Annual Report 2021/22

Murrayville Local Management Plan (Groundwater)

July 2021 - June 2022

Executive summary

GWMWater presents the annual report for the Murrayville Groundwater Management Area (GMA) Local Management Plan (LMP) for the 2021/22 season. This report provides an overview of groundwater use and management activities in the Murrayville Groundwater Management Area (GMA) during 2021/22.

The Local Management Plan is the primary reference for groundwater management in the Murrayville GMA. In addition to outlining the management objectives and the groundwater resource, the Local Management Plan also documents the rules and key information relevant to groundwater management in the area.

The Local Management Plan also outlines the program for the monitoring of groundwater levels and quality, the method for assessing rates of groundwater level drawdown, and for implementing restrictions, should they be necessary in future.

Metered extraction in the Murrayville GMA was 6,101 ML for the 2021/22 season, or 63 per cent of the total licensed entitlement volume. The volume extracted during 2021/22 is consistent with the average annual volume of extraction over the past 20 years. There was one confirmed instance of unauthorised take (i.e. non-compliance with the *Water Act 1989*) in the Murrayville GMA during 2021/22, which was subsequently resolved.

The monitoring of groundwater levels, use and water quality does not indicate any significant changes in the condition of the resource or water usage patterns. The water resource continues to be managed in accordance with the Local Management Plan and the resource condition is consistent with the objectives outlined in the Plan. The groundwater levels remain within the drawdown thresholds prescribed in the Local Management Plan.

Groundwater monitoring, metering and compliance programs will continue to be undertaken, which support the objectives of the Local Management Plan.

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1. Introduction

1.1 Purpose

This report provides an overview of groundwater management activities undertaken in the accordance with the Murrayville Groundwater Management Area Local Management Plan (LMP) for the 2021/22 season.

1.2 Groundwater Management Area

The Murrayville Groundwater Management Area (GMA) is located in the Wimmera-Mallee Groundwater Catchment in northwest Victoria and is part of the Murray Darling Basin. The GMA covers 1,916km^2 and is centred on the town of Murrayville and abuts the border with South Australia. Groundwater from the Upper Mid-Tertiary Limestone Aquifer (Murray Group Limestone) is the sole source of water for domestic and stock, town supply and irrigation in the area.

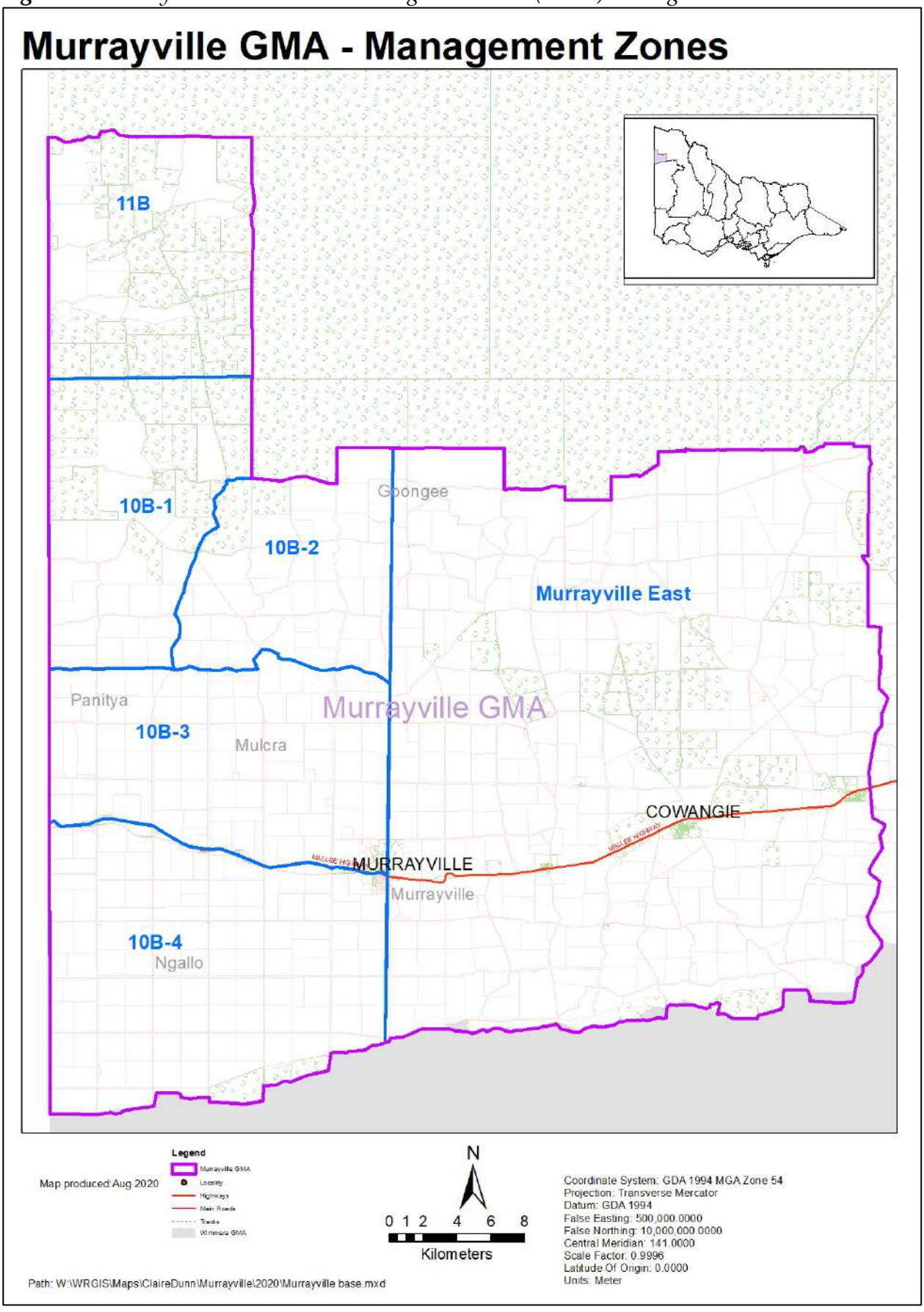
There are six management zones in the Murrayville GMA (Figure 1). Zones 10B-1, 10B-2, 10B-3 and 10B-4 of the Murrayville GMA combine to form Border Zone 10B; Zone 11B is within Border Zone 11B, and Murrayville East zone is outside of the Border Designated Area.

1.3 Local Management Plan

The Murrayville GMA Local Management Plan (LMP) describes the framework for managing groundwater resources in the Murrayville GMA. The LMP documents rules and information relating to the take and use of groundwater in the Murrayville GMA. The LMP can be accessed via the GWMWater website www.gwmwater.org.au.

The key objective of the Murrayville LMP is to ensure the equitable sharing of available water between licensed users, while protecting the environment and acknowledging its non-renewable nature, ensuring as much as practicable, the long-term sustainability of the water resource.

***Figure 1**: Murrayville Groundwater Management Area (GMA) Management Zones*



2. Groundwater Management

2.1 Licence entitlement

The Permissible Consumptive Volume for the Murrayville GMA is 11,005 ML/year. The current total licence entitlement volume in the GMA is 9,754.8 ML. Licence information is summarised in Table 1. There was one additional licence issued in Zone 10B-3 during the year, however there was no change in the total volume licensed in the zone.

The Permissible Annual Volume for Border Zone 10B is 6,720 ML, therefore the combined total volume licensed for zones 10B-1 to 10B-4 must not exceed this volume.

***Table 1**: Licence entitlement in the Murrayville GMA (at 30 June 2022)*

Zone	Number of Licences	Volume licensed ML	Zone limit ML
11B	3	1,600	1,720
10B-1	3	2,265	2,265
10B-2	2	1,120	1,370
10B-3	12	2,005	2,140
10B-4	6	1,327.8	2,830
Murrayville East	13	1,437	2,412
Total	**39**	**9,754.8**	

2.2 Groundwater use

Each active irrigation and commercial bore is fitted with a meter approved by the Authority to measure extraction. Groundwater users are encouraged to actively monitor their extraction volume throughout the season. GWMWater uses metering data and extraction information for water resource management and licence compliance purposes. Annual extraction volumes are uploaded to the Victorian Water Register by 30 June each year.

In most cases, meters are read mid-way through the irrigation season (January) as well as at the end of the irrigation season. Licensees are provided with mid-season and end of season water usage statements, which provides an opportunity for users to compare their records with data collected by GWMWater, and against their permitted volume of take.

To access additional water during the season, licensees must secure water from another licence holder by way of trade or transfer. Any such trade or transfer must be approved by GWMWater prior to the taking of additional water volumes.

Figure 2 illustrates the total extraction compared to previous years, while Table 2 provides a summary of extraction by zone for 2021/22.

In 2021/22, the total metered groundwater extraction in the Murrayville GMA was 6,101 ML, or 63 percent of the total licensed volume. As illustrated in Figure 2, the total licenced extraction in 2021/22 was 977 ML more than the annual average of 5,125 ML (calculated since 2001), and on a par with the previous year.

