Loddon Highlands Water Supply Protection Area Groundwater Management Plan

Annual Report

For year ending 30 June 2021

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Document History and Distribution

Versions

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Final	Mr Brad Drust Chief Executive Officer, North Central Catchment Management Authority	27 September 2021	

Foreword

Goulburn-Murray Water (GMW) is pleased to present the annual report for the *Loddon Highlands 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 21 November 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 Tatura office of GMW, or for download from the GMW website.

Charmaine Quick
MANAGING DIRECTOR

Date: 23/09/2021

Executive summary

The *Loddon Highlands Water Supply Protection Area Groundwater Management Plan* (the Plan) was approved on 21 November 2012 by the Minister for Water. The 2020/21 water year marks the ninth year of operation of the Plan.

In July 2020, Goulburn-Murray Water (GMW) announced that licence holders in five of the seven management zones of the Loddon Highlands Water Supply Protection Area (the WSPA) would have access to 100 per cent of their licence entitlement volume for the 2020/21 water year. Licence holders in the Newlyn Zone would have restricted access with an allocation of 75 per cent; and those in the Blampied Zone would start the year with a 75 per cent allocation, which later increased to 100 per cent after the resource had recovered sufficiently.

Recorded use in the WSPA in 2020/21 was 4,608.7 ML, or 22 per cent of the total licensed groundwater entitlement, which was the lowest since the Plan was implemented.

Transfer activity for licensed groundwater entitlement was moderate during the 2020/21 water year; eight temporary licence transfers totalling 331.0 ML and two permanent transfers totalling 40 ML/yr. A total of 3,039.2 ML has been carried over for use in the 2021/22 water year.

After three consecutive water years of below-average rainfall at Clunes, a total of 599 mm (9 mm above the long-term average) was recorded in 2020/21. This, coupled with low groundwater extraction in 2020/21, resulted in smaller seasonal groundwater level drawdowns and overall improved groundwater levels across much of the WSPA.

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

GMW commissioned a groundwater consultant to undertake an independent review of the monitoring arrangements in the Blampied and Newlyn management zones. The main findings of the report were that the current arrangements for managing groundwater levels in the Newlyn Zone are appropriate, and that the location of the allocation trigger bore for the Blampied Zone may not accurately reflect groundwater level behaviour from groundwater extraction, where extraction is at its most intense. GMW will discuss these findings with the Groundwater Reference Committee and decide if further actions are necessary.

Contents

1 Introduction

1.1 Purpose

This report has been prepared to meet the requirements of Prescription 7 of the *Loddon Highlands Water Supply Protection Area Groundwater Management Plan* (DSE, 2012) (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 Loddon Highlands Water Supply Protection Area (the WSPA), declared in June 2010, extends from Newlyn and Learmonth in the south to Dunolly in the north and includes the townships of Creswick, Waubra, Clunes, Talbot and Maryborough.

The WSPA incorporates management of groundwater resources to all depths.

There are seven management zones in the WSPA: Ullina Zone (1100), Talbot Zone (1101), Ascot Zone (1102), Mollongghip Zone (1103), Blampied Zone (1104), Waubra Zone (1106) and Newlyn Zone (1107), 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 21 November 2012 by the Minister for Water (the Minister), in accordance with section 32A(6) of the Act.

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

- Manage groundwater resources to protect groundwater users and the environment.
- Enable equitable access of groundwater resources to realise the potential for its use.
- Provide effective and transparent communication of Plan objectives, management rules and resource status.

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.

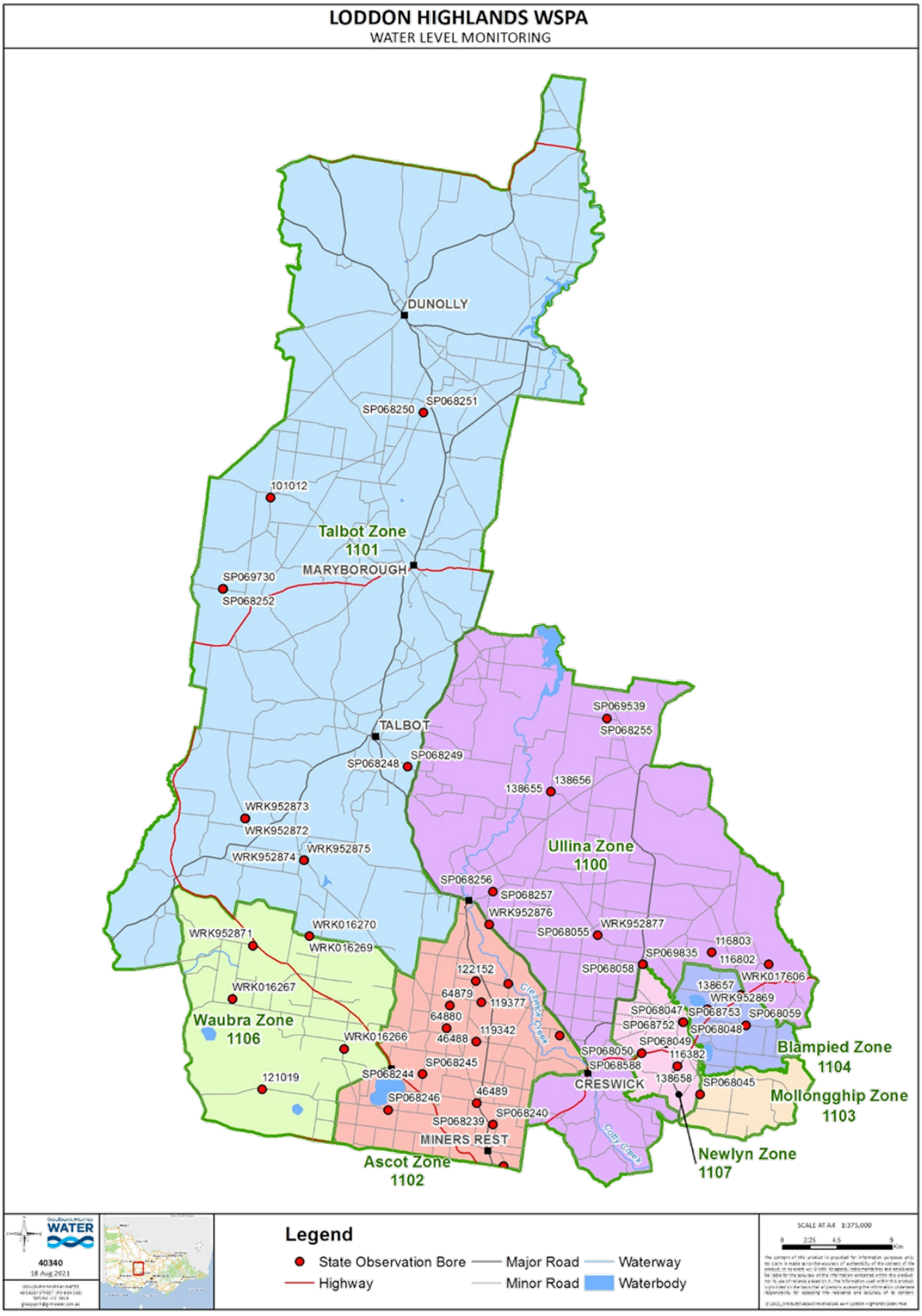

Figure 1 Loddon Highlands Water Supply Protection Area

2 Groundwater Management

2.1 Licence entitlement volume

The Minister declared a Permissible Consumptive Volume of 20,697 megalitres per year (ML/yr) for the WSPA in March 2013 (Victorian Government, 2013).

At 30 June 2021, the total of licence entitlement volume in the WSPA was 20,501.6 ML/yr. 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 Loddon Highlands WSPA in 2020/21

Management zone	Licences	Licensed bores	Licence entitlement volume (ML/yr)
Ullina Zone (1100)	23	29	2,992.2
Talbot Zone (1101)	12	12	1,195.7
Ascot Zone (1102)	70	104	7,057.2
Mollongghip Zone (1103)	3	7	333.0
Blampied Zone (1104)	19	27	1,252.5
Waubra Zone (1106)	30	61	4,702.8
Newlyn Zone (1107)	27	47	2,968.2
Total	**184**	**287**	**20,501.6**

Note: Licence data extracted from the Victorian Water Register on 30 June 2021.

2.2 Groundwater allocations

Annual groundwater allocations are determined by comparing average maximum groundwater recovery levels from key state observation bores against trigger levels outlined in Prescription 3 of the Plan. This relates to four of the seven management zones (Ascot, Blampied, Waubra and Newlyn), because of:

- high density of licences;
- historical seasonal drawdown; and
- greater rates of groundwater level decline during dry periods.

The state observation bores used to determine seasonal allocations in the four management zones are listed in Table 2, and shown in Figure 1.

Table 2 State observation bores used to determine annual allocations in the Loddon Highlands WSPA

Management zone	Bore number
Ascot Zone (1102)	64879, 64880, 122152, 119377, 119342
Blampied Zone (1104)	138657
Waubra Zone (1106)	WRK016266, WRK016267, WRK016269
Newlyn Zone (1107)	138658, 116382

Annual allocations are to be announced by 15 September of each year, based on groundwater level readings measured between 1 July and 30 August of the same year. If an allocation is announced at less than 100 per cent, it shall be reviewed based on groundwater level readings to November; an increase will be announced if there is sufficient further recovery.

GMW announced initial allocations for the 2020/21 water year on 31 July 2020. Licence holders in two of the four management zones (Ascot and Waubra) started the water year with an allocation of 100 per cent of licence entitlement volume (Figure 2, Figure 3). Licence holders in the Blampied and Newlyn zones were subject to restricted take and use of groundwater, with an allocation of 75 per cent of licence entitlement volume.

GMW continued to monitor groundwater recovery levels throughout spring. There was sufficient further recovery in the Blampied Zone bore (138657) to trigger a higher allocation (Figure 4). GMW announced 100 per cent allocation for the Blampied Zone on 14 September 2020. Further recovery was observed in the Newlyn Zone trigger bores; however, this was insufficient to trigger a higher allocation (Figure 5).

