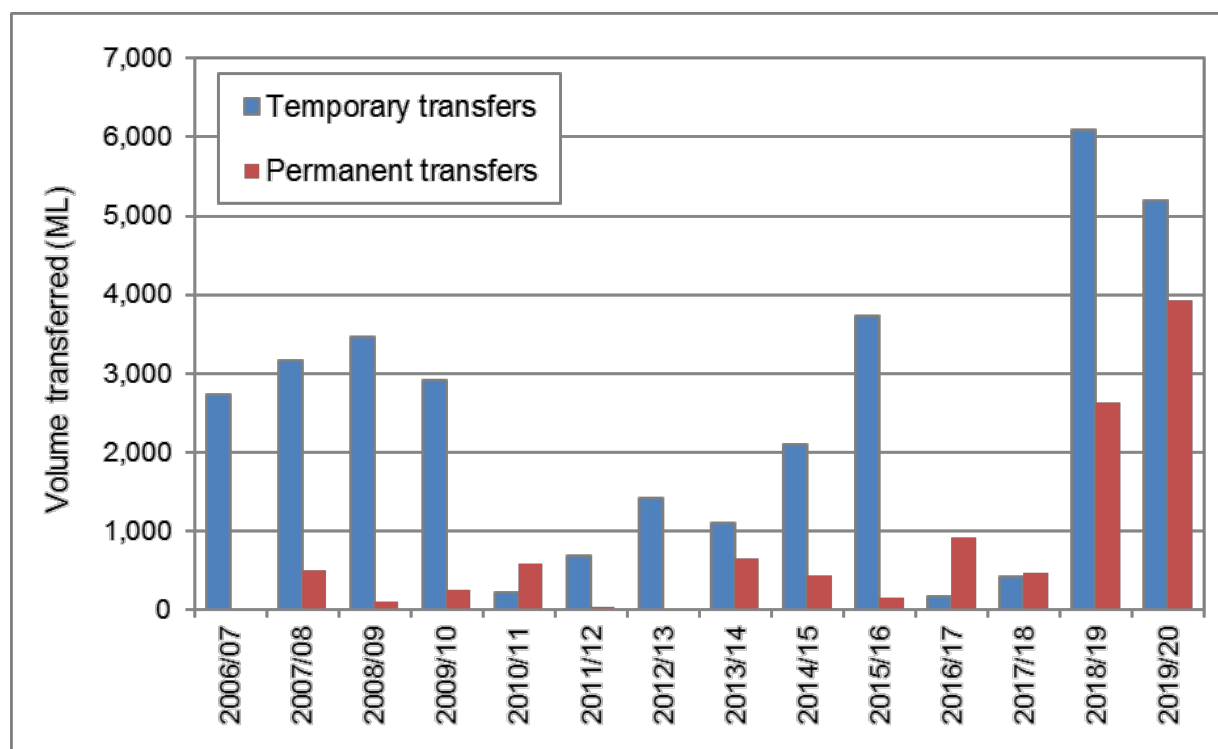


**Figure 4 Rainfall recorded at Cobram in the Katunga WSPA (BOM, 2020)**

## 2.5 Licence transfers

The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement volume. Groundwater licence transfer activity for 2019/20 compared with previous water years is

summarised in Figure 5. A detailed breakdown of licence transfer activity by management zone is provided in Table 5.



**Figure 5 Total licence entitlement volumes transferred in the Katunga WSPA**

**Table 5 Licence transfers in the Katunga WSPA in 2019/20**

Management zone	Temporary transfers				Permanent transfers			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfers	Volume (ML)	No. of transfers	Volume (ML)	No. of transfers	Volume (ML/yr)	No. of transfers	Volume (ML/yr)
Northwest Dryland Zone – 1061	1	100.0	-	-	1	200.0	2	400.0
Numurkah-Nathalia Zone – 1062	25	2,988.2	34	4,552.2	14	3,223.8	12	2,373.8
Cobram Zone – 1063	14	2,106.0	6	642	1	500.0	2	1,150.0
<b>Total</b>	<b>40</b>	<b>5,194.2</b>	<b>40</b>	<b>5,194.2</b>	<b>16</b>	<b>3,923.8</b>	<b>16</b>	<b>3,923.8</b>

During the 2019/20 water year there were 16 permanent transfers, totalling 3,923.8 ML/yr (Table 5). This is 1,290.8 ML/yr more than the total for 2018/19 and the largest since the Plan has been implemented (Figure 5).

Forty temporary transfers totalling 5,194.2 ML occurred in 2019/20 (Table 5). This is 899.3 ML less than the total in 2018/19, but significantly higher than other water years prior (Figure 5).

The 2017 amendments to the Plan relaxed trading rules by allowing new development through temporary transfers and removing the 20 per cent transfer to the environment that was applied to permanent transfers.

Rules were also introduced that allowed additional temporary transfer into areas which would previously have been refused under the original version of the Plan. These rules included the ability to temporarily transfer up to 125 per cent of licence entitlement volume into areas where the intensity of entitlement would otherwise prevent such trade. It is likely that the amended trading rules have contributed to improved confidence in the use of transfers to improve or maintain productivity in the 2019/20 water year.

## 2.6 Metering

There were 198 metered service points and 103 deemed service points in the WSPA at 30 June 2020. All metered service points were read twice during 2019/20 and 53 meter-related activities were undertaken, including inspections, maintenance, battery replacements and new installations (Table 6).

**Table 6 Metering activities in the Katunga WSPA in 2019/20**

Metering activity	Year ending 30 June 2020
Total number of meters	198
Total number of meter reads	396
Meters installed or replaced	2
Meters inspection events	0
Meter maintenance events	51

## 2.7 Licence compliance

There were no prosecutions or convictions relating to groundwater matters in the WSPA during the 2019/20 water year.

There were ten instances of alleged overuse (i.e. licence entitlement volume exceedance) in 2019/20. These incidents are being investigated and GMW will take action in accordance with GMW's Risk-Based Compliance and Enforcement Framework.

## 2.8 Domestic and stock bore licences

Domestic and stock use is not required to be licensed as it is a private right under section 8 of the Act, provided that water is used in accordance with the constraints imposed by the Act.

The installation of a bore for domestic and stock use requires a bore construction licence, in accordance with section 67 of the Act. Upon completion of a bore, a bore completion report is required to be submitted to GMW and details are recorded in the Victorian state groundwater database, referred to as the Water Measurement Information System.