Figure 2 *Groundwater usage over time in the Murrayville GMA*

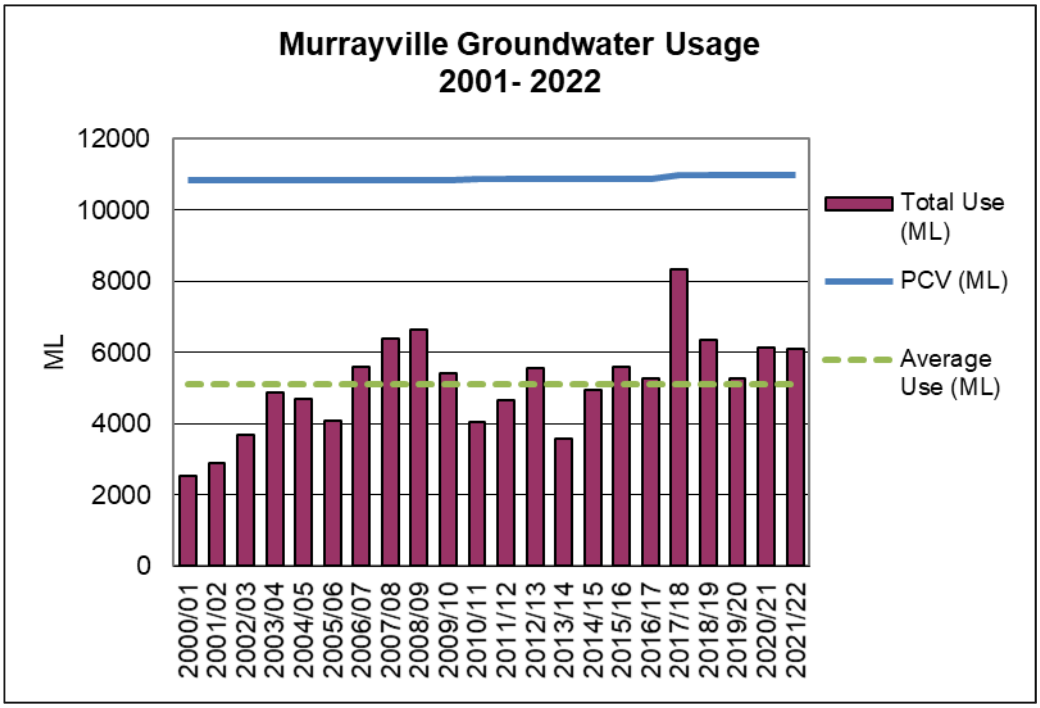


Table 2: *2021/22 Licensed Groundwater Extraction by Zone*

Zone	Volume Extracted 2021/22 ML	Volume licensed (30 June 2022) ML	Available volume 2021/22 (incl. carryover) ML	Zone limit ML
11B	1,493.4	1,600	1,815	1,720
10B-1	1,340.5	2,265	2,944	2,265
10B-2	1,655	1,120	1,733	1,370
10B-3	1,075	2,005	2,538	2,140
10B-4	502	1,327.8	1,336	2,830
Murrayville East	35	1,437	1,868	2,412
Total	**6,101**	**9,754.8**	**12,234**	

Figure 3 illustrates monthly rainfall recorded at Bureau of Meteorology site 76038 in Murrayville during the period July 2021 to June 2022. The recorded monthly rainfall as compared to average monthly rainfall provides an indication of the potential influence rainfall has had on groundwater use during the year. This is further illustrated in Figure 4 which provides a comparison between annual usage and annual rainfall over the past 20 years.

Figure 3 *Actual (2021/22) and average monthly rainfall for Murrayville*

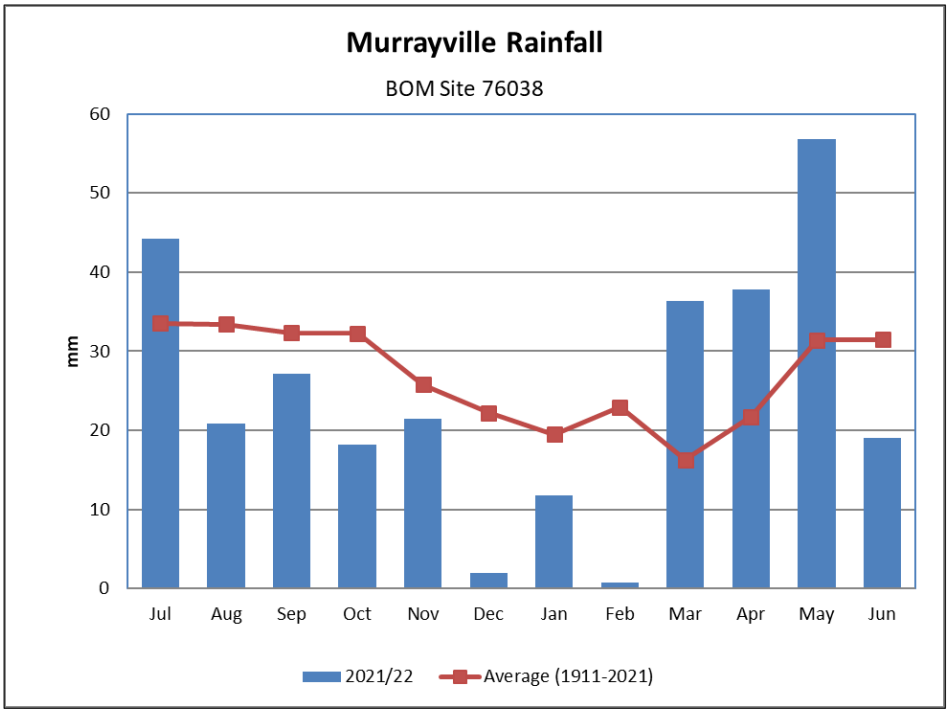
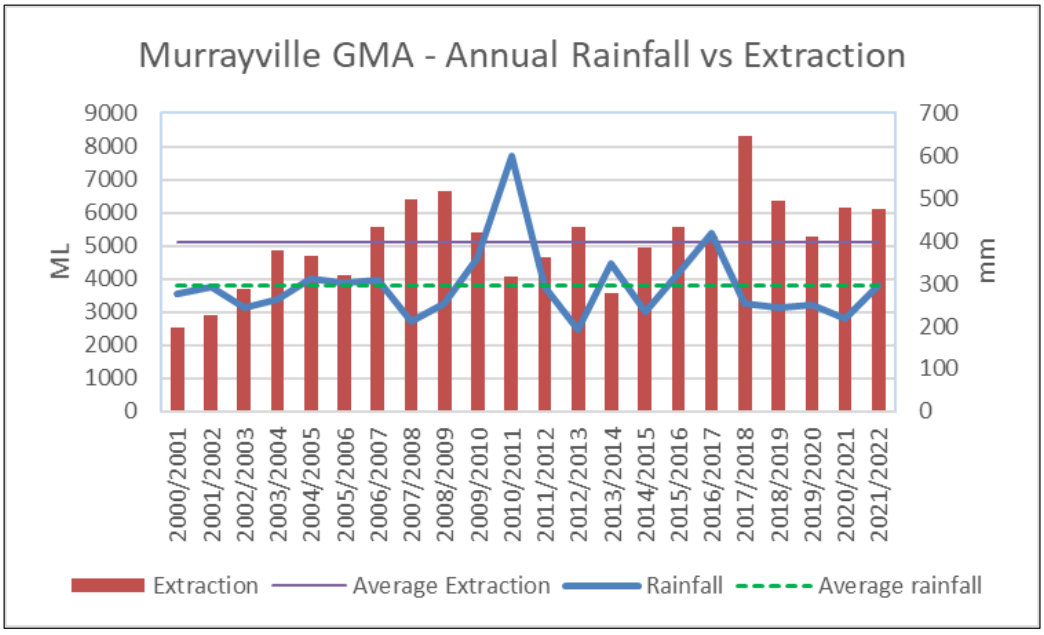


Figure 4 *Annual use compared with annual rainfall for Murrayville*



2.3 Accessing additional water – trade (temporary and permanent) and carryover

Licensees have the ability to apply for a transfer of entitlement (trade) from another licensee to secure additional water should they require it, either on a temporary or permanent basis. Approval of transfer applications is subject to assessment, trade rules and zone limits. Four temporary transfers (trades) of licence entitlement were processed during 2021/22.

Carryover of unused water to the following season is permitted in the Murrayville GMA, up to a maximum of 30% of licensed entitlement. Carryover water is not transferrable to other licensees. While there was a considerable volume of carryover water available for use during 2021/22, six licence holders in the GMA utilised carryover volumes.

2.4 Compliance and Enforcement

The Victorian Government has committed to a zero tolerance approach for unauthorised water take. Unauthorised take typically occurs when water users draw beyond what they have in their account – even if they have the intention of balancing it up later.

Meter reading and compliance checks are conducted by GWMWater throughout the year. Where a licence holder fails to comply with licence conditions, GWMWater investigates the matter, taking any necessary action, in line with the GWMWater Compliance and Enforcement Strategy (available at www.gwmwater.org.au/ces).

There was one confirmed instance of unauthorised take (i.e. non-compliance with the *Water Act 1989*) in the Murrayville GMA during 2021/22, which was subsequently resolved.

