Annual Report 2021/22

West Wimmera Groundwater Management Area

July 2021 to June 2022

EXECUTIVE SUMMARY

The West Wimmera Local Management Plan (LMP) 2019 is the primary reference document for groundwater management in the West Wimmera area and can be found on the GWMWater website www.gwmwater.org.au/WW-GMA. The LMP draws together the local management rules from the 2011 West Wimmera Groundwater Management Strategy and updated information relevant to groundwater management decisions in the area.

This report details GWMWater's activities in administering the LMP for the West Wimmera Groundwater Management Area during the period 1 July 2021 to 30 June 2022. It also can be found on the website www.gwmwater.org.au.

Status of the Groundwater Resource

Groundwater levels and metered extraction are monitored in the West Wimmera Groundwater Management Area (GMA) as outlined in the Local Management Plan. The data indicates that groundwater levels are responding to the level of extraction as expected. There is a decline in groundwater level in areas of intensive extraction (such as Neuarpur), and where extraction is more disperse, groundwater levels are generally stable. In more recent years the rate of decline in groundwater level in Neuarpur is less than previously observed, while the localised residual drawdown in groundwater level in the Yanipy sub-zone has placed it 'on watch' for management intervention should the decline continue.

Groundwater salinity remains stable based on samples obtained.

Groundwater extraction and use

A total volume of 22,995 megalitres (ML) was extracted from the Tertiary Limestone Aquifer in 2021/22, which is less than half of the total licensed volume in the GMA and slightly higher than the average use for the ten-year period to 30 June 2022, which is 22,632 ML.

Restrictions

All licences in Neuarpur Sub-zone 1 were restricted to 80% of entitlement in 2021/22. This restriction level will also remain for season 2022/23.

TABLE OF CONTENTS

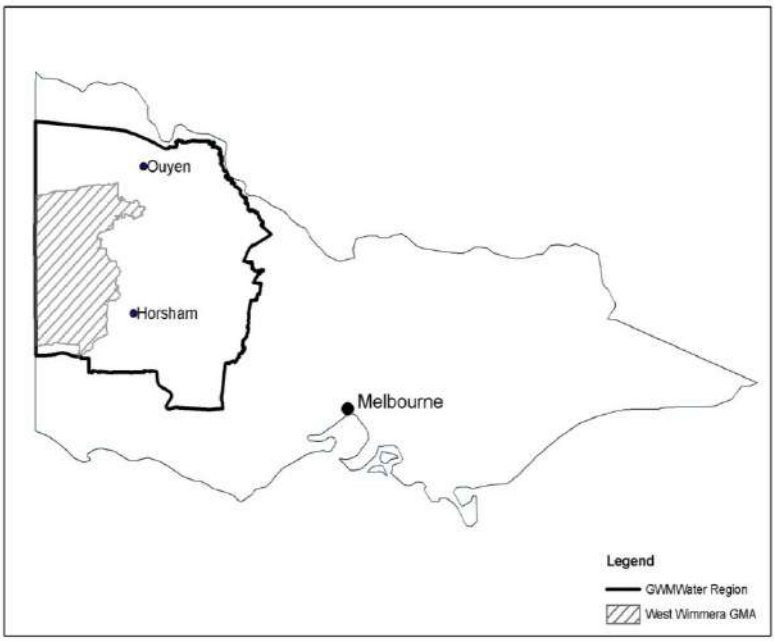
EXECUTIVE SUMMARY 2
1. Introduction 4
2. Groundwater Management 6
2.1. Entitlement Limits 6
2.2. Licensed volume 6
2.3. Groundwater use 7
2.4. Restrictions 8
2.5. Summary of groundwater trading 2021/22 9
2.6. Carryover 10
2.7. Compliance and Enforcement 10
2.8. Domestic and stock bores 10
2.9. New Entitlement Volume 10
3. Groundwater Monitoring 11
3.1. Groundwater Levels 11
3.1.1. Groundwater trend analysis 13
3.2. Water Quality 14
Appendix 1 15
A1.1: Locations of selected observation bores 15
A1.2: Observed Groundwater Levels 16
A1.3: Yearly groundwater level trend analysis 17
Appendix 2 21
A2.1: Salinity monitoring locations 21
A2.2: Salinity monitoring bore data (selected sites) 22

1. Introduction

This report provides an overview of groundwater management activities undertaken in the West Wimmera Groundwater Management Area (GMA) during the period 1 July 2021 to 30 June 2022.

The West Wimmera GMA is located in the far west of Victoria (as indicated in Figure 1), extending from north of the Glenelg River to the Big Desert, and east from the South Australian border to the Wimmera River. Groundwater is the primary source of water for irrigation, urban, stock and domestic supply in the GMA.

Figure 1: Location of West Wimmera GMA



The West Wimmera GMA is generally underlain by three main aquifers which vary in thickness, yield and water quality. The aquifers are the shallow Pliocene (Parilla) Sands Aquifer (PSA), Tertiary Limestone Aquifer (TLA) and the deeper Tertiary Confined Sands Aquifer (TCSA). For much of the area there are layers of clay between the aquifers.

The Tertiary Limestone Aquifer (TLA) is the focus for groundwater management in the West Wimmera GMA. The TLA is the resource that is primarily used for stock and domestic, irrigation and town supplies across the area, due to its water quality and yield.

The status of the groundwater resource varies within the West Wimmera GMA. Most of the GMA shows stable groundwater trends, however, some parts have been exhibiting declining groundwater levels. Management zones have been established within the GMA to represent areas that have common management requirements. These are based on hydrogeology, the management objective (stable groundwater trends) or other distinguishing characteristic, such as intensity of licences and extractions.

The objective of groundwater management in the GMA is to ensure the groundwater resource of the area is managed in an equitable manner to achieve the long-term sustainability of the resource and maintain the social, environmental and economic benefits that groundwater provides to the region.

As represented in Figure 2, the management zones for the West Wimmera GMA are:

- Big Desert
- Northern (including Yanipy sub-zone)
- Little Desert
- Neuarpur Zone (sub-zones 1 and 2)
- Gymbowen
- Southern, with sub-zones Apsley, Langkoop, Edenhope and Ullswater

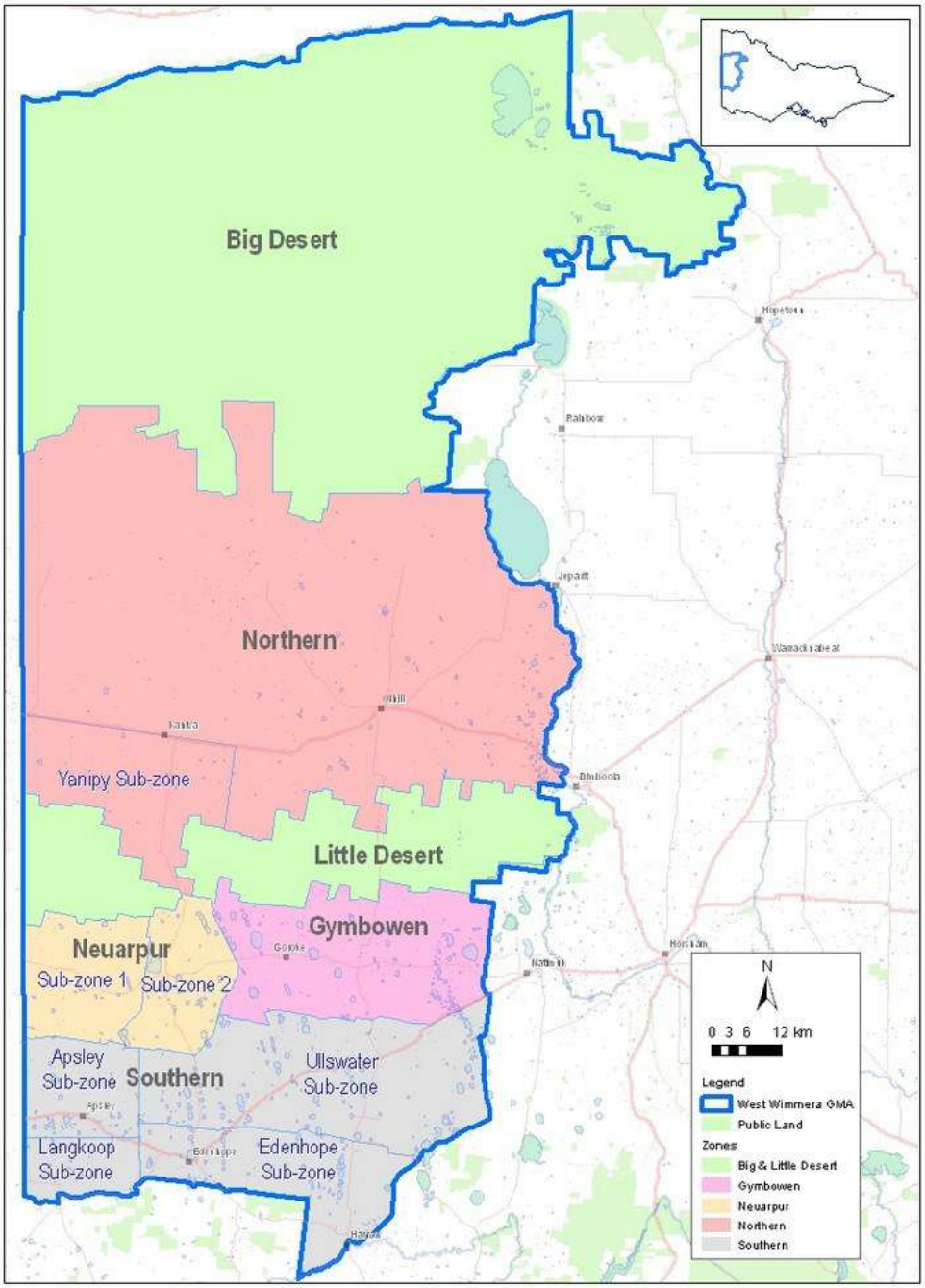


Figure 2: Management Zones of the West Wimmera GMA

2. Groundwater Management

2.1. Entitlement Limits

Under the provisions of the *Water Act 1989,* the Minister for Water may declare a Permissible Consumptive Volume (PCV) for an area or water system. The PCV sets limits on the total volumes that can be taken under a Take and Use Licence for a defined period of time. The PCV for the West Wimmera GMA is outlined in Table 1.