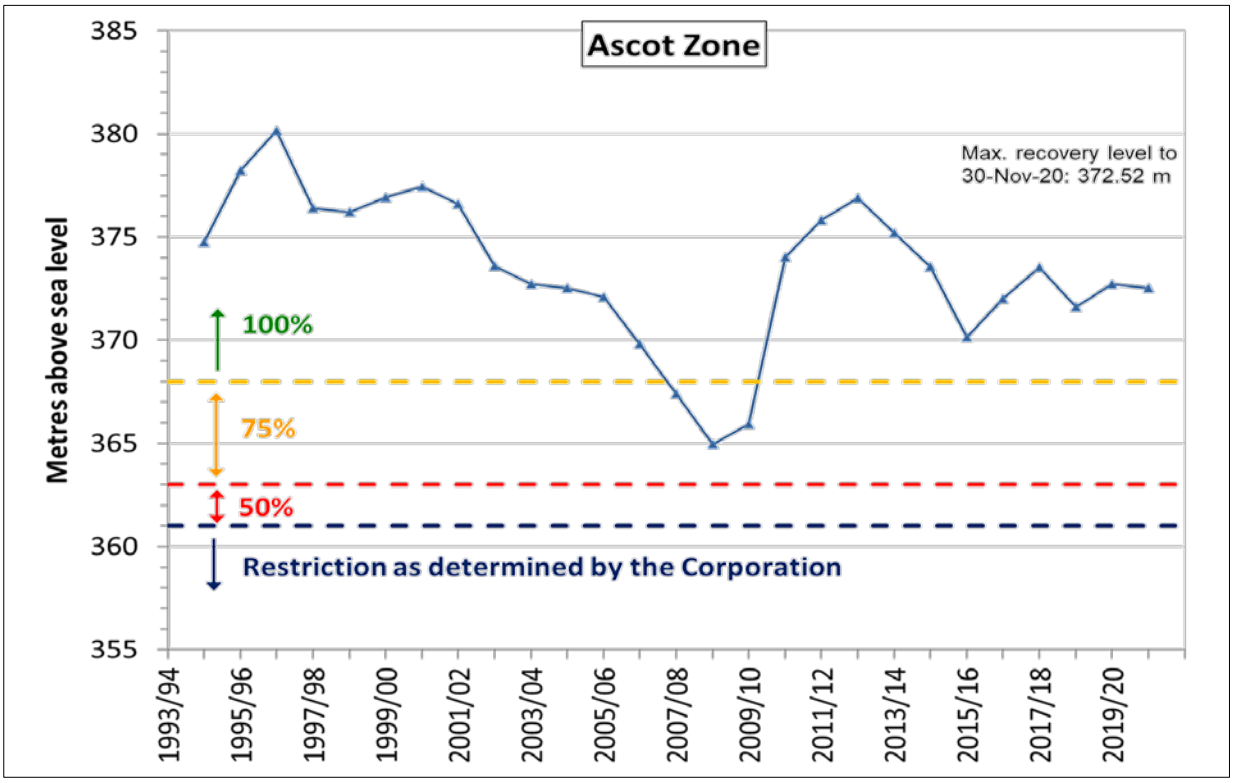

Figure 2 Trigger graph for determining Ascot Zone allocations, to 30 November 2020

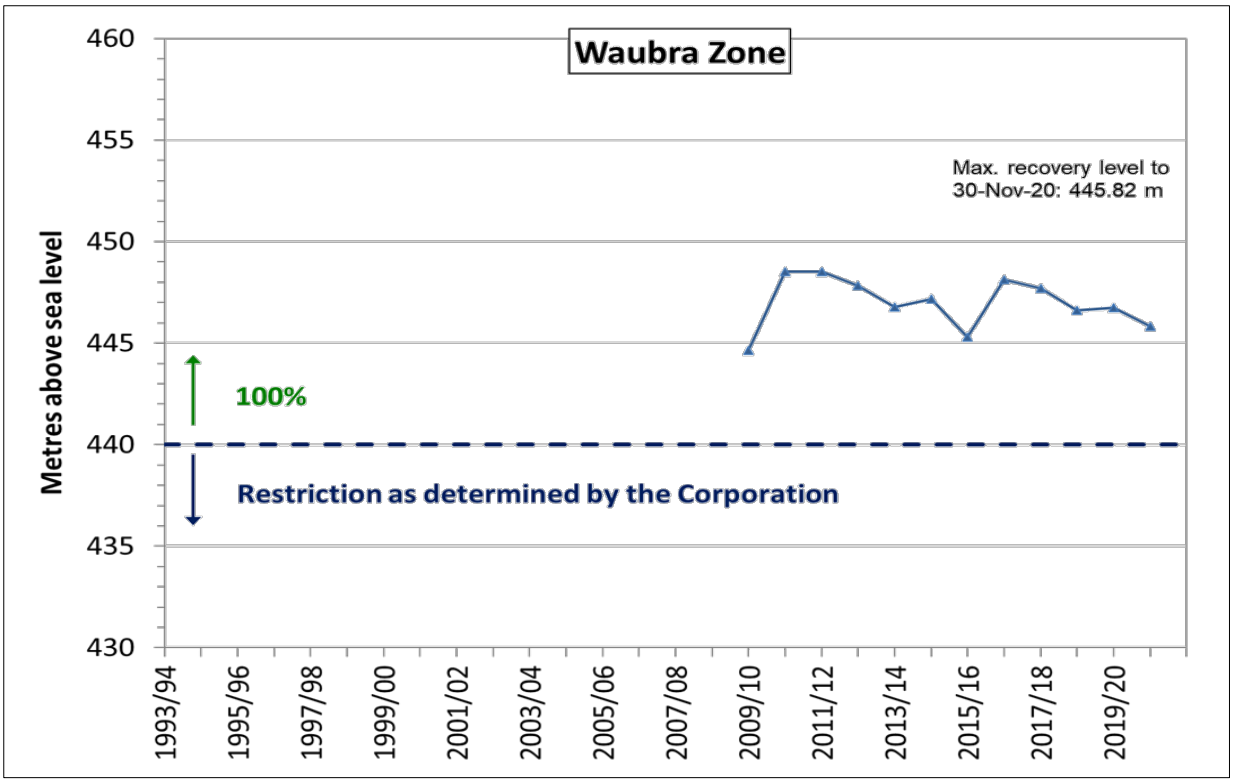

Figure 3 Trigger graph for determining Waubra Zone allocations, to 30 November 2020

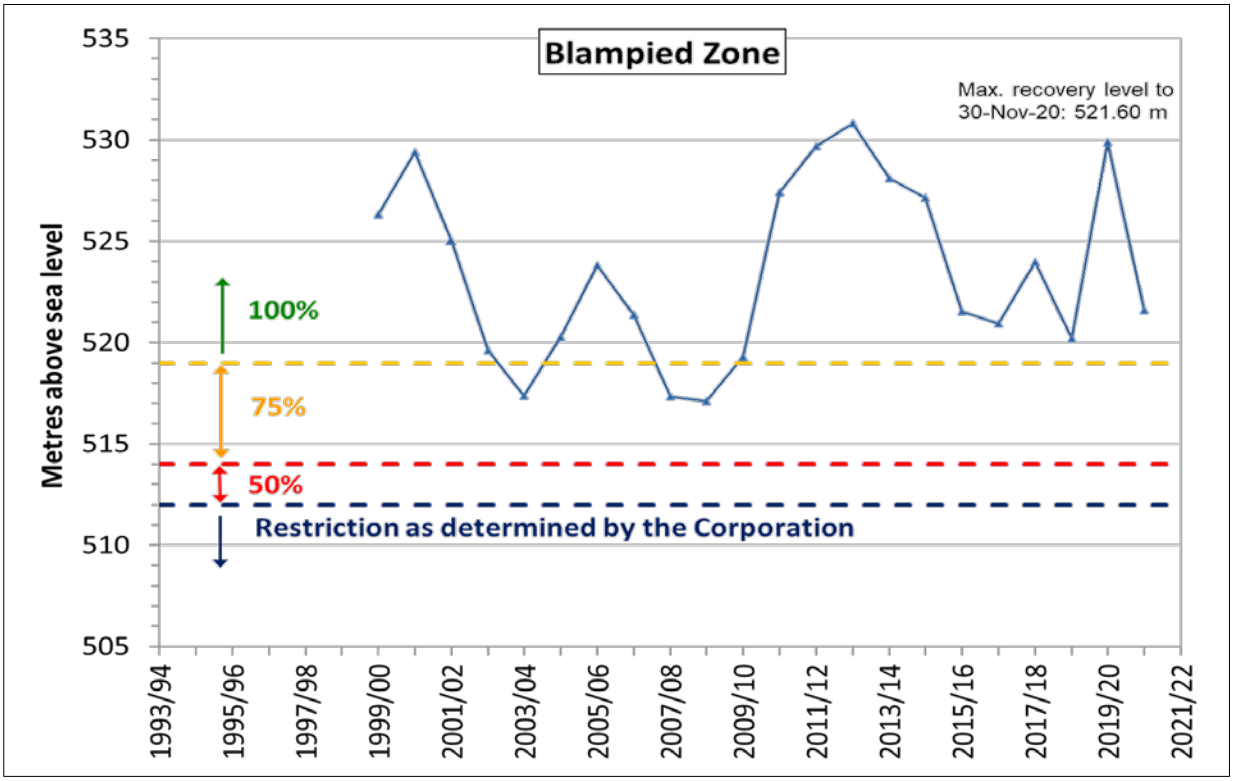

Figure 4 Trigger graph for determining Blampied Zone allocations, to 30 November 2020

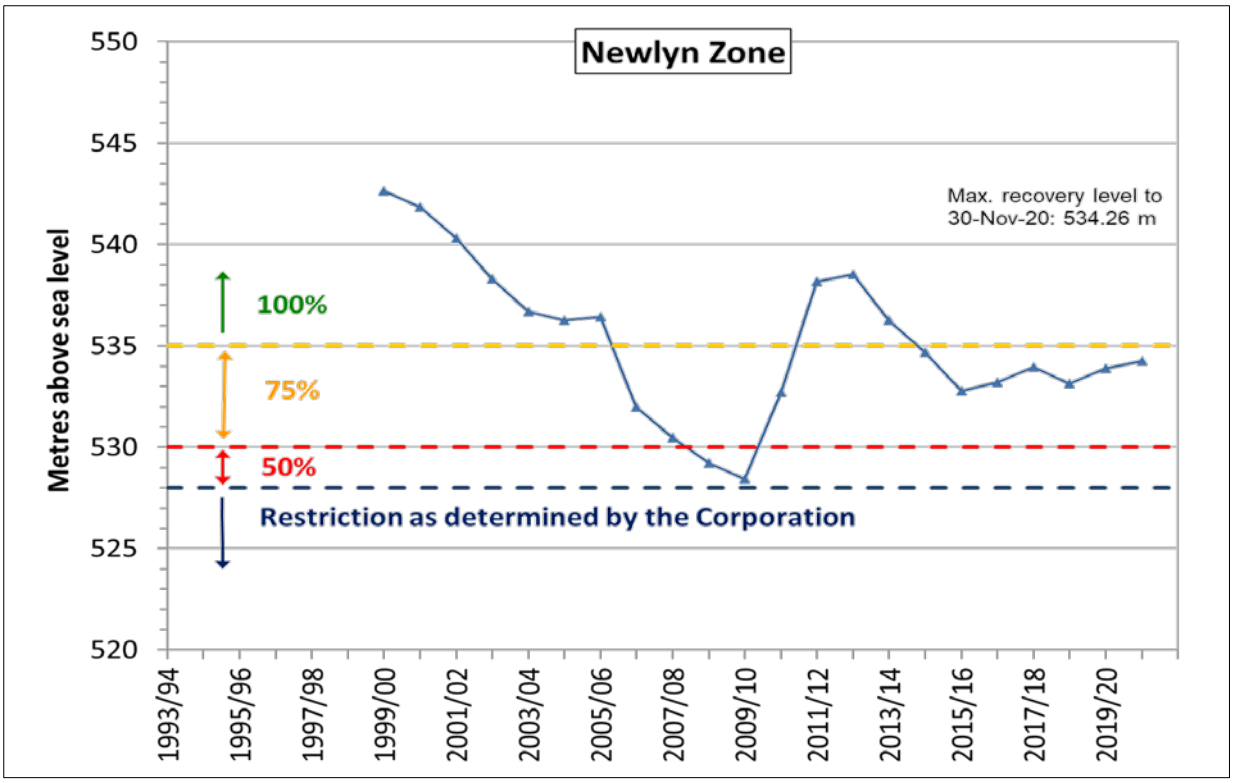

Figure 5 Trigger graph for determining Newlyn Zone allocations, to 30 November 2020

2.3 Groundwater use

Total recorded use in the WSPA in 2020/21 was 4,608.7 ML, or 22 per cent of the total licence entitlement volume, which was the lowest since the Plan was implemented in 2012/13 (Figure 6).