2.5 Domestic and stock bores

Landholders can apply for a licence to construct a domestic and stock bore via the Victorian Water Register (http://waterregister.vic.gov.au/).

There were no licences issued for the construction of new domestic and stock bores in the Murrayville GMA in 2021/22.

2.5.1. Reimbursement for works to domestic and stock bores

The Murrayville Local Management Plan allows for landholders to apply to GWMWater for reimbursement for works required to domestic and stock bores, should they be affected by falling groundwater levels resulting from licensed groundwater extraction.

There were no instances of landholders seeking reimbursement for the lowering or deepening of domestic and stock pumps, mills or bores in 2021/22, which is expected since the observed seasonal drawdown has been within the range previously experienced.

3. Monitoring Program

3.1 Groundwater quality monitoring

GWMWater undertakes water quality sampling of more than 40 domestic and stock bores located throughout the GMA. This sampling has been undertaken annually since 2008. A map illustrating the sampling data is illustrated in Appendix 1. Graphs of bores grouped by Parish are also illustrated. The salinity data is loaded into the Victorian Water Measurement Information System (WMIS) and is accessible to the public. There are also a number of observation bores that are sampled regularly for salinity, as part of the Victorian State Observation Bore Network; this data is also uploaded to WMIS.

Analysis of groundwater samples collected during 2021/22 showed no discernible increase in the salinity level of water in most of the bores tested. The Manya and Mulcra areas have shown a slightly increasing salinity trend, which will be monitored closely over the next few years (see Appendix 1).

3.2 Groundwater extraction monitoring

As discussed in Section 2.2, each active commercial and irrigation bore is metered, and seasonal extraction volume is confirmed by GWMWater annually in June. The meters installed provide high accuracy measurement, and enable data files to be interrogated to identify any potential faults or discrepancies which may require further investigation.

In 2021/22, the total volume of water extracted by licensed users in the Murrayville GMA was 6,101 ML.

3.3 Groundwater level monitoring

Water level monitoring is undertaken by a contractor on behalf of the Department of Environment, Land, Water and Planning (DELWP) and GWMWater. Data is transferred to the Victorian Water Measurement Information System (WMIS) which can be accessed at http://data.water.vic.gov.au . Observation bores are monitored on a quarterly basis. There are also a number of bores which have data loggers installed and can record and transmit data daily.

A map illustrating the locations of currently monitored observation bores is provided in Appendix 2. This illustrates the geographic extent of monitoring in the GMA, with particular concentration in areas where extraction is more intense.

3.4 Impact of use on observed groundwater levels

The location of selected observation bores in relation to the areas irrigated during the 2021/22 season are illustrated in Appendix 2. The groundwater levels as measured at selected bores within the observation bore network are also illustrated in Appendix 2.

The observed groundwater level response in terms of maximum drawdown and seasonal fluctuation generally corresponds to the volume of groundwater extraction in the zones of the GMA. The groundwater level represented in the hydrographs was similar to that observed in the previous 4-5 seasons, resulting from the volume extracted being near average both within the GMA, and over the border in South Australia.

The 11B-Manya North bores hydrograph displays an observed seasonal drawdown of over 5m which was similar to 2020/21. The extent of the season drawdown observed is less than historically observed over the period 2007-2009 and 2012-2013.

The Appendix 2 map illustrates the area irrigated in 2021/22 both within Murrayville GMA and 5km into South Australia (derived from satellite imagery). There was considerable activity adjacent to Zone 10B-1 in South Australia, which combined with the activity in 10B-1 (which was 200ML less than the previous year) has had an impact on the observed groundwater levels represented in the 10B-1 Panitya North Bores hydrograph. The groundwater levels observed indicate that the aquifer did not fully recover prior to the onset of irrigation, particularly in South Australia.

3.5 Resource condition assessment

3.5.1. Resource threshold

The Murrayville LMP outlines the means of assessing drawdown against the resource condition threshold (0.65m/year). The assessment examines the average annual change in groundwater level and applies a five year rolling average. The five year average avoids any overly reactive response due to seasonal factors, and averaging bores removes bias which may arise from using a single bore.

To comply with the resource condition threshold, the annual change in groundwater level should not show a decline of more than 0.65m/year for more than two consecutive years (based on the five year rolling average). The annual groundwater decline is determined from the level to which groundwater levels recover prior to the irrigation season (usually in September-October), and this is compared with the groundwater recovery level in the prior year. For this reason, the recovery level in response to extraction during 2020/21 is used for the current assessment of resource condition, as data was not yet available for recovery levels following the 2021/22 season (peak recovery level is measured prior to the onset of extraction for irrigation).

As illustrated by the *Average change in groundwater level* graphs in Appendix 3, the 0.65m threshold has not been approached in recent years in any of the zones assessed. The annual

change graphs have indicated recovery of groundwater levels in some years. This could be a reflection of the aquifer's response to relatively consistent extraction levels in those areas in the period to 2017. However, there has been an overall increased level of extraction in the past five years and the aquifer response is reflected in downturn of the annual change in groundwater level trends.

Fluctuations in the Panitya North (Zone 10B-1) graph appear to correlate with the annual extraction both sides of the South Australia-Victoria border varying from year to year, and the timing of the onset of the irrigation season not allowing groundwater levels to fully recover prior to the onset of extraction. Any decline noted remains well within the permitted drawdown limit.

The annual change graphs indicate that groundwater levels are relatively stable in the Border to Mulcra area (10B-3).

Consistent with the Murrayville LMP, groundwater level trends have been assessed against the resource condition threshold. As none of the assessment areas are approaching or have exceeded the threshold, there is no need for GWMWater to consider any form of seasonal restriction for 2022/23.

3.5.2. Maximum residual drawdown

The Murrayville LMP details a number of objectives, one of which is to "*manage the rate of decline in potentiometric water level allowing a maximum residual drawdown of 0.65 metres per year or 6.5 metres in the ten years to 2026*". The residual drawdown assessment undertaken this year reflects observations at the mid (5 year) mark of the ten year management window to 2026.

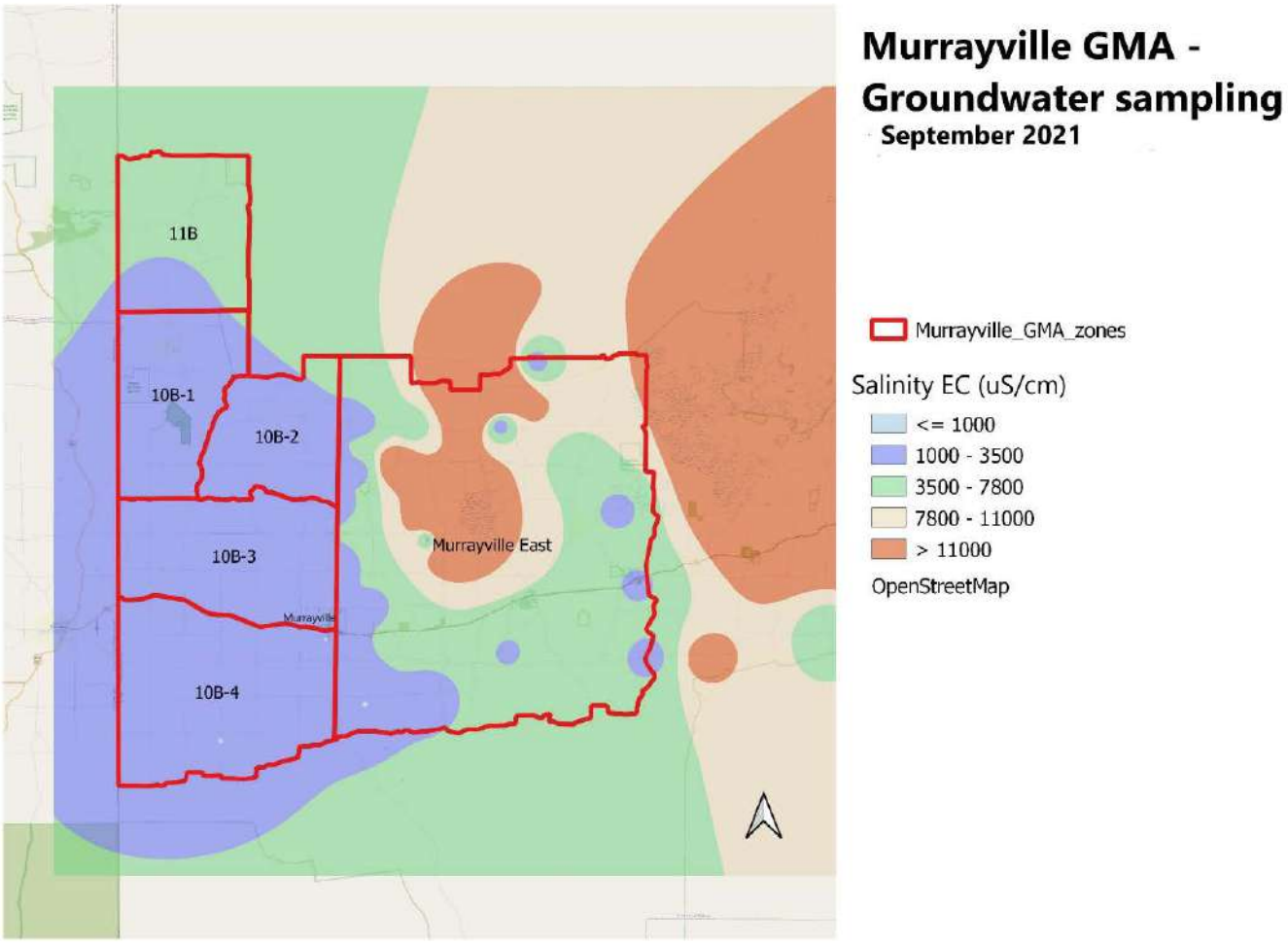
The graphs in Appendix 3 illustrate the cumulative effect of the observed annul change in groundwater level since 2000 for each resource condition bore group. In the five years since the commencement of the current 10-year management window in 2017, the observed residual drawdown has been 0.17 to 1.43 metres as summarised in Table 3. Therefore, midway through the ten year management window, the observed residual drawdown remains well within the permitted maximum residual drawdown.

