West Wimmera Groundwater Management Area

Annual Report 2015/16

GWMWater

FOREWORD

The purpose of this report is to detail GWMWater's activities undertaken in administering the West Wimmera Groundwater Management Strategy 2011 (The Strategy) during the period 1 July 2015 to 30 June 2016. It aims to outline the status of the groundwater resource, including groundwater levels and activities undertaken during the reporting period. This report is also available on the GWMWater website www.gwmwater.org.au.

Groundwater levels, salinity and metered extraction have continued to be monitored in the West Wimmera Groundwater Management Area (GMA). Assessment of the data indicates that groundwater levels continue to respond to the level of extraction as expected. Where there is considerable intensity of extraction and use, there is a decline in groundwater level (such as Neuarpur), and where extraction is more disperse groundwater levels are stable. Salinity remains relatively stable based on samples obtained.

Over the 2015/16 period, groundwater extraction from the Tertiary Limestone Aquifer was less than half of the total licenced entitlement. Irrigators in Neuarpur Sub-zone 1 recorded their highest metered extraction since 2009, however, the total use remained within the 80% restriction on their licence volumes.

GWMWater remains involved with the Border Groundwaters Agreement Review Committee and recognises the continuing challenges with how the groundwater resource is managed on both sides of the Border with South Australia. GWMWater works closely with the Department of Environment, Land, Water and Planning on Border related matters to ensure fairness is provided to its groundwater users.

As recommended within the Strategy, a small volume of water was made available for sale in two of the management zones. GWMWater conducted a sale of unallocated groundwater process commencing in December 2015 whereby expressions of interest were invited from landowners in the prescribed zones where water was available. As a result of the sales process there has been one licence issued, with additional licences expected to be issued once conditions have been satisfied.

The GWMWater Board extended the tenure of the West Wimmera GMA Implementation Committee while the five year technical review of the Strategy is underway. GWMWater will continue its monitoring program, implementation and periodic review of the strategy, engagement with the local community, and looks forward to its continuing relationship with the Committee.

Signed

Mark Williams
Managing Director

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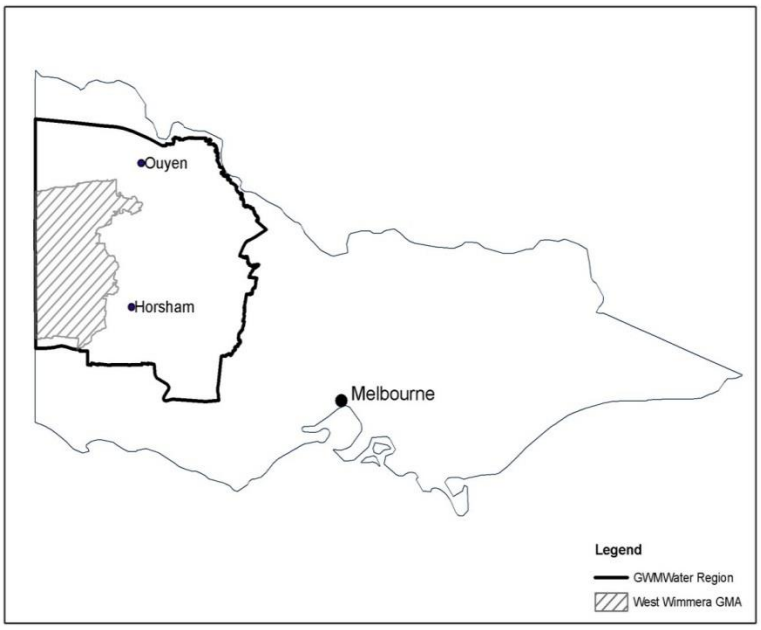
1. Introduction

The West Wimmera Groundwater Management Area (GMA) is 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 region.

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 West Wimmera Groundwater Management Strategy (the Strategy) contains further information regarding description of the groundwater resources. The Strategy can be found at http://www.gwmwater.org.au/services/groundwater/west-wimmera-gma.

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. Through the development of the groundwater management strategy for the area, management zones have been established to represent areas that have common management requirements that were determined by

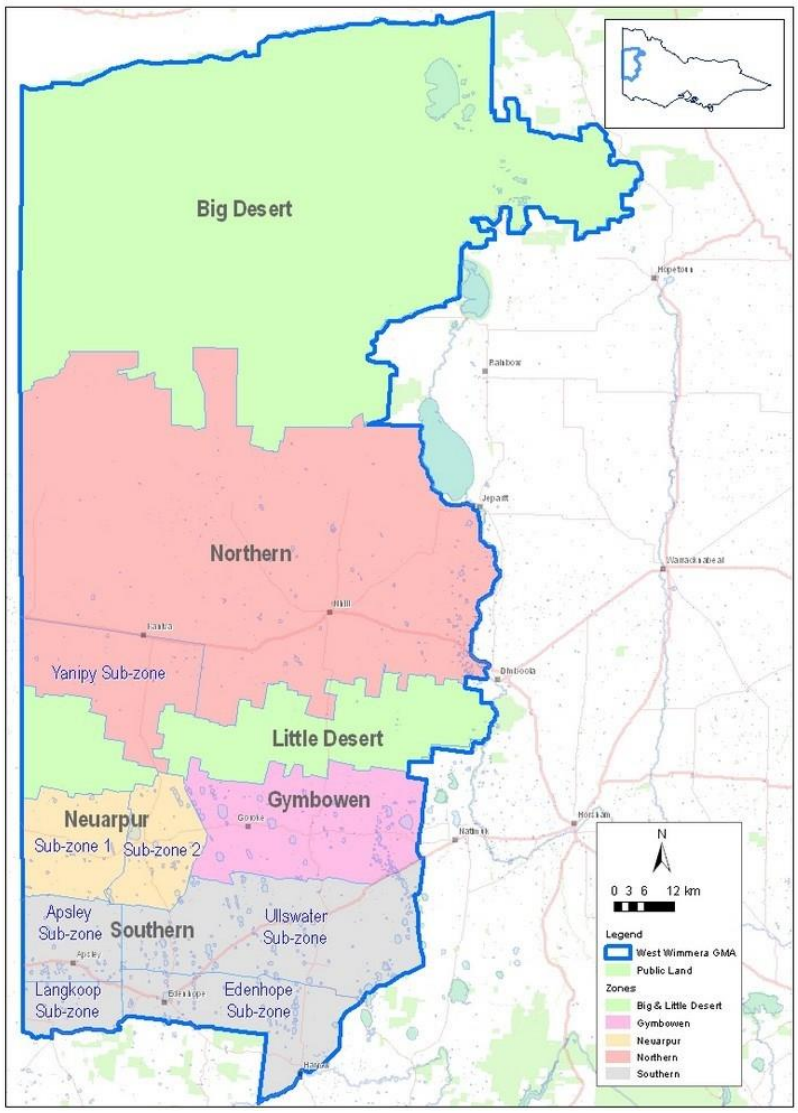
hydrogeology, the management objective (stable groundwater trends) or other distinguishing characteristic such as intensity of licences and use.