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

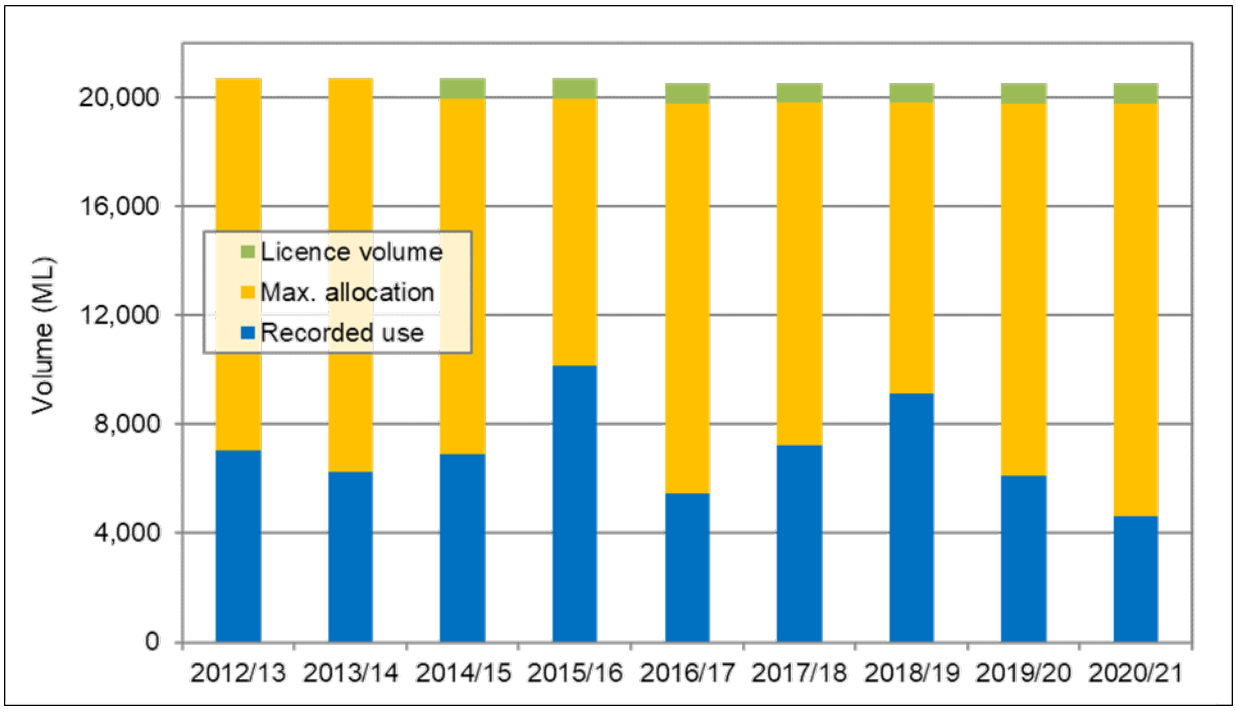

Figure 6 Entitlement, allocation and use in the Loddon Highlands WSPA since 2012/13

In 2020/21, the volume of recorded use was highest in the Ascot Zone, where the largest proportion of licence entitlement volume was held. The highest recorded use, as a percentage of licence entitlement volume, occurred in the Blampied Zone (Table 3).

Table 3 Recorded use in the Loddon Highlands WSPA in 2020/21

Management zone	Licence entitlement volume (ML/yr)	Recorded use (ML)	Proportion of licence entitlement volume used
Ullina Zone (1100)	2,992.2	238.8	8%
Talbot Zone (1101)	1,195.7	311.8	26%
Ascot Zone (1102)	7,057.2	2,062.6	29%
Mollongghip Zone (1103)	333.0	51.6	15%
Blampied Zone (1104)	1,252.5	472.9	38%
Waubra Zone (1106)	4,702.8	755.9	16%
Newlyn Zone (1107)	2,968.2	715.1	24%
Total	**20,501.6**	**4,608.7**	**22%**

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

2.4 Rainfall

Historic rainfall data, sourced from the Bureau of Meteorology weather station at Clunes (BOM, 2021), is presented in Figure 7 as an indicator of climate trends across the WSPA.

The data show that annual rainfall was generally above the long-term average (currently 580 mm) in the early 1970s, and remained relatively steady through the 1980s and 1990s. Between 1999/2000 and 2008/09, annual totals were below-average (Millennium Drought) until rainfall conditions improved in 2009/10 and 2010/11.

Since the 2012/13 water year, when the Plan was implemented, annual rainfall totals at Clunes have been below-average (398–525 mm), with the exception of 2016/17 (720 mm) and 2020/21 (599 mm). Over this period (nine years), a total of 4,590 mm has been recorded at Clunes which equates to 510 mm per year, on average. This trend has resulted in reduced recharge to groundwater systems within the WSPA.

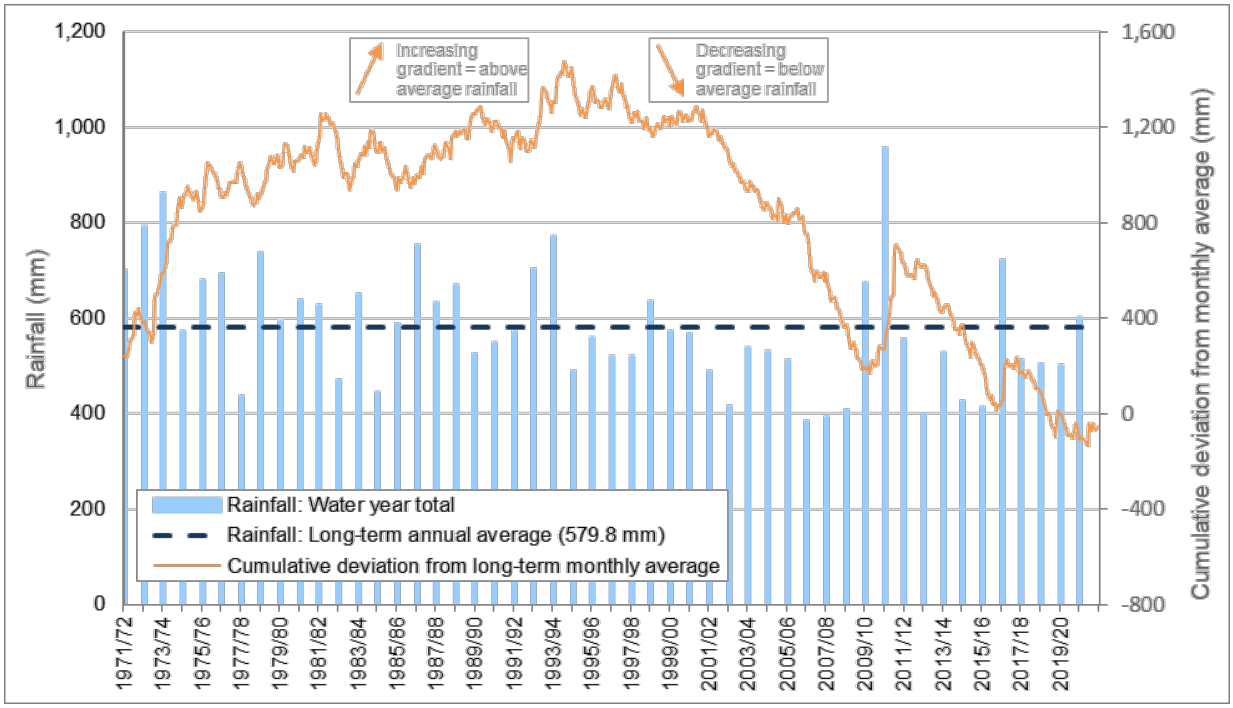

Figure 7 Rainfall recorded at Clunes in the Loddon Highlands WSPA (BOM, 2021)

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 eight temporary transfer transactions for a total of 331 ML, and two permanent transfer transactions for a total of 40 ML/yr (Figure 8).

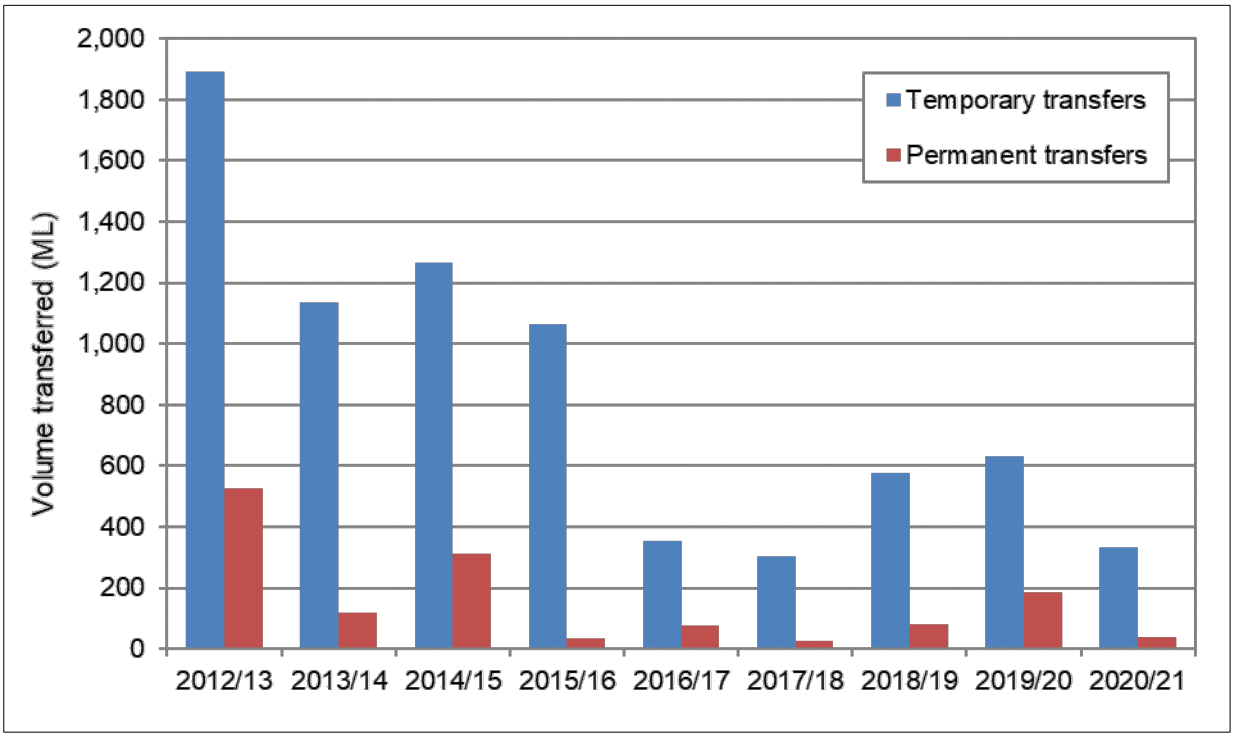

Figure 8 Licence entitlement volumes transferred in the Loddon Highlands WSPA, since 2012/13

The majority of transfers occurred between licence holders within the same management zones (Table 4).

Of the eight temporary transfers completed, three were between management zones: 45 ML transferred from the Newlyn Zone to the Ullina Zone; 10 ML from the Ascot Zone to the Ullina Zone; and 1 ML from the Ullina Zone to the Talbot Zone.

