

Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan

Annual Report

For year ending 30 June 2021

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Excellence



Honesty



Accountability



Courage



Caring

Document History and Distribution

Versions

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Foreword

Goulburn-Murray Water (GMW) is pleased to present the annual report for the *Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan* (the Plan) for the 2020/21 water year.

GMW is responsible for the implementation, administration and enforcement of the Plan, which was approved by the Minister administering the *Water Act 1989* on 17 October 2012.

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

This report provides an overview of the groundwater management activities administered under the Plan during the 2020/21 water year.

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



Charmaine Quick
MANAGING DIRECTOR

Date: 23/09/2021

Executive summary

The *Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan* (the Plan) was approved on 17 October 2012 by the Minister for Water. The 2020/21 water year marks the ninth year of operation of the Plan.

Goulburn-Murray Water (GMW) announced an allocation of 75 per cent for all management zones of the Lower Campaspe Valley Water Supply Protection Area (the WSPA) during the 2020/21 water year. This is the first time the three northern management zones have had an allocation of less than 100% since the Plan was implemented.

Recorded use in the WSPA in 2020/21 was 33,050.4 ML, or 59 per cent of the total licence entitlement volume, which is less than the preceding three years.

There was substantial trade activity in the WSPA during the 2020/21 water year; 34 temporary licence transfers totalling 5,793.9 ML and four permanent licence transfers totalling 274.4 ML/yr.

Licence holders in the WSPA are entitled to carryover up to a maximum of 25 per cent of their unused licence entitlement volume for use in the subsequent water year. A total of 11,623.33 ML was carried over for use in the 2021/22 water year.

A third consecutive year of below-average rainfall (i.e. 2020/21, following 2019/20 and 2018/19) was recorded at Rochester within the WSPA. The cumulative impacts of these drier conditions, combined with the larger volumes of groundwater extraction, resulted in lower groundwater recovery levels across much of the WSPA.

Groundwater monitoring and metering programs continue to be successfully undertaken to support the objectives of the Plan.

Contents

Document History and Distribution.....	2
Foreword.....	3
Executive summary.....	4
1 Introduction.....	6
1.1 Purpose.....	6
1.2 Water Supply Protection Area.....	6
1.3 Groundwater Management Plan.....	6
2 Groundwater Management.....	8
2.1 Licence entitlement volume.....	8
2.2 Groundwater allocations.....	8
2.3 Groundwater use.....	10
2.4 Rainfall.....	10
2.5 Licence transfers.....	11
2.6 Carryover.....	12
2.7 Metering.....	13
2.8 Licence compliance.....	13
2.9 Domestic and stock bore licences.....	13
3 Monitoring Program.....	14
3.1 Groundwater levels.....	14
3.2 Groundwater quality.....	16
4 Administration and Engagement.....	20
4.1 Groundwater Reference Committee.....	20
4.2 Groundwater allocations fact sheet.....	20
5 References.....	21
Appendix A – Assessment of activities against Plan prescriptions.....	22
Appendix B – Groundwater level data.....	25
Appendix C – Groundwater quality results.....	31

1 Introduction

1.1 Purpose

This report has been prepared to meet the requirements of Prescription 7 of the *Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan* (the Plan) and section 32C of the *Water Act 1989* (the Act).

The report provides an overview of groundwater resource status and summarises the groundwater management activities undertaken in accordance with the Plan during the 2020/21 water year (1 July 2020 to 30 June 2021).

1.2 Water Supply Protection Area

The Lower Campaspe Valley Water Supply Protection Area (WSPA) was declared in June 2010. It extends from Lake Eppalock in the south to Echuca in the north, and includes the towns of Axedale, Goornong, Elmore, Lockington and Rochester.

The WSPA includes groundwater resources to all depths, except where it is overlain by the Shepparton Irrigation Region Groundwater Management Area. In these areas, the Plan only applies to the management of groundwater resources greater than 25 metres (m) depth below the surface (DBNS).

There are 4 management zones within the WSPA: Elmore-Rochester Zone (1031), Bamawm Zone (1032), Echuca Zone (1033) and Barnadown Zone (1034), as shown in Figure 1.

1.3 Groundwater Management Plan

The Plan was approved on 17 October 2012 by the Minister for Water, in accordance with section 32A(6) of the *Water Act 1989*.

The objective of the Plan is to ensure that groundwater resources within the WSPA are managed in an equitable and sustainable manner. More specifically, the Plan seeks to:

- Protect existing groundwater users and the environment by managing groundwater levels and the potential for change in groundwater salinity.
- Enable equitable development of groundwater resources to realise the potential for its use in the region.
- Communicate the Plan's objectives, management rules and resource status with stakeholders and the wider community.

Goulburn-Murray Water (GMW) is responsible for the implementation, administration and enforcement of the Plan. A summary of GMW's activities in accordance with Plan prescriptions is presented in [Appendix A](#).

A copy of the Plan can be downloaded from GMW's website: www.gmwater.com.au

2 Groundwater Management

2.1 Licence entitlement volume

The Minister declared the Permissible Consumptive Volume of 55,875 megalitres per year (ML/yr) for the WSPA in March 2013 (Victorian Government, 2013).

At 30 June 2021, licence entitlement volume in the WSPA was 55,860.4 ML/yr (Table 1). This has not changed from 30 June 2020. 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 Lower Campaspe Valley WSPA in 2020/21

Management zone	Licences	Licensed bores	Licence entitlement volume (ML/yr)
Elmore-Rochester Zone (1031)	54	67	17,152.6
Bamawm Zone (1032)	43	48	25,873.3
Echuca Zone (1033)	16	19	4,839.5
Barnadown Zone (1034)	20	59	7,995.0
Total	133	193	55,860.4

Note: Data extracted from the Victorian Water Register 30 June 2021.

2.2 Groundwater allocations

Annual groundwater allocations in the WSPA are determined by comparing the average of annual maximum groundwater recovery levels recorded in key state observation bores from the previous three water years (i.e. a 3-year rolling average) against trigger levels outlined in Prescription 1 of the Plan. These trigger levels are illustrated in Figure 2 for the northern management zones and in Figure 3 for the Barnadown Zone only.

During the 2019/20 water year, the Department of Environment, Land, Water and Planning (DELWP) undertook a State Observation Bore Network (SOBN) refurbishment program. The program included treatment of bore 79324, which is used to determine annual allocations for the northern management zones (i.e. Elmore-Rochester, Bamawm and Echuca zones). The bore was decommissioned due to ageing materials and replaced by a new observation bore (WRK117046) constructed 20 March 2020 at the same location and to the same specifications.

2020/21 allocation

GMW determined allocations for the 2020/21 water year based on the average of maximum recovery levels recorded for the respective trigger bores over the previous three water years (i.e. 2017/18 to 2019/20). An allocation of 75 per cent was set for all management zones. This marked the first time a restriction had been placed on groundwater extraction for all management zones in the WSPA since the Plan was implemented in 2012.

2021/22 allocation

GMW announced allocations for the 2021/22 water year on 17 June 2021. An allocation of 75 per cent was set for all management zones, as the average of maximum recovery levels recorded for both trigger bores, individually, over the previous three water years (2018/19 to 2020/21), was below the 16-metre trigger level (Figure 2 and Figure 3).

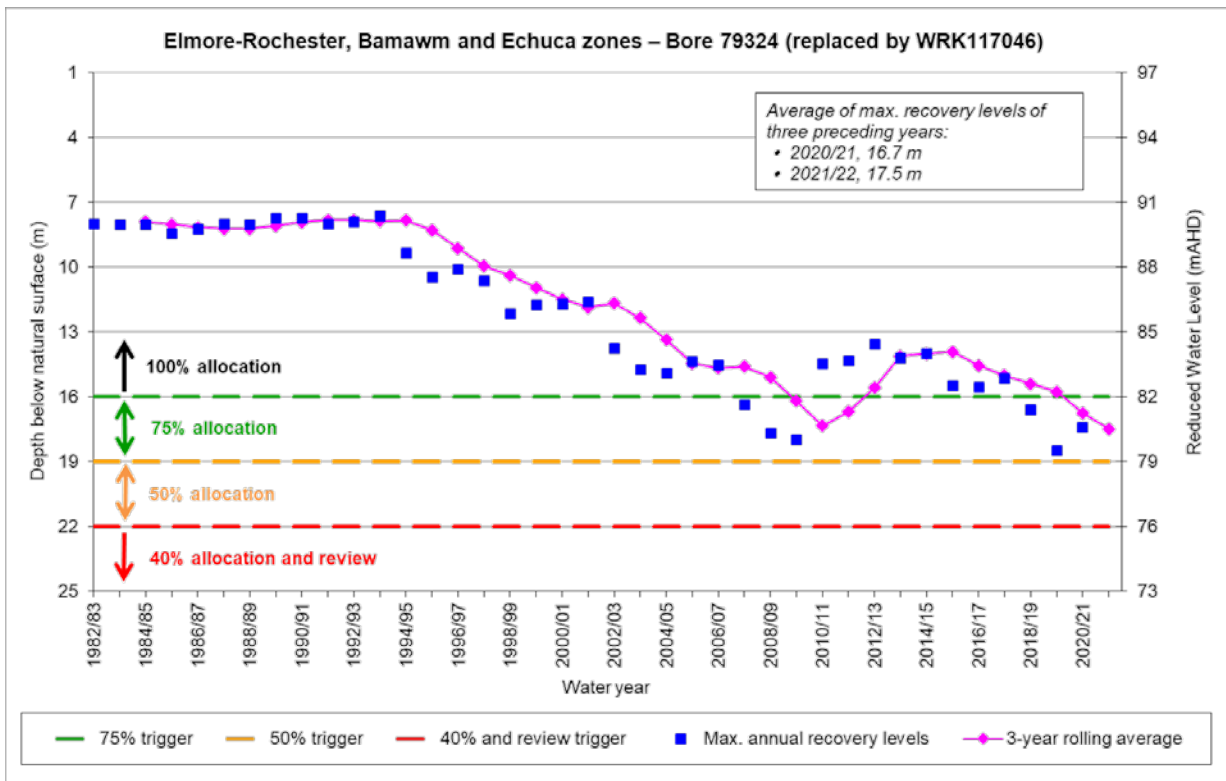


Figure 2 Trigger graph for determining allocations for the northern zones of the Lower Campaspe Valley WSPA

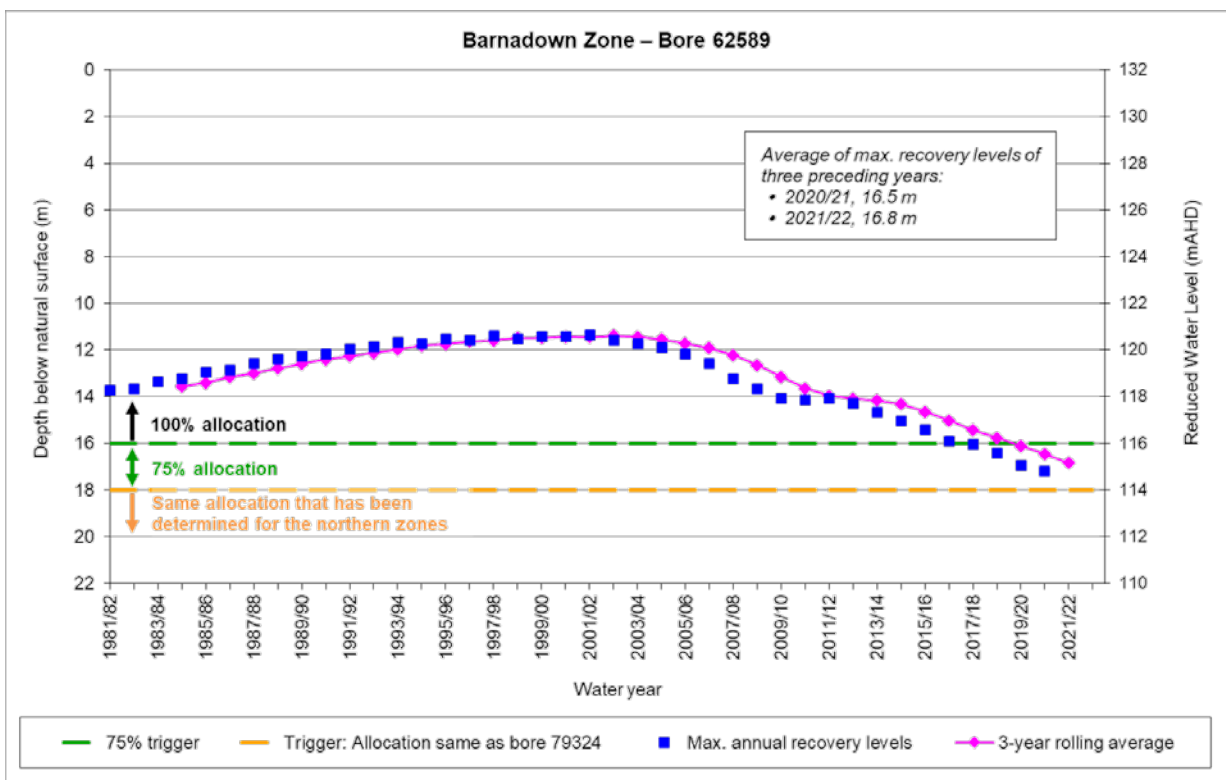


Figure 3 Trigger graph for determining allocations for the Barnadown Zone

2.3 Groundwater use

Total recorded use in the WSPA in 2020/21 was 33,050 ML, or 59 per cent of total licence entitlement volume (Figure 4). This is a 21 per cent decrease compared to the volume used in 2019/20.