Table 1: Permissible Consumptive Volume (PCV) for all aquifers

West Wimmera GMA Zone or Sub-zone	Pliocene Sands Aquifer PCV in ML	Tertiary Limestone Aquifer PCV in ML	Tertiary Confined Sand Aquifer PCV in ML	All other formations PCV in ML
Big Desert Zone	0	25	0	0
Gymbowen Zone	50	2,000	200	0
Little Desert Zone	0	25	0	0
Neuarpur Zone				
• Neuarpur Sub-zone 1	0	20,700	200	0
• Neuarpur Sub-zone 2	0	4,050	200	0
Northern Zone	50	22,390	500	0
• Yanipy Sub-zone		(6,103*)		
Southern Zone				
• Apsley Sub-zone	0	2,901	200	0
• Edenhope Sub-zone	50	680	50	0
• Langkoop Sub-zone	0	2,000	100	0
• Ullswater Sub-zone	50	888	100	0

*the PCV for Yanipy Sub-zone is included in the overall Northern Zone PCV

2.2. Licensed volume

A summary of licensed volume in the West Wimmera GMA is outlined in Table 2. Further detailed information may be obtained from the Victorian Water Register http://waterregister.vic.gov.au/. The volume licensed in the Northern Zone has decreased slightly from last year, due to one licence not being renewed.

Table 2: Summary of Licences as at 30 June 2022

Management Zone	Number of Licences	Licensed volume (ML)
Neuarpur	*45*	*24,691*
Northern	*69*	*21,967*
Southern	*35*	*5,615*
Gymbowen	*11*	*1,052*
Total	***160***	***53,325***

2.3. Groundwater use

Each irrigation bore and active commercial bore is fitted with a meter approved by GWMWater, 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.

Meters in Neuarpur and Apsley are read remotely as required, while manual readings are taken for the remaining meters. In most cases manual readings are taken twice yearly, once in January/February (mid-irrigation season) with end of season readings taken in May/June. Bores used for extraction of water for domestic and stock purposes are not metered.

Licensees must secure water from another licence holder by way of trade or transfer should they require any volume of water in addition to their licence volume during the season. Any such trade or transfer must be approved by GWMWater prior to the taking of additional water volumes.

There are currently 160 groundwater licences in the West Wimmera GMA with a total licence entitlement volume of 53,325 ML. The volume available for extraction for 2021/22 was 61,706 ML which considers any carryover volume (up to 30% of unused entitlement volume from previous year), and the restricted volume available in Neuarpur sub-zone 1 (discussed further in *2.4 Restrictions*).

This year (2021/22), 99 of the 160 licences were active and extracted a total volume of 22,995 ML (see Table 3 for use by zone). Extraction for irrigation and commercial purposes accounted for 22,496 ML, while 499 ML was extracted for town supply. The total volume used was approximately 807 ML less than that reported for the previous year (2020/21), which was 23,802 ML. While an increase of 775 ML was observed in Neuarpur compared to last reporting year, less groundwater was extracted in each of the remaining zones including 1,400 ML less in the Northern Zone (see Table 4 and Figure 3 for a summary of usage in past years). The use in the Neuarpur Zone was more than the average for the past 20 years (discussed in 2.4).

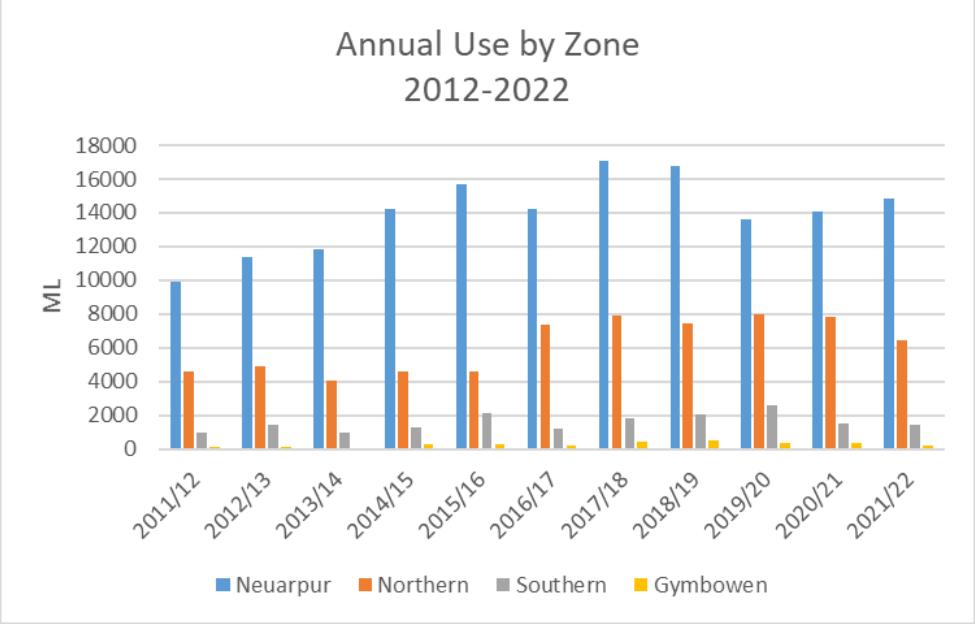
Table 3: Summary of groundwater extractions by management zone 2021/22.

Zone	Number of licences	Permanent Entitlement Volume ML	Extraction (Usage) 2021/22 ML
Neuarpur	45	24,691	14,877
Northern	69	21,967	6,472
Southern	35	5,615	1,442
Gymbowen	11	1,052	204
TOTAL	**160**	**53,325**	**22,995**

Table 4: Summary of groundwater use by management zone since 2011/12

Zone	Permanent Entitlement Volume ML	Use (ML)										
		2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Neuarpur	24,691	9,947	11,410	11,868	14,246	15,676	14,223	17,086	16,784	13,590	14,101	14,877
Northern	22,330	4,040	4,901	4,053	4,589	4,611	7,353	7,920	7,409	7,948	7,855	6,472
Southern	5,615	831	1,440	975	1,294	2,103	1,212	1,858	2,049	2,605	1,496	1,442
Gymbowen	1,052	29	164	69	291	268	209	446	497	377	350	204
TOTAL	**53,688**	**14,847**	**17,915**	**16,965**	**20,420**	**22,658**	**22,998**	**27,310**	**26,739**	**24,520**	**23,802**	**22,995**

Figure 3: West Wimmera GMA Annual extraction by management zone.



2.4. Restrictions

Restrictions are being used to manage groundwater use in Neuarpur sub-zone 1 to address the declining groundwater levels observed in that area.

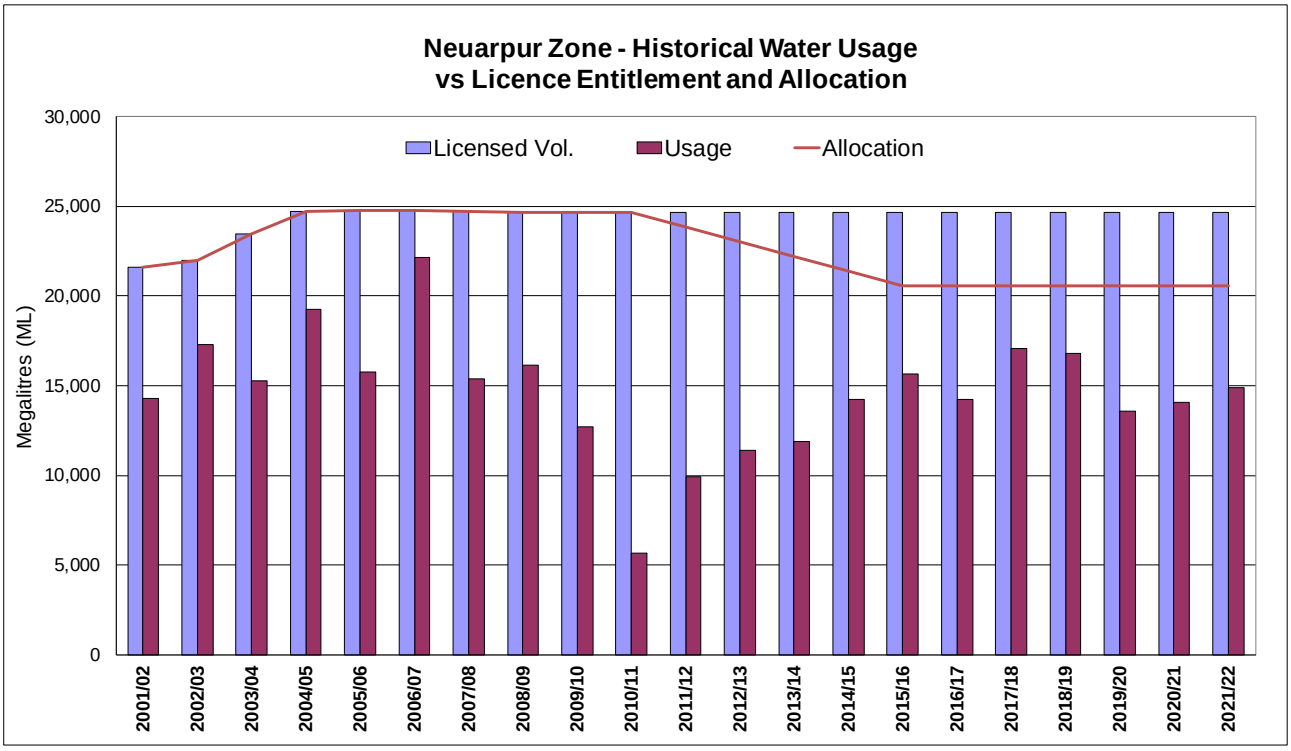
All licences in Neuarpur Sub-zone 1 were restricted to 80% of entitlement in 2021/22, while licences within the remaining zones of the West Wimmera GMA have remained at 100% of licence entitlement.