During the 2019/20 water year in the WSPA, 54 licences to construct a bore for domestic and stock use were issued by GMW and the Victorian Water Register (combined). Fifty bore completion reports were received and processed by GMW.

# 3 Monitoring Program

## 3.1 Groundwater levels

The Plan requires that groundwater levels are monitored in 7 State Observation Bores Network (SOBN) bores, specified in Schedule 1 of the Plan. The SOBN bores that were routinely monitored in the WSPA during the 2019/20 water year are shown in Figure 1 and hydrographs of the monitoring data are provided in Appendix B.

Monitoring data indicate that Deep Lead (comprising the Calivil Formation and the Lower Shepparton Formation) groundwater levels have steadily declined as groundwater development increased from 1990 onwards. This is represented by historical water levels in 3 nested bores on Langan Road in Katamatite (Figure 6). Drawdown levels in some bores have reached record lows during 2019/20, with maximum recovery levels to 30 June 2020 also remaining low.

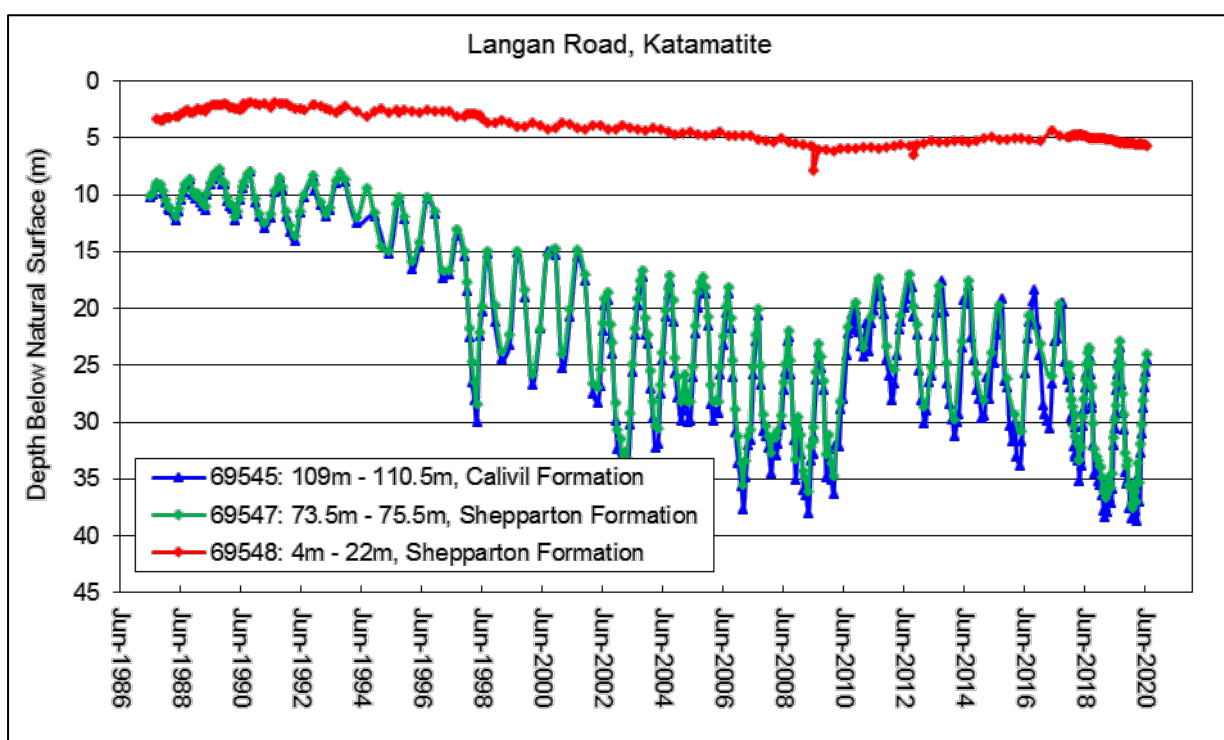


Figure 6 Groundwater monitoring in the Cobram Zone at Katamatite – June 1986 to June 2020 (DELWP, 2020)

## 3.2 Groundwater quality

The amended Plan requires GMW to sample bores specified in Schedule 1 of the Plan and have samples analysed for salinity once a year (Prescription 5). Locations of bores sampled are shown in Figure 1. Salinity measured in these bores is uploaded to the State groundwater database, the Water Management Information System. Sampling results from October 2019 are shown in Table 7 and the full suite of results are presented in Appendix C.

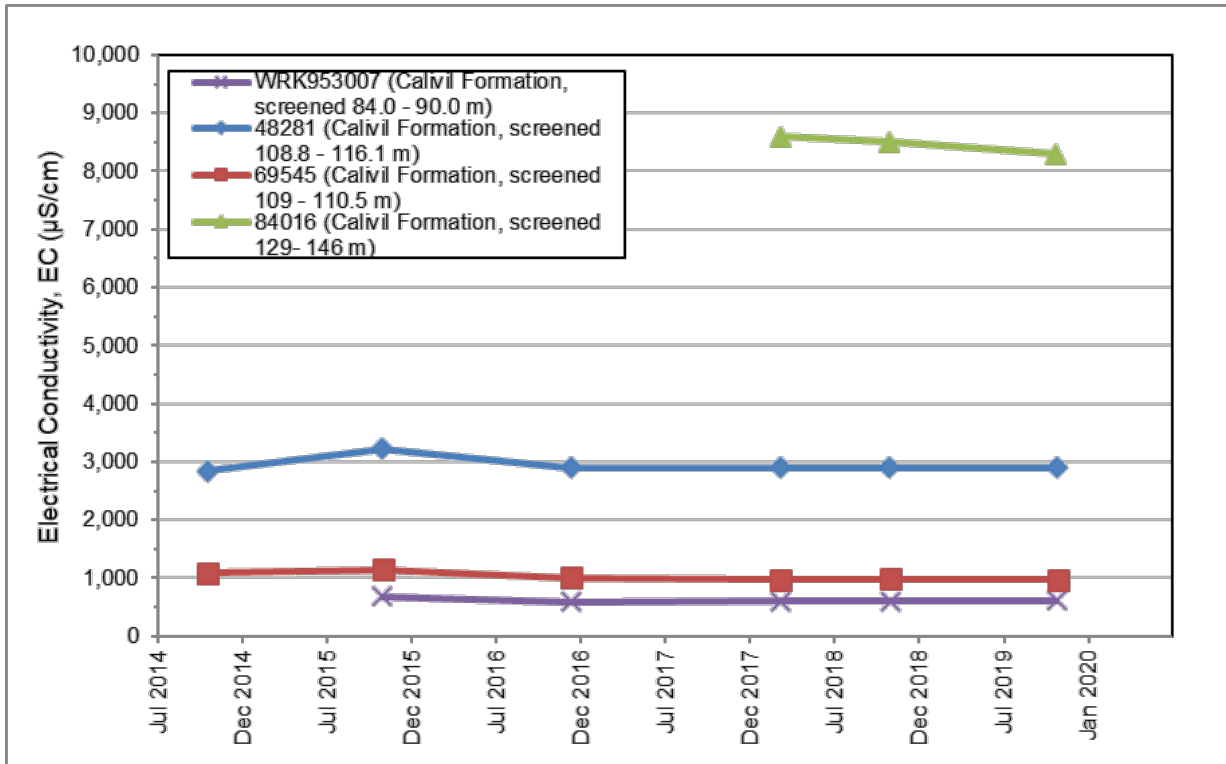
**Table 7 Groundwater salinity results for bores sampled during 2019/20 in the Katunga WSPA**