The objective of the Strategy 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 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: Zones of the West Wimmera GMA



The Strategy outlines the status of the TLA resource, expressed in terms of the general groundwater levels in the zone and objectives for each zone (or sub-zone). This is summarised in the following table.

Table 1: Zone groundwater status and management objectives (Extracted from West Wimmera Groundwater Management Strategy, 2011)

Zone/sub-zone	Groundwater Status (in 2011)	Management Objective and Related Actions
Big Desert	Stable	Limit groundwater diversions to maintain current stable groundwater levels.
Northern	Generally stable	Maintain stable trends across the zone, allowing: • Trade out of, but not into the Yanipy sub-zone where there is existing high intensity of use. • New entitlements within the area subject to an acceptable level of intensity of entitlements.
Little Desert	Stable	Limit groundwater diversions to maintain current stable groundwater levels
Neuarpur sub-zone 1	Consistently declining	Achieve stabilised groundwater levels over a period of about 20 year.
Neuarpur sub-zone 2	Stable	Maintain stable levels. No additional entitlement allowed. Limited trade from Neuarpur sub-zone 1 to Neuarpur sub-zone 2. No trade from Neuarpur sub-zone 2 to Neuarpur sub-zone 1.
Gymbowen	Stable	Maintain stable trends. Allow new developments subject to a maximum allowable intensity of use. Release parcels of water progressively to ensure that stable levels are maintained with each parcel release.
Southern – Apsley and Langkoop,	Declining trends, but with some potential for recharge thought to occur.	Stabilise groundwater levels. Review water levels in five years. No additional entitlements allowed. If declining trends continue, introduce seasonal restrictions. No trade will be permitted between sub-zones of the Southern Zone until a review of data in 5 years.
Southern - Edenhope	Limited information available, declining levels in southern fringe.	Stabilise levels, limited development permitted. Additional volume of 200 ML in parcels up to 20 ML.
Southern - Ullswater	Limited information, but near stable trends.	Maintain stable trends, limited development permitted. Additional volume of 500 ML in parcels up to 50 ML. To be reviewed in five years.

2. Water Levels

Groundwater levels are measured either monthly or quarterly in dedicated observation bores located throughout the West Wimmera GMA. There is a greater number of observation bores located in the vicinity of concentrated groundwater extraction. There is generally an observation bore within five kilometres of an active licence of greater than 200 ML. Figure 3 illustrates the location of observation bores monitored during the 2014/15 period in the GMA.