As can be seen in Table 3, most water used in the West Wimmera GMA was extracted in the Neuarpur Zone. Figure 4 illustrates observed extraction as compared to the volume available for use over the past 20 years in the Neuarpur Zone.

While there is less water technically available due to the 80% restriction to entitlement, the reduced volume being extracted was not necessarily attributed to the restriction as the total extraction volume has not reached the total available restricted volume. The average use over the 20-year period is 14,656 ML.

A method for assessing the need, and process for implementing any new restrictions for the remainder of the GMA, is described within the West Wimmera GMA Local Management Plan (Section 7.2). There are no restrictions foreshadowed in response to the observed change in groundwater level in recent years based on this assessment (see section *3.1.1. Groundwater trend analysis*).

Figure 4: Neuarpur Zone water use, licence entitlement volume and allocation over time.



2.5. Summary of groundwater trading 2021/22

Groundwater trading, either permanent or temporary, provides flexibility for new and existing users to manage production and in some cases establish new developments. Trading rules for the West Wimmera GMA have been established to maximise opportunities for groundwater trading, while preserving the management objective for each zone. The West Wimmera GMA trading rules allow (subject to assessment) groundwater trades within zones. Trades, however, cannot occur into Neuarpur Sub-zone 1, or the Yanipy, Apsley or Langkoop Sub-zones. Any trade or transfer must be approved by GWMWater prior to the taking of the additional water volumes.

During 2021/22 there were nine temporary transfers of water entitlement, mostly in the Neuarpur Zone, and one permanent trade (250ML) of water entitlement.

2.6. Carryover

Carryover provides the ability for a licence holder's unused allocation to be used in the following water year. Unused allocation to an upper limit of 30% licence volume may be carried over to the following year. In Neuarpur sub-zone 1, this equates to an upper limit of 30% of the total restricted entitlement volume, while in the remainder of the GMA, licensees may carry over up to 30% of their full (un-restricted) licence entitlement, should it be unused. The end of season water usage statements issued by GWMWater provide licensees with information on the volume of carryover available for the following season.

2.7. Compliance and Enforcement

The Victorian Government has a zero tolerance approach for unauthorised water take. GWMWater, as the delegate for the Minister for Water, is responsible for the compliance and enforcement of the rules and legislative requirements surrounding the take and use of unregulated surface water and groundwater.

Meter reading and compliance checks are conducted by GWMWater throughout the year. When a licence holder fails to comply with the 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). In a groundwater sense, unauthorised take (or 'overuse') typically occurs when groundwater users extract a volume beyond that which is their account (available volume) – even if they have the intention of balancing it up later.

There was a small number of non-compliances detected during the year (primarily unauthorised take or 'overuse'). These instances were all investigated by GWMWater, with licensees acting to resolve all matters. There were no outstanding or unresolved compliance matters in the West Wimmera GMA at 30 June 2022.

2.8. 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 31 bore construction licence issued for the construction or alteration of bores domestic and stock bores in the West Wimmera GMA in 2021/22. This is similar to the number of bore construction licence applications made in the prior year.

2.9. New Entitlement Volume

At the conclusion of the 2015/16 competitive sales process for new entitlement, not all of the available volume was sold. GWMWater will finalise the framework and pricing for this remaining unallocated groundwater early in 2022/23.

3. Groundwater Monitoring

3.1. Groundwater Levels

Groundwater levels are measured at regular intervals in dedicated observation bores located throughout the West Wimmera GMA. The bores are monitored by Ventia under the State Observation Bore Network monitoring contract, of which GWMWater is a partner.

While there is an extensive observation bore network across the GMA, there are a greater number of observation bores located in the vicinity of concentrated groundwater extraction. Figure 5 illustrates the location of observation bores monitored during the 2021/22 period. There are 15 observation bores that are telemetered and water level data is recorded and transmitted hourly via the mobile phone network.

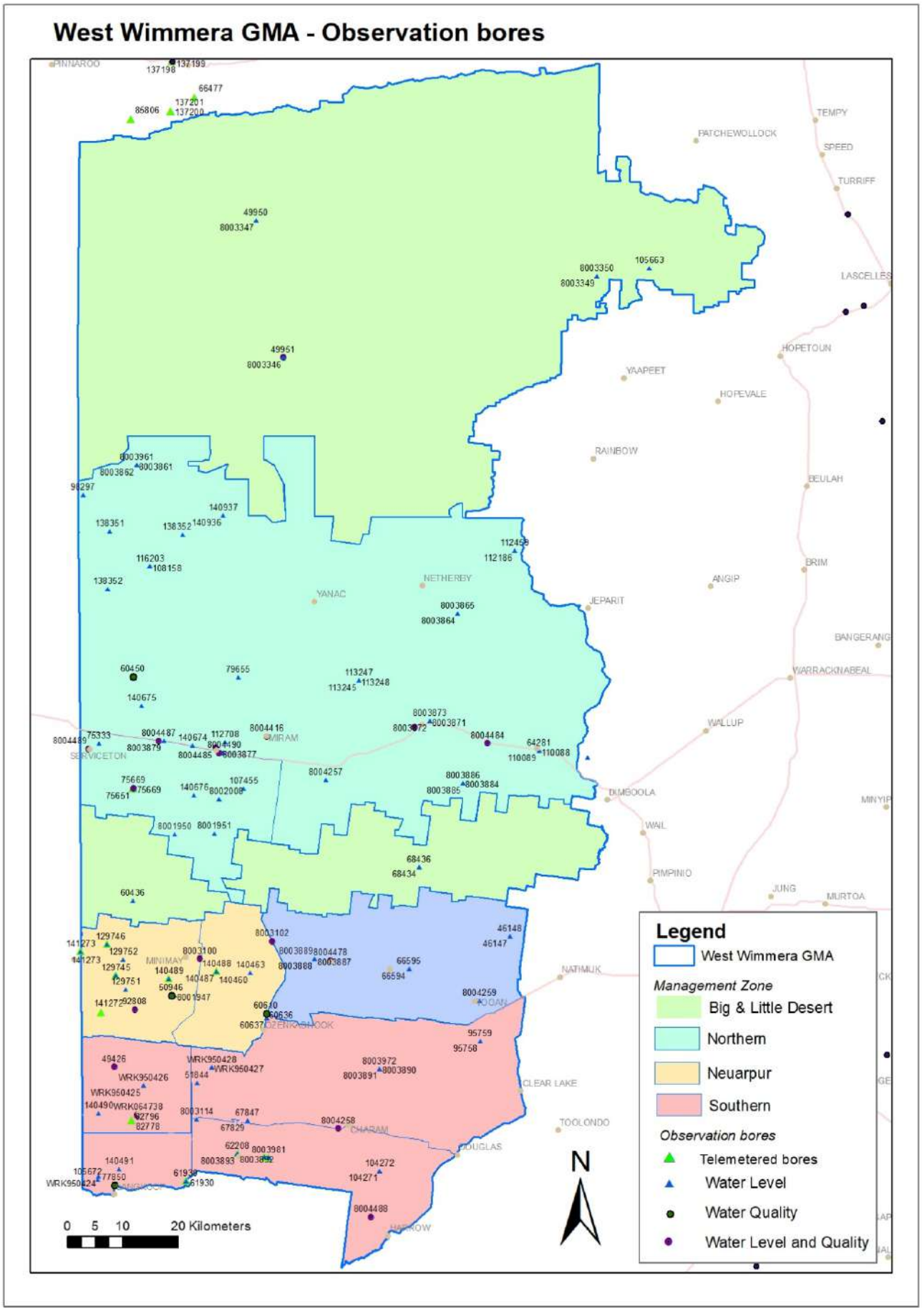
Groundwater monitoring information is publicly available via DELWP Water Measurement Information System at http://data.water.vic.gov.au/
This system is currently being redesigned and a new, more user friendly map based system should be available next year.

Graphs illustrating groundwater levels over time in a number of selected observation bores are illustrated in Appendix 1. Table 5 provides a status summary by zone (or sub-zone).

Table 5: Observed groundwater status over the 2021/22 period.

Zone/sub-zone	Groundwater Status 2022	Comment
Big Desert	Stable	
Northern	Generally stable	Yanipy sub-zone: seasonal trend of drawdown and recovery is evident in bores located close to where there is a higher volume of extraction for irrigation. There has been some localised residual drawdown in this more intensively irrigated area. Overall a stable trend exists for the Northern zone.
Little Desert	Stable	
Neuarpur sub-zone 1	Declining	Declining, however, the rate of decline has reduced since 2010 in much of the sub-zone.
Neuarpur sub-zone 2	Generally stable	Generally stable, however closer to the western border ongoing minor declining trends are observed.
Gymbowen	Stable	
Southern – Apsley and Langkoop,	Generally stable	Groundwater level in this zone are influenced by climatic conditions and use within Victoria and South Australia.
Southern - Edenhope	Stable	
Southern - Ullswater	Stable	

Figure 5: Observation bores monitored during 2021/22



3.1.1. Groundwater trend analysis

Appendix 1 includes the yearly trend analysis undertaken for the zones identified by GHD in the 2018 technical review of the West Wimmera GMA as being at moderate-high risk of not achieving the management objective of stable groundwater levels. These graphs allow changes in groundwater level trends to be assessed on an annual, 5 yearly, and longer-term basis. The methodology averages the change in groundwater level data (averaged across a number of bores) and minimises potential bias by not being dependent on any one particular observation bore.

The cumulative graphs represent change in water level over time. They illustrate a continued steadying in the downward trend in Neuarpur and a slight annual decline in the Yanipy sub-zone, while a stable trend exists in the remainder of the Northern zone.