Management zone	Location	Bore ID	Depth of screened interval (m)	Aquifer screened	Salinity, as electrical conductivity (µS/cm)
North Western Dryland Zone – 1061	River Road, Barmah National Park	WRK953007	84 – 90	Calivil Formation	610
		WRK953008	36 – 39	Shepparton Formation	610
Numurkah-Nathalia Zone – 1062	Goulburn Valley Highway, Numurkah	48281	109 – 116	Calivil Formation	2,900
		48288	10 – 16	Shepparton Formation	3,000
	James Bridge Road, Picola	84016	129 – 146	Calivil Formation	8,300
		84021	4.5 – 14.5	Shepparton Formation	24,000
Cobram Zone – 1063	Langan Road, Katamatite	69545	109 – 110.5	Calivil Formation	970
		69547	73.5 – 75.5	Lower Shepparton Formation	290
		69548	4 – 22	Shepparton Formation	370

Time series groundwater salinity results in the Calivil Formation aquifer, presented in Figure 7, indicate that groundwater salinity levels have not changed much over the last 6 years, with the exception of 84016 which has had a small decline in salinity over the last 3 years. Ongoing comparisons of trends across a number of water years will be made in subsequent annual reports when more groundwater quality sampling is available.

Additionally, the Plan requires GMW to provide a sample bottle to any groundwater user in WSPA who requests one and to test the salinity level of returned samples. In 2019/20 no requests for sample bottles were received for the WSPA.

Domestic and stock groundwater users are also encouraged to submit a salinity sample from their groundwater bore. In accordance with the Plan, a user must contact GMW to register interest to be supplied with a sample bottle.



**Figure 7 Salinity of groundwater in Calivil Formation monitoring bores in the Katunga WSPA (DELWP, 2020)**



# 4 Administration and Engagement

## 4.1 Groundwater Reference Group

GMW appointed a Groundwater Reference Group comprising landholders and representatives from GMW, Goulburn Valley Water and the Goulburn Broken Catchment Management Authority.

GMW met with the Groundwater Reference Group in Cobram on 19 November 2019.

Key points of discussion included:

- Actions from last meeting discussed
- Resource condition
- 2019/20 allocation and outlooks
- Plan implementation

Meeting actions comprised:

- Change the wording used in *Figure 2- Trigger levels used to determine allocations in the WSPA* from 'Average' to 'Annual Average' in the future annual reports.
- Publish actual recovery levels in future annual reports.

## 4.2 Plan review

GMW will meet with the Groundwater Reference Group in September 2020 to present a summary of the 2019/20 water year and discuss any need to review the Plan.

## 5 References

Bureau of Meteorology (BOM), 2020. *Climate Data Online – Cobram station number 080109*. Retrieved on August 2020 from:

[http://www.bom.gov.au/jsp/ncc/cdio/wData/wdata?p\\_nccObsCode=139&p\\_display\\_type=dataFile&p\\_stn\\_num=080109](http://www.bom.gov.au/jsp/ncc/cdio/wData/wdata?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=080109)

Victorian Department of Environment, Land, Water and Planning (DELWP), 2020. *Water Measurement Information System*. Data retrieved in August 2020 from: <https://data.water.vic.gov.au>

Victorian Department of Sustainability and Environment (DSE), 2006. *Groundwater Management Plan for the Katunga Water Supply Protection Area*. Consolidated version incorporating amendment made in 2017. Department of Sustainability and Environment, Melbourne.

Victorian Government, 2013. *Victorian Government Gazette No. G10 Thursday 7 March 2013*. Victoria State Government, Melbourne

*Water Act 1989* (Vic), viewed 30 June 2020,  
[http://classic.austlii.edu.au/au/legis/vic/consol\\_act/wa198983/](http://classic.austlii.edu.au/au/legis/vic/consol_act/wa198983/)

# Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant								
<b>PRESCRIPTION 1 Limit on groundwater licences</b>										
<p>GMW must not approve an application for a groundwater licence if the approval of the application would cause:</p> <p>a) the total licensed volume within a 2 km radius of the proposed extraction site exceeding 3,700 ML/year; or</p> <p>b) the following zone limits to be exceeded.</p> <table border="1" data-bbox="264 512 1131 692"> <thead> <tr> <th>Management zone</th> <th>Zone limit (ML/year)</th> </tr> </thead> <tbody> <tr> <td>North Western Dryland Zone (1061)</td> <td>6,500</td> </tr> <tr> <td>Numurkah-Nathalia Zone (1062)</td> <td>No limit</td> </tr> <tr> <td>Cobram Zone (1063)</td> <td>25,000</td> </tr> </tbody> </table>	Management zone	Zone limit (ML/year)	North Western Dryland Zone (1061)	6,500	Numurkah-Nathalia Zone (1062)	No limit	Cobram Zone (1063)	25,000	<p>No applications were approved that contravened Prescription 1.</p>	<p>Yes</p>
Management zone	Zone limit (ML/year)									
North Western Dryland Zone (1061)	6,500									
Numurkah-Nathalia Zone (1062)	No limit									
Cobram Zone (1063)	25,000									
<b>PRESCRIPTION 2: Restrictions on taking groundwater</b>										
<p>By 15 September 2017, and by 1 July each year thereafter GMW will:</p> <p>a) determine the rolling average of the maximum annual groundwater recovery levels from the preceding 5 irrigation years for bores listed in Schedule 1 and announce a corresponding allocation for the subsequent irrigation season as detailed below:</p> <table border="1" data-bbox="264 919 1131 1171"> <thead> <tr> <th>Trigger level depth below natural surface (m)</th> <th>Allocation</th> </tr> </thead> <tbody> <tr> <td>21.0 and above</td> <td>100%</td> </tr> <tr> <td>21.1 to 24.0</td> <td>70%</td> </tr> <tr> <td>Below 24.1</td> <td>70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group</td> </tr> </tbody> </table> <p>b) Announce allocations by listing them on its website, sending letters to all licence holders and placing public notices in local newspapers</p>	Trigger level depth below natural surface (m)	Allocation	21.0 and above	100%	21.1 to 24.0	70%	Below 24.1	70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group	<p>a) Allocations were determined in accordance with the Plan methodology and a 100 per cent allocation was announced on 28 June 2019.</p> <p>b) All licence holders were informed by mail posted on 27 June 2019. Allocation information was also published on the GMW website and Public notices announcing the revised 2019/20 allocation were printed in the <i>Shepparton News</i> and <i>Country News</i>.</p>	<p>Yes</p>
Trigger level depth below natural surface (m)	Allocation									
21.0 and above	100%									
21.1 to 24.0	70%									
Below 24.1	70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group									

Prescription	Activity	Compliant
<b>PRESCRIPTION 3 Transfer of a groundwater licence</b>		
<p><b>3.1</b> GMW may approve a permanent transfer of a groundwater licence provided relevant matters have been considered and:</p> <ul style="list-style-type: none"> <li>a) zone limits in Prescription 1 will not be exceeded; and</li> <li>b) the total licensed volume within 2 km of an applicant's bore will be less than 3,700 ML/year; or</li> <li>c) where the total licensed volume within 2 km of an applicant's bore is equal to or greater than 3,700 ML/year, the permanent transfer is from other licence holders within a 2 km radius of the applicant's bore.</li> </ul>	All applications were assessed with regard to this prescription.	Yes
<p><b>3.2</b> GMW may approve a temporary transfer of a groundwater licence provided relevant matters have been considered and:</p> <ul style="list-style-type: none"> <li>a) zone limits in Prescription 1 will not be exceeded; and</li> <li>b) the total licensed volume within 2 km of an applicant's bore will be less than 3,700 ML/year; or</li> <li>c) where the total licensed volume within 2 km of an applicant's bore is equal to or greater than 3,700 ML/year – <ul style="list-style-type: none"> <li>i. the applicant's licensed volume in one water season will not exceed 125% of their permanent licensed volume prior to any temporary trade occurring; or</li> <li>ii. the temporary transfer is from other licence holders within a 2 km radius of the applicant's bore</li> </ul> </li> </ul>	All applications were assessed with regard to this prescription.	Yes
<b>PRESCRIPTION 4 Metering of licensed take</b>		
<p><b>4.1</b> GMW will:</p> <ul style="list-style-type: none"> <li>a) ensure that a meter is fitted to new licensed bores;</li> <li>b) read each meter at least once a year and record take in appropriate database(s); and</li> <li>c) if GMW is unable to measure the volume of water taken through a meter it may: <ul style="list-style-type: none"> <li>i. make an estimate of take; or</li> <li>ii. request the licence holder to provide a meter reading</li> </ul> </li> </ul>	All new bores metered. Meter readings recorded once annually.	Yes

Prescription	Activity	Compliant
<b>PRESCRIPTION 5 Groundwater level monitoring</b>		
<p><b>5.1</b> GMW will:</p> <ul style="list-style-type: none"> <li>a) obtain groundwater levels from bores used for allocation assessments (listed in Schedule 1) on a monthly basis. If a bore used for allocation assessments becomes defective an alternative bore may be monitored and the defective bore should be decommissioned. The alternative bore will be selected by consensus between DELWP and GMW.</li> <li>b) undertake water level monitoring at appropriate locations throughout the Katunga WSPA to: <ul style="list-style-type: none"> <li>i. assess annual and long-term impact on water levels from groundwater pumping;</li> <li>ii. monitor regional and local seasonal drawdown; and</li> <li>iii. monitor the impacts of groundwater pumping generally across the Katunga WSPA and in areas of high intensity groundwater pumping.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>a) Groundwater levels for allocation assessments are being obtained on a monthly basis.</li> <li>b) Water level monitoring is undertaken at appropriate locations in Katunga Water Supply Protection Area.</li> </ul>	Yes
<p><b>5.2</b> DELWP will manage the State observation bore network so that:</p> <ul style="list-style-type: none"> <li>a) continuous regional baseline monitoring is maintained to provide sufficient information to identify changes in groundwater resource availability and condition;</li> <li>b) State observation bores are properly maintained; and</li> <li>c) data collected from the bores is entered into the groundwater database, within 30 days after it has been collected.</li> </ul>	<ul style="list-style-type: none"> <li>a) Baseline monitoring is being supported by DELWP.</li> <li>b) State observation bores are maintained by DELWP. Data collected from the bores is entered into the groundwater database by DELWP.</li> </ul>	Yes
<b>PRESCRIPTION 6 Groundwater salinity monitoring</b>		
<p><b>6.1</b> GMW must:</p> <ul style="list-style-type: none"> <li>a) sample bores specified in Schedule 1 and have the samples analysed at an accredited laboratory for salinity once a year;</li> <li>b) enter salinity measured in bores referred to in Schedule 1 to the State groundwater database; and</li> <li>c) provide a sample bottle to any groundwater user in the Katunga WSPA who requests 1, test the salinity level of returned samples and provide the results to the groundwater user.</li> </ul>	<ul style="list-style-type: none"> <li>a) Bores specified in Schedule 1 were sampled and analysed for salinity in October 2019.</li> <li>b) Salinity results were entered into the State groundwater database.</li> <li>c) No groundwater users in the WSPA requested a sample bottle in 2019/20.</li> </ul>	Yes
<b>PRESCRIPTION 7 Annual reporting</b>		
<p>By 30 September each year GMW will prepare an annual report on the enforcement and administration of the Plan. The report will be provided to the Minister and the Goulburn Broken Catchment Management Authority and made publicly available on GMW's website.</p>	<p>An annual report was prepared by GMW and provided to the Minister and the Goulburn Broken Catchment Management Authority on 26 September 2019.</p> <p>The annual report was also published on GMW's website.</p>	Yes