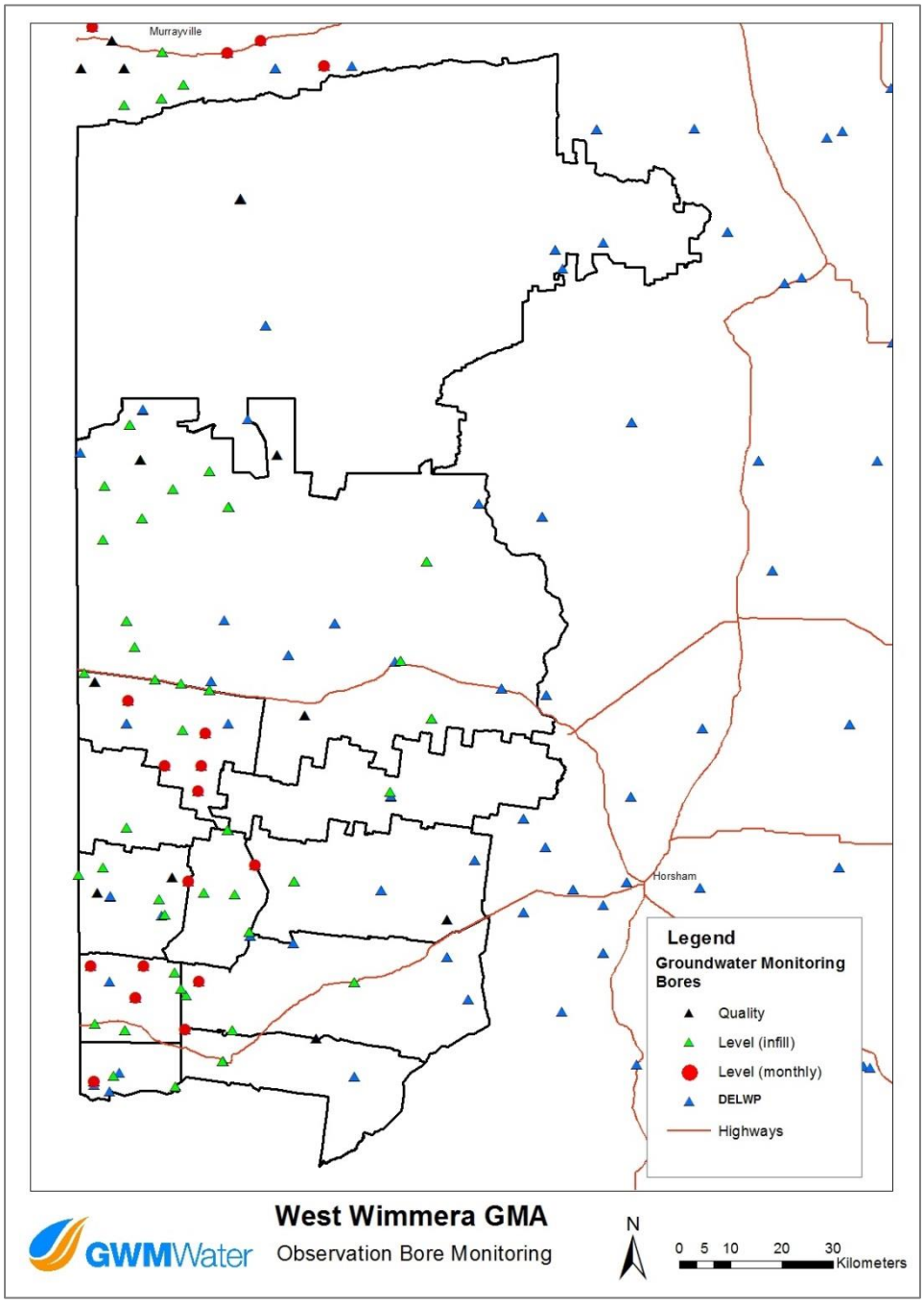


Figure 3: Observation bores monitored during 2015/16

Graphs illustrating groundwater levels over time in a number of selected observation bores are illustrated in Appendix 1. Table 2 provides the summarised observed groundwater status by zone (or sub-zone).

Table 2: Observed groundwater status over the 2014/15 period.

Zone/sub-zone	Groundwater Status 2016	Comment
Big Desert	Stable	Little to no groundwater extraction
Northern	Generally stable	Yanipy sub-zone - seasonal trend of drawdown and recovery evident close to higher volume extraction for irrigation, some localised residual drawdown. Overall stable trend for the zone.
Little Desert	Stable	Little to no groundwater extraction
Neuarpur sub-zone 1	Declining	Rate of decline reduced since 2010 (discussed further in section 2.1)
Neuarpur sub-zone 2	Stable	
Gymbowen	Stable	
Southern – Apsley and Langkoop,	Generally stable	Some bores are indicating a declining trend, however the rate of decline since 2010 has reduced.
Southern - Edenhope	Stable	
Southern - Ullswater	Stable	

2.1. Groundwater trend analysis Neuarpur Sub-zone 1

The Strategy recommended the introduction of restrictions on groundwater extraction to arrest the declining trends in groundwater levels in Neuarpur Sub-zone 1.

The magnitude of restriction required to achieve stabilisation of groundwater levels is not precisely known and so a progressive management approach was adopted to incrementally increase restrictions over a 5 year period. The initial restriction to 96% of licenced entitlement was declared for season 2011-12 and since that time restrictions on licences in Neuarpur Sub-zone 1 have been reviewed annually and increased by 4% each year. In 2015/16,restrictions reached their planned maximum of 80% of licence entitlement.

Figure 4 illustrates the average rate of change in groundwater level in Neuarpur Sub-zone 1. This graph has been created as a simple means of assessing the overall groundwater trend in Neuarpur Sub-zone 1. This methodology averages the resource as a whole and is not dependent on any one bore therefore avoiding debate on representativeness and minimises bias based on bore location. To develop this average graph, the hydrographs for Neuarpur sub-zone 1 were examined, and all considered to be predominantly declining. They were clustered into three groups based on their general magnitude of decline and more recent variations in trend. The rate of change in June each year has been determined and averaged for each group as illustrated.

The average rate of change graph shows the predominant trend, with the management target in Neuarpur Sub-zone 1 of stable water levels shown for comparison as a red line. Values above the red line indicate recovery in groundwater levels and values below the red line indicate levels are falling. The aim is to manage groundwater levels so that the annual rate of change is either positive (above the red line) or less than a -0.10 m decline.