Table 3: *Cumulative change in groundwater level 2017-2021*

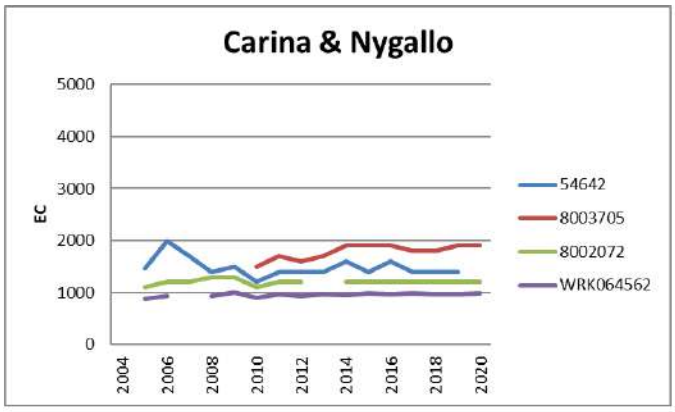
Resource condition bore group	**Residual drawdown 2017-2021**
11B & Manya North	-0.8m *(12% of 10-year limit)*
10B-1 Panitya North	-1.43m (*22% of 10-year limit*)
10B-2 & Goongee	-0.17m (*3% of 10-year limit*)
10B-3 Border to Mulcra	-0.71m (*11% of 10-year limit*)

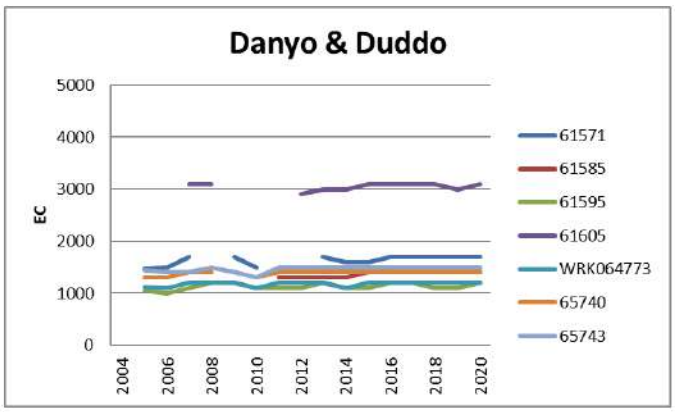
Appendix 1 – Water Quality Monitoring

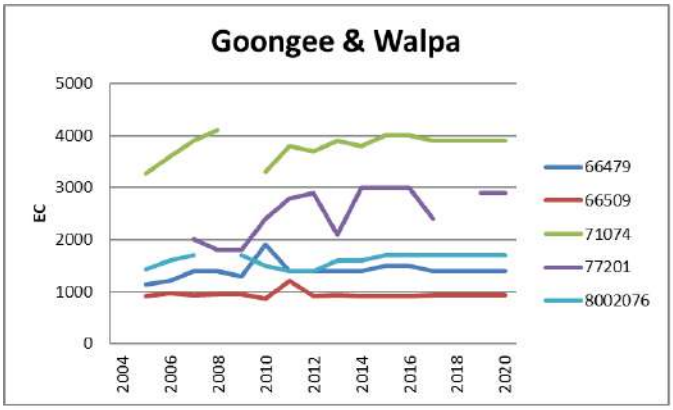
Groundwater Salinity – Spring 2021, from annual water quality sampling of D&S bores

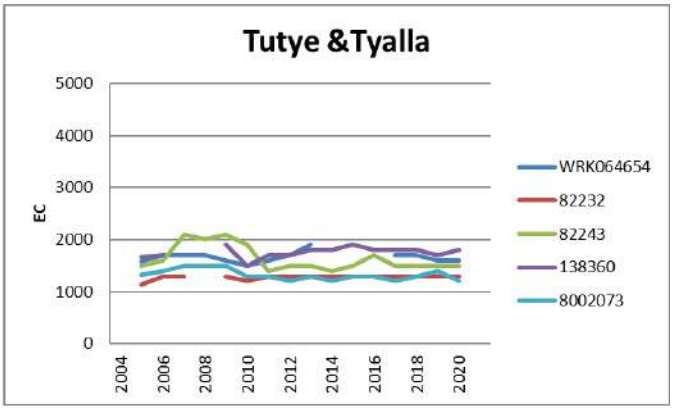


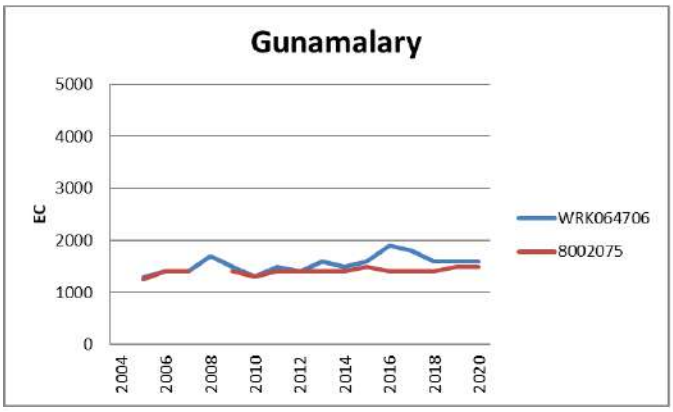
D&S annual sampling salinity data (graphed by parish)