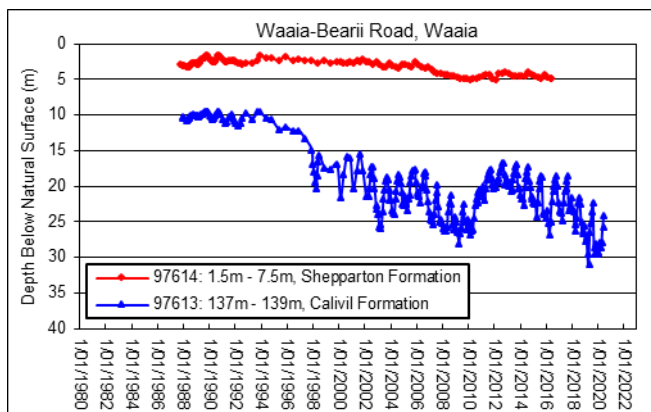
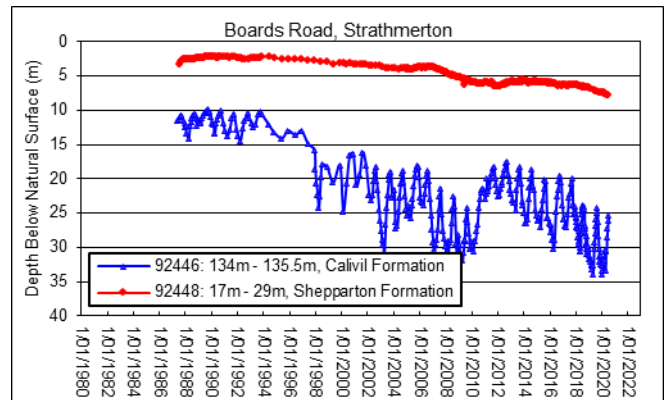
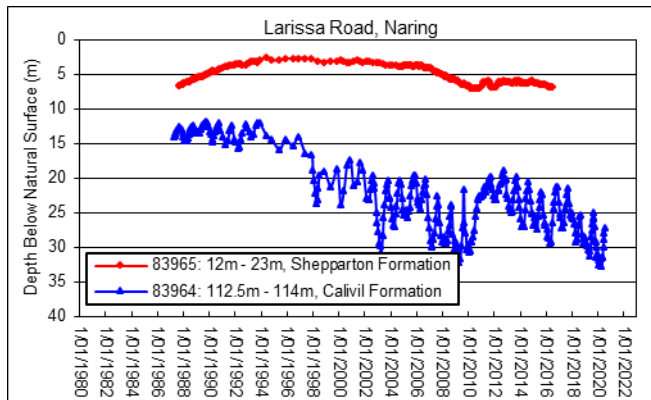
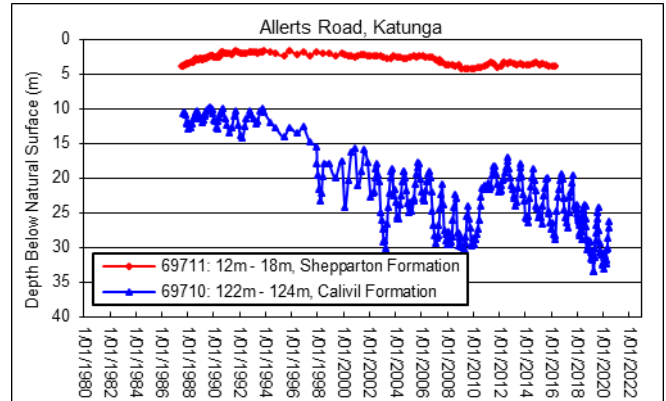
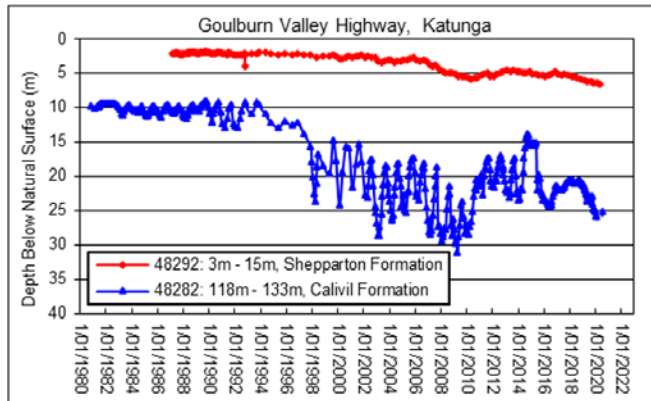
# Appendix B – Groundwater level data

## Schedule 1 bores

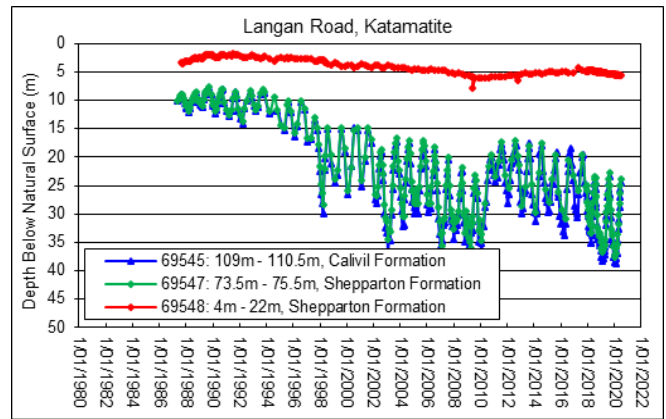
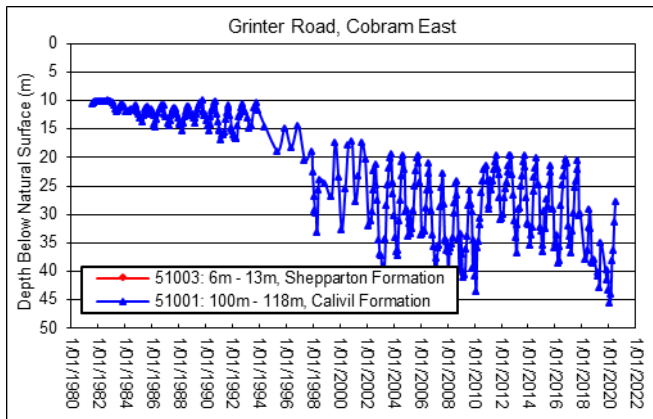
Hydrographs are provided for key monitoring bores listed in Schedule 1 of the Plan. All data is sourced from the Water Measurement Information System (DELWP, 2020). Note: monitoring of some bores has ceased.