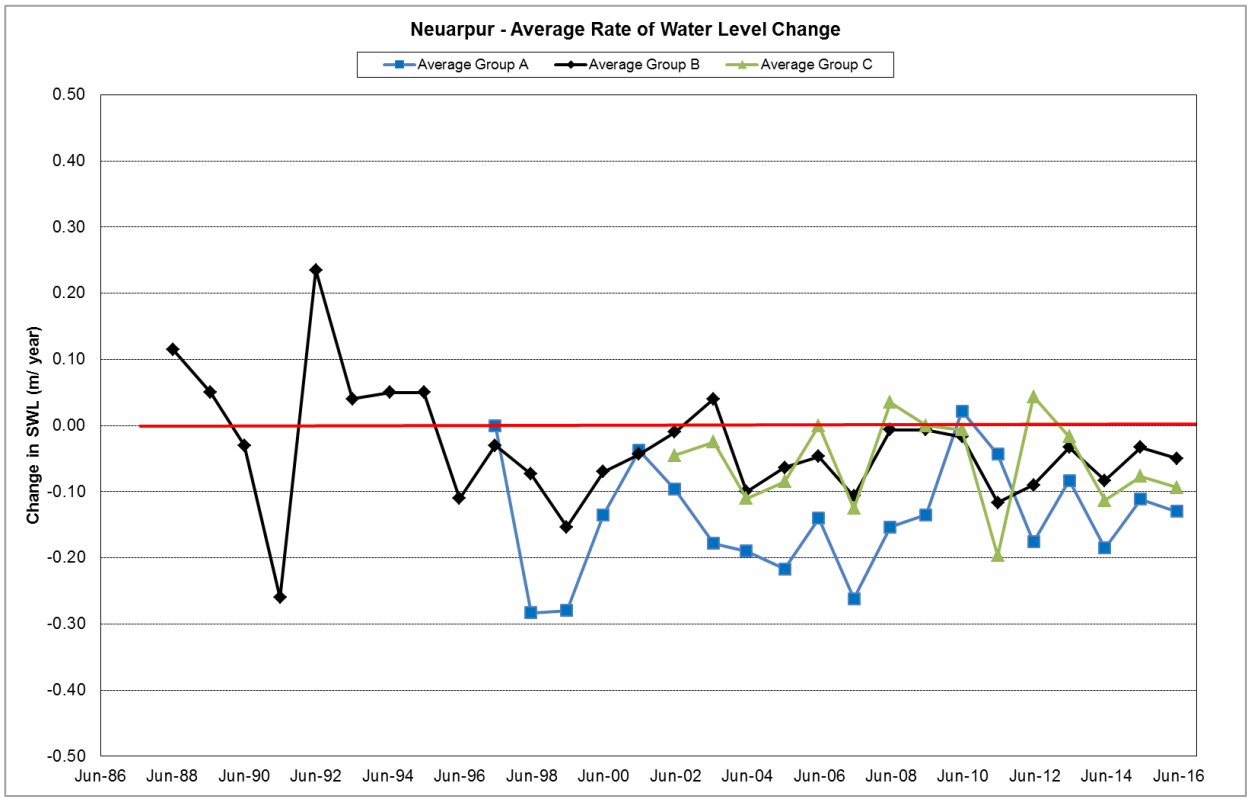


Figure 4: *Average rate of change in groundwater level in Neuarpur Sub-zone 1*

Figure 5 shows the cumulative rate of average change in groundwater level since 1988 (when irrigation commenced in Neuarpur Sub-zone 1). While groundwater levels are declining where use is most concentrated, the rate of decline has eased slightly in recent years.

In terms of informing the decision making process for seasonal restrictions in Neuarpur Sub-zone 1, the rate of decline was sufficient to conclude that continuing restrictions to 80% of licence entitlement is required for 2016/17 irrigation season. Irrigators were advised of this decision in March 2016.

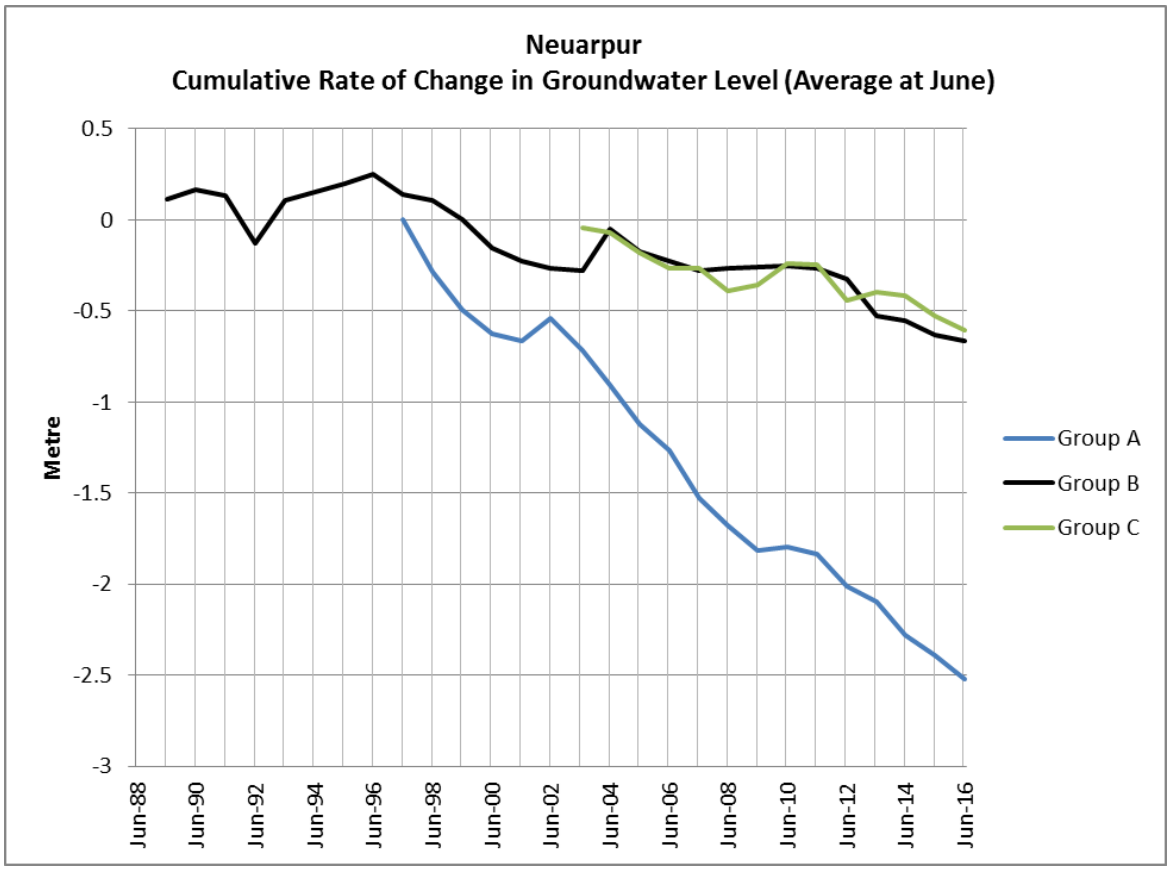


Figure 5: *Cumulative rate of average change*

3. Water Quality

The location of bores screened to the TLA and monitored for salinity are illustrated in Appendix 2. Graphs illustrating a selection of the bores where data is collected are also illustrated in Appendix 2.