Of the two permanent transfers completed, one was between management zones: 10 ML/yr from the Ascot Zone to the Ullina Zone.

Table 4 Licence transfers in the Loddon Highlands WSPA in 2020/21

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)
Ullina Zone (1100)	2	11.0	3	65.0	-	-	1	10.0
Talbot Zone (1101)	-	-	1	1.0	-	-	-	-
Ascot Zone (1102)	5	275.0	4	265.0	2	40.0	1	30.0
Mollongghip Zone (1103)	-	-	-	-	-	-	-	-
Blampied Zone (1104)	-	-	-	-	-	-	-	-
Waubra Zone (1106)	-	-	-	-	-	-	-	-
Newlyn Zone (1107)	1	45.0	-	-	-	-	-	-
Total	**8**	**331.0**	**8**	**331.0**	**2**	**40.0**	**2**	**40.0**

2.6 Carryover

The Minister declared in November 2012 that groundwater licence holders in the WSPA were authorised to carryover up to a maximum of 15 per cent of licence entitlement volume for use in the subsequent water year (Victorian Government, 2012).

There was a total of 2,996.9 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 3,039.2 ML was carried over for use in the 2021/22 water year.

2.7 Metering

There were 234 metered service points and 55 deemed service points in the WSPA at 30 June 2021. There were 204 meter-related activities undertaken during the 2020/21 water year, including corrective and preventative maintenance (Table 5).

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

Table 5 Metering activities in the Loddon Highlands WSPA in 2020/21

Metering activity	Year ending 30 June 2021
Total number of meters	234
Total number of meter reads	468
Meters installed or replaced	-
Meter inspection events	181
Meter maintenance events	11

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.gmwater.com.au/water-resources/water-use-compliance .

There were four 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 and is not regulated by the Plan.

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 (WMIS).

According to the Victorian Water Register, there were 33 domestic and stock bore construction licences issued, and 13 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 51 state observation bores, located within the WSPA, were monitored by GMW and the Department of Environment, Land, Water and Planning (DELWP) – refer Figure 1. This total includes the 34 key bores listed in Schedule 1 of the Plan, where practicable. Of the 51 monitored bores, 44 were monitored remotely using telemetry equipment, with measurements recorded hourly; and seven were monitored manually, with measurements recorded on a monthly or quarterly basis.

Water level data for these bores are presented in Appendix B – Groundwater level data.

Groundwater recovery levels were relatively steady during the late 1980s and early 1990s; declined from the mid-1990s to 2009, largely in response to below-average rainfall throughout the Millennium Drought; and recovered strongly in response to above-average rainfall in 2009/10 and 2010/11.

Groundwater levels have generally declined since the Plan was approved in late 2012, consistent with reduced rainfall recharge, which is a result of generally drier than the long-term average rainfall conditions across the reported period – refer discussion in section 2.4.

In 2020/21, groundwater levels recorded in monitoring bores at Cotswald Road, Glengower, in the Ullina Zone and Forest Road, Glenbrae (within the lower Basalt aquifer), in the Waubra Zone, recovered slightly, after being at their lowest on record during 2019/20 (Figure 9). These may be positive signs from a resource management perspective; however, the levels recorded in a shallower monitoring bore in the Waubra Zone (upper Basalt aquifer) uncharacteristically showed little sign of recovery after the 2019/20 water year and continued to decline throughout 2020/21, reaching the lowest level in five years (17.18 m below natural surface) in May 2021 (Figure 10). GMW will keep a close watch on groundwater levels in the Waubra Zone and investigate further if required.

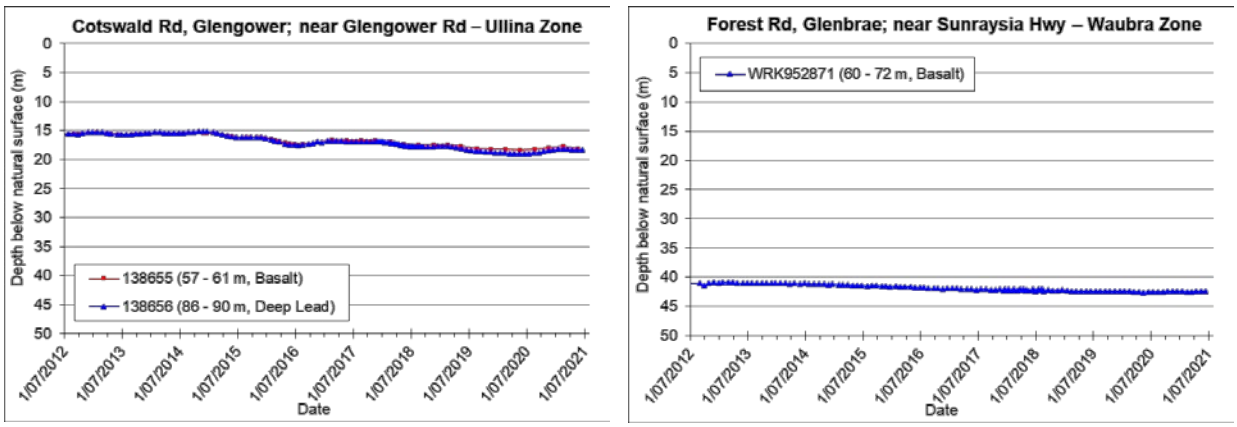

Figure 9 Groundwater level monitoring in the Ullina Zone, at Glengower (left); and in the Waubra Zone, within the lower extent of the Basalt aquifer (right) – July 2012 to June 2021 (DELWP, 2021)

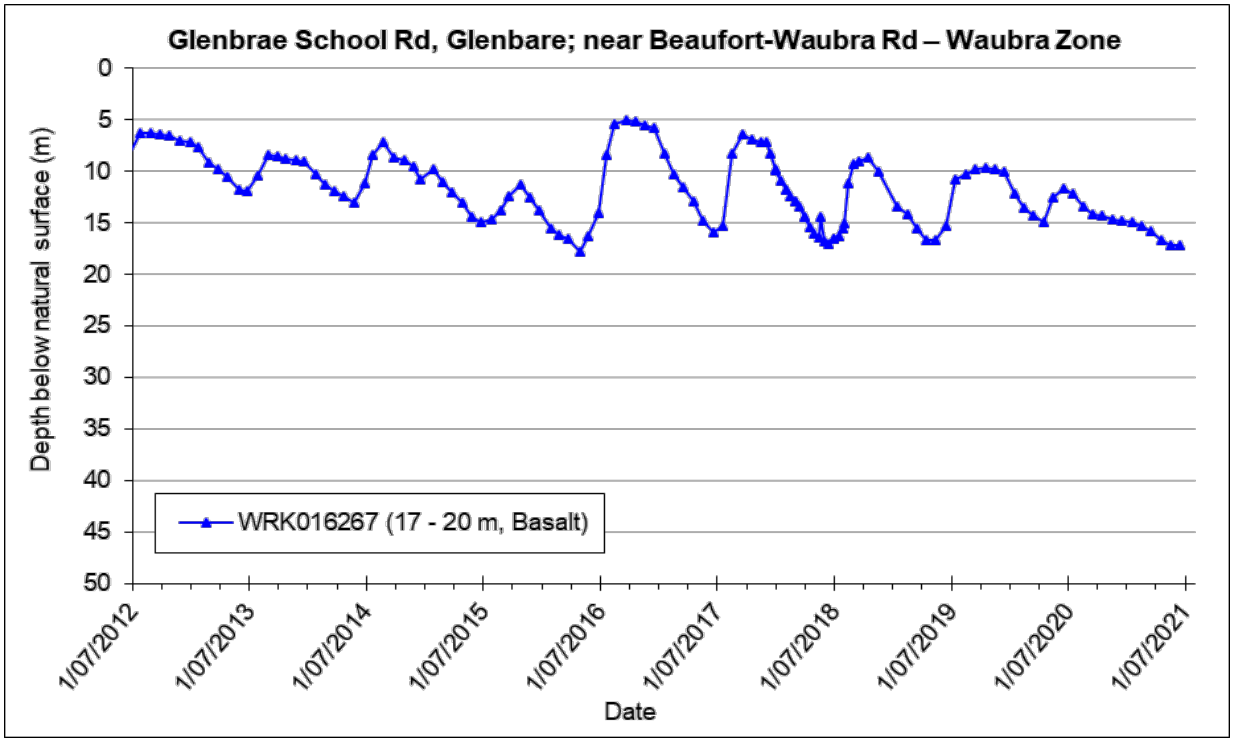

Figure 10 Groundwater level monitoring in the Waubra Zone, within the upper extent of the Basalt aquifer – July 2012 to June 2021 (DELWP, 2021)

Seasonal drawdown during the 2020/21 water year was typically less than 6 m across the WSPA. In the Ascot Zone, where the greatest volume of groundwater was abstracted (Table 3), drawdown up to 7.34 m was recorded in bore 64880 (Figure 11) and 6.76 m in bore 119377, both located at Coghills Creek.

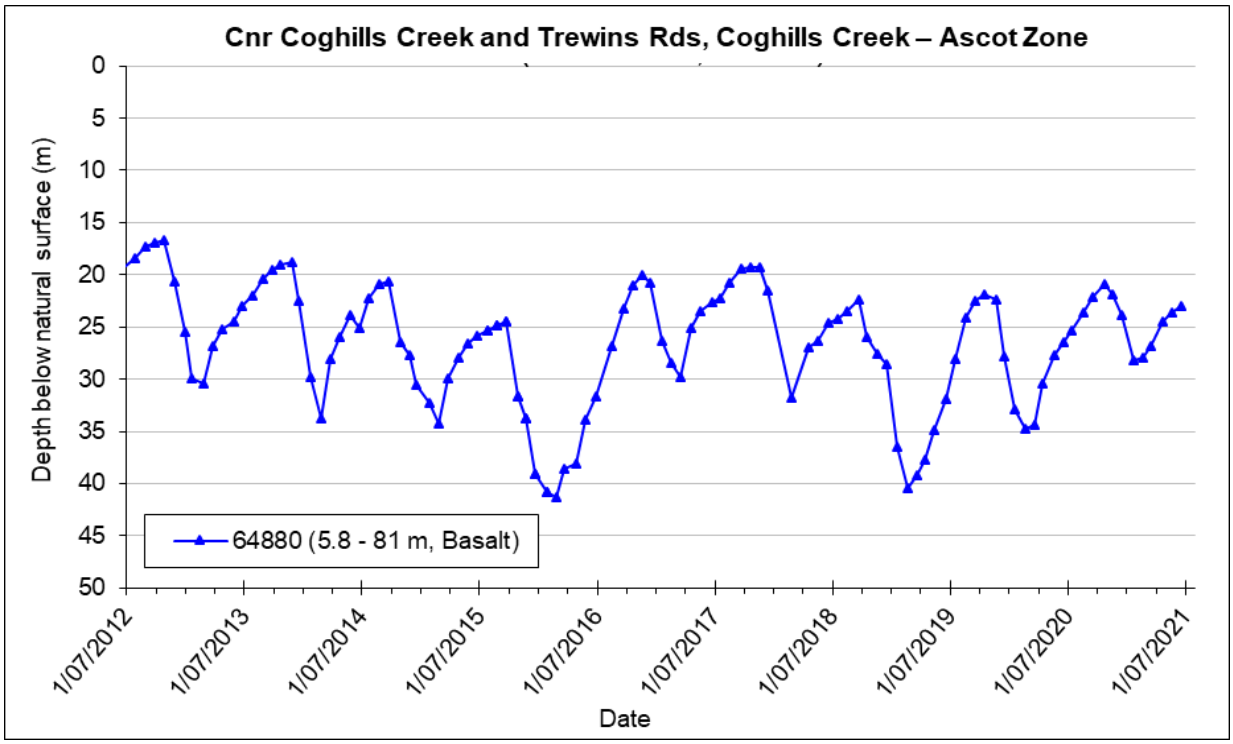

Figure 11 Groundwater level monitoring in the Ascot Zone, at Coghills Creek – July 2012 to June 2021 (DELWP, 2021)

3.2 Groundwater quality

During the 2020/21 water year, four state observation bores, located at two nested sites within the WSPA, were sampled by GMW and DELWP. Nested sites feature two or more bores in close proximity, each monitoring a different aquifer. The sites used for water quality testing, which are listed in Schedule 1 of the Plan, are located in the Talbot and Ullina zones and monitor groundwater in both the Deep Lead and basalt aquifers.