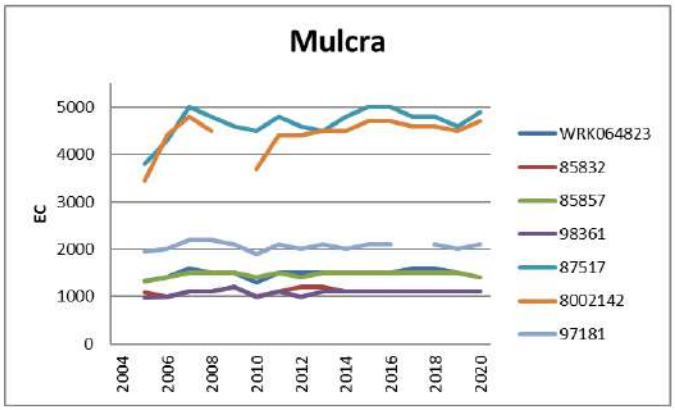


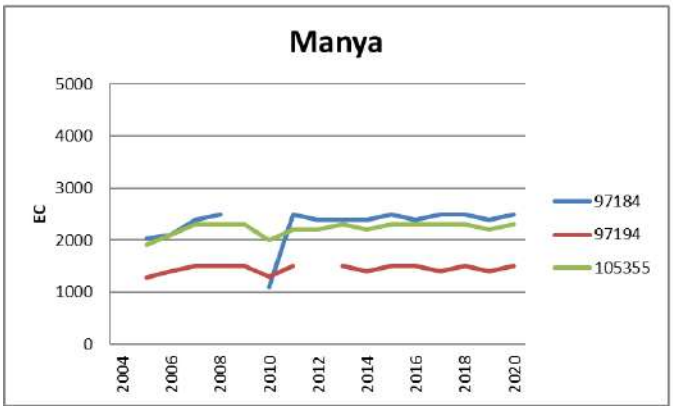


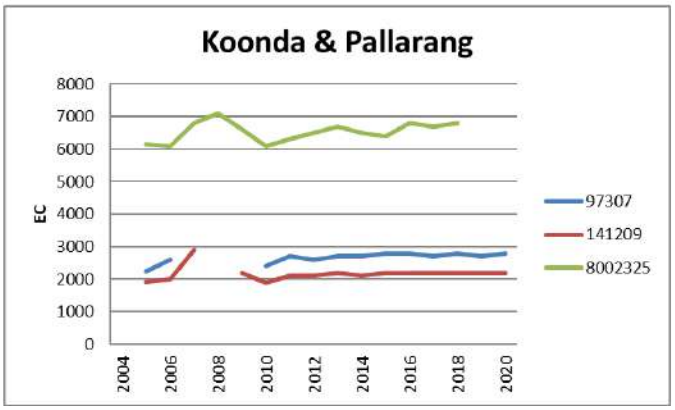




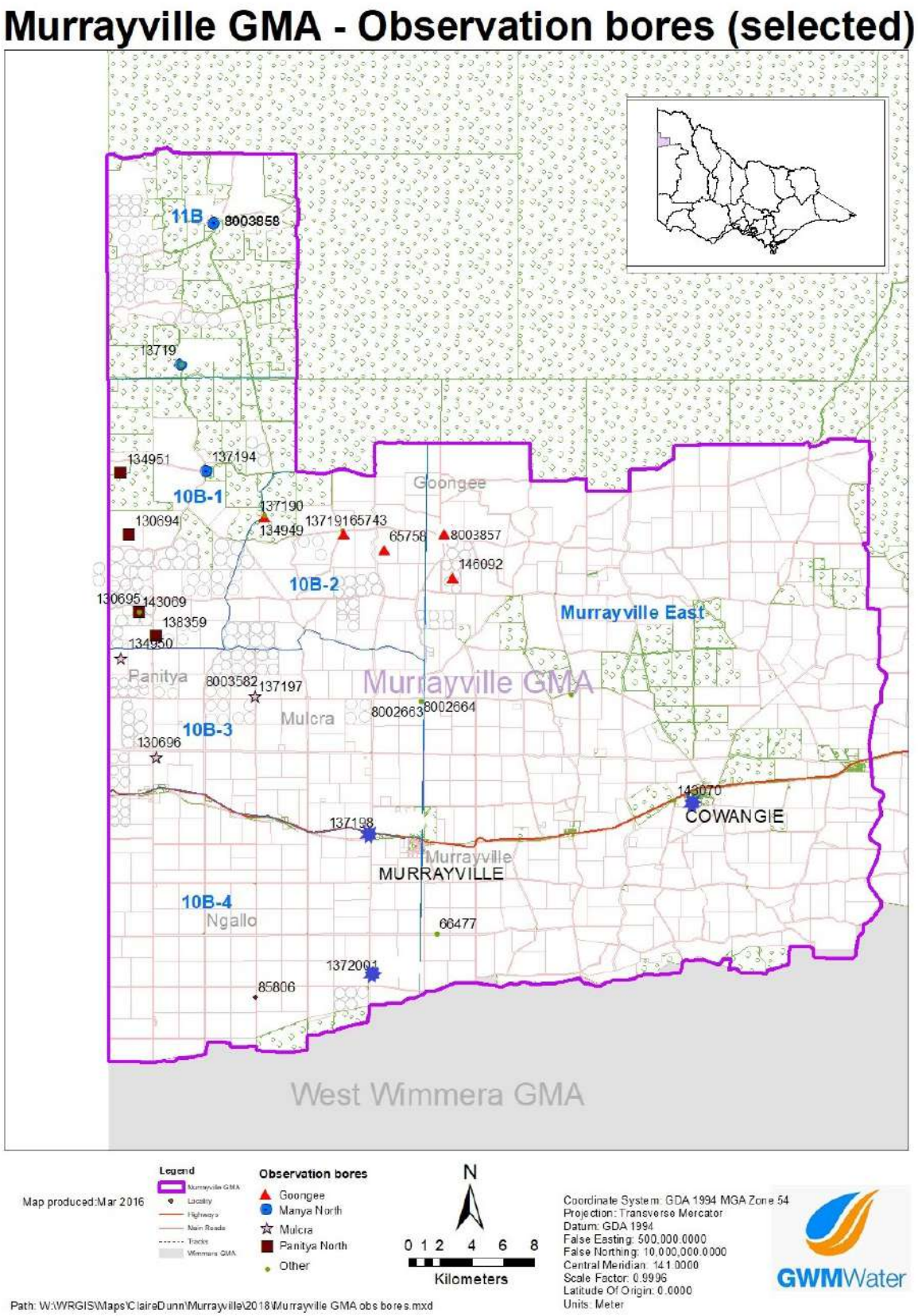




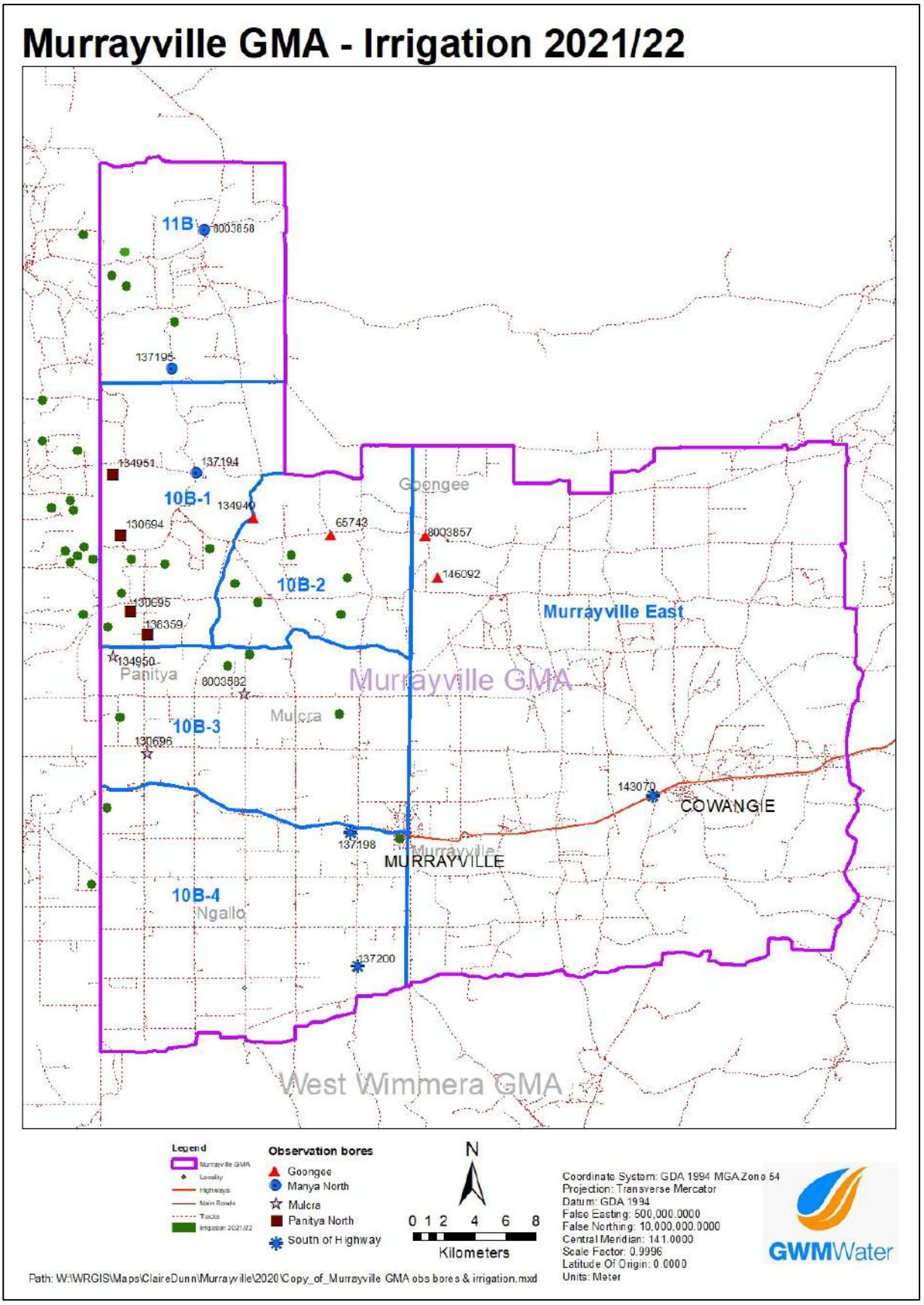




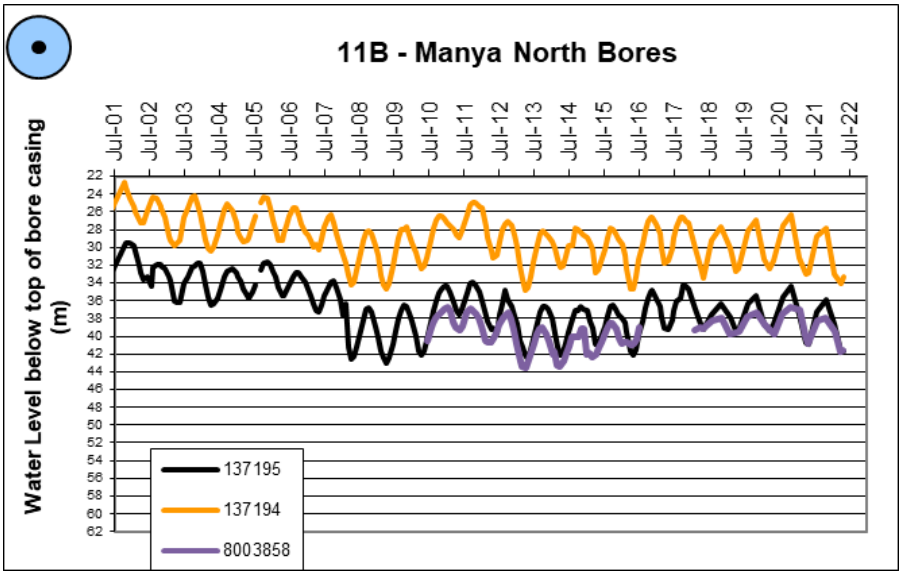
Appendix 2 – Water level monitoring network