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 and doesn't seem to be a resource management issue at this stage.

4. Water Availability and Use

There are currently 172 groundwater licences in the West Wimmera GMA for a total volume of 53,372 ML. This year (2015/16), 92 licences were active and extracted a total volume of 22,658 ML (see Table 3 for use by zone). Extraction for irrigation and commercial purposes accounted for 21,820 ML, while 838 ML was used for urban town supply. Use in the previous year (2015/16) was 20,420 ML (see Table 4). The dominant use was irrigation.

Within the GMA there are 197 meters used to measure the volume of groundwater being extracted through the licenced bores. Meters are read twice yearly, February (mid-irrigation season) and June (end of irrigation season). Domestic and stock use is not metered. One licensee used a volume in excess of the allowable volume for the licence (including carryover). GWMWater has since served the licensee with a Notice of Contravention under Section 151 of the *Water Act 1989*.

***Table 3**: Summary of groundwater use by management zone 2015/16.*

Zone	Licence Entitlement ML	No of licences	2015/16 Use ML
Neuarpur	24,691	50	15,676
Northern	22,345	78	4,611
Southern	5,584	35	2,102.5
Gymbowen	752	9	268.5
TOTAL	**53,372**	**172**	**22,658**

As discussed in Section 2.1, restrictions are being used to manage groundwater use in Neuarpur sub-zone 1 to address the declining groundwater levels observed in that area. The aim of restrictions to entitlements is to achieve stable groundwater levels in Neuarpur sub-zone 1 within 20 years (or 2031), with signs of stabilisation being evident within 10 years (or 2021).

While all licences in Neuarpur Sub-zone 1 were restricted to 80% of entitlement in 2015/16, all licensees 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 5 illustrates use as compared to the volume available for use over the past 15 years in the Neuarpur Zone. There has been a steady increase in use each year since 2010 in the Neuarpur Zone. The total use in 2015/16 was the largest recorded volume since 2009, and an increase of 1,430 ML used in the previous year. While there is

less water technically available due to the 80%restriction to entitlement, there is no corresponding reduction in the volume being extracted in Neuarpur sub-zone 1 as total extraction has not yet reached the restricted volume.

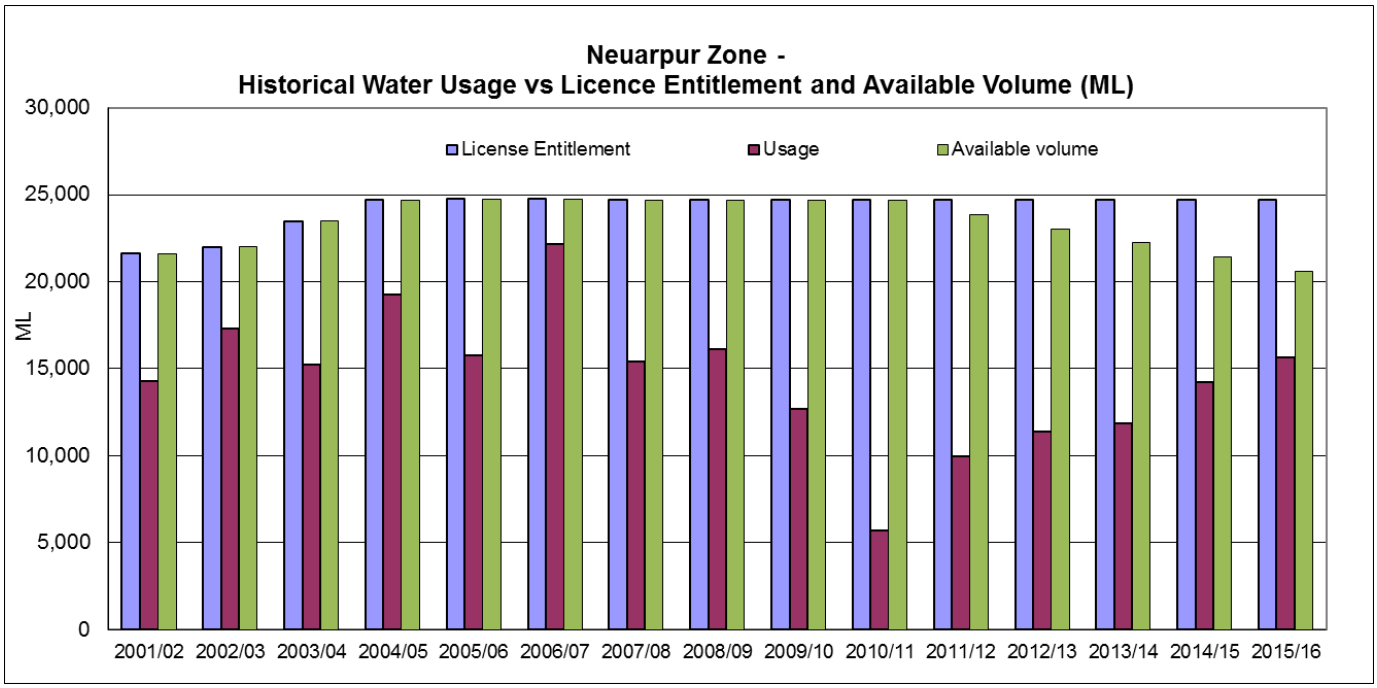


Figure 5: *Neuarpur Zone water use, licence entitlement volume and available volume over time.*