Note: 'recorded use' refers to metered and deemed use.

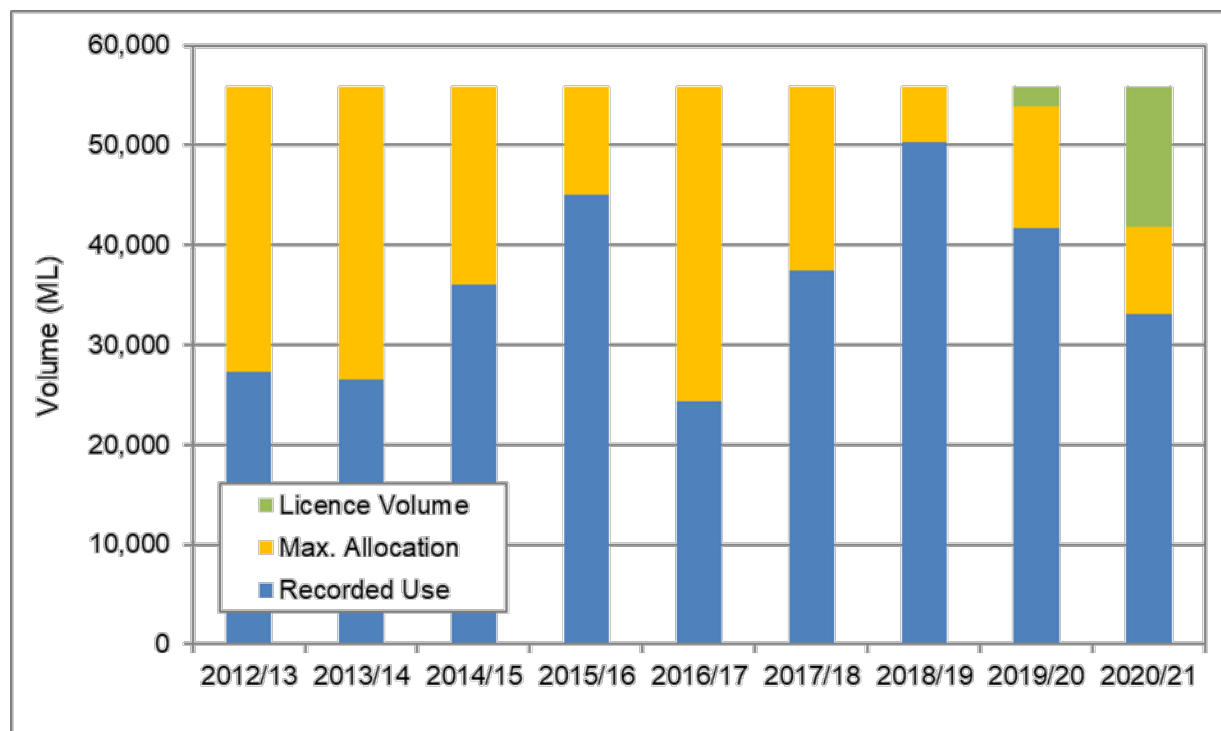


Figure 4 Entitlement, allocation and use in the Lower Campaspe Valley WSPA, since 2012/13

In 2020/21, the volume of recorded use was greatest in the Bamawm Zone, where the highest proportion of licence entitlement volume is held (Table 2). Recorded use as a proportion of total licence entitlement was highest in the Echuca Zone, at 75 per cent.

Table 2 Recorded use in the Lower Campaspe Valley WSPA in 2020/21

Management zone	Licence entitlement volume (ML/yr)	Recorded use (ML)	Proportion of total licence entitlement volume used
Elmore-Rochester Zone (1031)	17,152.6	9,280.1	54%
Bamawm Zone (1032)	25,873.3	17,268.7	67%
Echuca Zone (1033)	4,839.5	3,619.7	75%
Barnadown Zone (1034)	7,995.0	2,881.9	36%
Total	55,860.4	33,050.4	59%

Note: Recorded use data extracted from Irrigation Planning Module on 26 July 2021.

2.4 Rainfall

Historical rainfall data, sourced from the Bureau of Meteorology weather station at Rochester (BOM, 2021), is presented in Figure 5 as an indicator of climate trends across the WSPA.

The data show that annual rainfall was generally above the long-term average (443.7 mm) in the early 1970s and remained relatively steady through the 1980s and 1990s. Between 2001/02 and 2008/09, annual totals were below-average (i.e. during the Millennium Drought). Conditions improved in 2010.

With the exception of the 2013/14 and 2016/17 water years, annual rainfall totals have been below average since the Plan was implemented, resulting in reduced recharge to groundwater systems within the WSPA.

There was a total of 337.9 mm of rainfall recorded for Rochester during the 2020/21 water year. A higher than average rainfall occurred in March 2021, which resulted in an insignificant short-term increase in the mean monthly trend.

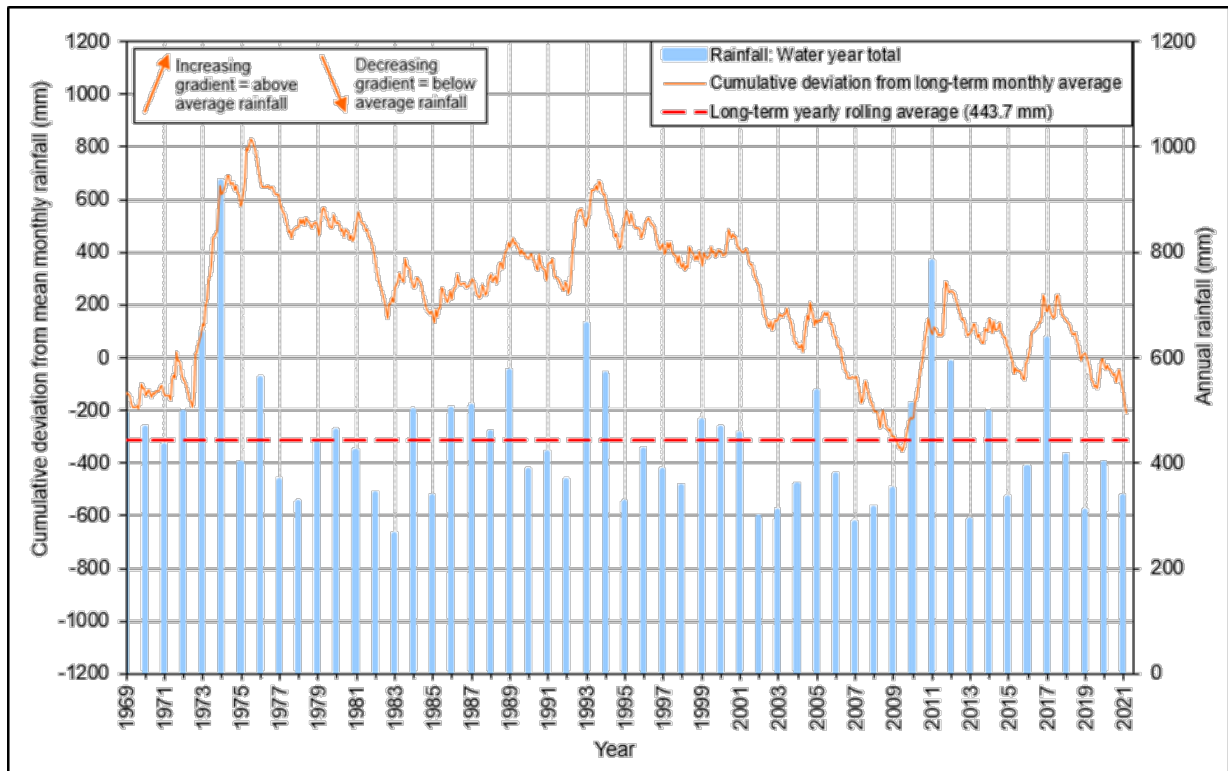


Figure 5 Rainfall recorded at Rochester in the Lower Campaspe Valley WSPA (BOM, 2021)

2.5 Licence transfers

The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement volume. During the 2020/21 water year, there were 34 temporary licence transfer transactions for a total of 5,793.9 ML and four permanent transfers for a total of 274.4 ML/yr (Figure 6).

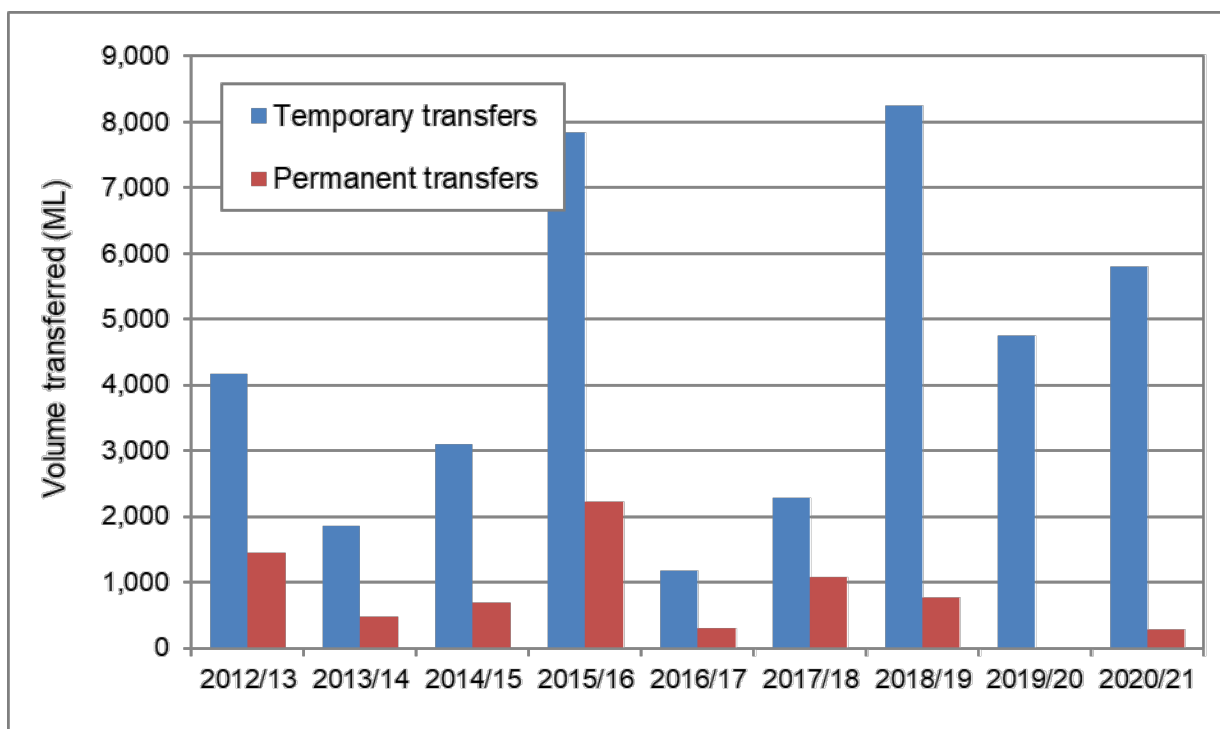


Figure 6 Licence entitlement volumes transferred in the Lower Campaspe Valley WSPA, since 2012/13

The majority of transfers occurred between licence holders within the same management zones (Table 3).