Groundwater samples collected from these bores were sent to a laboratory for analysis. The full suite of results are presented in Appendix C.

Time series groundwater salinity results, presented in Figure 12, indicate that groundwater salinity levels continue to be higher in the basalt aquifers than the underlying Deep Lead aquifers, at both sites. Ongoing annual monitoring of these bores will enable natural variance to be established and any trends in groundwater quality to be observed.

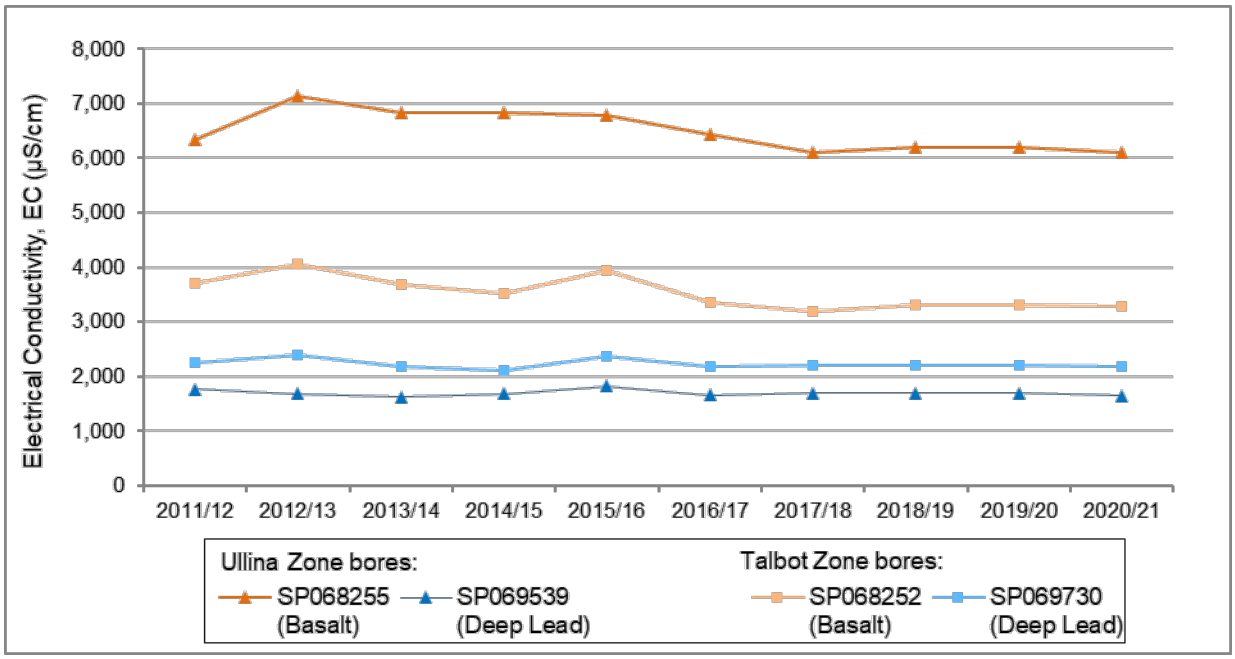

Figure 12 Salinity of groundwater in key monitoring bores in the Loddon Highlands WSPA (DELWP, 2021)

Groundwater salinity data from Central Highlands Water (CHW) licensed monitoring bores have also been used to monitor changes in groundwater quality across the WSPA. Data collected during 2020/21 were obtained from CHW bore fields at Forest Hill in the Newlyn Zone, Learmonth (Ascot Zone), Clunes (Ullina Zone), Waubra (Waubra Zone) and Bung Bong (Talbot Zone) (Figure 13). The data indicate that groundwater salinity levels are relatively stable and within historical ranges.

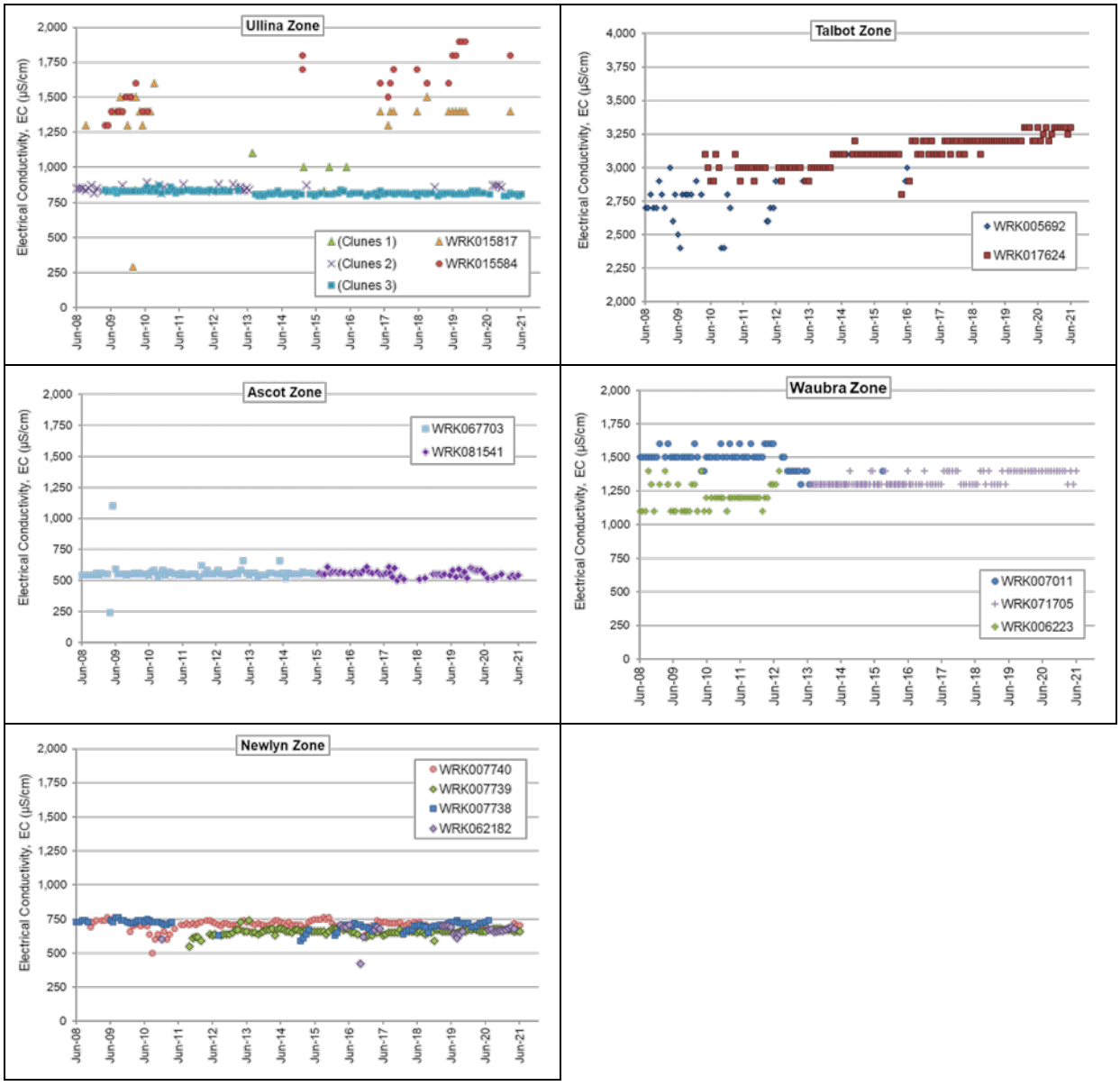

Figure 13 Groundwater salinity monitoring data from Central Highlands Water bores located in the Loddon Highlands WSPA

4 Administration and Engagement

4.1 Groundwater Reference Committee

The Groundwater Reference Committee (the Committee), appointed in accordance with Prescription 7(c) of the Plan, had its eighth meeting on 18 November 2020, via videoconference.

Key topics included:

- Changes to GMW team and committee membership
- Outstanding actions from previous meetings
- Plan implementation and administration, including a summary of the 2019/20 water year
- Resource condition and 2020/21 season outlook

The committee received a presentation from Damien Finlayson, Technical Director of Groundwater Consulting Australia (GCA), on his review of groundwater monitoring arrangements in the Blampied and Newlyn zones. A copy of the report was provided to the committee for review and feedback.

4.2 Further technical investigations

The Plan identifies additional technical investigations that could be undertaken to enhance the understanding of groundwater resources in the WSPA; and inform a review of the Plan. One of these is a study to quantify the impacts of groundwater pumping on baseflow in streams.

One of the Plan objectives relates to managing resources to protect groundwater users and the environment (including baseflow) by managing groundwater extraction with appropriate trigger levels and restrictions, as well as other mechanisms.

Independent review of groundwater monitoring in the Blampied and Newlyn zones

In response to issues raised by the Committee, and in line with technical investigations identified in the Plan, GMW engaged a groundwater consultant (Groundwater Consulting Australia) in April 2020 to undertake an independent, contemporary review of groundwater monitoring arrangements in the Blampied and Newlyn zones, and provide advice on:

1. the effectiveness of the existing bores for the monitoring of the resource; and
2. the implementation of restrictions on the use of groundwater, in line with the objectives of the Plan.

After reviewing a draft report and providing feedback to the consultant, GMW received a final report in November 2020 (GCA, 2020).

The following advice and conclusions were provided by the consultant (GCA, 2020):

1. In relation to the Newlyn Zone–
    - The two allocation trigger bores (138658 and 116382) are located in positions to most accurately (of available observation bores) reflect groundwater level behaviour from groundwater extraction where extraction is at its most intense (i.e. the centre of the zone, near Forest Hill).
    - Using the average of levels from the two bores is appropriate to account for some behaviour variability that can occur in a complex aquifer system comprising multiple layers of fractured basalt.

- Recommendation: these two bores should continue to be relied upon for groundwater management in the Newlyn Zone, unless there is a change in management approach.