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

Zone	Licence Entitlement ML	Use (ML)				
		2011/12	2012/13	2013/14	2014/15	2015/16
Neuarpur	24,691	9,947	11,410	11,868	14,246	15,676
Northern	22,345	4,040	4,901	4,053	4,589	4,611
Southern	5,539	831	1,440	975	1,294	2,102.5
Gymbowen	752	29	164	69	291	268.5
TOTAL	**53,327**	**14,847**	**17,915**	**16,965**	**20,420**	**22,658**

4.1. Summary of groundwater trading 2015/16

Groundwater trading, either permanent or temporary, provides greater flexibility for new and existing users to manage production and establish new developments. Trading rules in the West Wimmera have been established to maximise opportunities for groundwater trading while preserving the management objective for each zone, protecting the integrity of the aquifer and minimising the potential for unacceptable impacts on existing groundwater users.

There were 18 temporary transfers of water entitlement, mostly in the Neuarpur Zone to manage use due to the influence of the seasonal restriction on the volume of water available to irrigators.

Five permanent trades of water entitlement occurred during 2015/16 totalling 1,306 ML.

4.2. Carryover

Carryover provides the ability for a licence holder's unused allocation to be used in the following water year. An upper limit of 30% of unused allocation 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 volume available, 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.

Carryover was utilised by five licensees in 2015/16.

4.3. Sale of unallocated groundwater

There is provision within the West Wimmera GMA permissible consumptive volume (PCV) for additional water in the Gymbowen and Southern zones.

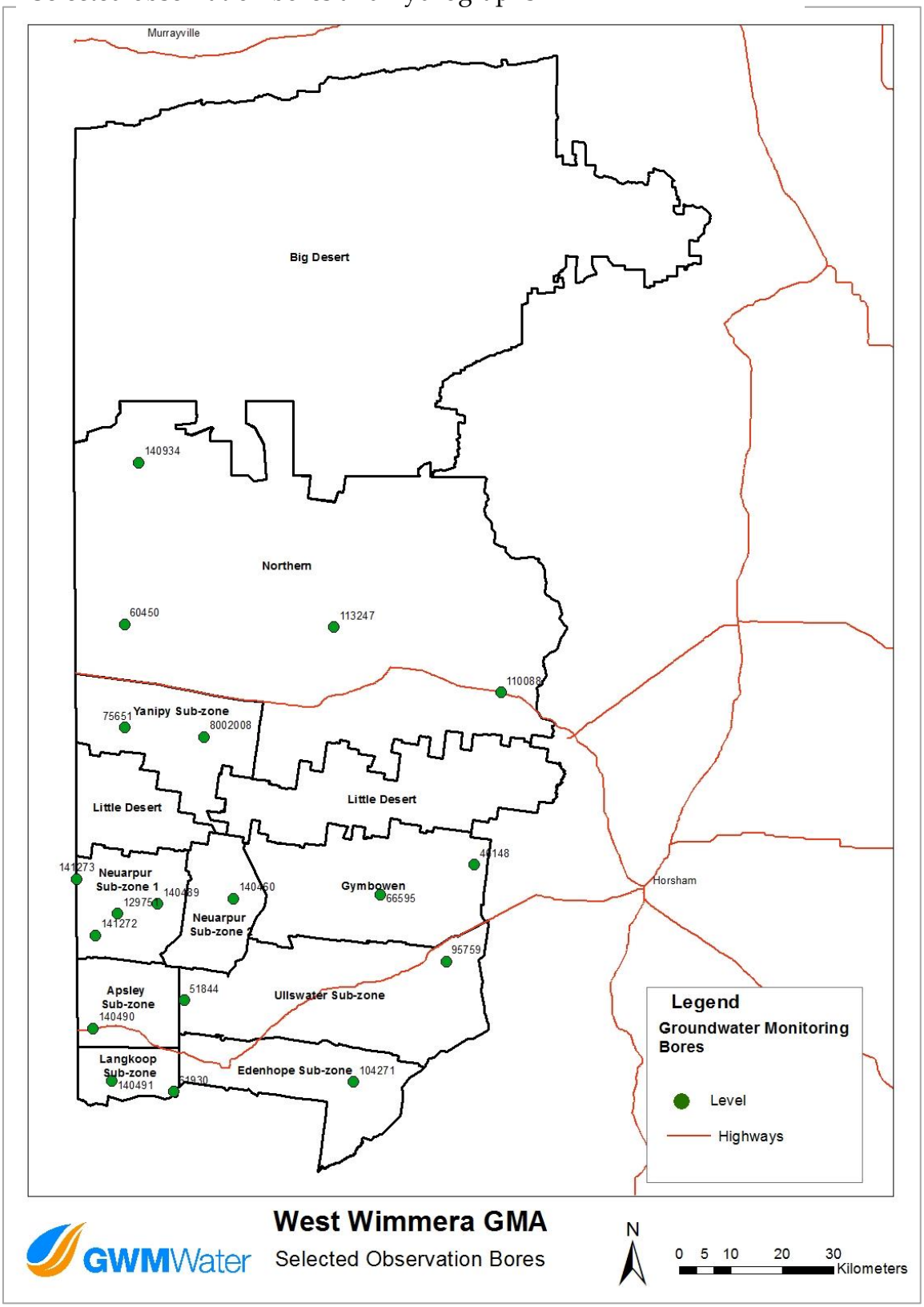
GWMWater established a sales process for the purchase of unallocated groundwater whereby expressions of interest were invited for the purchase of the following groundwater volumes:

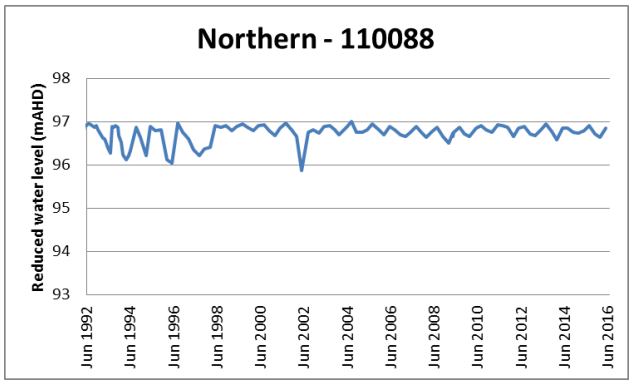
- Gymbowen Zone: 1,000 ML (parcels of up to 200 ML)
- Southern Zone – Ullswater Sub-zone: 450 ML (parcels of up to 50 ML)
- Southern Zone – Edenhope Sub-zone: 180 ML (parcels of up to 20 ML)

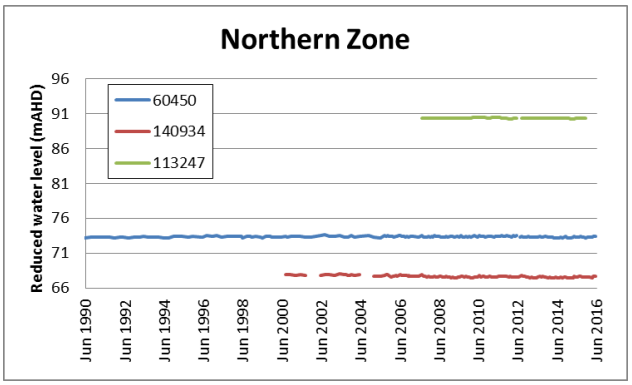
A reserve price per megalitre was determined (but not publically disclosed) as a means to value the water and accept expressions of interest. Payment of the purchase price, along with compliance with specific water resource technical conditions, is required prior to licences being issued.

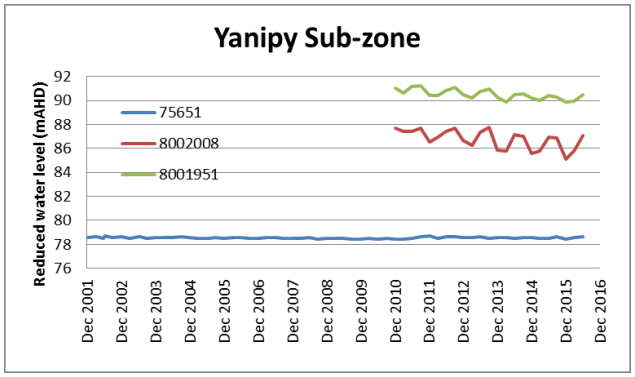
Expressions of interest closed in mid-February 2016. One new licence was issued in 2015/16, while a number of other applications are still being processed.

Appendix 1
Selected observation bores and hydrographs




Northern - 110088
Reduced water level (mAHD)
98
97
96
95
94
93
Jun 1992
Jun 1994
Jun 1996
Jun 1998
Jun 2000
Jun 2002
Jun 2004
Jun 2006
Jun 2008
Jun 2010
Jun 2012
Jun 2014
Jun 2016


Northern Zone
Reduced water level (mAHD)
96
91
86
81
76
71
66
60450
140934
113247
Jun 1990
Jun 1992
Jun 1994
Jun 1996
Jun 1998
Jun 2000
Jun 2002
Jun 2004
Jun 2006
Jun 2008
Jun 2010
Jun 2012
Jun 2014
Jun 2016


Yanipy Sub-zone
Reduced water level (mAHD)
92
90
88
86
84
82
80
78
76
75651
8002008
8001951
Dec 2001
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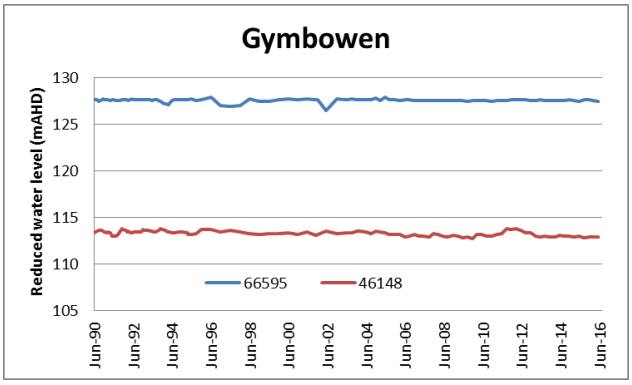
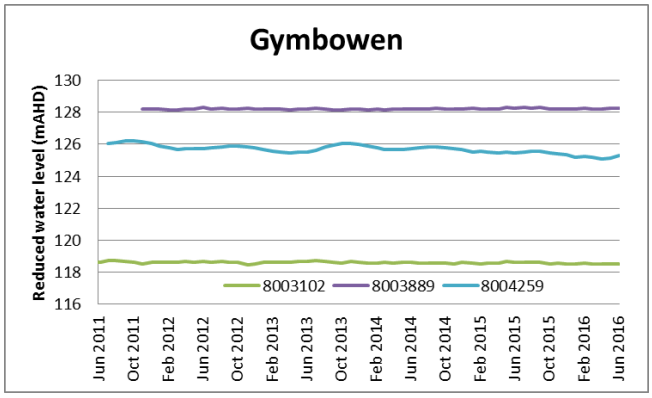
Dec 2014
Dec 2015
Dec 2016