Of the 34 temporary transfers, six were between management zones resulting in a net increase of temporary licence volume in the Echuca zone of 390 ML. Temporary licence transfers occurred in all four management zones of the WSPA; however, the permanent transfers occurred exclusively between licence holders within the Bamawm Zone (Table 3).

Table 3 Licence transfers in the Lower Campaspe Valley WSPA in 2020/21

Management zone	Temporary				Permanent			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)	No. of transfer	Volume (ML/yr)	No. of transfer	Volume (ML/yr)
Elmore-Rochester Zone (1031)	8	640.3	6	410.3	0	0	0	0
Bamawm Zone (1032)	18	3,733.6	17	3,573.6	4	274.4	4	274.4
Echuca Zone (1033)	0	0	3	390.0	0	0.0	0	0.0
Barnadown Zone (1034)	8	1,420	8	1,420.0	0	0.0	0	0.0
Total	34	5,793.9	34	5,793.9	4	274.4	4	274.4

2.6 Carryover

In November 2012, the Minister declared that groundwater licence holders in the WSPA were authorised to carry over up to a maximum of 25 per cent of their unused licence entitlement volume for use in the subsequent water year (Victorian Government, 2012).

There was a total of 12,590.6 ML carried over by licence holders in the WSPA for use in the 2020/21 water year. At the conclusion of 2020/21, a total of 11,623.33 ML was carried over for use in the 2021/22 water year.

2.7 Metering

There were 152 metered service points and 40 deemed service points in the WSPA as at 30 June 2021. There were 135 meter-related activities undertaken during the 2020/21 water year, including inspections, maintenance and battery replacements (Table 4).

All meters were read at least twice during the 2020/21 water year.

Table 4 Metering activities in the Lower Campaspe Valley WSPA in 2020/21

Metering activity	Year ending 30 June 2021
Total number of meters	152
Total number of meter reads	304
Meters installed or replaced	0
Meter inspection events	118
Meter maintenance events	9

2.8 Licence compliance

The Victorian Government and GMW have a zero-tolerance approach to unauthorised take of non-urban water. GMW is responsible for ensuring water users in northern Victoria comply with their licence conditions. All incidents of non-compliance are investigated by GMW and action is taken in accordance with GMW's Risk-Based Compliance and Enforcement Framework. More information can be found on GMW's website, at www.gmwwater.com.au/water-resources/water-use-compliance.

There were eight instances of alleged unauthorised take of water (i.e. licence entitlement volume exceedance) in the WSPA in 2020/21; there were zero prosecutions or convictions relating to groundwater matters.

2.9 Domestic and stock bore licences

The volume of groundwater taken for 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.

According to the Victorian Water Register, there were 33 domestic and stock bore construction licences issued, and 23 domestic and stock bore completion reports received by GMW, for locations within the WSPA, during the 2020/21 water year.

3 Monitoring Program

3.1 Groundwater levels

During the 2020/21 water year, a total of 101 state observation bores, located within the WSPA, were monitored by GMW and DELWP (Figure 1). This figure includes the 60 key bores listed in Schedule 1 of the Plan, where practicable. Of the 101 bores, 34 were monitored remotely using telemetry equipment, with measurements recorded hourly, and 67 were monitored manually, with measurements recorded on a monthly or quarterly basis.

Water level data for these bores are presented in [Appendix B](#).

Monitoring indicates that seasonal groundwater recovery levels have been generally declining since the Plan was implemented in 2012. Groundwater recovery levels in the Calivil Formation Aquifer (Deep Lead) across much of the WSPA in 2020/21 continued to decline and were lower than the 2019/20 water year. However, seasonal drawdown levels were less for some locations than what was observed in the previous water year.

The maximum recovery level in a Deep Lead observation bore (60134), located near Rochester in the Elmore-Rochester Zone, was 0.1 m higher in 2020/21 than the maximum level in 2019/20; 16.03 m DBNS in August 2019, versus 16.13 m in August 2018 (Figure 7). The magnitude of seasonal drawdown was 13.11 m during 2019/20, recorded in the same Deep Lead bore. The magnitude of seasonal drawdown in 2020/21 was 9.2 m, which was less than the drawdown recorded in 2019/20.

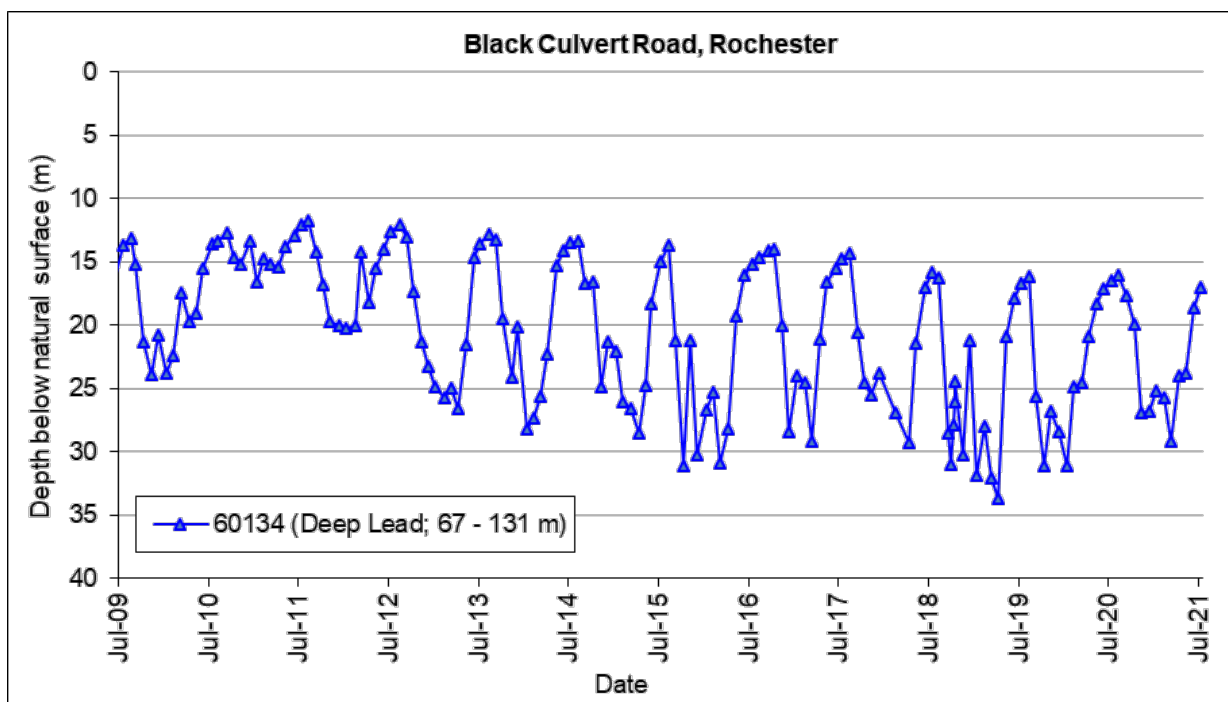


Figure 7 Groundwater level monitoring in the Elmore-Rochester Zone, at Rochester – July 2009 to June 2021 (DELWP, 2021)

In the Bamawm Zone, there was a larger decline in maximum recovery levels in 2020/21. In Deep Lead observation bore 47247 at Strathallan, the maximum recovery level was 22.18 m DBNS in August 2020 compared to 22.79 m in August 2019 (Figure 8). The magnitude of seasonal drawdown was approximately 11.59 m during 2020/21.

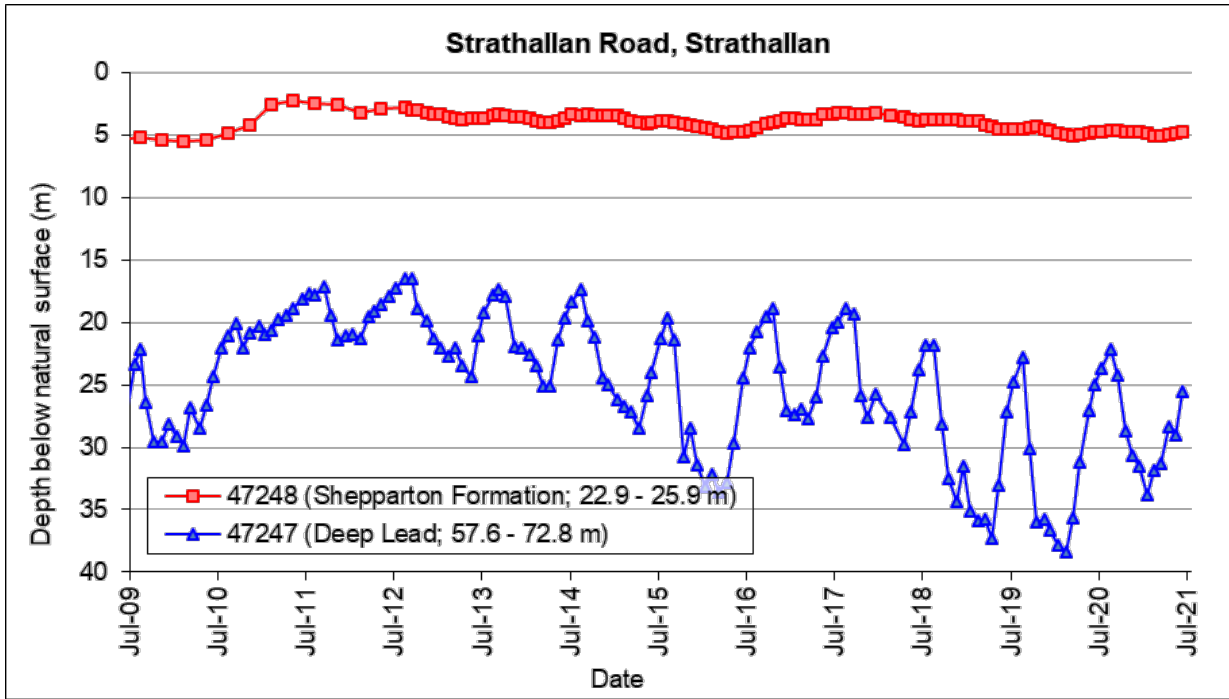


Figure 8 Groundwater level monitoring in the Bamawn Zone, at Strathallan – July 2009 to June 2021 (DELWP, 2021)

In the Echuca Zone, groundwater recovery levels remained relatively steady in 2021/22. In Deep Lead observation bore 79324 at Echuca West, the maximum recovery level was 17.64 m DBNS in August 2020. That is 2.2 m higher than the maximum recovery level in 2019/20, which was 19.4 m in August 2019 (Figure 9). In the same bore, the magnitude of seasonal drawdown was 4.8 m during 2019/20. The magnitude of seasonal drawdown in 2020/21 was 3.2 m i.e. less than the drawdown recorded in 2019/20.