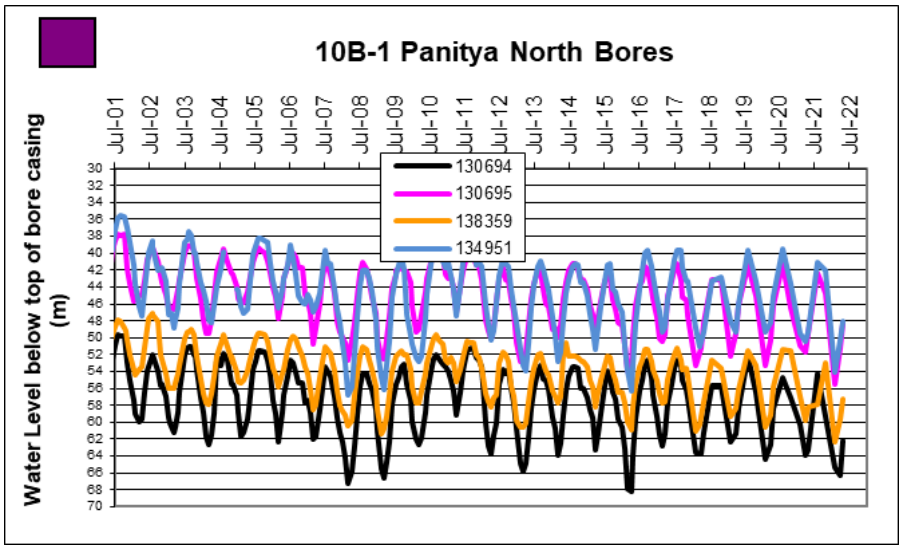


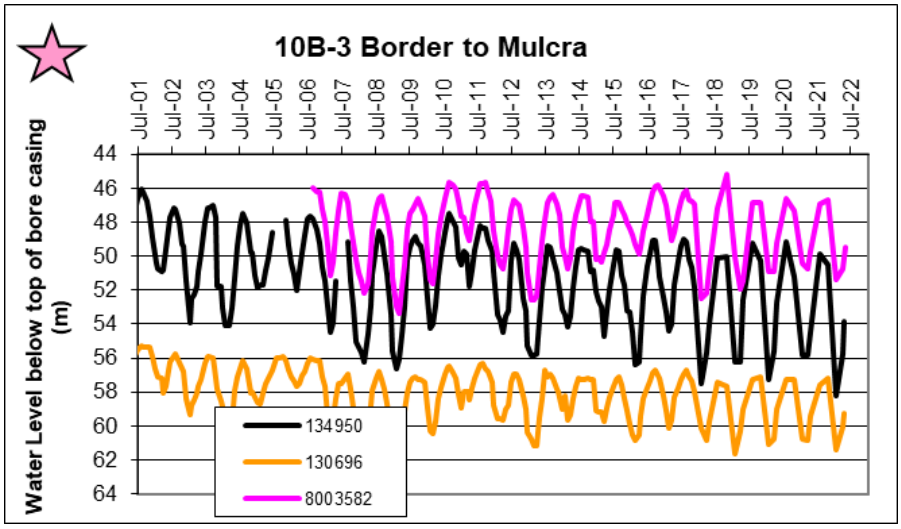
Selected Observation Bores and Irrigation (map)

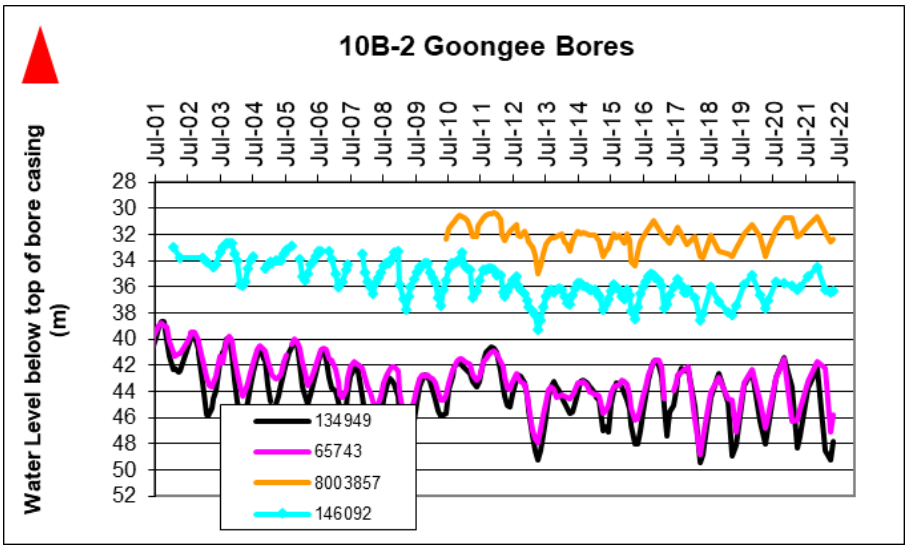


Groundwater levels as measured in selected observation bores.
Measurements taken in August, November, February, April and May.








10B-2 Goongee Bores
Water Level below top of bore casing (m)
Jul-01
Jul-02
Jul-03
Jul-04
Jul-05
Jul-06
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
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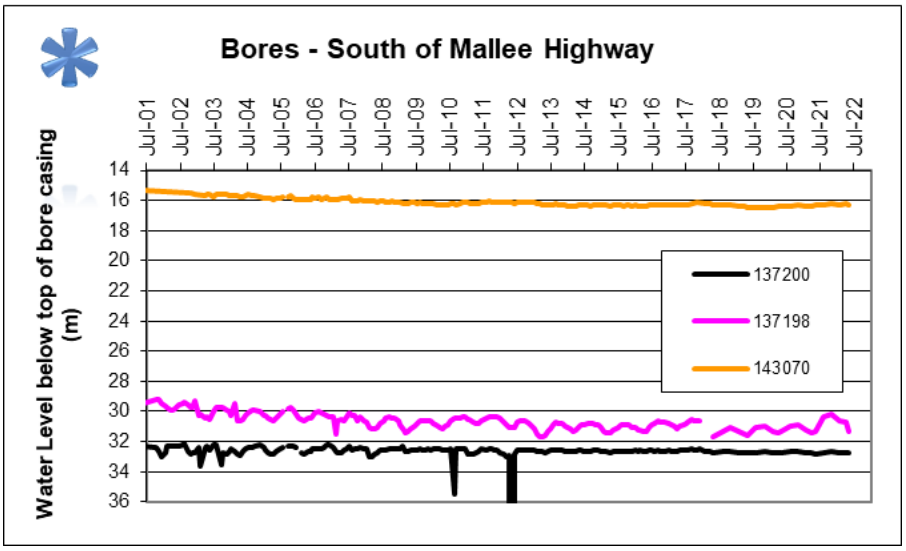
Bores - South of Mallee Highway
Water Level below top of bore casing (m)
Jul-01
Jul-02
Jul-03
Jul-04
Jul-05
Jul-06
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
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143070

Appendix 3 – Resource Condition Threshold

The Local Management Plan (LMP) for the Murrayville GMA has an objective to manage the rate of decline in groundwater levels, allowing a maximum residual drawdown of 6.5 metres in the ten years to 2026.

The Local Management Plan (LMP) for the Murrayville GMA includes a resource condition threshold which was developed as a means of interpreting changes in groundwater levels which may influence the ability to achieve the LMP's objective to manage the rate of decline in groundwater levels. The threshold is a warning trigger for management intervention such as restrictions. The annual change in water level graphs form the basis for assessment against the threshold.

The confined nature of the aquifer means that groundwater levels can exhibit large seasonal drawdown fluctuations in response to pumping. It is because of this factor that the change in groundwater levels each year are assessed at the 'recovery level', being the groundwater level prior to the onset of the following irrigation season; usually in spring.