Further groundwater level information is available on the Water Measurement Information System at <https://data.water.vic.gov.au>

### Numurkah-Nathalia Zone – 1062



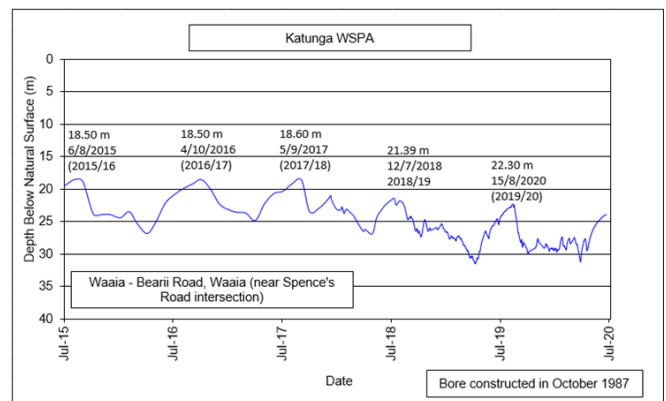
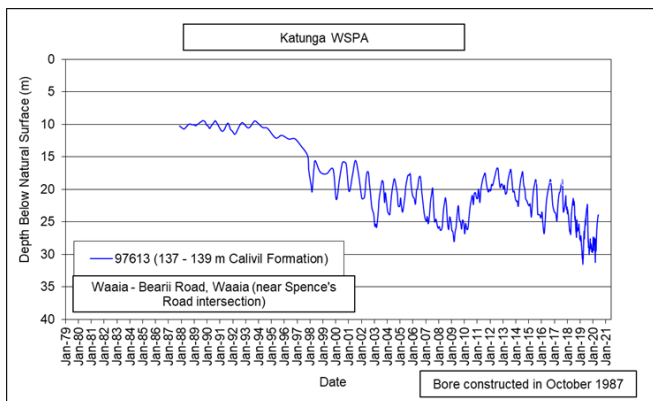
## Cobram Zone – 1063



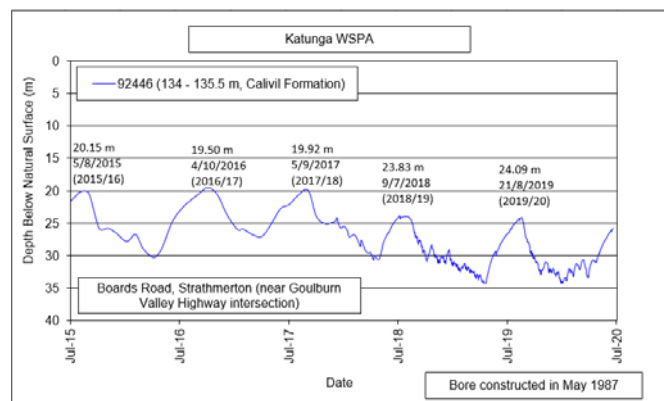
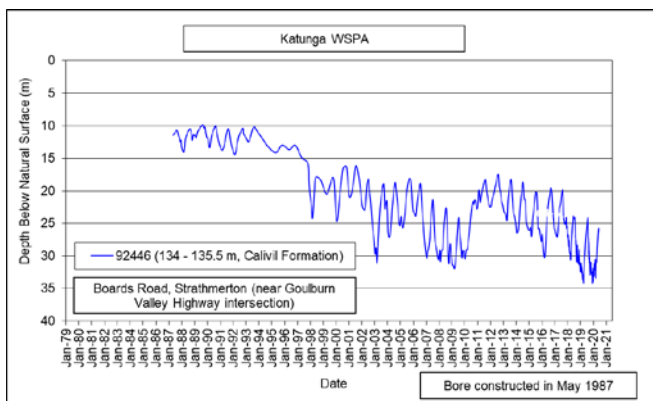
## Allocation assessment bore levels

The 2020/21 allocations were determined using the 7 SOBNI trigger bores listed Schedule 1 of the Plan. The available data used for this determination (to 23 June 2020) are shown in the hydrographs below. The hydrographs on the left side of each row show the full monitoring record for the allocation trigger bore and the hydrographs on the right show the last 5 years only.

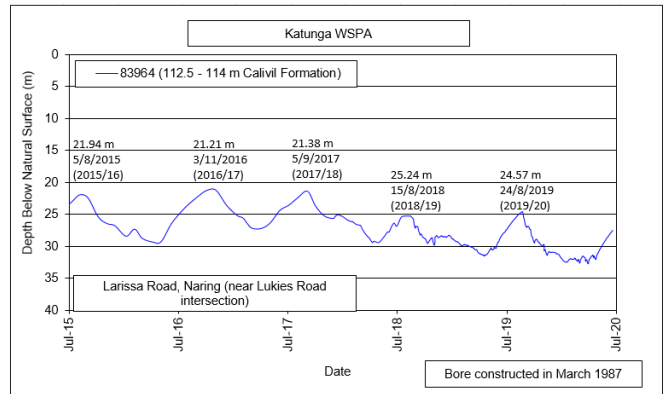
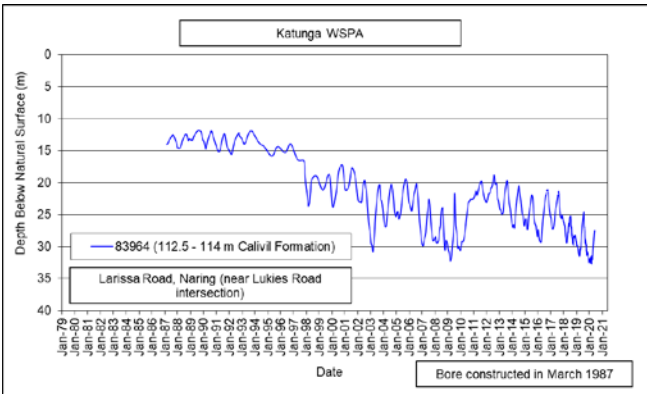
### Bore 97613