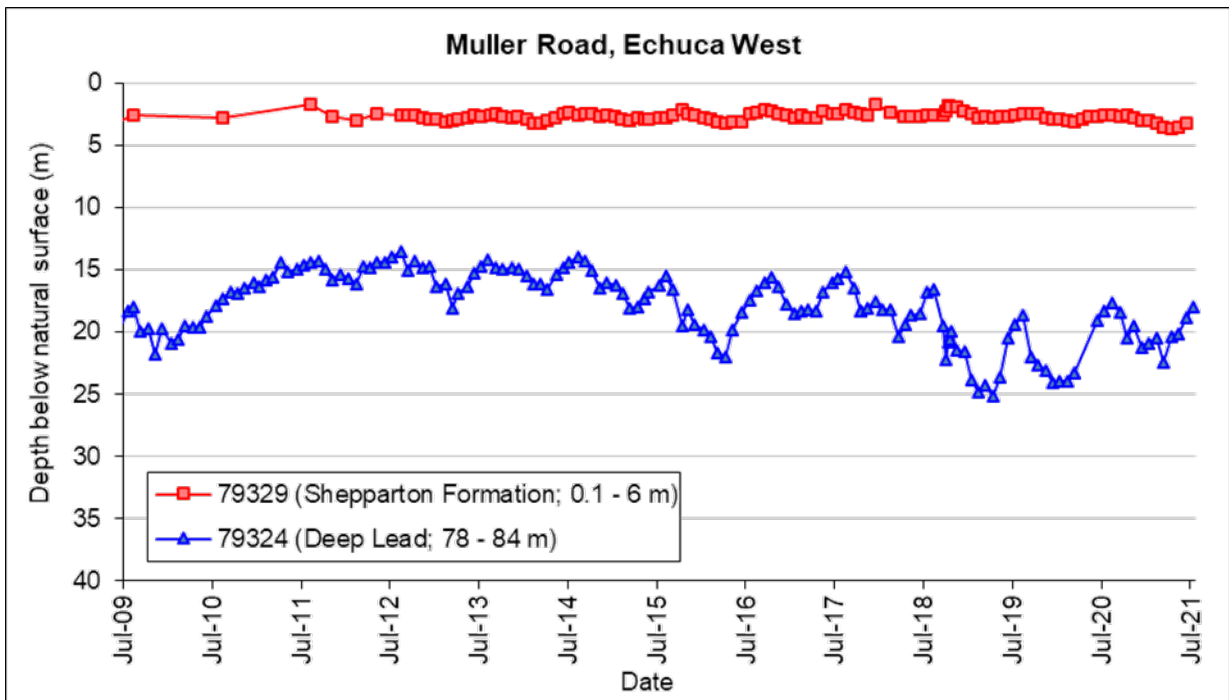


Figure 9 Groundwater level monitoring in the Echuca Zone, at Echuca West – July 2009 to June 2021 (DELWP, 2021)

In the Barnadown Zone, there is typically less seasonal variation in groundwater levels compared to the other three management zones. In a Deep Lead observation bore located adjacent to the Campaspe River at Runnymede (G8010638/07), the maximum recovery level in 2020/21 was 24.64 m DBNS compared to 24.63 m DBNS in the previous year (Figure 10). The magnitude of seasonal drawdown was approximately 1.29 m during 2020/21.

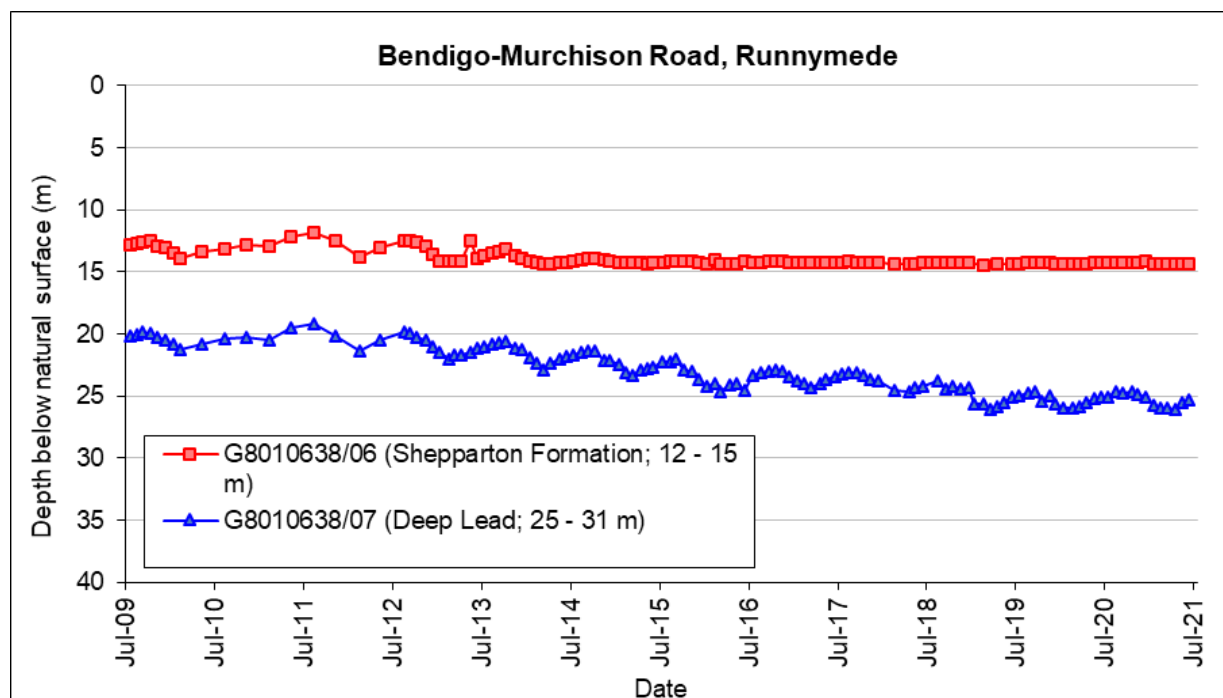


Figure 10 Groundwater level monitoring in the Barnadown Zone, at Runnymede – July 2009 to June 2021 (DELWP, 2021)

3.2 Groundwater quality

Groundwater user salinity sampling

GMW sent 156 sample bottles and reply-paid envelopes to licence holders, and domestic and stock users upon request, to collect a groundwater sample from their bore for analysis. There were 25 samples returned for analysis; a return rate of 16 per cent.

GMW measured the groundwater salinity of each sample; advised each bore owner of their result; and recorded the data in the State groundwater database, the Water Management Information System. The results are presented spatially in Figure 11 and show that less saline groundwater occurs within the Elmore-Rochester Zone. Groundwater samples collected from bores within the Echuca Zone, west of the Campaspe River, were more saline (>4,000 $\mu\text{S}/\text{cm}$). No groundwater salinity sampling was undertaken in the Barnadown Zone. The previous (2019/20) data for the Barnadown Zone showed the highest salinity results and upward trends in salinity.

A higher and more consistent sample return rate would assist with spatially assessing any changes in groundwater salinity over time. Groundwater users are strongly encouraged to participate in this program so that they can identify any changes in groundwater salinity.

Targeted sampling of private bores

GMW has enlisted 11 licence holders to participate in a targeted groundwater salinity monitoring program. Samples are collected on an annual basis from the same set of 11 private bores which have been strategically selected based on location and bore construction details. The aim of the program is to build

a reliable and consistent dataset of groundwater salinity over time to support licensing and resource management decisions. There were four samples returned for analysis; a return rate of 36 per cent.

Results from the groundwater samples collected in 2020/21 are presented in [Appendix C](#).

Groundwater salinity varies between water years, although there has been a rising salinity trend of groundwater in some bores, notably licensed bores WRK010877 in the Barnadown Zone and WRK015989 in the Bamawm Zone. However, no salinity data was collected for the 2020/21 for these two bores so any further increase since 2019/20 is not known. Continued monitoring will enable trends to be better understood and to inform future resource management decisions.

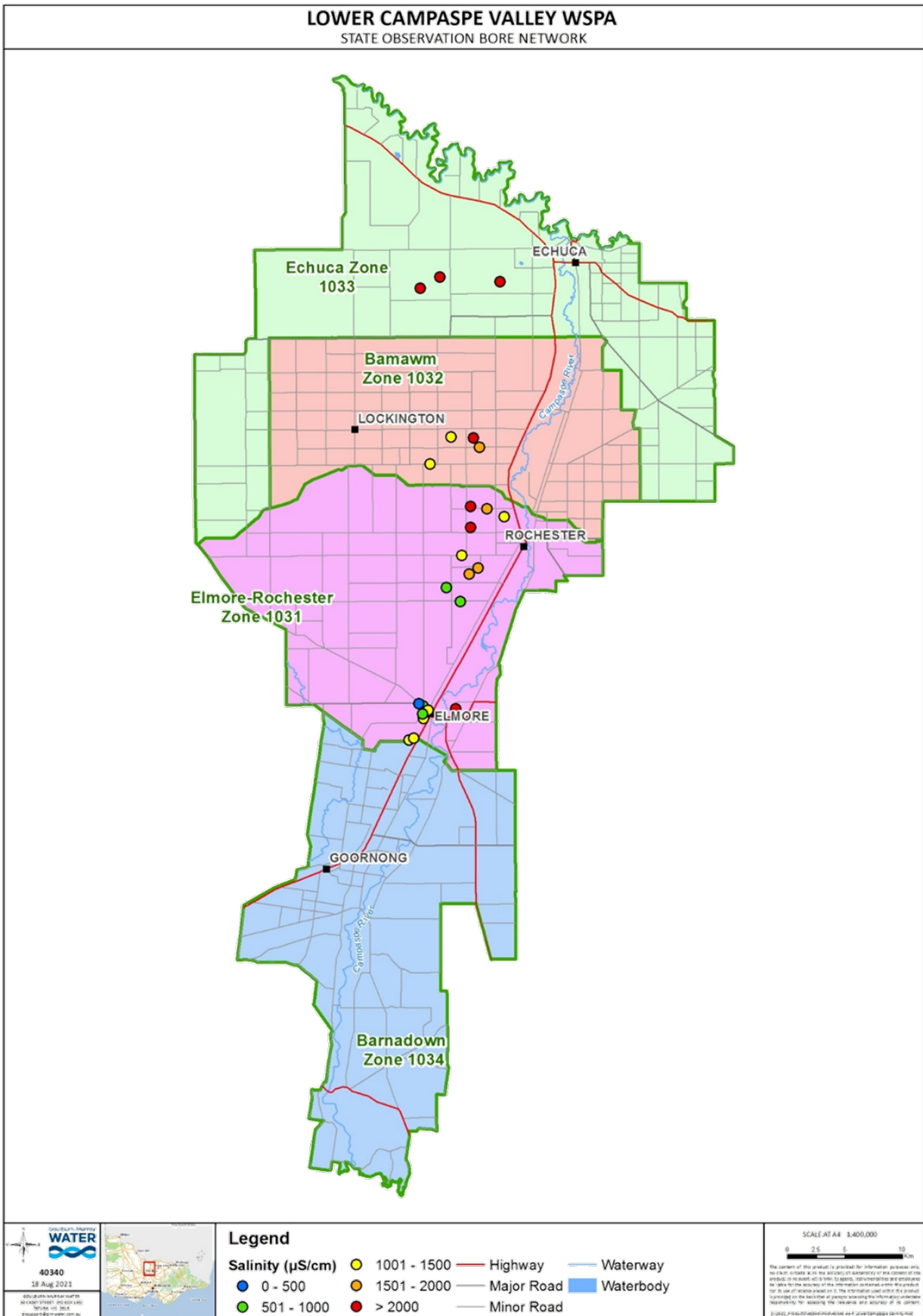


Figure 11 Salinity results of samples submitted by groundwater users during 2020/21 in the Lower Campaspe Valley WSPA

Sampling of state observation bores

Groundwater samples from nested state observation bores were sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. The full suite of results are presented in [Appendix C](#).

Nested sites feature two or more monitoring bores in close proximity, each monitoring a different aquifer. The State observation bores used for water quality testing are located in areas of intensive groundwater pumping west of Rochester and at the northern margins of the WSPA.

Groundwater salinity results from samples collected during the 2020/21 water year are presented in Table 5. These results are compared against historical data in [Appendix C](#).

Groundwater salinity varies between water years, but Bore 89584 in the Elmore-Rochester Zone declined from a value of 1,400 $\mu\text{S}/\text{cm}$ in 2019/20 to 1,200 $\mu\text{S}/\text{cm}$ in 2020/21. All other sites recorded slight increases compared to the previous water year. There were no strong trends in the data; however, salinity levels have been generally declining in some bores since 2015/16. Continued monitoring of groundwater quality will enable trends to be better understood and support future management decisions.

Table 5 Groundwater salinity results for bores sampled during 2020/21 in the Lower Campspe Valley WSPA

Management zone	Location	Bore ID	Depth of screened interval (m)	Aquifer screened	Salinity, as electrical conductivity ($\mu\text{S}/\text{cm}$)
Elmore-Rochester Zone (1031)	Lowe Road, Diggora	89584	100 – 140	Deep Lead	1,200
		89596	2 – 14	Shepparton Formation	(Bore dry)
Bamawm Zone (1032)	Strathallan Road, Lockington	WRK059873	82 – 87	Deep Lead	3,900
		WRK059876	92 – 97	Deep Lead	3,100
		WRK059877	34 – 37	Shepparton Formation	4,500
	Strathallan Road, Bamawm	47251	22 – 27	Shepparton Formation	4,100
		47250	73 – 85	Deep Lead	1,800
Echuca Zone (1033)	Casey Road, Wharparilla	102827	108 – 114	Deep Lead	4,500
		102828 ¹	160 – 167	Deep Lead	9,900
		102829	71 – 74	Shepparton Formation	4,100
	Craig Road, Koyuga	73425	87 – 89	Deep Lead	10,000
		73426	6 – 18	Shepparton Formation	8,800
Barnadown Zone (1034)	Railway Road	*62589	78-102	Deep Lead	1,000

*An additional sample was taken in 2020/21 to cover the Barnadown Zone

4 Administration and Engagement

4.1 Groundwater Reference Committee

The Groundwater Reference Committee, appointed in accordance with Prescription 7(c) of the Plan, met on 2 December 2020.