2. In relation to the Blampied Zone–
    - The allocation trigger bore (138657) is located in a position that may not accurately reflect groundwater level behaviour from groundwater extraction, where extraction is at its most intense (i.e. the northern portion of the zone).
    - Recommendation: Bore 138657 should be replaced with an alternative allocation trigger bore (located further to the west; e.g. near the intersection of Jefferies Road and Daylesford-Clunes Road), if the current management approach is to continue.
3. The pattern of groundwater behaviour in the aquifer system in both management zones is dominated by rainfall and recharge from rainfall, which is rapid. Groundwater pumping results in secondary seasonal “noise” on a larger primary pattern of water level behaviour related to rainfall.
4. While groundwater extraction exerts a collective impact on groundwater levels in any pumped aquifer system, the impact of groundwater pumping from the CHW bore field, located on the northern side of Forest Hill, should contribute a lesser impact on groundwater levels observed in the Newlyn Zone trigger bores than licensed groundwater users in closer proximity to those bores.
5. Historic groundwater use has consistently been below the licensed allocation volume. In years when allocation restrictions have been imposed by the trigger bore system, groundwater use has been below the allowable limits.
6. Recommendation: A specific review of the efficacy of the current trigger level process should be conducted as it applies to the pattern of groundwater use and groundwater behaviour in both the Newlyn and Blampied zones.
7. Recommendation: A specific groundwater interaction program for Birch Creek should be considered, involving the installation of dedicated shallow groundwater monitoring bores adjacent to Birch Creek, in the central Newlyn Zone; and a program of groundwater level and creek level monitoring and water quality sampling to more accurately quantify and improve understanding of groundwater-surface water interaction.

GMW will discuss these recommendations with the Committee at its next meeting and consider if any further actions are required.

5 References

Bureau of Meteorology (BOM), 2021. *Climate Data Online – Clunes station number 088015*. Retrieved on 27 August 2021 from: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=088015

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Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
PRESCRIPTION 1 Carryover		
The Corporation shall: a) Apply to the Minister for Water to declare the availability of carryover in the Loddon Highlands WSPA up to a maximum of 15% of licence entitlement that will not be subject to restriction in the form of allocations. b) Consult with the Groundwater Reference Committee about the need to alter the percentage of carryover.	The Minister declared that licence holders in the WSPA may carryover up to 15 per cent licence entitlement volume from November 2012.	Yes
PRESCRIPTION 2 Triggers and restrictions		
The Corporation shall: a) By 15 September each year determine the maximum seasonal groundwater recovery level in the relevant bore/s, or its replacement, and corresponding seasonal allocation as detailed in the Plan. b) Determine a seasonal allocation for the relevant zone based on the outcomes of a review of available data. The review will be undertaken when the 50% allocation is triggered in the Blampied, Newlyn or Ascot Zone. The Corporation shall consult with the Groundwater Reference Committee during the review. c) Determine a seasonal allocation for the Waubra Zone and consult with Groundwater Reference Committee. d) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers. e) Review allocations based on groundwater level readings to November each year and announce an increase if triggered.	GMW announced allocations for the 2020/21 water year on 31 July 2020; these were based on groundwater recovery levels recorded in July 2020. Initial allocations were: 75 per cent for Blampied and Newlyn zones; and 100 per cent for all other management zones. On 14 September 2020, GMW increased the allocation for Blampied Zone to 100 per cent as there had been sufficient further recovery in the Blampied Zone trigger bore. The allocation remained unchanged for the Newlyn Zone as there was not sufficient recovery in the Newlyn Zone trigger bores to affect a higher allocation. GMW announced all allocations by listing them on its website, sending letters to all licence holders and placing public notices in local newspapers.	Yes

<table>
<tr><th>Prescription</th><th>Activity</th><th>Compliant</th></tr>
<tr><td colspan="3">PRESCRIPTION 3 Trading between zones</td></tr>
<tr><td>The Corporation may approve a temporary or permanent transfer of groundwater licence entitlement under section 62 of the Water Act 1989 provided section 53 matters have been considered and the following conditions are satisfied:
a) The permanent transfer of licence entitlement is between zones as specified in the Plan.
b) The temporary transfer of licence entitlement is between zones as specified in the Plan.
c) Despite (b) above, a temporary transfer of licence entitlement may be considered where bores are located within 2.5 km of each other across an internal zone boundary.
d) Licence entitlement may be temporarily traded into, or out of, the Loddon Highlands WSPA provided that the PCV is not exceeded.</td><td>In 2020/21, GMW processed: 8 transactions for temporary transfer of licence entitlement volume, totalling 331.0 ML; and 2 transactions for permanent transfer of licence entitlement volume, totalling 40 ML/yr.
All transfers were compliant with Prescription 3.</td><td>Yes</td></tr>
<tr><td colspan="3">PRESCRIPTION 4 Groundwater level interference</td></tr>
<tr><td>The Corporation may approve an application to take and use groundwater under section 51 or a transfer under section 62 of the Water Act 1989 provided that section 53 matters have been considered and the following conditions are satisfied:
a) Licence entitlement may be temporarily or permanently transferred up to 1,000 ML/yr within 2.5 km radius of a licensed bore.
b) Where the licence entitlement within a 2.5 km radius of a licensed bore exceeds 1,000 ML/yr then:
<table>
<tr><td>(i). For temporary transfer of licence entitlement</td><td>1. Trade with usage in any one season limited to 115% of entitlement, whether it occurs through trade or carryover (this could include transferring from outside the 2.5 km radius); or
2. Trade from others within 2.5 km radius of the applicant’s bore for usage to exceed 115% of entitlement; or
3. Assess the application to consider other relevant information such as historical use and, if required undertake detailed investigations, when seeking to use more than 115% of your licence entitlement to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</td></tr>
<tr><td>(ii). For permanent transfer of licence entitlement</td><td>1. Trade from others within 2.5 km radius of the applicant’s bore; or
2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</td></tr>
</table></td><td>GMW processed all groundwater licence applications in accordance with Prescription 4.</td><td>Yes</td></tr>
</table>

Prescription	Activity	Compliant
PRESCRIPTION 5 Groundwater monitoring		
The Corporation shall: (a) Obtain monthly groundwater level readings, where practicable, from State observation bores listed in Schedule 1 or their replacement (up to 288 readings per season). (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, and send them to a NATA accredited laboratory for analysis.	GMW obtained regular (hourly, monthly or quarterly) groundwater level readings from bores listed in Schedule 1 of the Plan, where practicable. GMW used groundwater salinity monitoring data provided by Central Highlands Water, from their urban supply bores and monitoring bores, to fulfil the requirements of a targeted salinity monitoring program. GMW facilitated the collection of groundwater samples from nested State observation bores identified in Schedule 1, and sent them to a NATA[1] accredited laboratory for analysis.	Yes
PRESCRIPTION 6 Metered licensed use		
The Corporation shall: (a) Ensure that a meter is fitted to all operational licensed bores. (b) Read each meter at least twice each season.	GMW ensured that use was accounted for each operational licensed bore; and read each meter in January/February and May/June during the 2020/21 water year.	Yes
PRESCRIPTION 7 Plan implementation		
The Corporation shall: (a) By 30 September each year: (i). prepare an annual report on the administration and enforcement of the Plan for the Minister for Water and relevant agencies. (ii). mail a newsletter to groundwater licence holders, and domestic and stock users upon request, summarising the outcomes in the annual report. (b) Post on its website the Plan; annual report, newsletters and groundwater level monitoring results. (c) Meet with a Groundwater Reference Committee at least once each year to report on the implementation of the Plan and consider the need to review the Plan. (d) Undertake a review of the Plan after 5 years from its approval, or sooner if warranted by any prescription contained within the Plan.	In the first quarter of 2020/21, GMW prepared an annual report on the administration and enforcement of the Plan during the 2019/20 water year. GMW mailed the report to the Minister, and the North Central Catchment Management Authority, on 28 September 2020. GMW also prepared a newsletter, summarising the information in the report; a copy was mailed to all licence holders. GMW posted on its website: the Plan; the 2019/20 annual report and newsletter; and a selection of hydrographs of groundwater levels which GMW updated every month throughout 2020/21. GMW met with the Groundwater Reference Committee on 18 November 2020 to discuss the implementation of the Plan. GMW undertook a comprehensive review of the Plan in 2018.	Yes

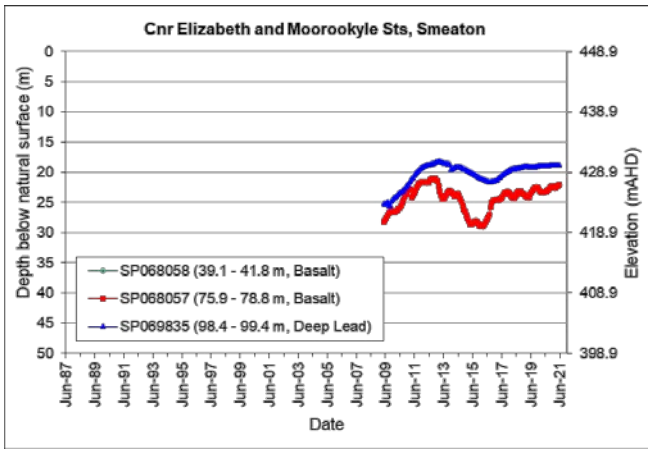
[1] *NATA refers to the National Association of Testing Authorities, Australia*

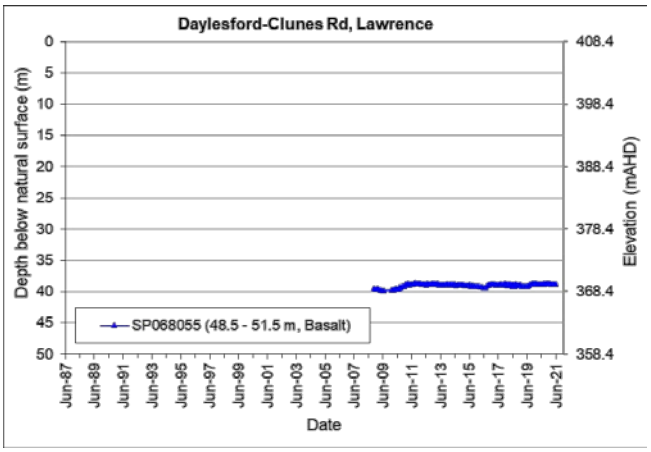
Appendix B – Groundwater level data

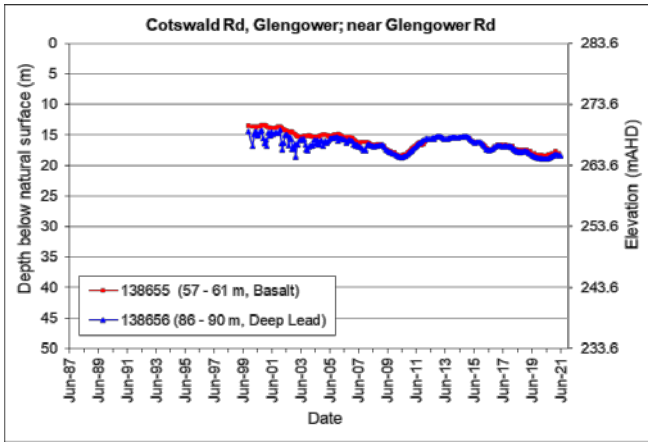
Hydrographs are provided for key monitoring bores listed in Schedule 1 of the Plan. All data is sourced from the Water Measurement Information System (DELWP, 2021).