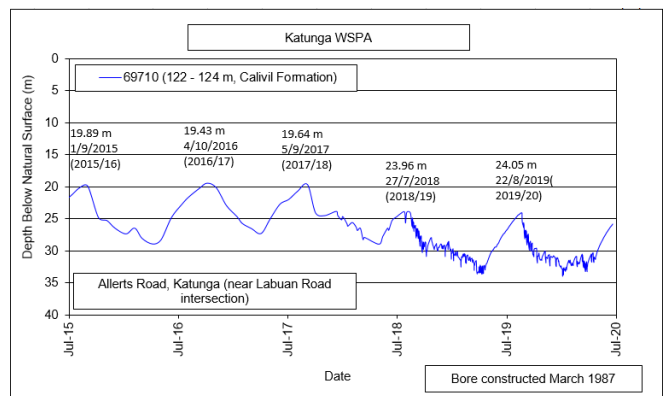
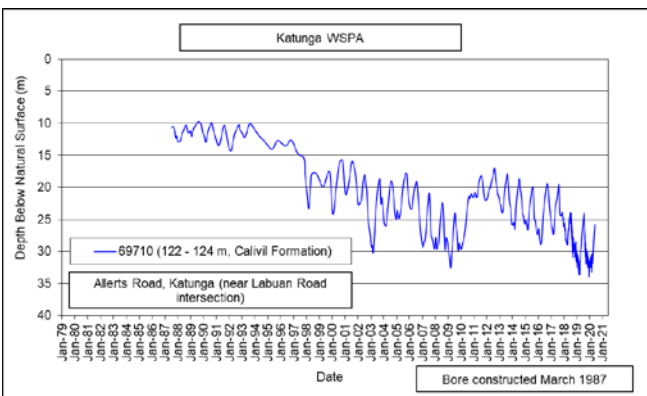
### Bore 92446



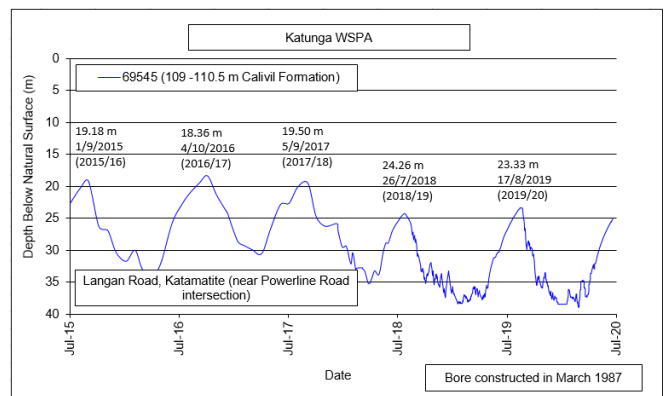
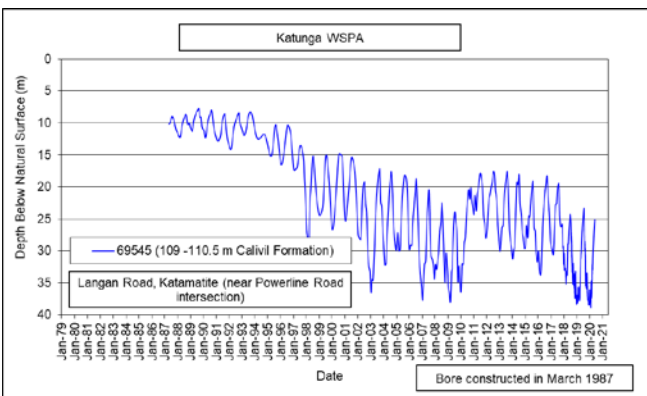
### Bore 83964



### Bore 69710

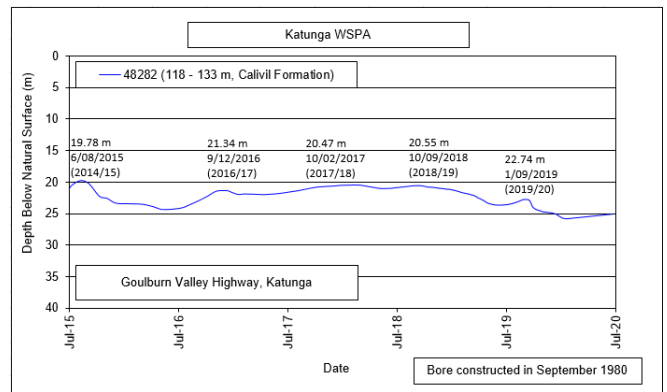
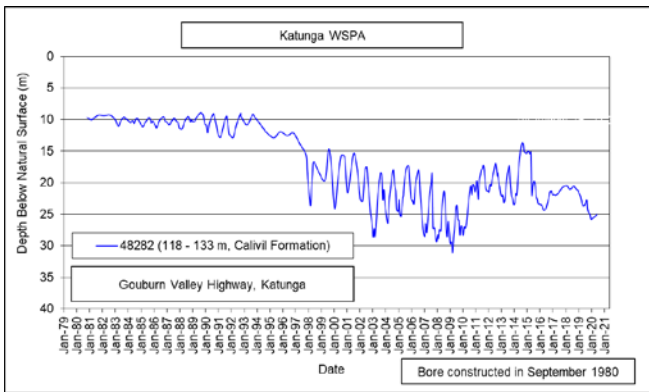