Key points of discussion included:

- Actions from last meeting discussed and committee updated
- Local issues – current and emerging including:
 - Brief presentation on exploration and underground mine expansion by Fosterville Gold Mine Managed Aquifer Recharge
 - Brief overview of Managed Aquifer Recharge case study for the Lower Campaspe WSPA completed by consultant RMCG
 - Groundwater development around Gunbower, north-west of WSPA with a brief overview of licence applications, a hydrogeological study and licensing considerations.
- Resource update and administration activities.

4.2 Groundwater allocations fact sheet

In May 2021 GMW prepared a fact sheet at the request of the Lower Campaspe Valley WSPA Groundwater Reference Committee to provide information about the likely allocations of licensed groundwater entitlement for the 2021/22 water year.

The fact sheet was mailed to all licence holders within the WSPA and was also placed on the GMW website.

5 References

Bureau of Meteorology (BOM), 2021. *Climate Data Online – Rochester station number 080049*.

Retrieved in August 2021, from:

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Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
PRESCRIPTION 1 Triggers and Restrictions		
<p>By 1 July each year the Corporation will:</p> <ul style="list-style-type: none"> (a) Determine the rolling average of the maximum annual groundwater recovery levels from the preceding 3 seasons for the relevant bore, or its replacement, and announce a corresponding allocation for the subsequent season for zones as detailed in the Plan. (b) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers. (c) Not apply restrictions to any water authorised to be taken in a subsequent water season (carryover). 	<p>In June 2020, GMW determined the allocations for the 2020/21 water year based on the rolling average of the maximum annual groundwater recovery levels from the preceding three water years. Allocations were set at 75 per cent for all management zones.</p> <p>GMW announced allocations by placing public notices in local newspapers, listing them on their website and sending letters to all licence holders.</p>	Yes
PRESCRIPTION 2 Trading rules		
<p>The Corporation may approve a transfer of a groundwater licence under section 62 of the <i>Water Act 1989</i> provided section 53 matters have been considered and it accords with the following:</p> <ul style="list-style-type: none"> (a) Transfer of licence entitlement can occur between zones as specified in the Plan (b) Despite (a) above, if the groundwater level falls to a depth of 18 metres below the natural surface in bore 62589 a licence may be transferred between the Barnadown Zone and other zones (c) Limits on the maximum licence volume in each zone as specified in the Plan are not exceeded. 	<p>GMW processed 34 temporary transfer transactions for a total of 5,793.9 ML/yr; and 4 permanent transfers for a total of 274.4 ML/yr in 2020/21.</p> <p>GMW processed all groundwater licence applications in accordance with Prescription 2(a) and (c).</p>	Yes
PRESCRIPTION 3 Intensive groundwater pumping		
<p>The Corporation may approve an application to take and use groundwater under section 51 or a transfer under section 62 of the <i>Water Act 1989</i> provided that section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> (a) For a permanent transfer, the total licence entitlement of bores within a 4 km radius of an applicant's bore is less than 7.5 GL/yr. (b) Where summed licence entitlement exceed the limits specified in (a) above, then a licence holder's usage is to be limited to 125% of entitlement in one water season whether it occurs through either temporary transfer of entitlement or carryover. (c) Usage may exceed 125% of entitlement as specified in (b) above through temporary or permanent transfer of entitlement from others within the 4 km radius. 	<p>GMW processed all groundwater licence applications in accordance with Prescription 3.</p>	Yes

Prescription	Activity	Compliant
PRESCRIPTION 4 Monitoring groundwater levels		
<p>The Corporation will:</p> <ul style="list-style-type: none"> (a) Obtain monthly groundwater level readings (up to 480 readings per season) from key State observation bores from the list in Schedule 1, or their replacement, where practicable. (b) Install at least one new observation bore in the Coonambidgal Formation to better inform groundwater interaction with the Campaspe River. 	<p>GMW obtained monthly groundwater level readings from bores listed in Schedule 1 of the Plan, where practicable. GMW installed an 8.5 m bore screening the Coonambidgal Formation which was drilled and constructed on 3 September 2020 adjacent to the Campaspe River at Runnymede, just south of Elmore.</p>	Yes
PRESCRIPTION 5 Monitoring groundwater salinity		
<p>The Corporation will:</p> <ul style="list-style-type: none"> (a) Support annual groundwater user salinity sampling by: <ul style="list-style-type: none"> (i) Providing a sample bottle and a reply paid envelope to each groundwater licence holder and request that they collect a groundwater sample from all their licensed bores and return the samples to the Corporation for salinity analysis. (ii) Providing a sample bottle and a reply paid envelope to any domestic and stock groundwater user upon their request for them to provide a sample for salinity analysis. (iii) Measuring groundwater salinity in all returned sample bottles and providing the bore owner with the results. (iv) Entering the groundwater salinity results into the State groundwater database. (b) Establish a targeted groundwater salinity monitoring program to collect and analyse groundwater samples from selected licensed bores each year. (c) Collect groundwater samples from selected State observation bores identified in Schedule 1 where practicable, or their replacement. 	<p>GMW provided sample bottles to licence holders, and domestic and stock users upon request. GMW measured the groundwater salinity in returned samples, advised bore owners of the result and entered the results into the State groundwater database.</p> <p>GMW engaged with the 11 licence holders participating in the target sampling of licensed bores. A total of 4 bores were sampled in 2020/21.</p> <p>GMW collected groundwater samples from nested State observation bores identified in Schedule 1, where practicable, and sent them to a NATA accredited laboratory for analysis.</p>	Yes
PRESCRIPTION 6 Metered licensed use		
<p>The Corporation will:</p> <ul style="list-style-type: none"> (a) Ensure that a meter is fitted to all operational licensed bores. (b) Read each meter at least once a year and enter readings into the Water Register. 	<p>GMW ensured that use was accounted for each operational licensed bore.</p> <p>Meters were read in February/March and May/June 2021 and the data were entered into the Water Register.</p>	Yes

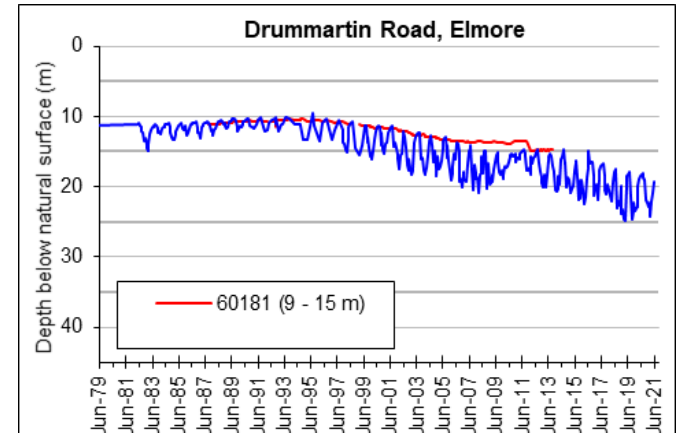
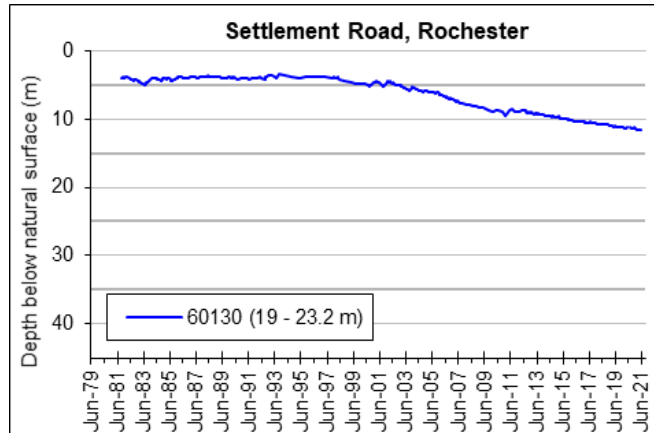
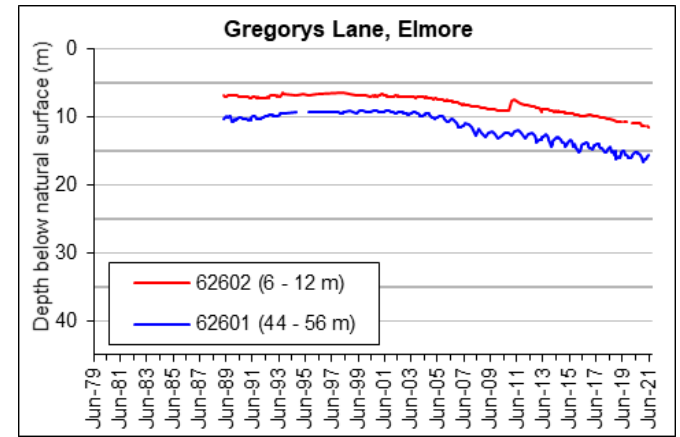
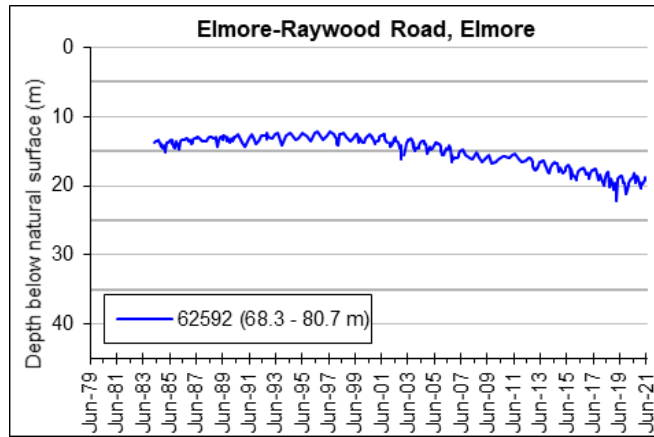
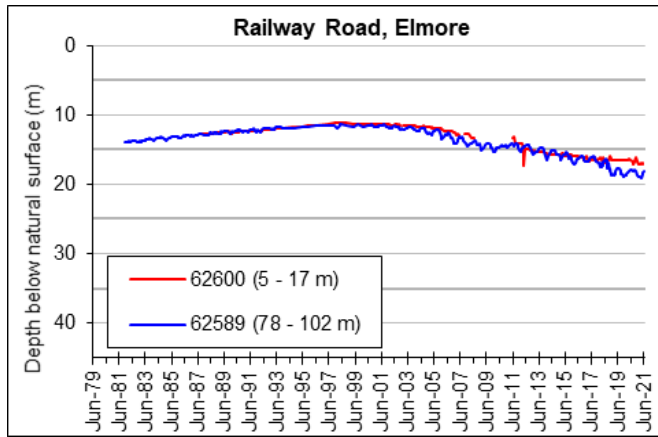
Prescription	Activity	Compliant
PRESCRIPTION 7 Plan implementation		
<p>The Corporation will:</p> <ul style="list-style-type: none"> (a) Post on its website the Plan; annual reports and newsletters; groundwater levels; and rolling average for trigger bores. (b) Mail a newsletter in October each year to groundwater licence holders, and domestic and stock users upon request, in the Lower Campaspe Valley WSPA and relevant agencies stating the resource position and summarising outcomes in the annual report. (c) Meet with the Groundwater Reference Committee at least once each year to report on the groundwater resource status and implementation of the Plan and consider the need to review the Plan. (d) Undertake a comprehensive review of the Plan after 5 years from approval, or sooner if warranted by any clause contained within the Plan. 	<p>GMW prepared an annual report on the administration and enforcement of the Plan during the 2019/20 water year; for the Minister and relevant agencies. GMW also sent a newsletter to licence holders summarising the information in this report.</p> <p>GMW has posted on its website: the Plan; and the 2019/20 annual report and 2020 newsletter (and previous versions).</p> <p>GMW updates a selection of hydrographs of groundwater levels on its website every quarter.</p> <p>GMW undertook a comprehensive review of the Plan in 2018.</p> <p>GMW met with the Groundwater Reference Committee in December 2020 to discuss Plan implementation, resource conditions and the outlook of allocations for 2020/21 being 75% for all zones as being likely based on recovery levels to November 2020.</p>	<p>Yes</p>