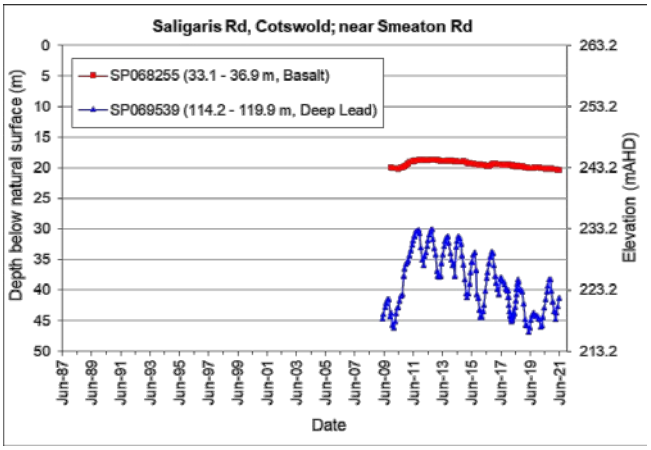
Further groundwater level information is available on the Water Measurement Information System, at https://data.water.vic.gov.au

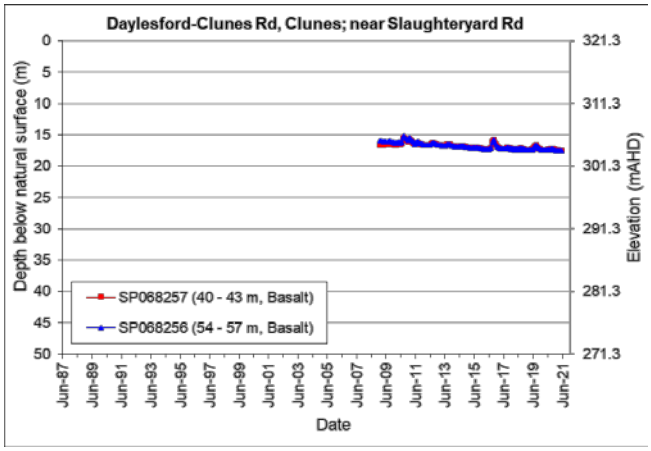
Ullina Zone (1100)



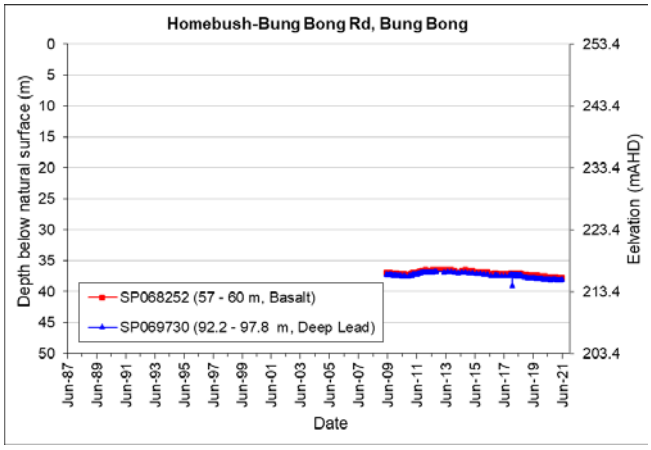




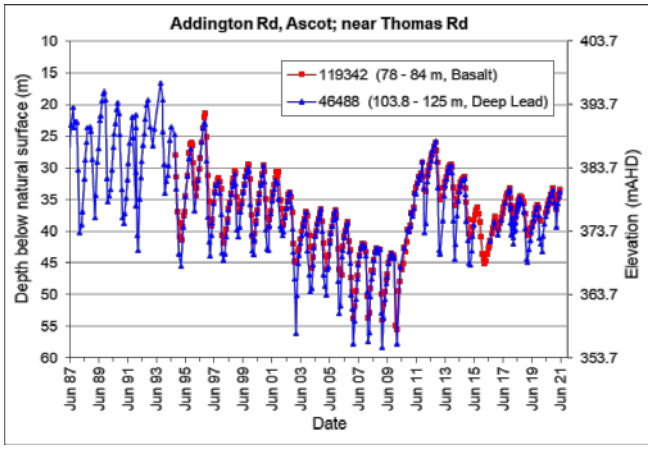


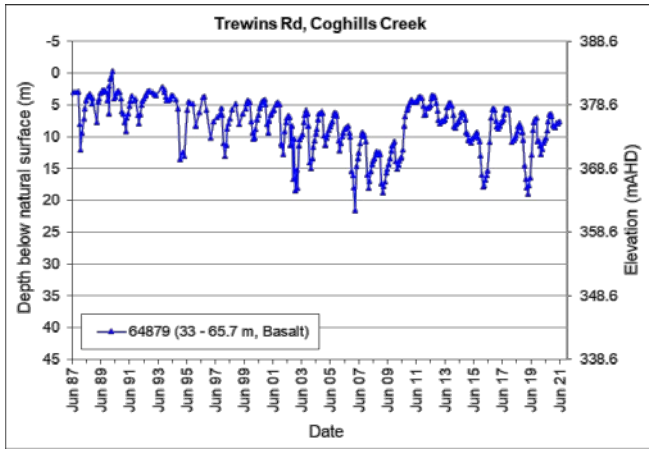


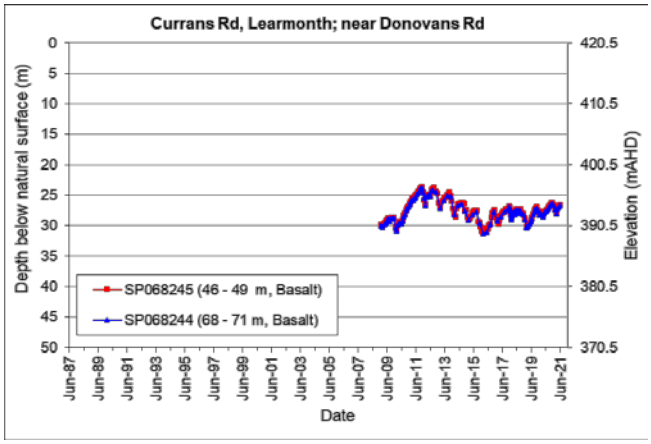
Talbot Zone (1101)

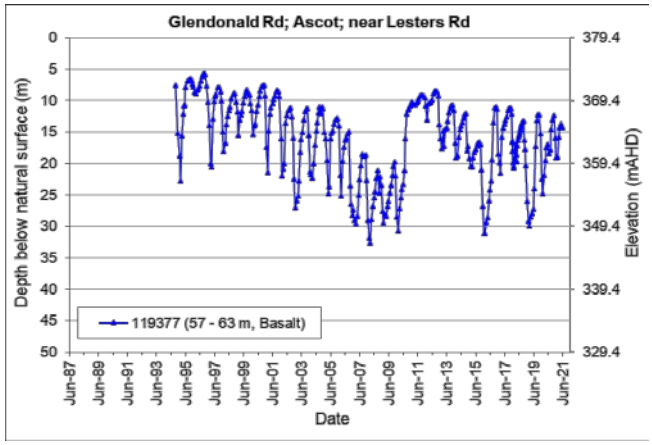


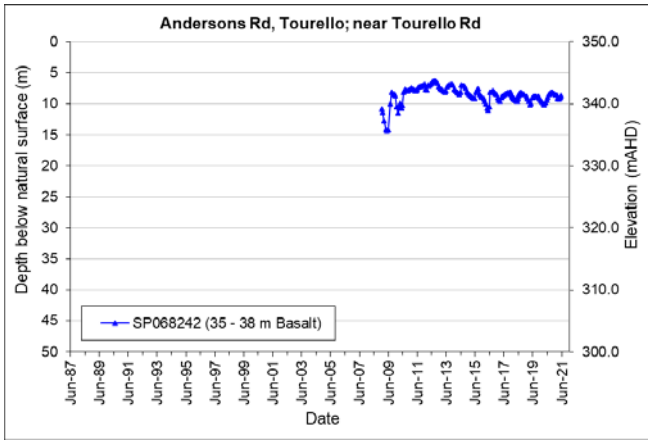
Ascot Zone (1102)