### Bore 69545

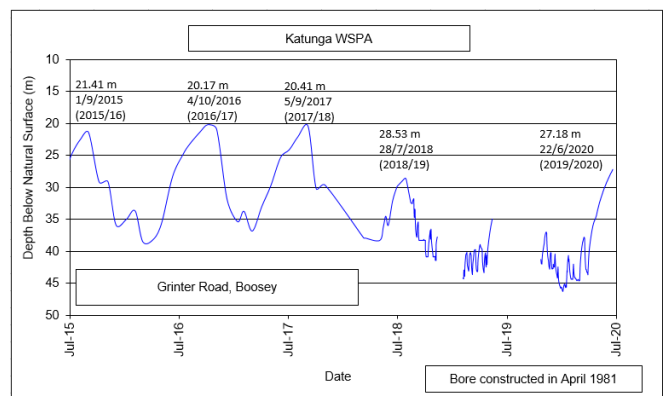
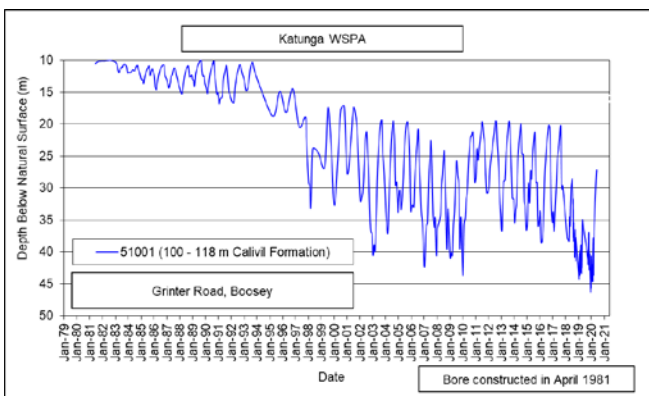




## Bore 48282



## Bore 51001



# Appendix C – Groundwater quality results

## Analytical chemistry results for 2019/20

Analytical chemistry results are provided for key monitoring bores listed in Schedule 1 of the Plan.

Further groundwater quality information is available on the Water Measurement Information System at <https://data.water.vic.gov.au>

		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Shepparton Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Upper Shepparton Formation</b>
		<b>Date:</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>
<b>Analyte</b>	<b>Unit</b>										
Conductivity @ 25°C	µS/cm		610	610	2900	3000	8300	24000	970	290	370
pH	pH units		7.1	7.2	6.8	7.2	8.1	7	7.4	7.4	7.6
Ionic balance	%		2.46	0.79	6.2	8.13	1.33	1.74	5.02	-1.1	-5.42
Total Anions	meq/L		6	6	30	32	80	381	10	3	4
Total Cations	meq/L		6	6	27	27	78	368	9	3	4
Ion Balance - TDS (EC) vs TDS	mg/l		2	1.9	1.9	1.9	1.9	1.3	2	1.7	1.8
Total Alkalinity, as CaCO <sub>3</sub>	mg/L		170	220	120	330	42	640	150	95	140
Bicarbonate Alkalinity, CaCO <sub>3</sub>	mg/L		170	220	120	330	42	640	150	95	140
Calcium, as Ca	mg/L		5.8	6.4	28	43	58	500	8.5	1.1	6.5
Carbonate Alkalinity, as CaCO <sub>3</sub>	mg/L		2	2	2	2	2	2	2	2	2
Chloride, as Cl	mg/L		62	36	840	760	2800	11000	210	20	15
Hydroxide Alkalinity, as CaCO <sub>3</sub>	mg/L		2	2	2	2	2	2	2	2	2
Potassium, as K	mg/L		1.3	1.3	4	6	19	17	2.2	0.8	7.8

		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Shepparton Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Upper Shepparton Formation</b>
		<b>Date:</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>
<b>Analyte</b>	<b>Unit</b>										
Sodium, as Na	mg/L		110	120	460	460	1600	5800	170	61	55
Ammonia, as N	mg/L		0.1	0.1	0.1	0.1	2.1	0.7	0.1	0.1	0.1
Nitrite, as N	mg/L		0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
Nitrate, as N	mg/L		0.05	0.01	0.08	1.4	0.01	0.01	0.08	0.01	1.9
Nitrate + Nitrite, as N(0.003d	mg/L		0.06	0.01	0.09	1.4	0.01	0.01	0.09	0.02	1.9
Sulphate, as SO4	mg/L		52	52	190	180	6	2800	51	18	17
Total Kjeldahl Nitrogen, as N	mg/L		0.1	0.1	0.1	0.1	2.2	1	0.1	0.1	0.7
Total Nitrogen, as N	mg/L		0.1	0.1	0.1	1.6	2.2	1	0.2	0.1	2.6
Arsenic, as As	mg/L		0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.002	0.001
Iron, dissolved as Fe	mg/L		0.02	0.59	0.24	0.01	0.06	0.32	0.01	0.06	0.15
Mercury, as Hg	mg/L		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Magnesium, as Mg	mg/L		10	9.6	61	57	57	1100	14	2.1	13
Manganese, dissolved as Mn	mg/L		0.002	0.05	0.16	0.035	0.088	12	0.004	0.01	0.081
Total Dissolved Solids, 180C	mg/L		310	320	1500	1600	4300	18000	490	170	200
Total Organic Carbon	mg/L		2.2	2.3	2.1	5.2	2	8.2	1.7	1.2	2
Turbidity, NTU	NTU		1.7	18	150	1.4	17	13	9.2	40	19
Phosphorus, total as P	mg/L		0.07	0.11	0.1	0.05	0.1	0.5	0.23	0.18	0.07
Lead, dissolved (ICP-MS)	mg/L		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Nickel, dissolved (ICP-MS)	mg/L		0.001	0.001	0.001	0.001	0.001	0.0002	0.024	0.066	0.003

		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Shepparton Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Upper Shepparton Formation</b>	<b>Calivil Formation</b>	<b>Lower Shepparton Formation</b>	<b>Upper Shepparton Formation</b>
		<b>Date:</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>24/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>23/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>	<b>28/10/2019</b>
<b>Analyte</b>	<b>Unit</b>										
Cadmium, dissolved (ICP-MS)	mg/L		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Chromium, dissolved (ICP-MS)	mg/L		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Copper, dissolved (ICP-MS)	mg/L		0.001	0.001	0.001	0.001	0.001	0.016	0.001	0.001	0.003
Zinc, dissolved (ICP-MS)	mg/L		0.013	0.002	0.006	0.001	0.001	0.006	0.013	0.003	0.013

Note: Some results may be below detection limits, but these limits are not available from data source.

## Historic groundwater salinity data for key monitoring bores listed in Schedule 1 of the Plan