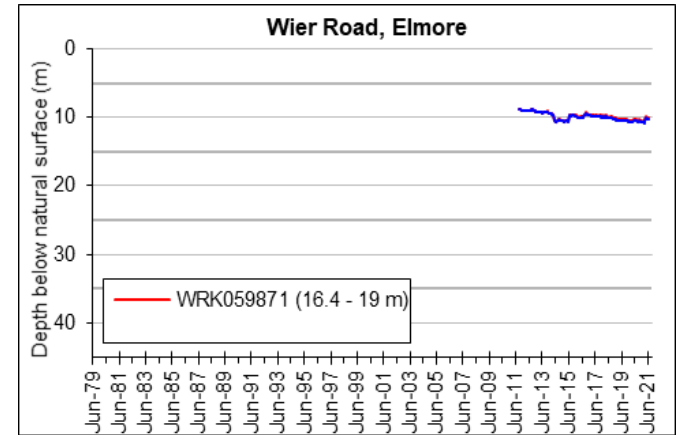
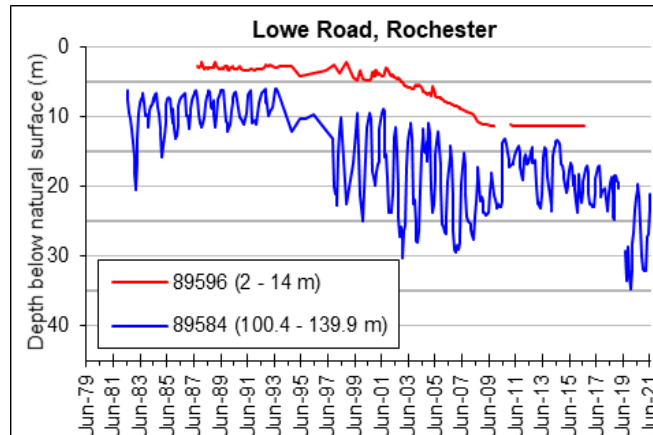
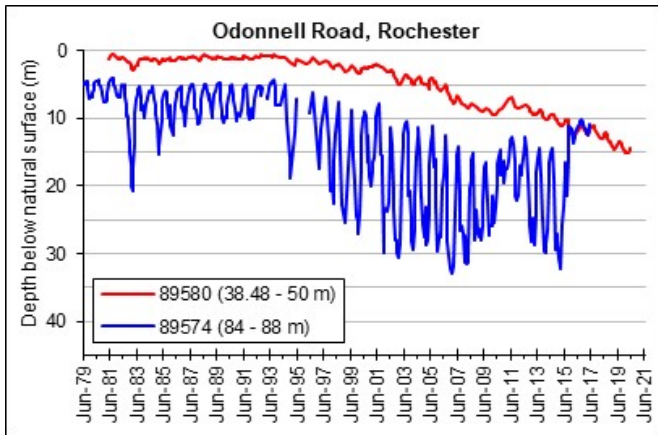
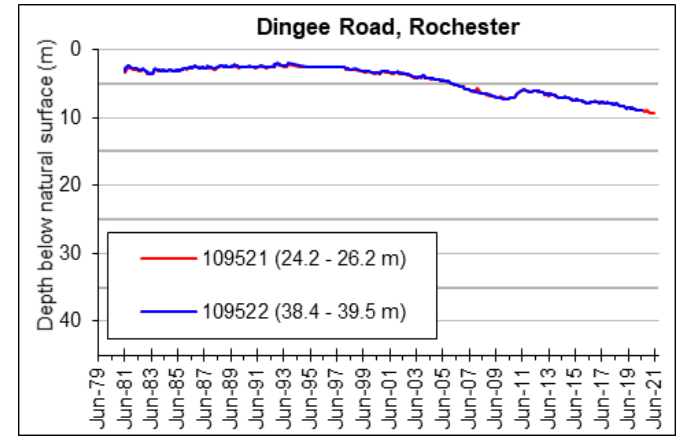
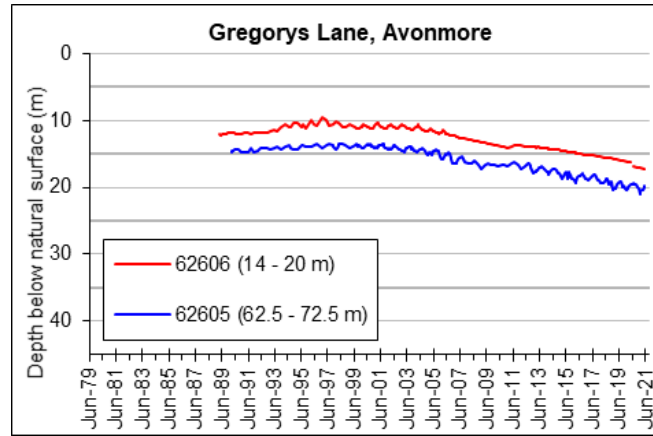
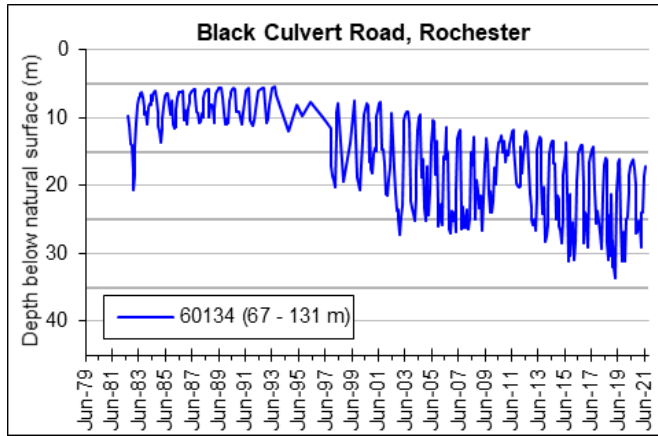
Appendix B – Groundwater level data

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, 2021).

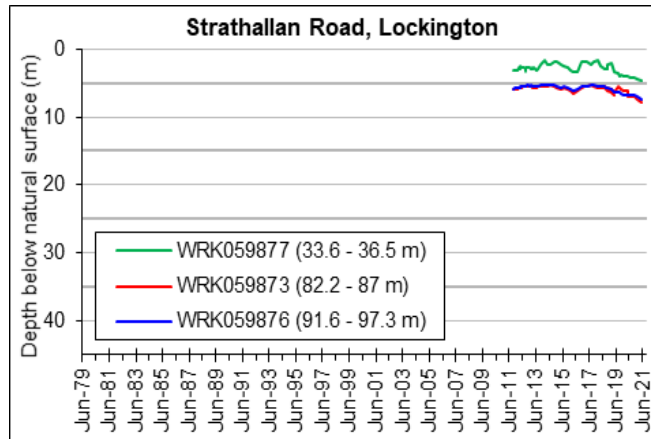
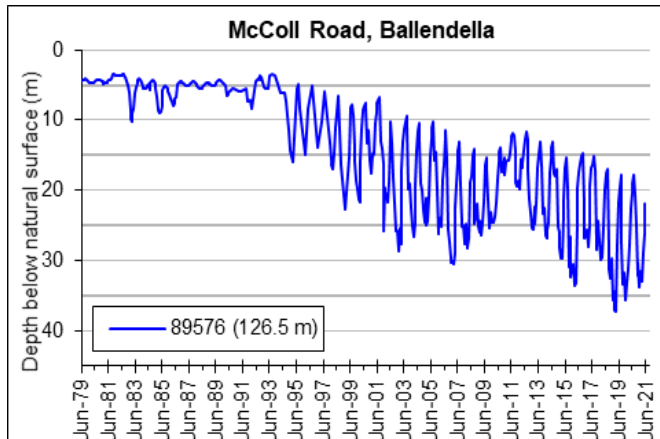
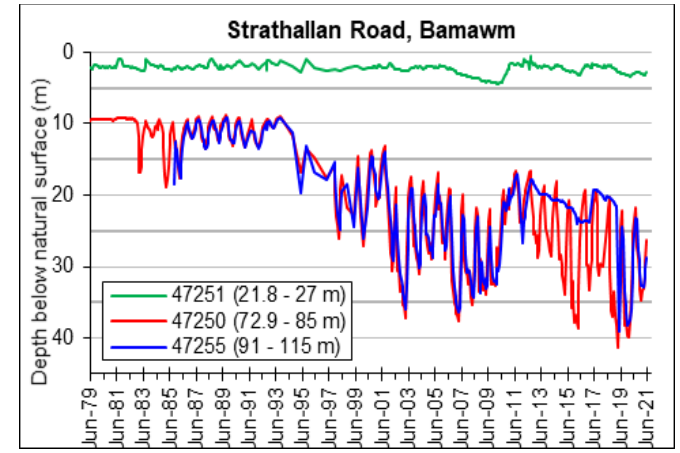
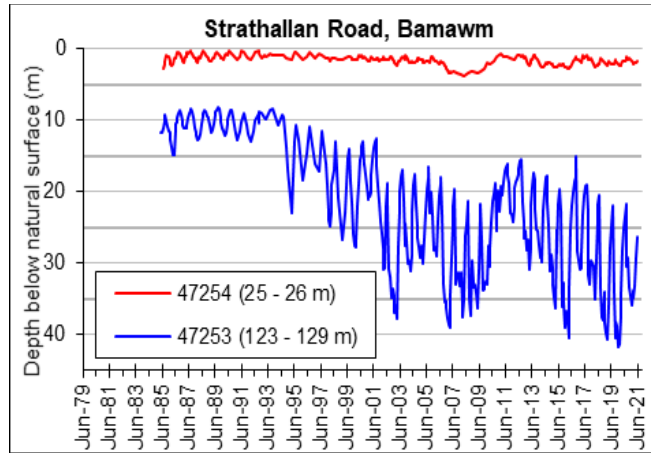
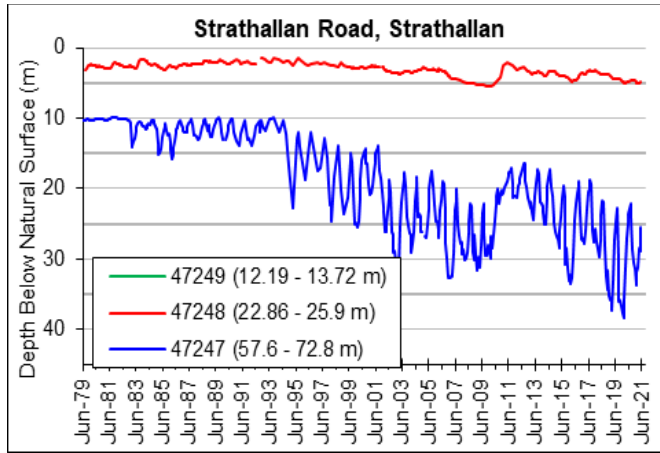
Further groundwater level information is available on the Water Measurement Information System, at <https://data.water.vic.gov.au>

Elmore-Rochester Zone (1031)