With the exception of Neuarpur Sub-zone 1, the only sub-zones where an annual drawdown in excess of the trigger level of 0.1m has been recorded at least once in the last five years are Yanipy, Northern (west) and Apsley. These instances have not necessitated a management response because the breaches of the trigger level have not been recorded in consecutive years (stable or water level increase have occurred in the intervening years). These observations provide an 'on-watch' warning.

While the annual change in groundwater level in Neuarpur Sub-zone 1 has been within the 0.1m threshold for the past two years there has been a continued decline of groundwater levels in Sub-zone 1 and the restriction to 80% of licence volume is to remain for 2022/23 season. This will be reassessed next year to determine the implications for the 2023/24 irrigation season as per the prescriptions of the Local Management Plan.

Groundwater levels in the Apsley and Langkoop sub-zones are influenced both by climatic conditions and use within Victoria and South Australia. The aquifer is relatively quick to respond to rainfall and pumping as indicated by the groundwater level tends. In recent years, groundwater trends had shown signs of stabilisation within the Apsley and Langkoop sub-zones, however a marginal decline in groundwater levels was noted last year, which coincided with above average groundwater use. This year there has been recovery in groundwater levels, with average use observed in these sub-zones.

The Yanipy sub-zone is "on watch". The limestone aquifer is confined and displays cyclic fluctuations in groundwater levels as a result of the change in pressure from seasonal groundwater pumping in the sub zone. This sub-zone requires assessment over an extended period due to the large variation in groundwater level that exists due to the nature of the aquifer. The observations indicated that the drawdown last year exceeded 0.1 metre, while this year, the annual change remains within the threshold by a margin of 0.01 metre. The Cumulative Annual Change graph illustrates the overall result of the annual change in groundwater level over the years. The remainder of the Northern Zone exhibits relatively stable groundwater levels.

Stable groundwater levels are also observed in the Ullswater and Edenhope sub-zones, and the Gymbowen zone, where the volumes of groundwater extraction are currently relatively low and there is little to no impact evident to groundwater levels.

3.2. Water Quality

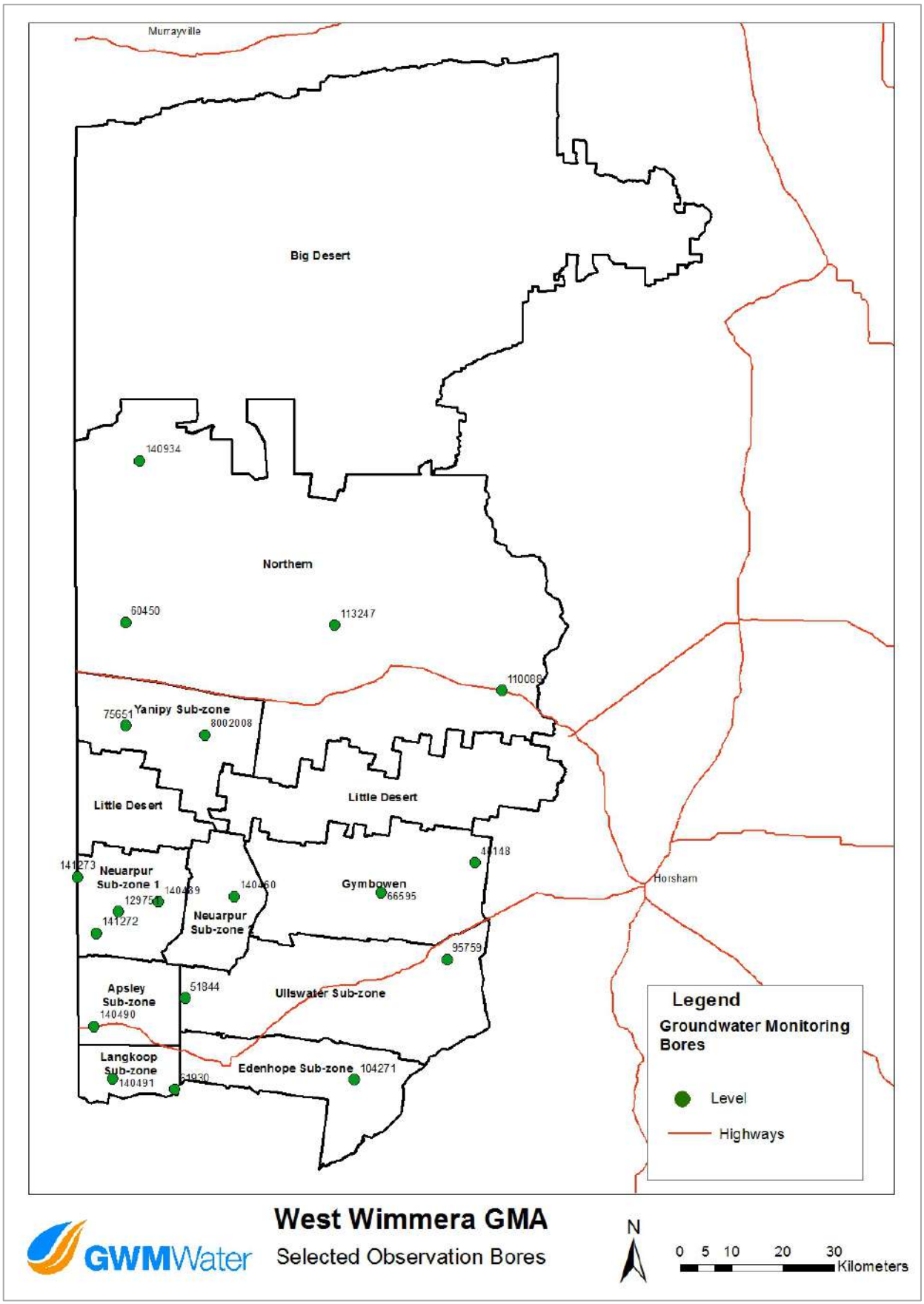
The location of bores screened in the Tertiary Limestone Aquifer (TLA) which are monitored regularly for salinity as part of the SOBN program are illustrated in Appendix 2. Graphs illustrating a selection of the bores where data is collected are also illustrated in Appendix 2. There were a small number of bores that missed being sampled in the 2021/22 period, this will be rectified and the information presented next year.

In general, the salinity of the TLA is low and less than 1,500 EC units (uS/cm) or 1,000 mg/L of Total Dissolved Solids (TDS) through the middle section of the GMA, and less than 2,500 EC (1,500 mg/L TDS) across most of the remaining area. Towards the southern and northern boundaries, salinity typically ranges from 2,500 to 5,400 EC (1,500 to 3,500 mg/L TDS). There are small, isolated areas of higher salinity groundwater toward the south-west corner of the GMA and north of Kaniva.

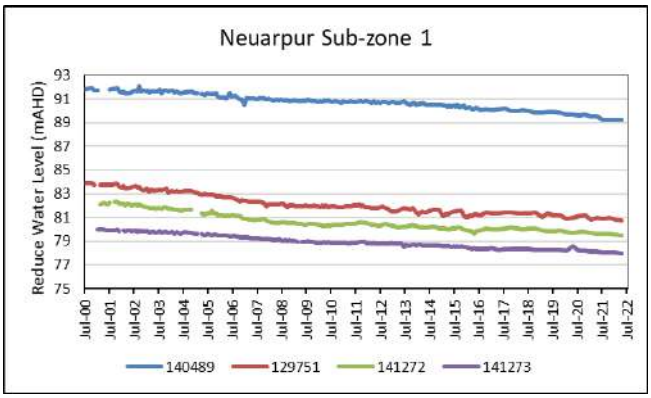
The salinity of groundwater appears to be relatively stable in most of the bores sampled, and has not been identified as a resource management issue.

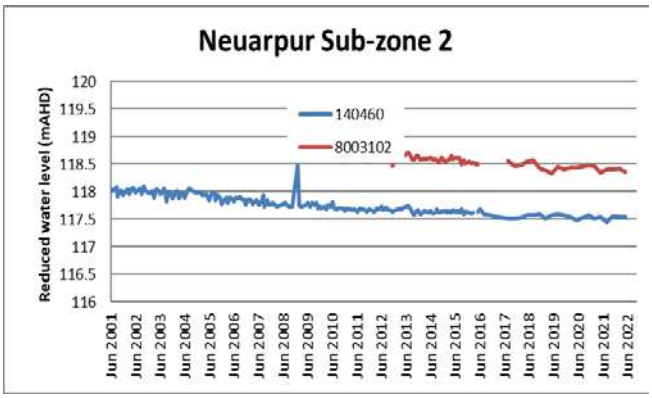
Appendix 1

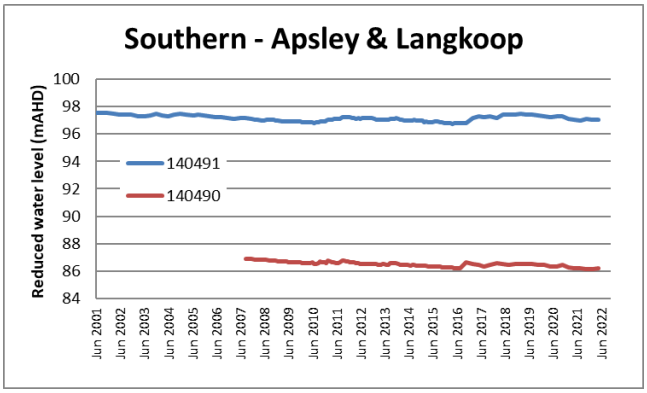
A1.1: Locations of selected observation bores