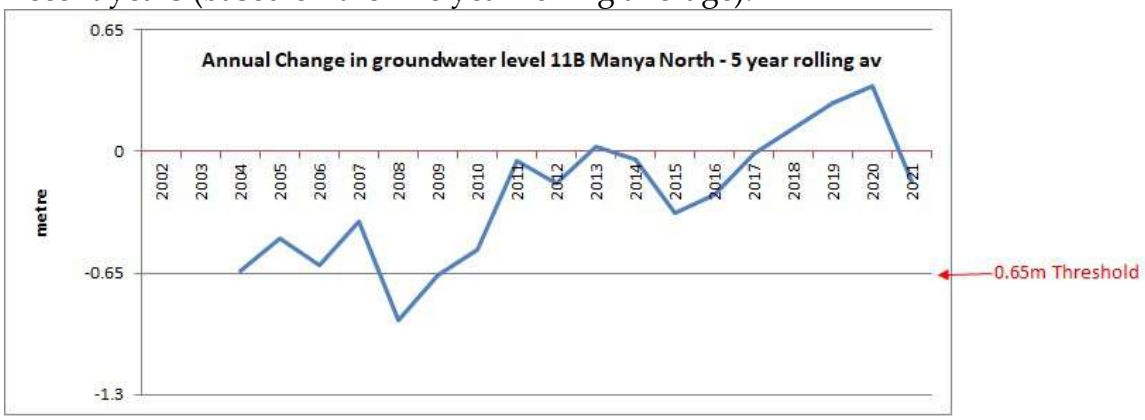
Interpreting the *Annual Change in Water Level* graphs

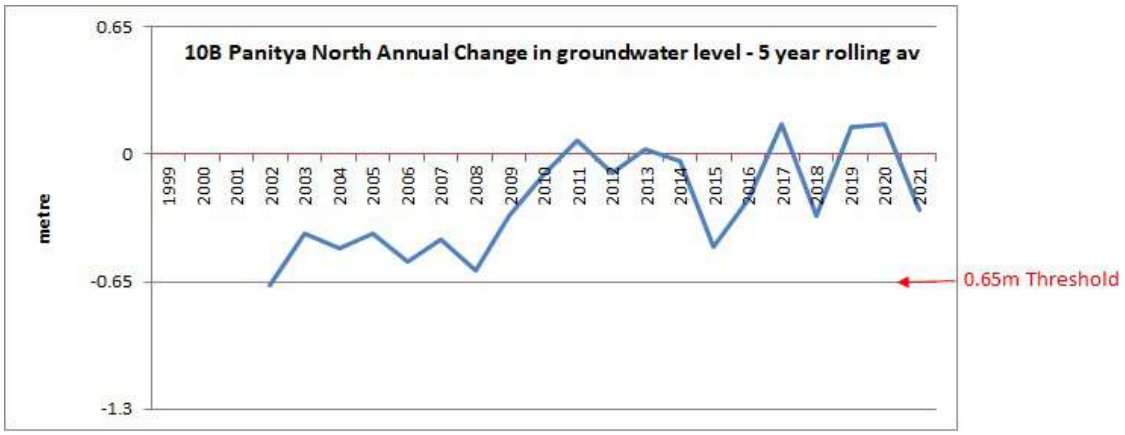
- Generally, those values above the 0 metre (red) line indicate groundwater levels are recovering.
- Values below the 0 metre line indicate groundwater levels are declining.
- The threshold line at -0.65 metres is a warning trigger, and sustained annual declines in excess of -0.65 metres per year may necessitate restrictions.
- Annual declines which are not more than -0.65m are within the acceptable drawdown threshold.

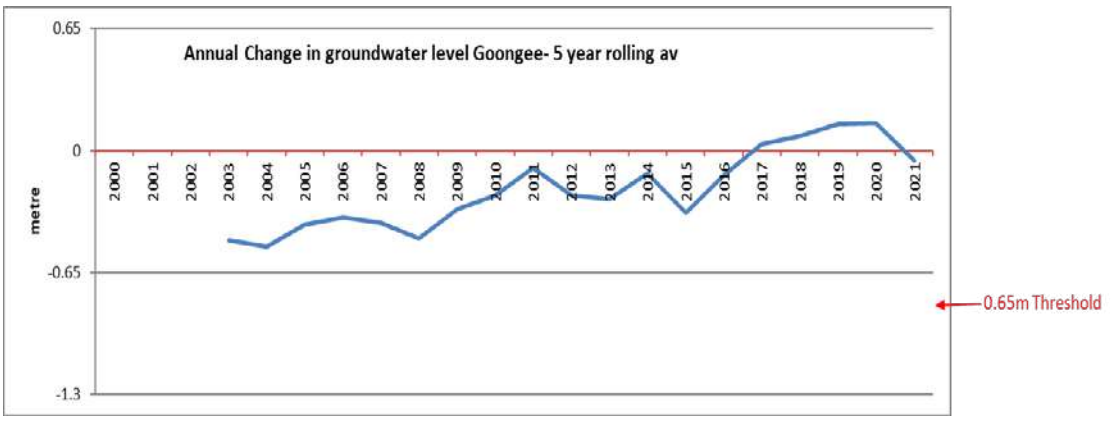
These Annual Change graphs are indicating a more recent decline in groundwater level which correlates with the above average level of extraction in the last two years (2019/20-2021/22) within the Murrayville GMA in addition to the extraction in South Australia within 5km of the border adjacent to Zone 10B-1 (see Apendix 2). The annual declines remain within the acceptable drawdown threshold.

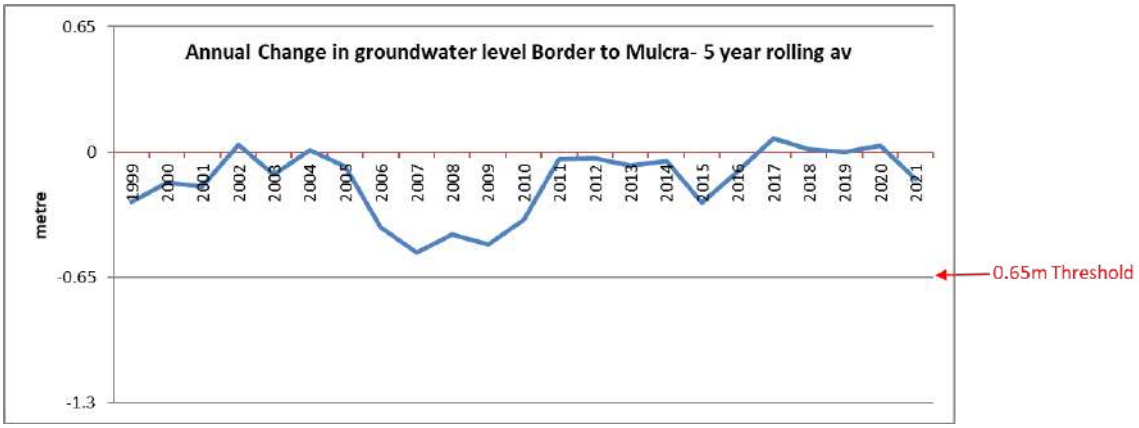
Average change in groundwater level graphs.

The 0.65m threshold has not been reached in any of the resource condition assessment areas in recent years (based on the five year rolling average).