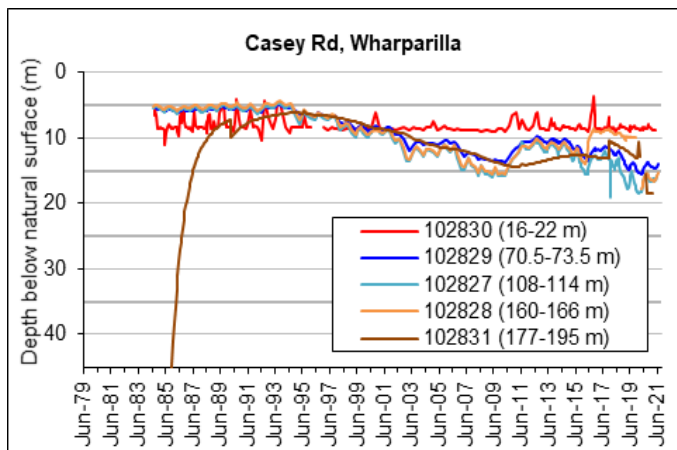
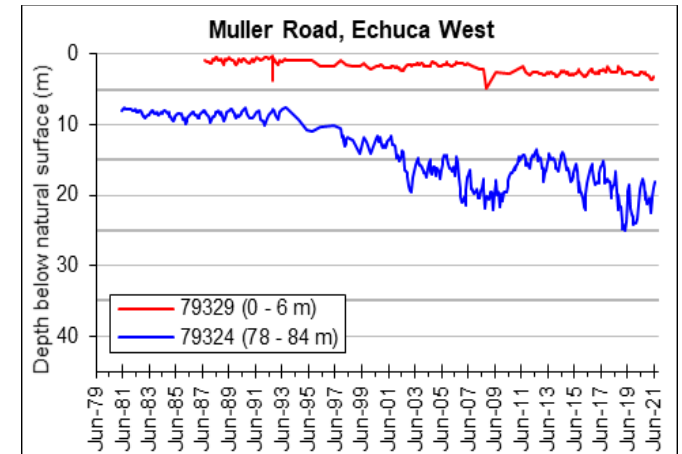
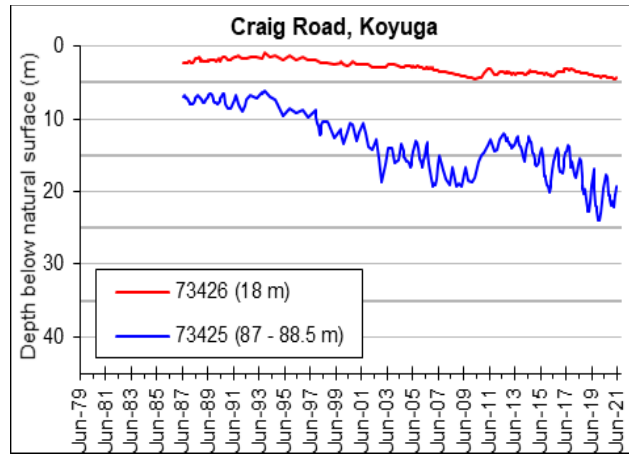
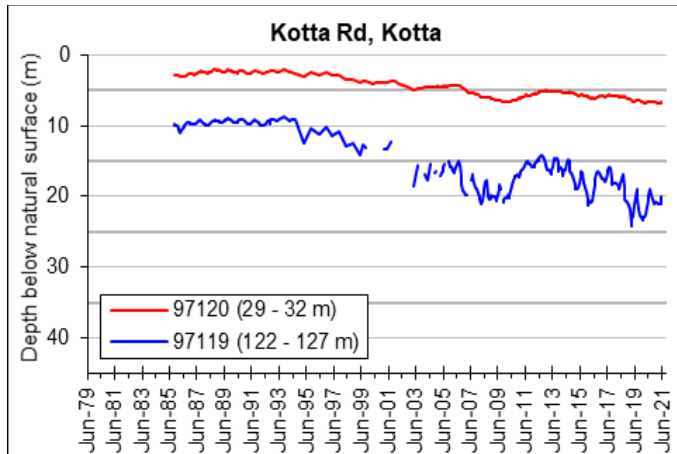




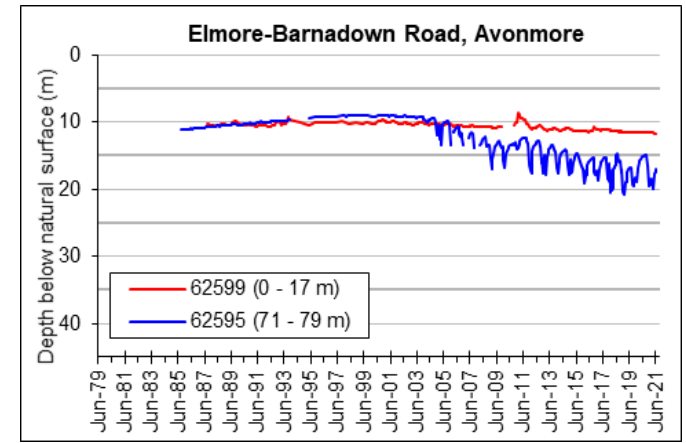
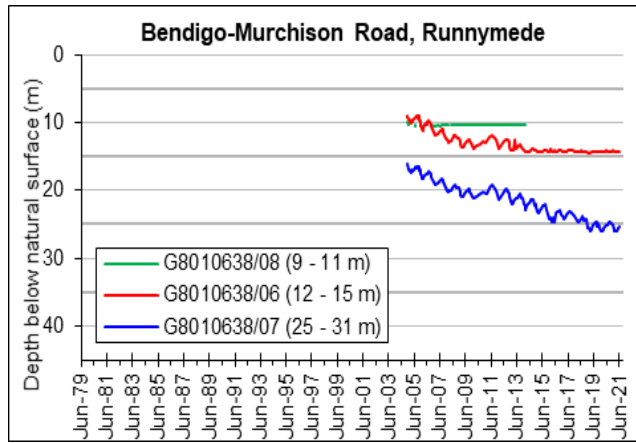
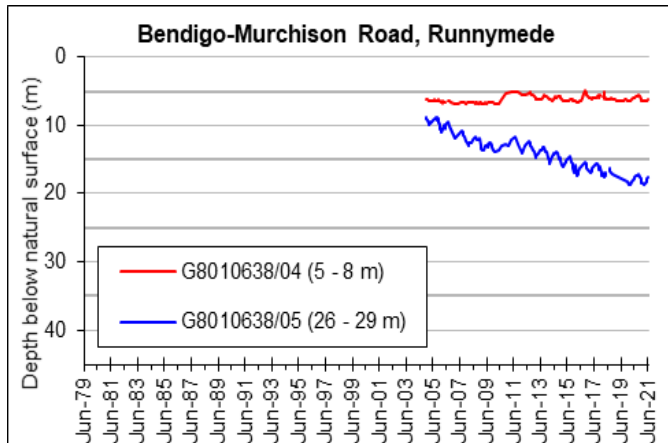
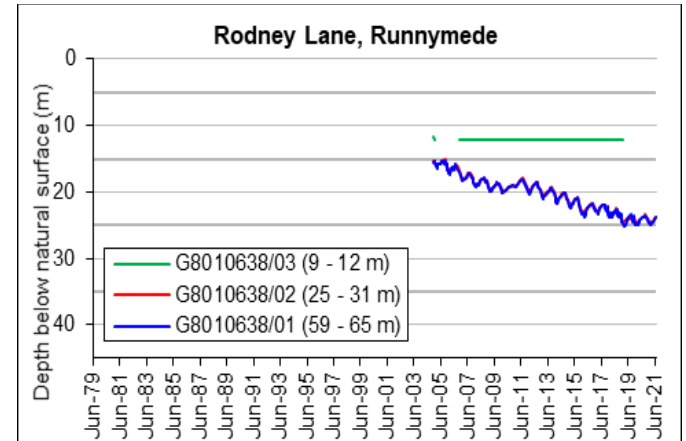
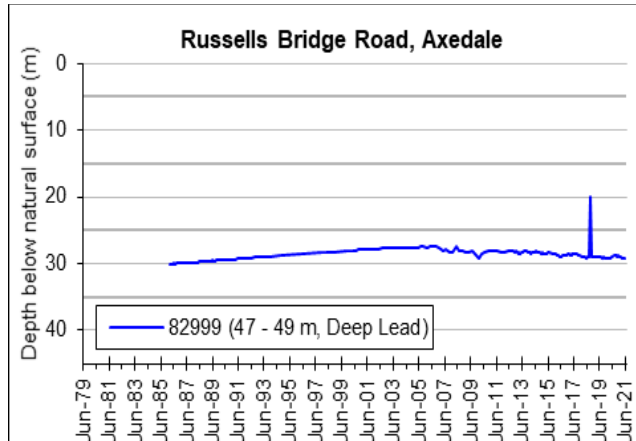
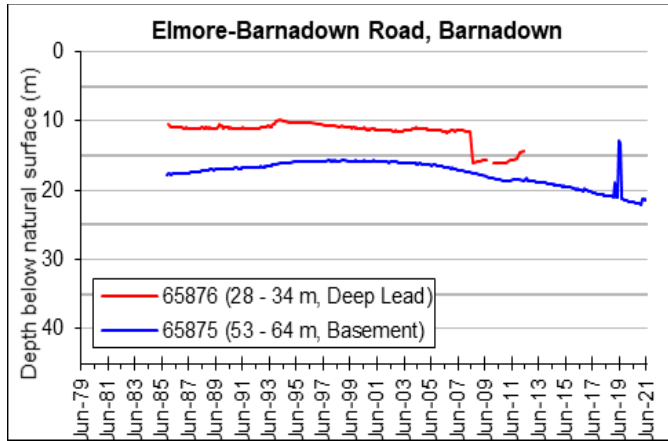
Bamawm Zone (1032)

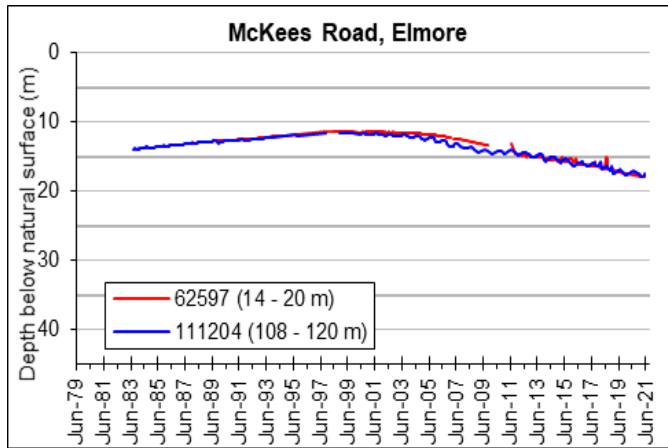


Echuca Zone (1033)



Barnadown Zone (1034)





Appendix C – Groundwater quality results

Analytical chemistry results for 2020/21

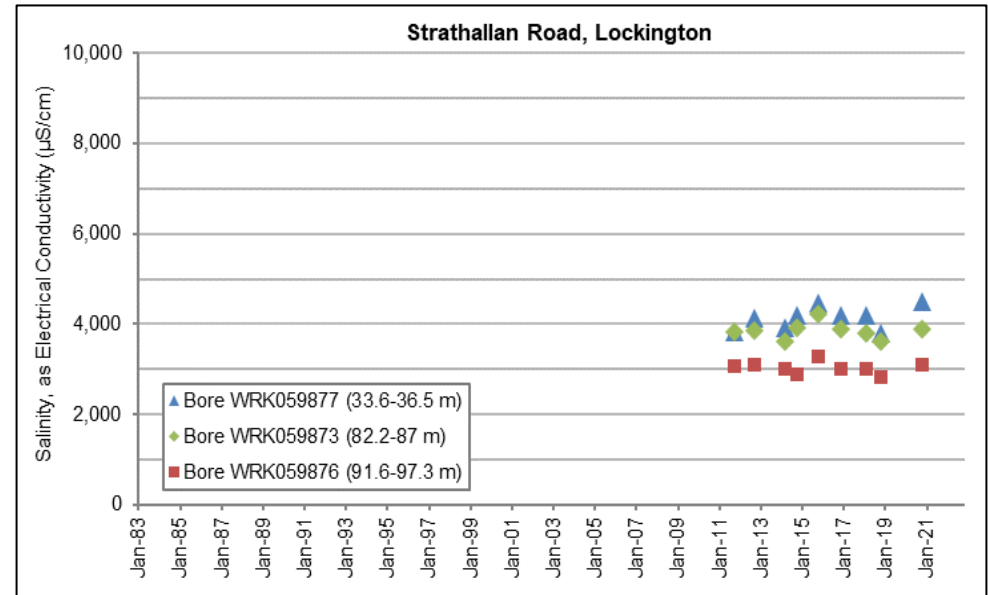
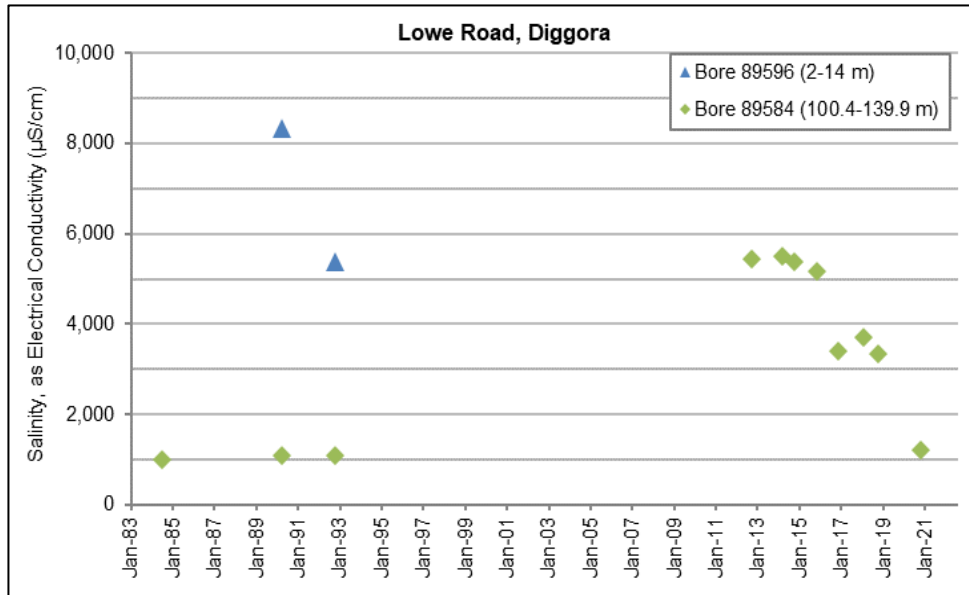
Analytical chemistry results are provided for key monitoring bores listed in Schedule 1 of the Plan.