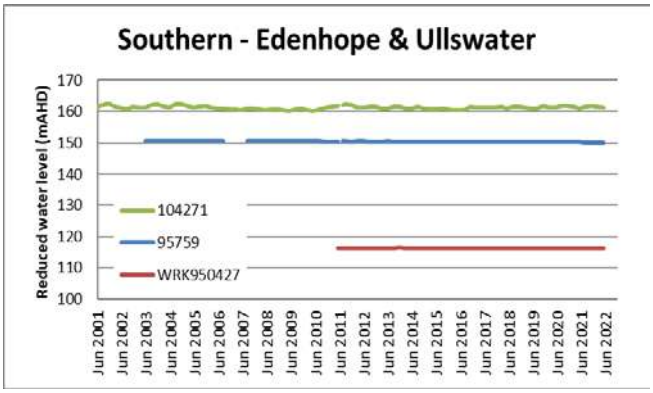


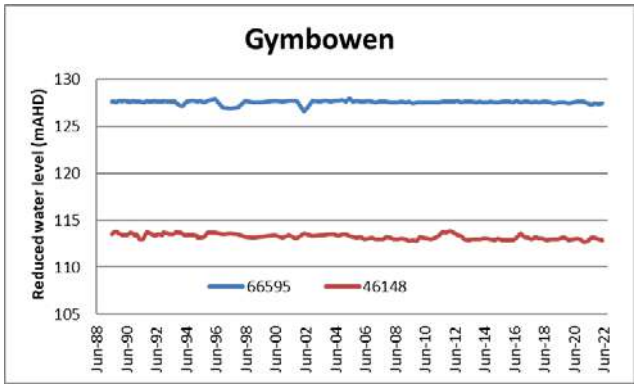
A1.2: Observed Groundwater Levels

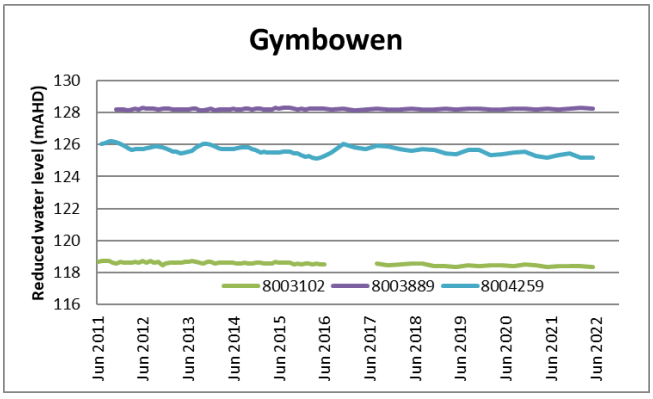


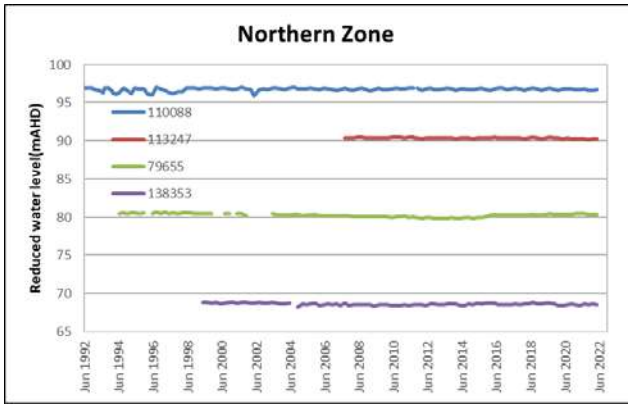


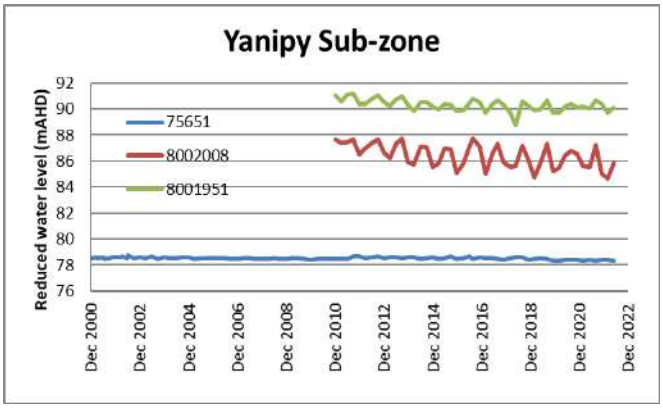




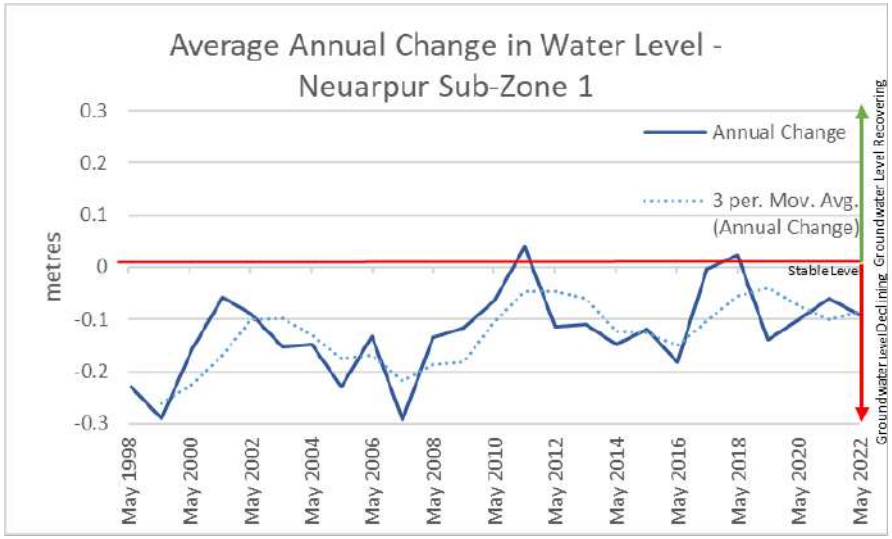


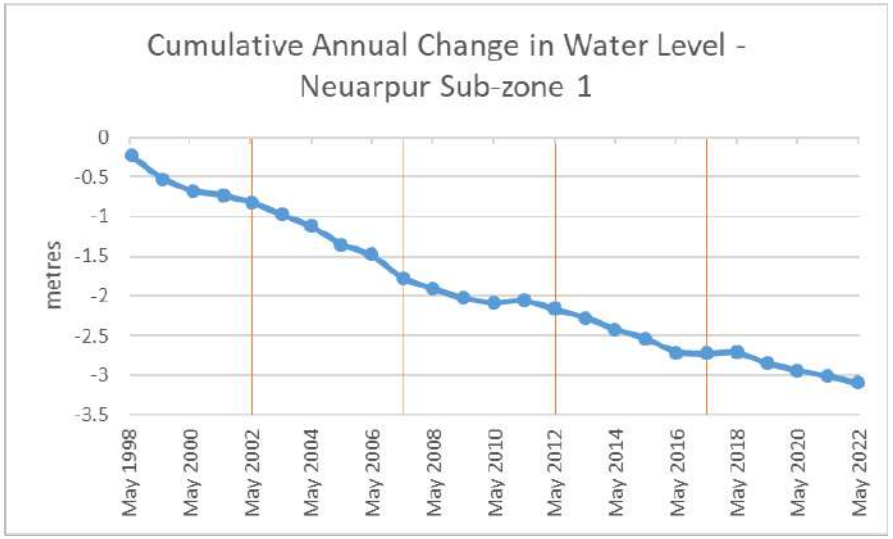


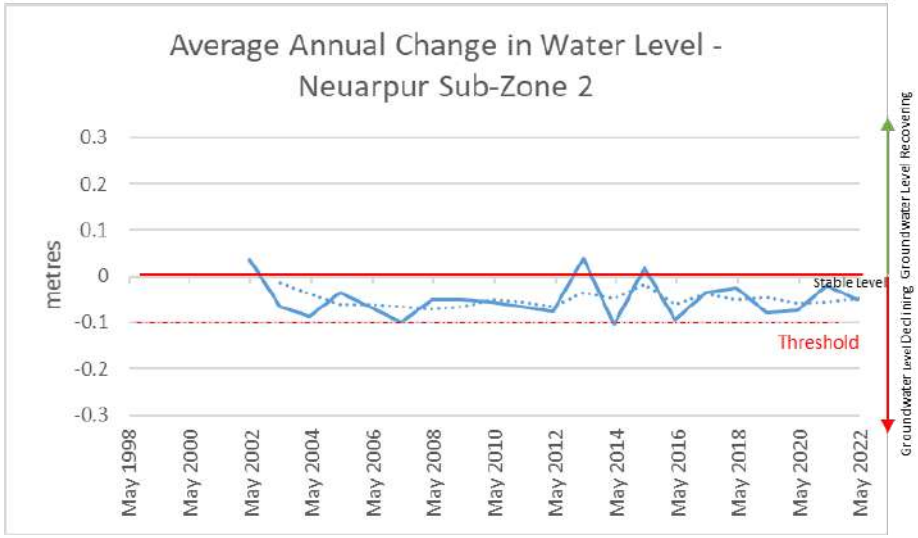


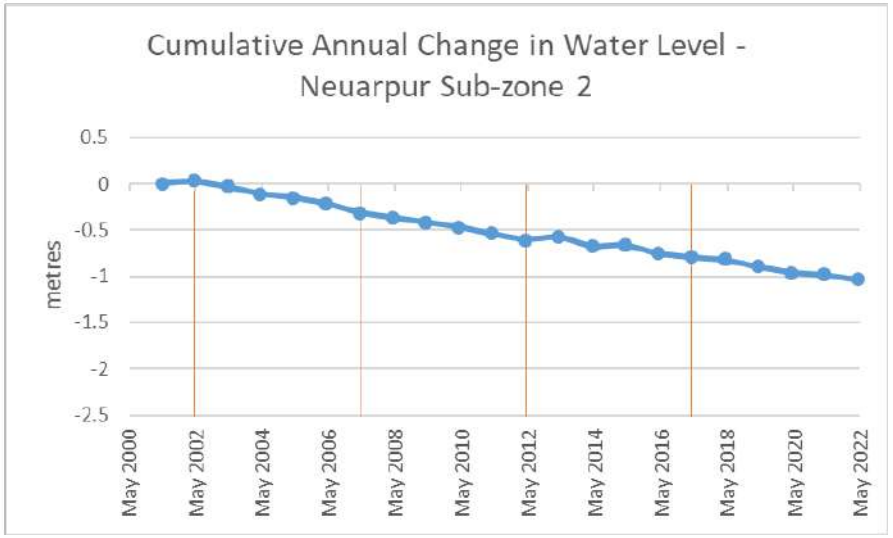


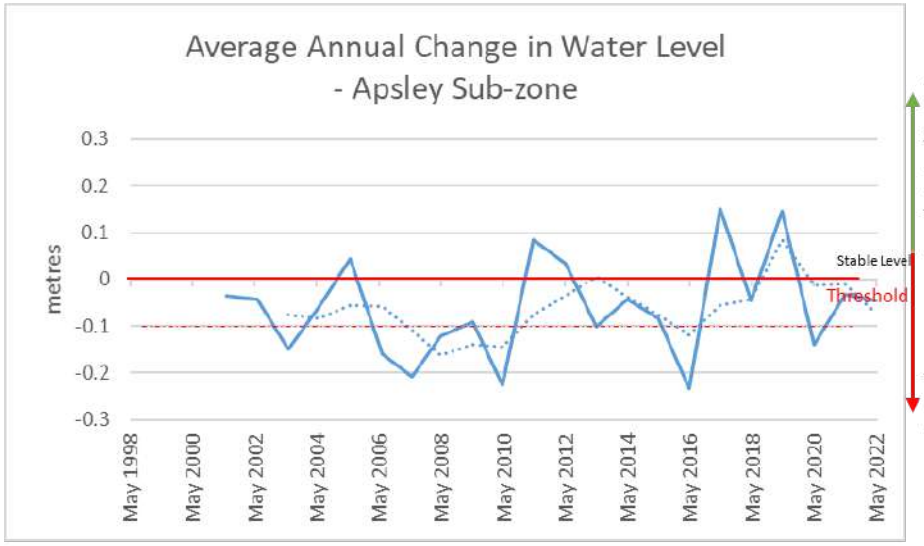
A1.3: Yearly groundwater level trend analysis - representative hydrographs for West Wimmera GMA zones and sub-zones