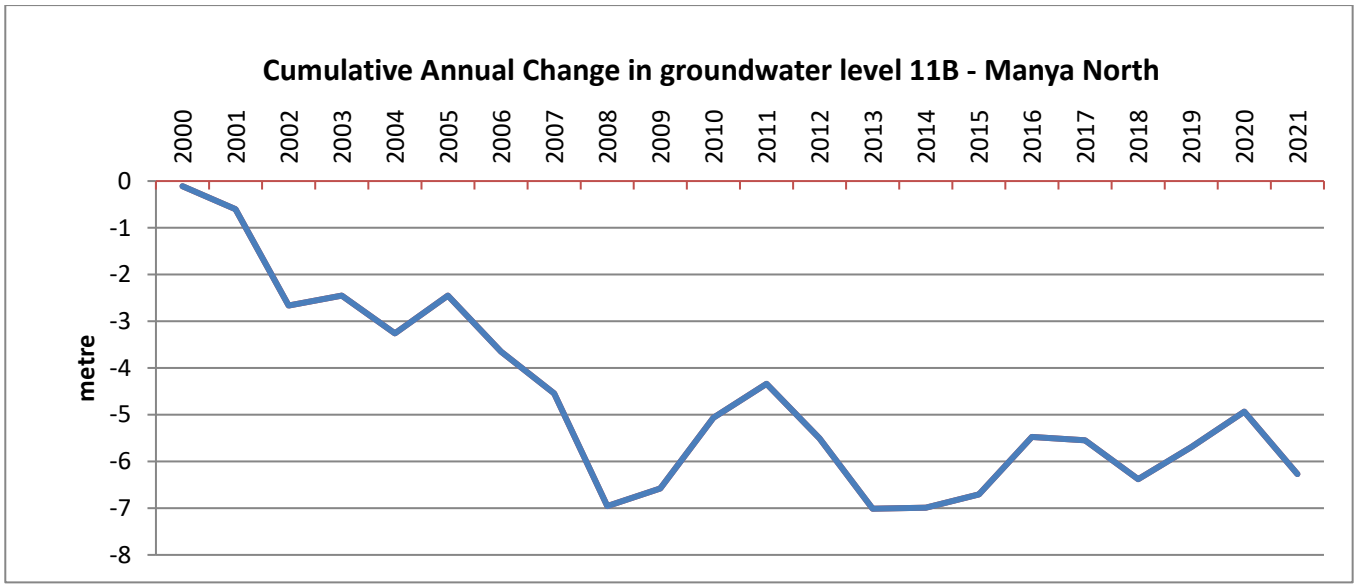


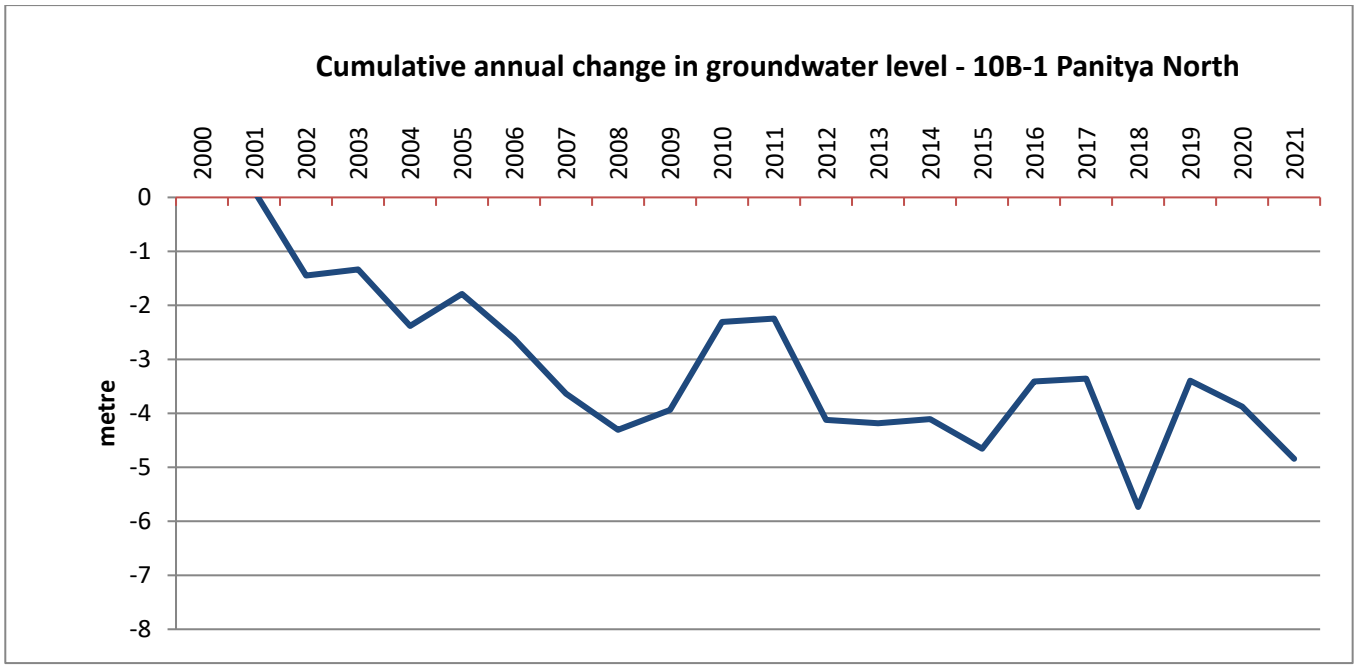


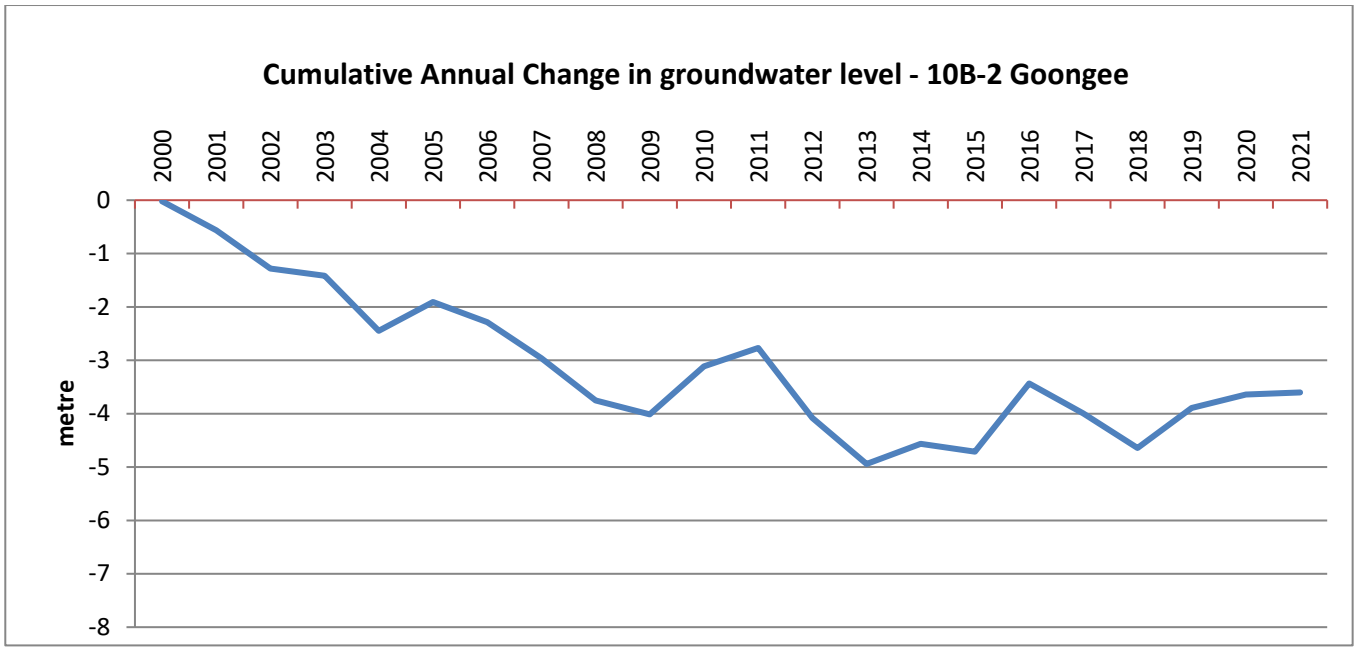


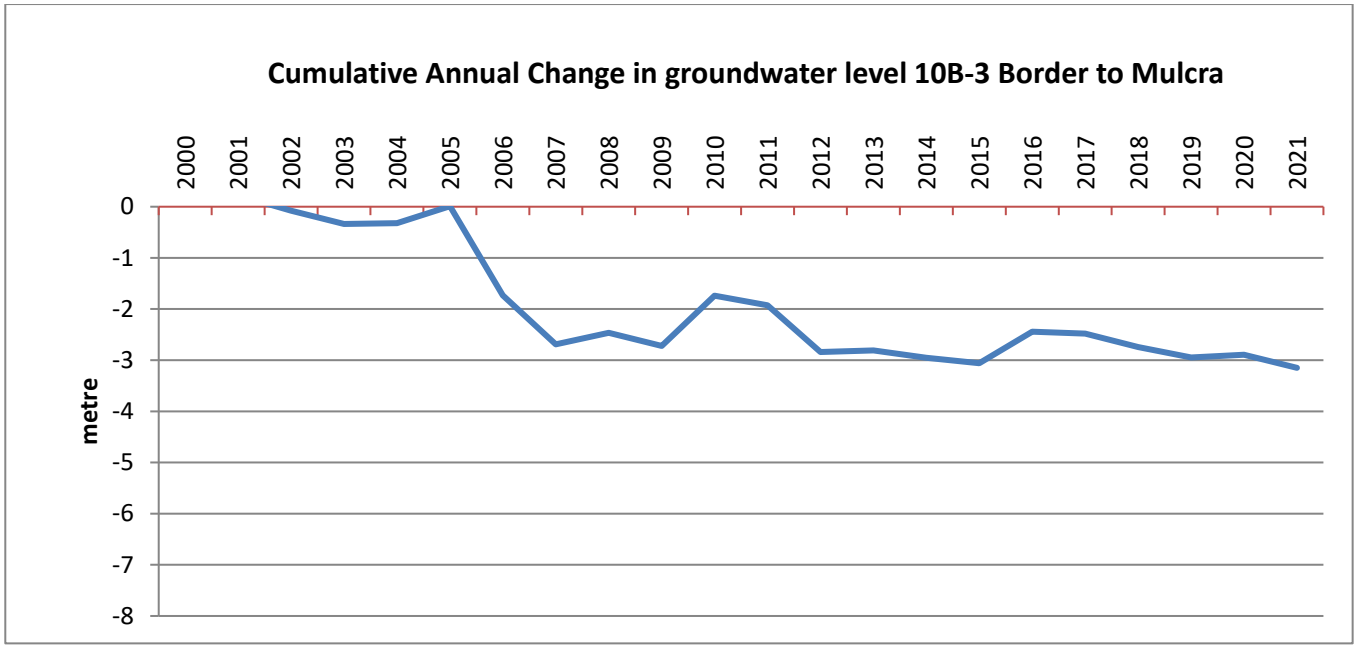
The cumulative effect of the observed annual change in groundwater levels since 2000 is reflected in the graphs below.

Summary - Cumulative change in groundwater level (or residual drawdown) in the recent planning period since 2017:
11B & Manya North = -0.8m
10B-1 Panitya North = -1.43m
10B-2 & Goongee = -0.17m
10B-3 Border to Mulcra = -0.71m






Cumulative Annual Change in groundwater level - 10B-2 Goongee
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
0
-1
-2
-3
-4
-5
-6
-7
-8
metre


Cumulative Annual Change in groundwater level 10B-3 Border to Mulcra
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
0
-1
-2
-3
-4
-5
-6
-7
-8
metre