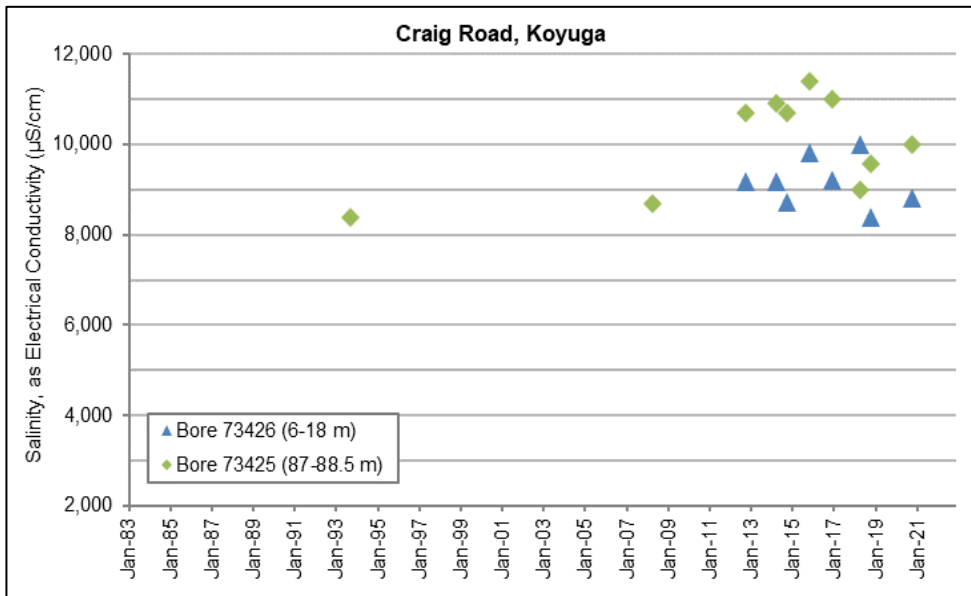
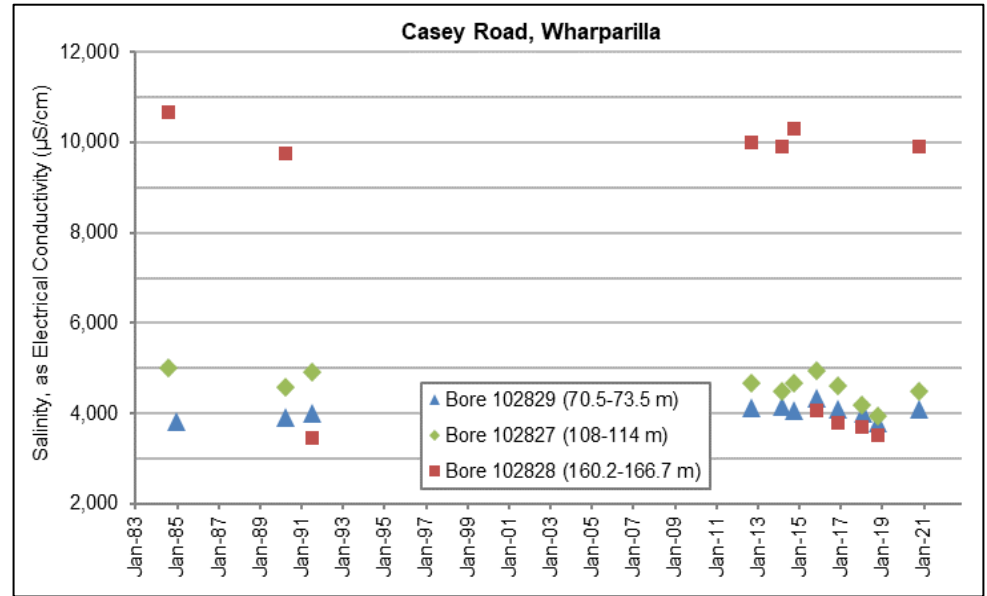
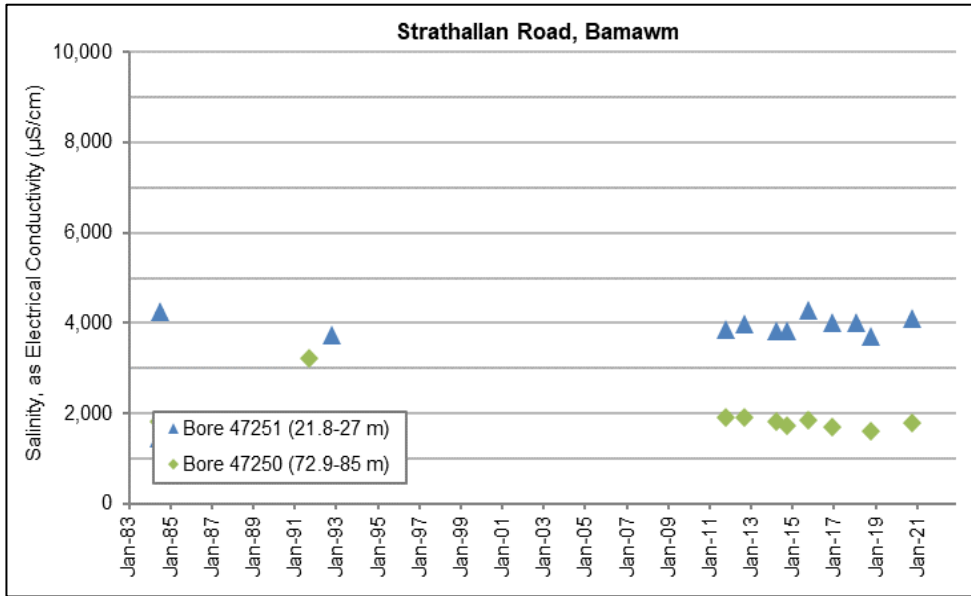
Further groundwater quality information is available on the Water Measurement Information System at <https://data.water.vic.gov.au>

		102827	102828	102829	47250	47251	62589	73425	73426	89584	WRK059873	WRK059877	WRK059876
Bore:		102827	102828	102829	47250	47251	62589	73425	73426	89584	WRK059873	WRK059877	WRK059876
Aquifer:		Deep Lead		Deep Lead	Shepparton Formation	Deep Lead	Deep Lead	Shepparton Formation	Deep Lead	Shepparton Formation	Deep Lead	Deep Lead	Deep Lead
Date:		27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020
Analyte	Unit												
Conductivity @ 25°C	µS/cm	4500	9900	4100	1800	4100	1000	10000	8800	1200	3900	3100	4500
pH	pH units	8.8	7.2	7.5	7	8.8	6.6	8.7	7	9.2	7	6.7	6.8
Ionic balance	%	3.68	-2.98	0.42	9.12	1.78	8.63	10.9	8.53	3.35	9.84	1.33	4.03
Total Anions	meq/L	45	39	97	17	41	10	123	95	11	38	29	44
Total Cations	meq/L	42	96	41	14	36	8	99	35	10	78	26	40
Ion Balance - TDS (EC) vs TDS	mg/l	2	2	1.8	2.2	2	1.7	1.8	2.2	2.1	1.8	2.1	2
Total Alkalinity, as CaCO ₃	mg/L	190	160	180	130	160	70	200	56	56	130	170	150
Bicarbonate Alkalinity, as CaCO ₃	mg/L	160	160	180	120	140	70	200	56	40	130	170	150
Calcium, as Ca	mg/L	32	39	79	120	74	26	14	19	14	100	46	62
Carbonate Alkalinity, as CaCO ₃	mg/L	22	<2	<2	10	21	<2	<2	<2	16	<2	<2	<2
Chloride, as Cl	mg/L	1300	3100	990	500	2600	250	3800	1200	350	1100	900	1200
Hydroxide Alkalinity, as CaCO ₃	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Potassium, as K	mg/L	10	8	15	12	12	3.3	5	11	4	7	8	11
Sodium, as Na	mg/L	730	720	1600	260	650	84	1600	660	180	1300	420	530
Ammonia, as N	mg/L	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1

		Bore:	102827	102828	102829	47250	47251	62589	73425	73426	89584	WRK059873	WRK059877	WRK059876
		Aquifer:	Deep Lead		Deep Lead	Shepparton Formation	Deep Lead	Deep Lead	Shepparton Formation	Deep Lead	Shepparton Formation	Deep Lead	Deep Lead	Deep Lead
		Date:	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020	27/10/2020
Analyte	Unit													
Nitrite, as N	mg/L	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate, as N	mg/L	0.04	0.04	0.04	0.01	0.14	0.44	0.01	1.2	0.02	2.5	0.01	0.03	
Sulphate, as SO4	mg/L	1000	340	290	1	190	51	580	330	1	22	220	190	
Total Kjeldahl Nitrogen, as N	mg/L	0.3	<0.1	1	<0.1	0.1	0.3	0.3	<0.1	0.1	0.3	0.2	0.2	
Total Nitrogen, as N	mg/L	0.2	<0.1	1	0.3	0.2	0.43	0.3	0.3	0.1	2.8	<0.1	1.2	
Arsenic, as As	mg/L	<0.001	<0.001	<0.001	0.003	0.002	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	
Iron, dissolved as Fe	mg/L	0.02	0.06	8.4	<0.01	3.3	<0.01	0.13	<0.01	0.02	<0.01	0.32	<0.01	
Mercury, as Hg	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Magnesium, as Mg	mg/L	100	91	260	280	61	36	26	100	20	200	68	110	
Manganese, dissolved as Mn	mg/L	0.12	0.06	0.44	0.11	0.093	0.002	0.052	0.028	0.022	<0.001	0.079	<0.001	
Total Dissolved Solids, 180C	mg/L	2200	2100	5500	800	1900	600	5600	2200	580	4900	1500	1900	
Total Organic Carbon	mg/L	<0.5	0.9	1.2	3.2	4.2	0.7	<0.5	0.8	1.9	5.5	0.9	1	
Turbidity, NTU	NTU	41	17	120	7.7	5.7	0.6	3.7	0.6	3.8	30	7	54	
Phosphorus, total as P	mg/L	10	8	15	12	12	0.11	5	11	4	7	8	11	
Lead, dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Nickel, dissolved	mg/L	<0.001	0.039	<0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.003	<0.001	<0.001	
Cadmium, dissolved	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Chromium, dissolved	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.008	
Copper, dissolved	mg/L	<0.001	<0.001	0.007	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Zinc, dissolved	mg/L	<0.001	0.009	0.025	0.002	0.018	0.021	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	

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





Historic groundwater salinity data for private bores sampled in the targeted sampling program