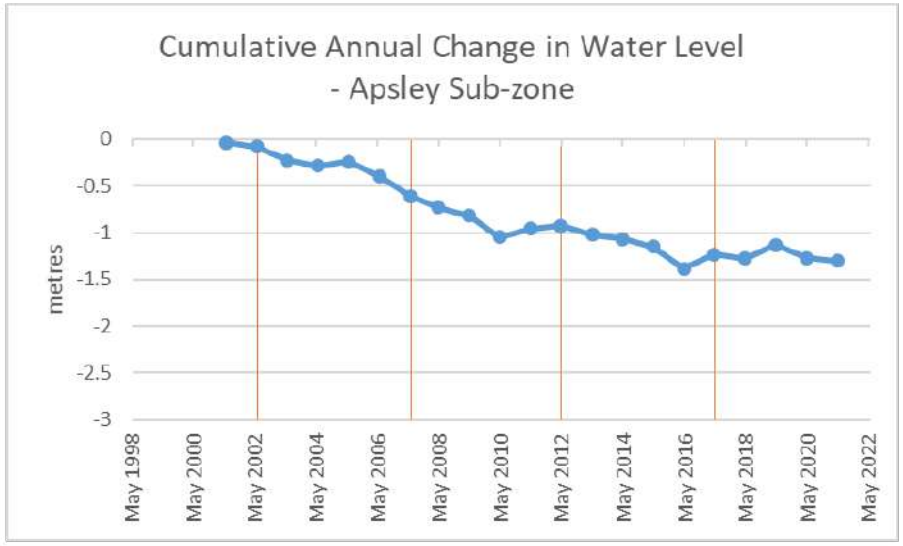


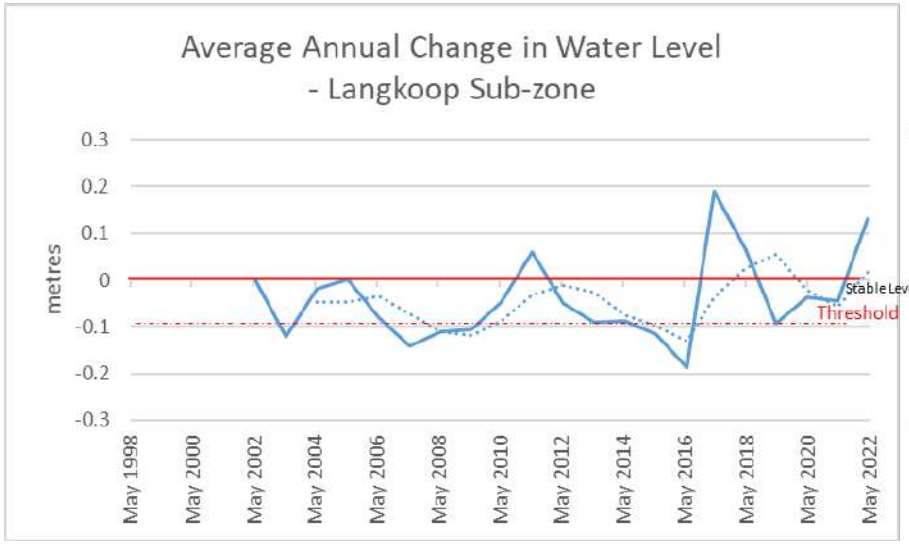


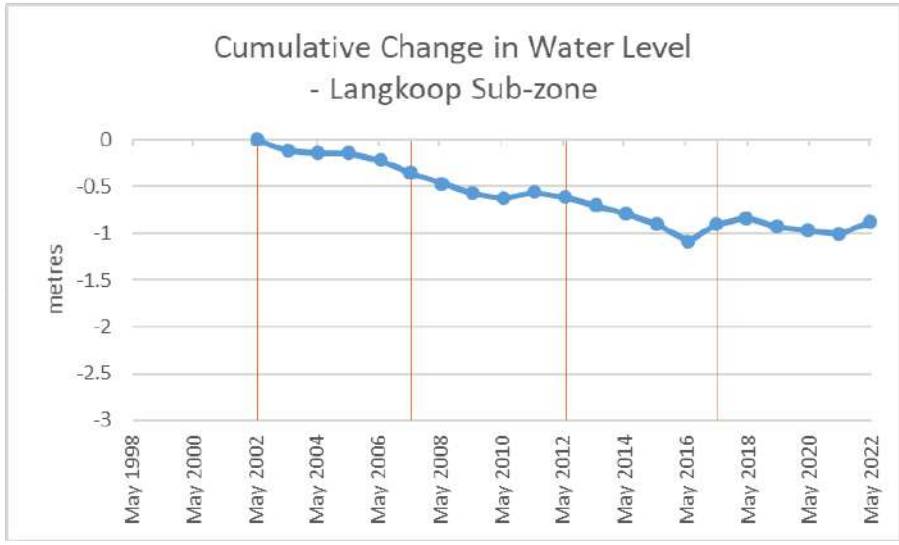


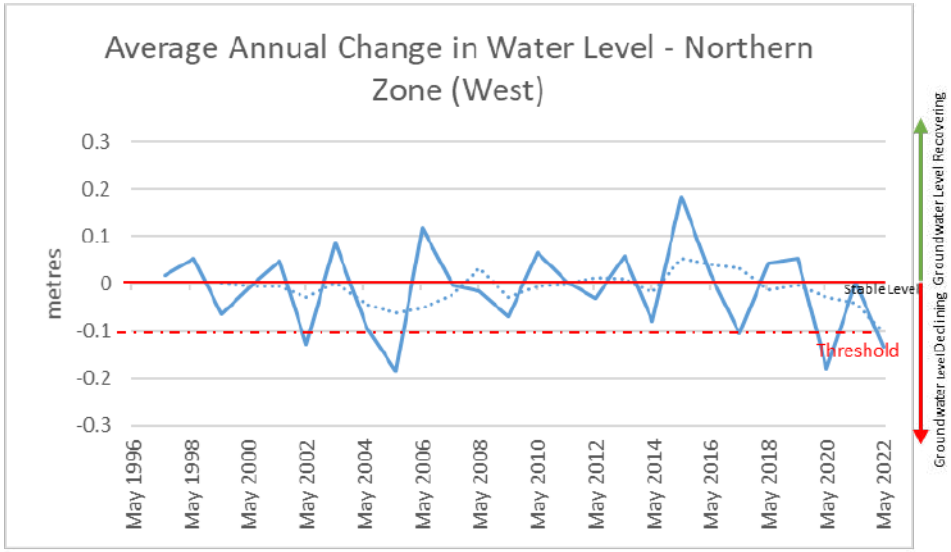


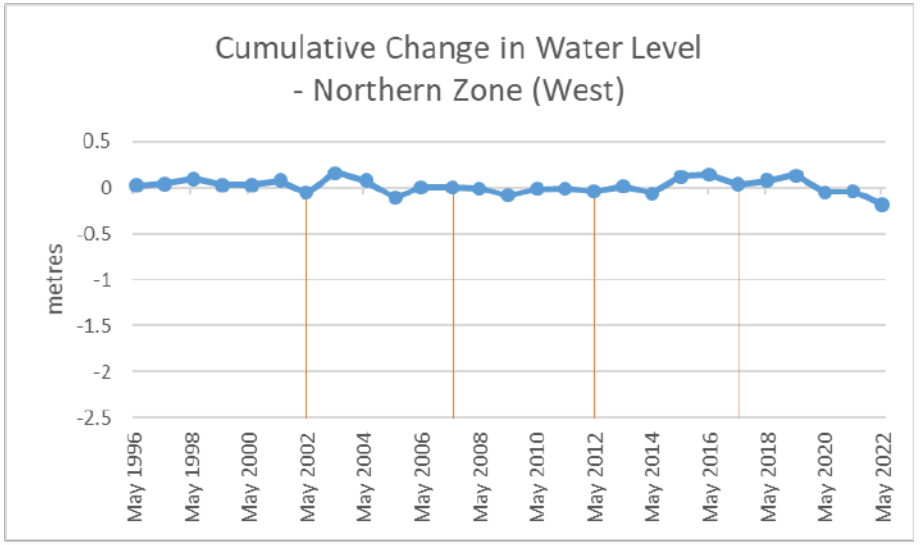

Average Annual Change in Water Level
- Apsley Sub-zone
metres
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Stable Level
Threshold
Groundwater Level Declining
Groundwater Level Recovering
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