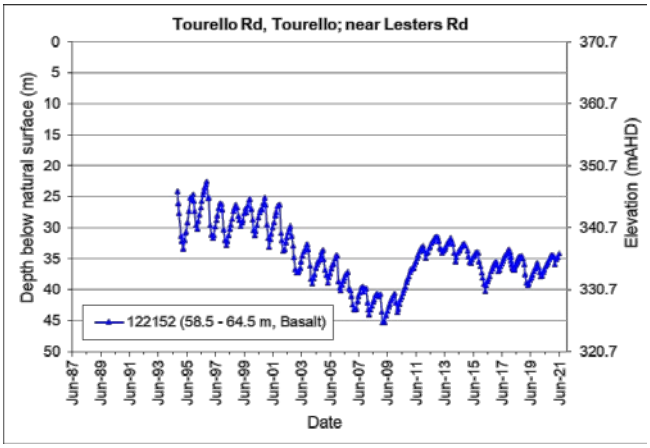


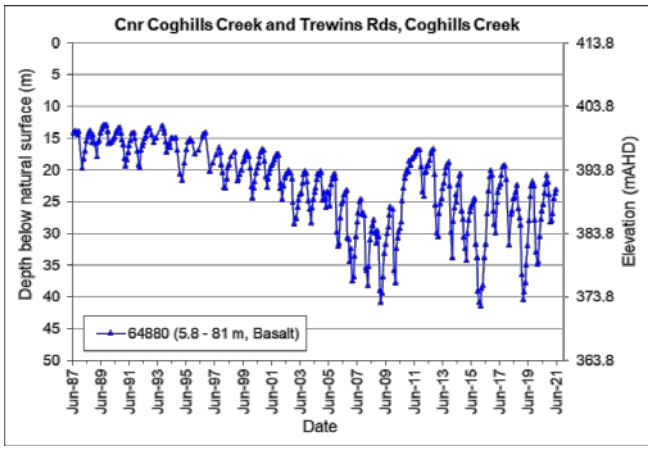




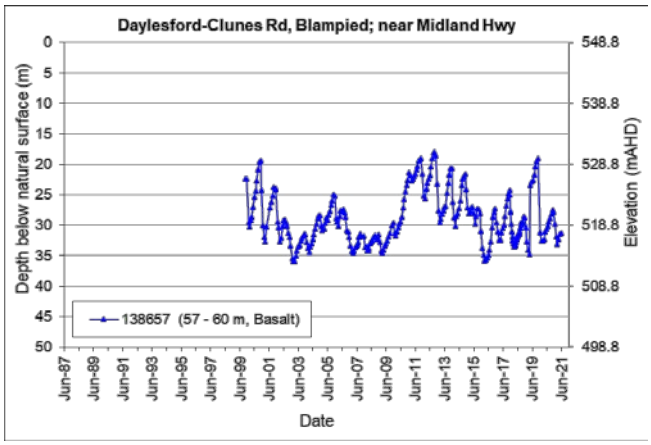


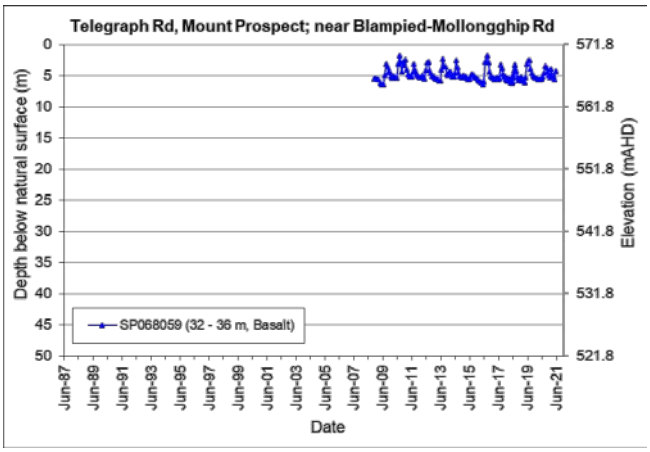




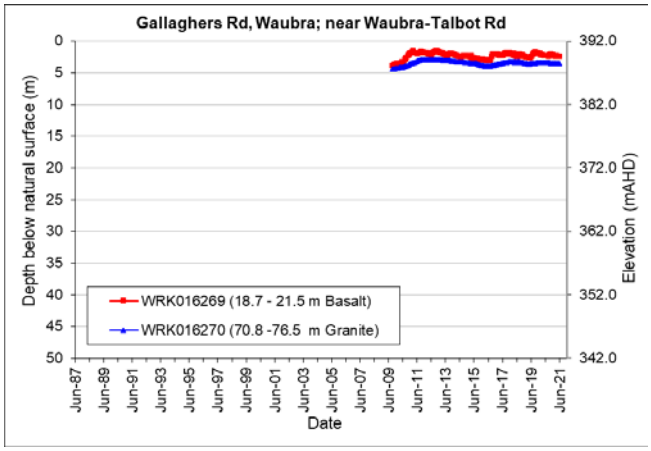


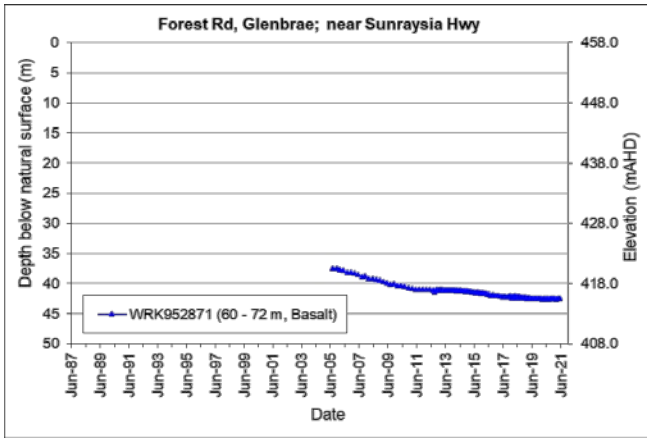
Blampied Zone (1104)

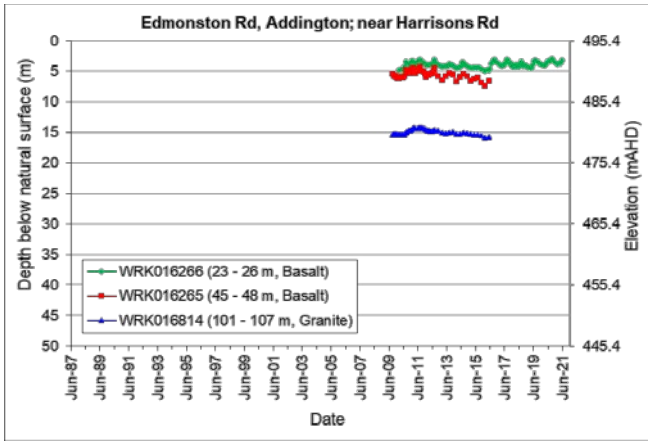


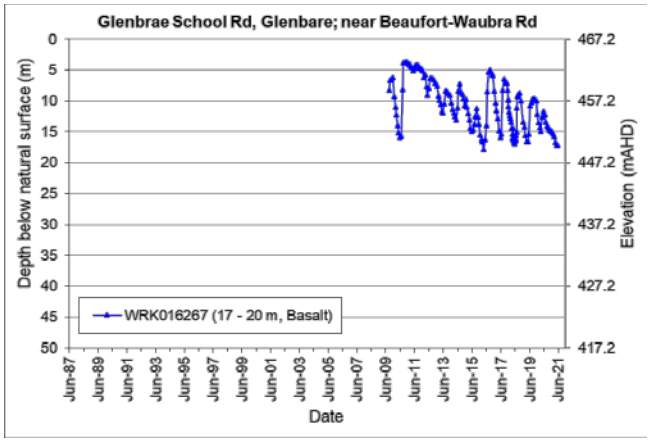


Waubra Zone (1106)

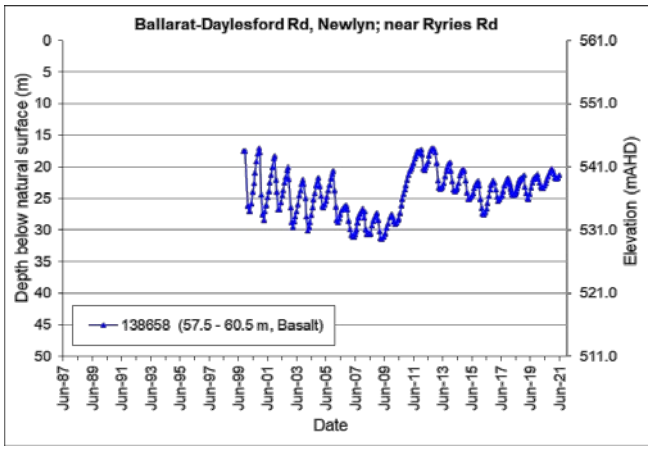


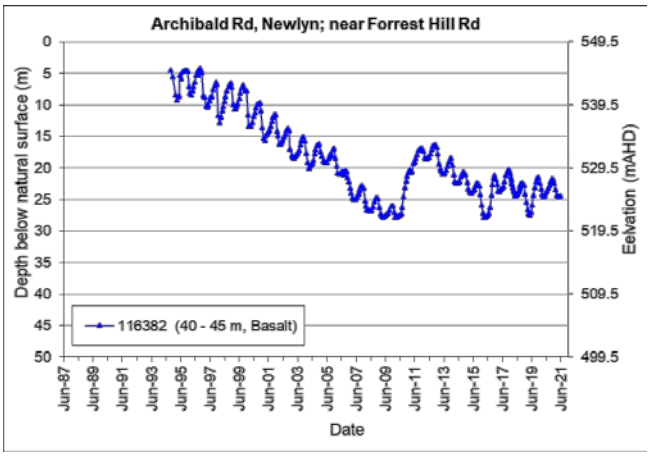


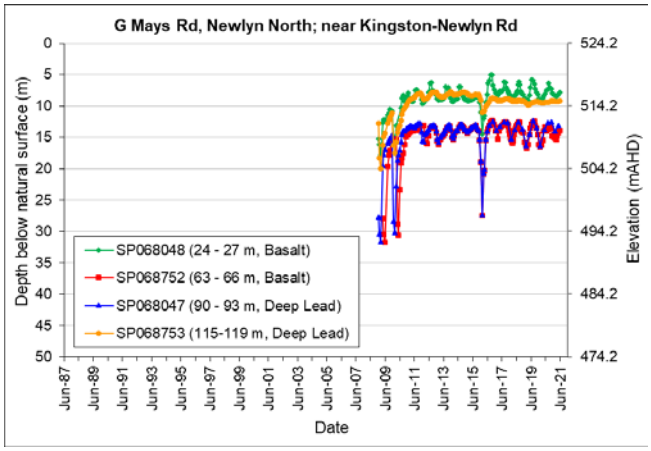


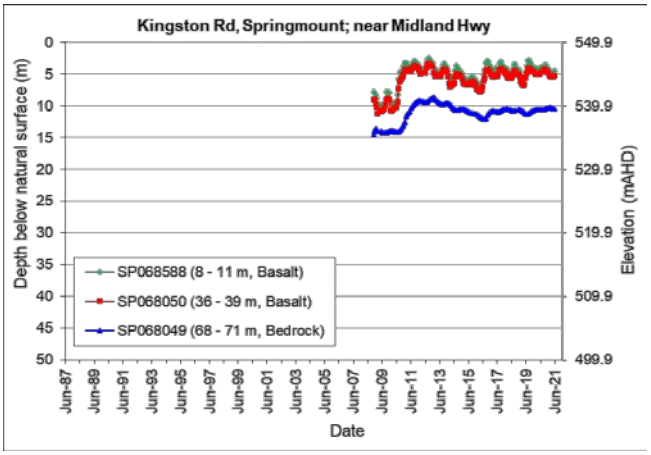


Newlyn Zone (1107)






G Mays Rd, Newlyn North; near Kingston-Newlyn Rd
Depth below natural surface (m)
Elevation (mAHD)
Date
SP068048 (24 - 27 m, Basalt)
SP068752 (63 - 66 m, Basalt)
SP068047 (90 - 93 m, Deep Lead)
SP068753 (115-119 m, Deep Lead)


Kingston Rd, Springmount; near Midland Hwy
Depth below natural surface (m)
Elevation (mAHD)
Date
SP068588 (8 - 11 m, Basalt)
SP068050 (36 - 39 m, Basalt)
SP068049 (68 - 71 m, Bedrock)

Appendix C – Groundwater quality results

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

	Bore:	SP068255	SP069539	SP068252	SP069730
	Aquifer:	Basalt	Deep Lead	Basalt	Deep Lead
	Date:	29/10/2020	29/10/2020	29/10/2020	29/10/2020
Analyte	**Unit**				
Conductivity @ 25°C	µS/cm	6100	1700	3300	2200
pH	pH units	7.8	7.1	7.6	7.8
Ionic balance	%	8.31	7.81	8.98	3.37
Total Anions	meq/L	61	17	34	22
Total Cations	meq/L	52	15	28	21
Ion Balance - TDS (EC) vs TDS	mg/L	1.8	2	1.6	2.4
Bicarbonate Alkalinity, CaCO3	mg/L	230	370	280	260
Carbonate Alkalinity, as CaCO3	mg/L	<2	<2	<2	<2
Hydroxide Alkalinity, as CaCO3	mg/L	<2	<2	<2	<2
Total Alkalinity, as CaCO3	mg/L	230	370	280	260
Calcium, as Ca	mg/L	94	42	79	57
Chloride, as Cl	mg/L	1800	320	900	540
Potassium, as K	mg/L	11	8.5	7.1	5.2
Sodium, as Na	mg/L	580	170	310	230
Ammonia, as N	mg/L	0.3	<0.1	<0.1	<0.1
Nitrite, as N	mg/L	<0.01	<0.01	0.01	<0.01
Nitrate, as N	mg/L	12	<0.01	4.3	1.9
Sulphate, as SO4	mg/L	270	30	140	75
Total Kjeldahl Nitrogen, as N	mg/L	0.2	<0.1	0.3	0.3
Total Combustible Nitrogen, as N	mg/L	13	<0.1	4.7	2.2
Arsenic, as As	mg/L	<0.001	<0.001	0.002	0.003
Iron, dissolved as Fe	mg/L	<0.01	0.28	<0.01	<0.01
Mercury, as Hg	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Magnesium, as Mg	mg/L	260	59	130	92
Manganese, dissolved as Mn	mg/L	<0.001	0.086	<0.001	<0.001
Total Dissolved Solids, 180C	mg/L	3400	850	2000	920
Total Organic Carbon	mg/L	1.7	2	1.4	1.3
Turbidity, NTU	NTU	0.1	1.2	0.4	0.6
Phosphorus, total as P	mg/L	0.1	0.11	0.16	0.13
Lead, dissolved (ICP-MS)	mg/L	<0.001	<0.001	<0.001	<0.001
Nickel, dissolved (ICP-MS)	mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium, dissolved (ICP-MS)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Chromium, dissolved (ICP-MS)	mg/L	0.002	0.001	0.002	0.002
Copper, dissolved (ICP-MS)	mg/L	0.001	<0.001	<0.001	0.001
Zinc, dissolved (ICP-MS)	mg/L	0.013	0.017	0.008	0.017