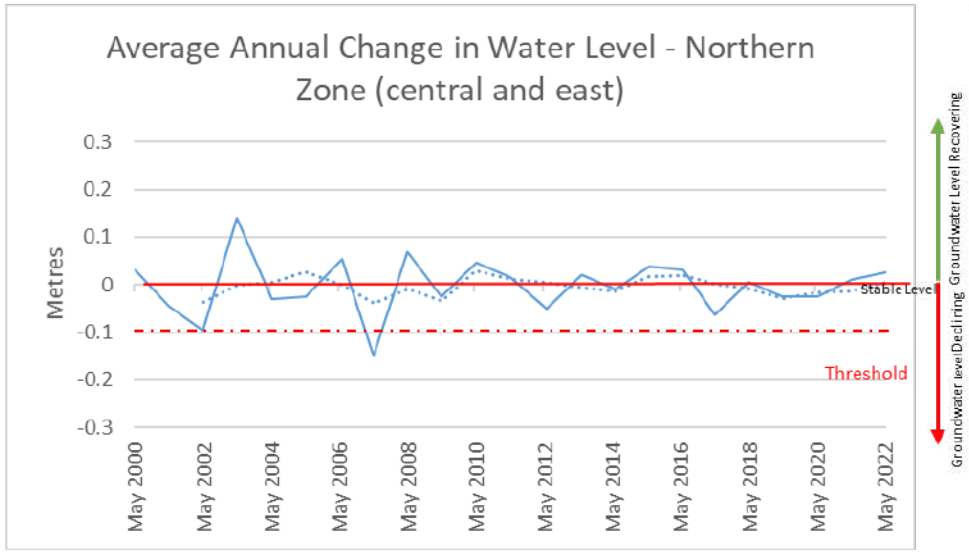

Cumulative Annual Change in Water Level
- Apsley Sub-zone
metres
0
-0.5
-1
-1.5
-2
-2.5
-3
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

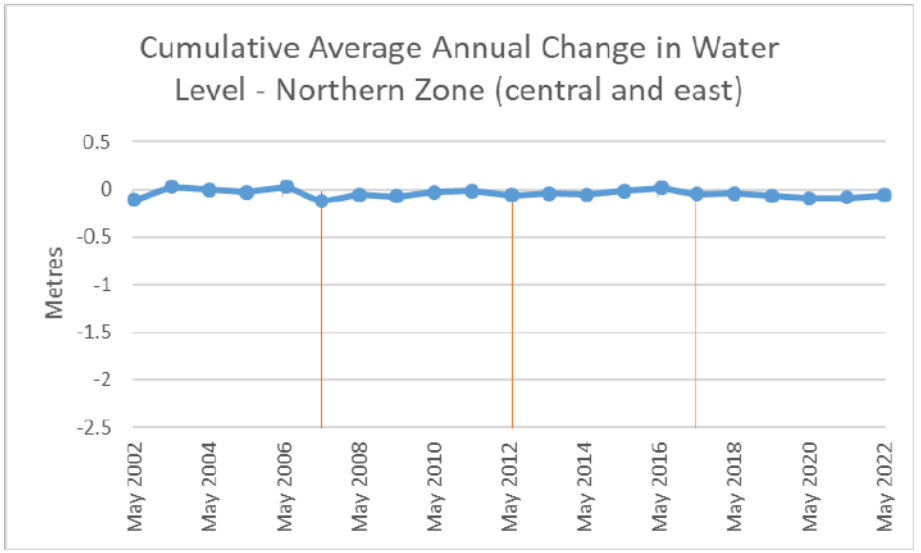

Average Annual Change in Water Level
- Langkoop Sub-zone
metres
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Stable Level
Threshold
Groundwater Level Declining
Groundwater Level Recovering
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

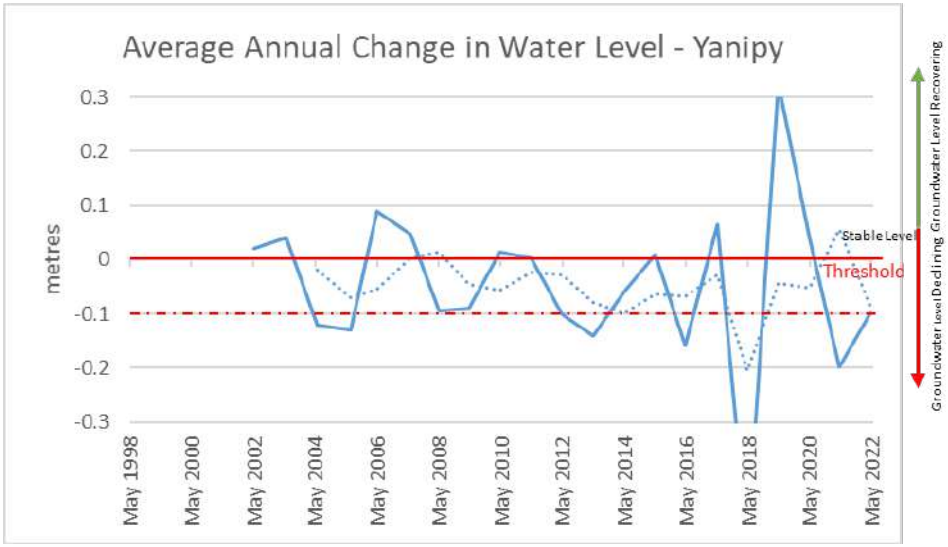

Cumulative Change in Water Level
- Langkoop Sub-zone
metres
0
-0.5
-1
-1.5
-2
-2.5
-3
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

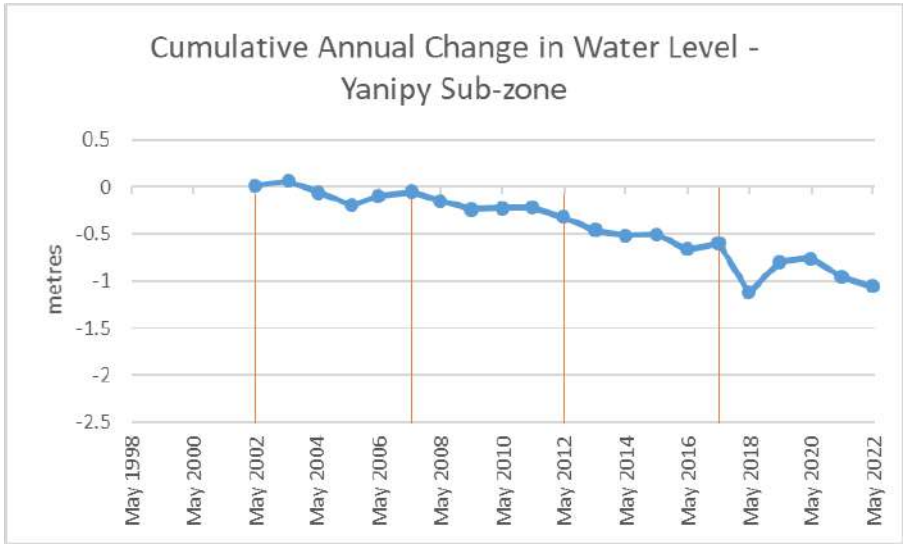

Average Annual Change in Water Level - Northern Zone (West)
metres
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Stable Level
Threshold
Groundwater level Declining
Groundwater Level Recovering
May 1996
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022


Cumulative Change in Water Level - Northern Zone (West)
metres
0.5
0
-0.5
-1
-1.5
-2
-2.5
May 1996
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022


Average Annual Change in Water Level - Northern Zone (central and east)
Metres
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Stable Level
Threshold
Groundwater level Declining
Groundwater Level Recovering
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

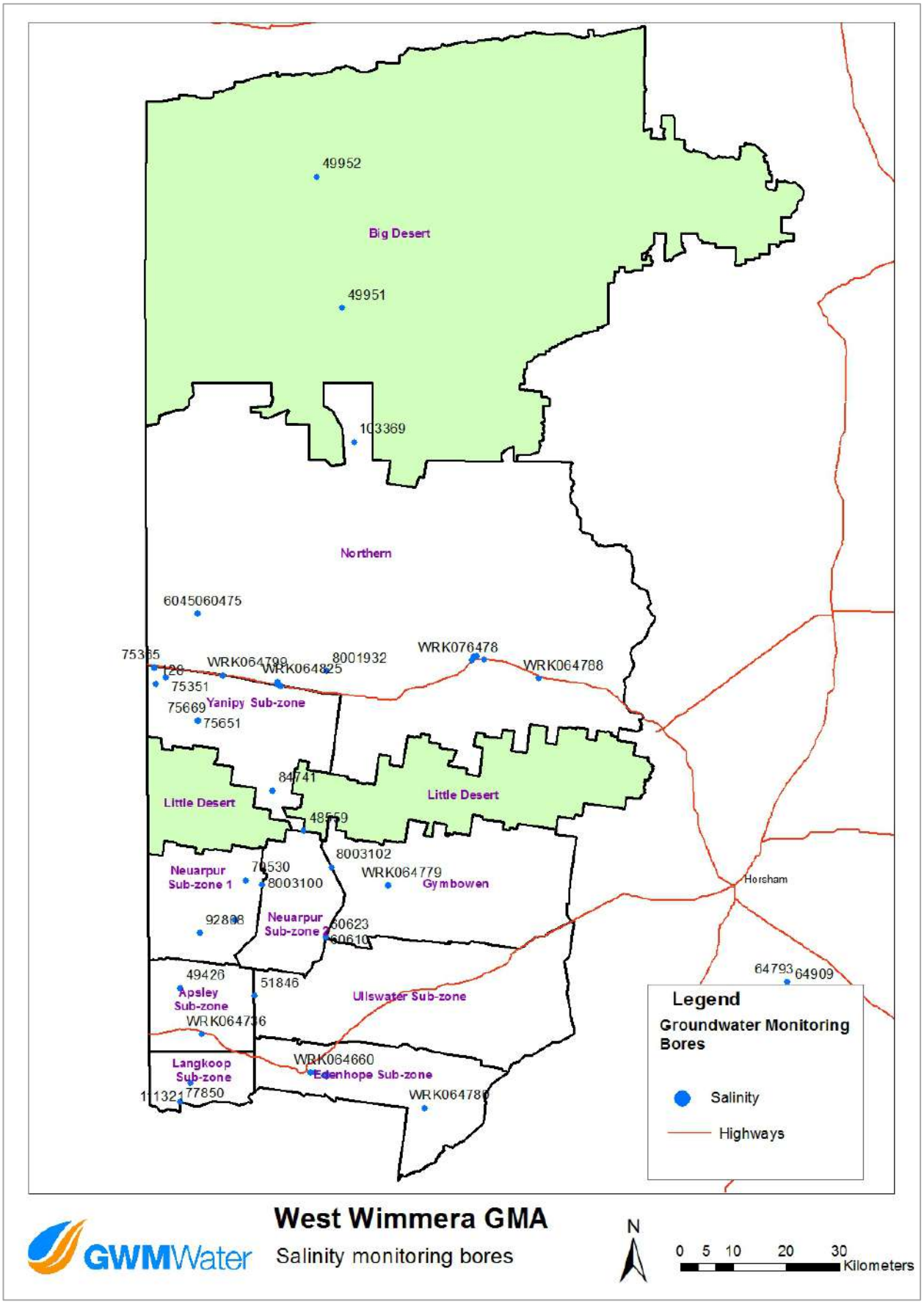
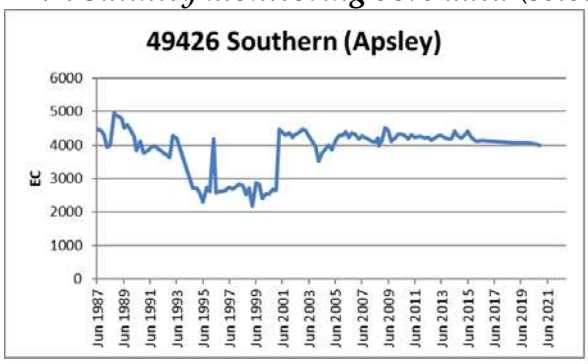
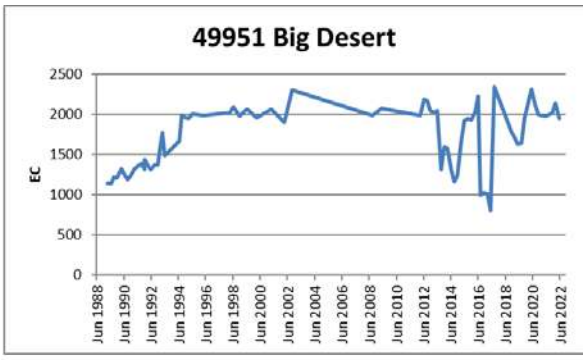
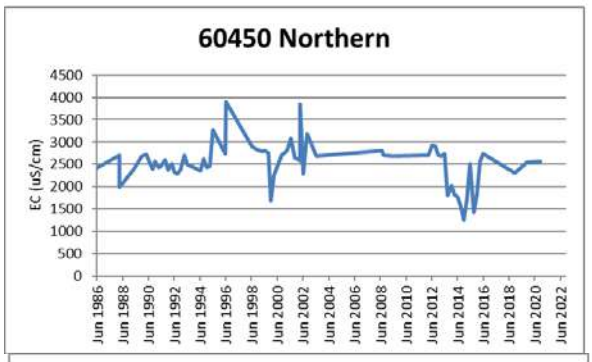
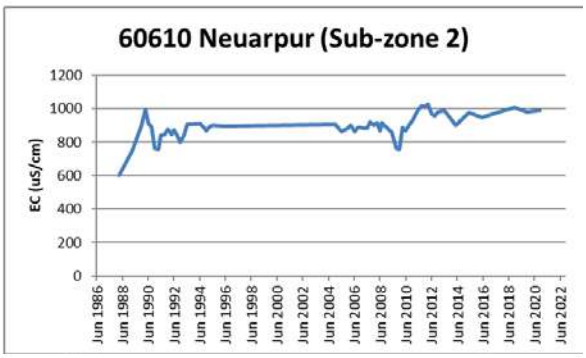
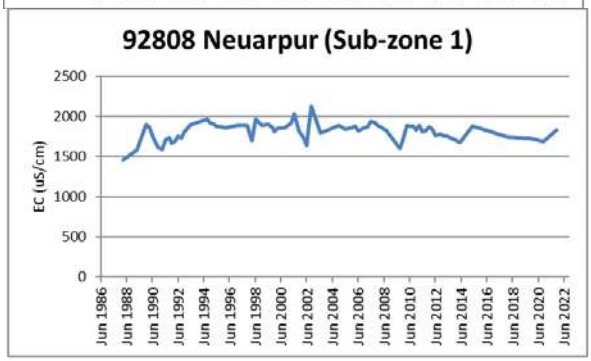
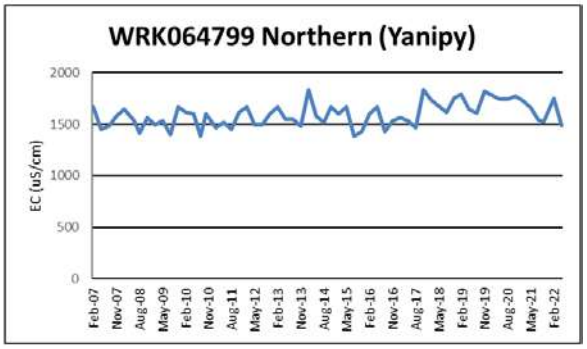
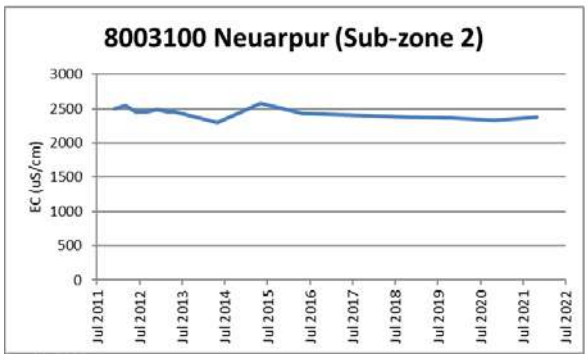
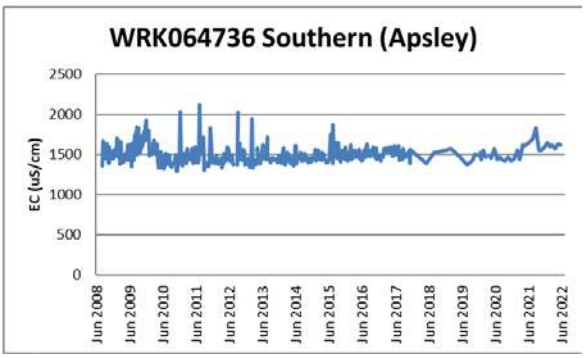
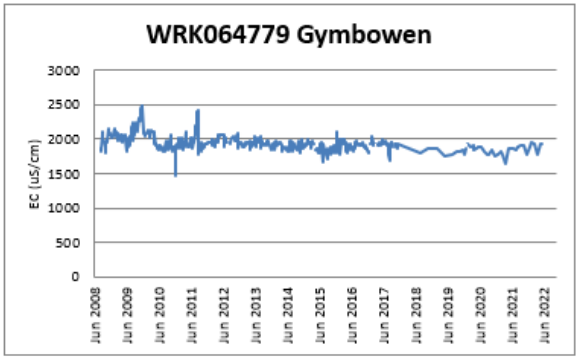
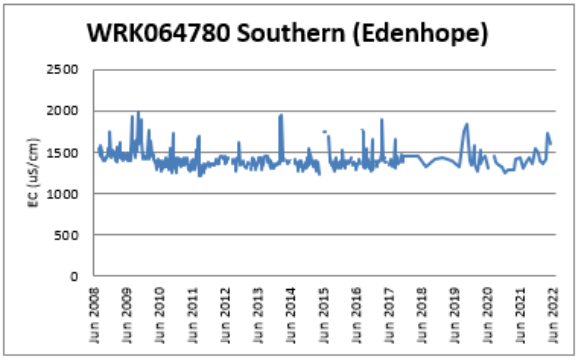

Cumulative Average Annual Change in Water Level - Northern Zone (central and east)
Metres
0.5
0
-0.5
-1
-1.5
-2
-2.5
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022


Average Annual Change in Water Level - Yanipy
metres
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Stable Level
Threshold
Groundwater level Declining
Groundwater Level Recovering
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022


Cumulative Annual Change in Water Level - Yanipy Sub-zone
metres
0.5
0
-0.5
-1
-1.5
-2
-2.5
May 1998
May 2000
May 2002
May 2004
May 2006
May 2008
May 2010
May 2012
May 2014
May 2016
May 2018
May 2020
May 2022

Appendix 2

A2.1: Salinity monitoring locations



A2.2: Salinity monitoring bore data (selected sites)