Gymbowen
Reduced water level (mAHD)
130
125
120
115
110
105
66595
46148
Jun-90
Jun-92
Jun-94
Jun-96
Jun-98
Jun-00
Jun-02
Jun-04
Jun-06
Jun-08
Jun-10
Jun-12
Jun-14
Jun-16


Gymbowen
Reduced water level (mAHD)
130
128
126
124
122
120
118
116
8003102
8003889
8004259
Jun 2011
Oct 2011
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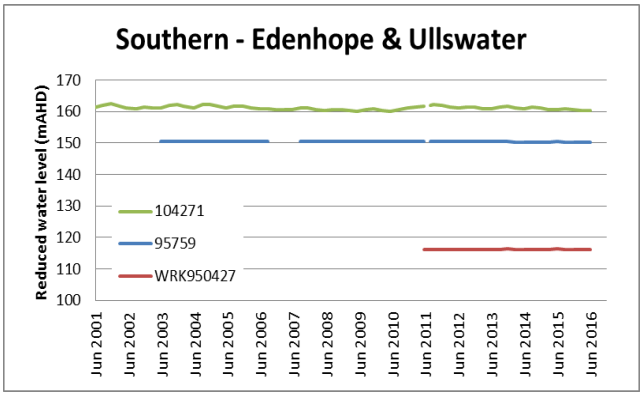
Jun 2015
Oct 2015
Feb 2016
Jun 2016


Southern - Edenhope & Ullswater
Reduced water level (mAHD)
170
160
150
140
130
120
110
100
104271
95759
WRK950427
Jun 2001
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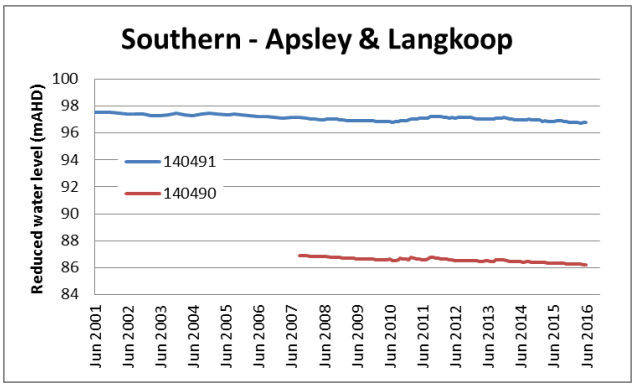
Jun 2014
Jun 2015
Jun 2016


Southern - Apsley & Langkoop
Reduced water level (mAHD)
100
98
96
94
92
90
88
86
84
140491
140490
Jun 2001
Jun 2002
Jun 2003
Jun 2004
Jun 2005
Jun 2006
Jun 2007
Jun 2008
Jun 2009
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Jun 2011
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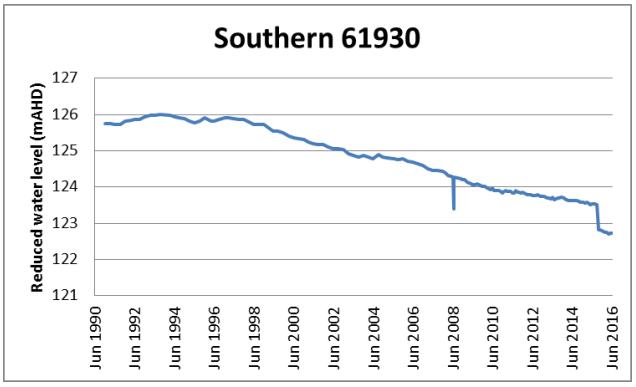
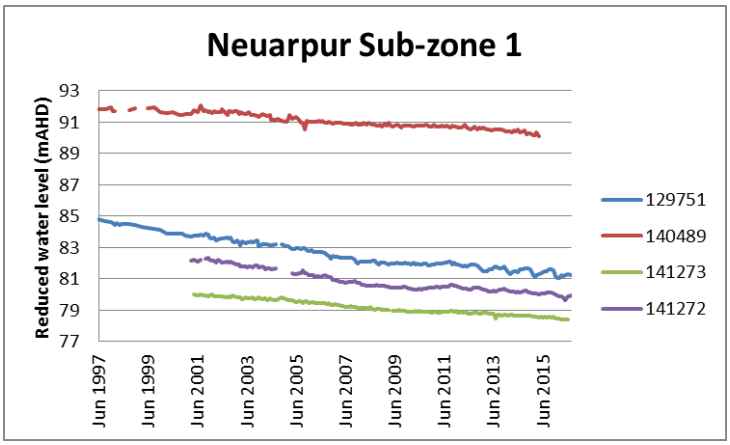
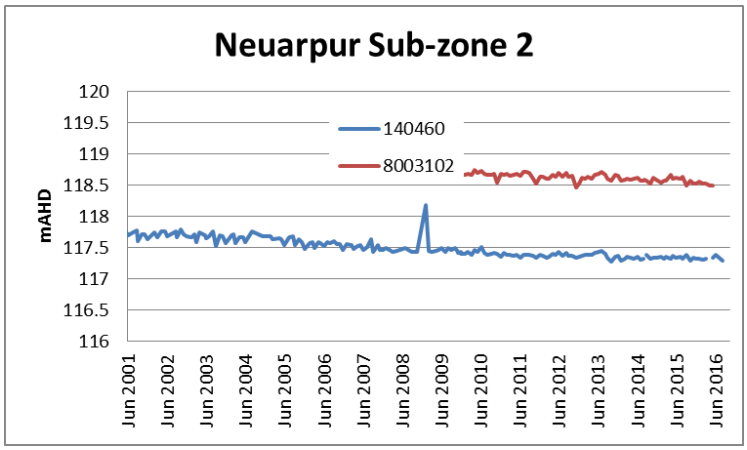
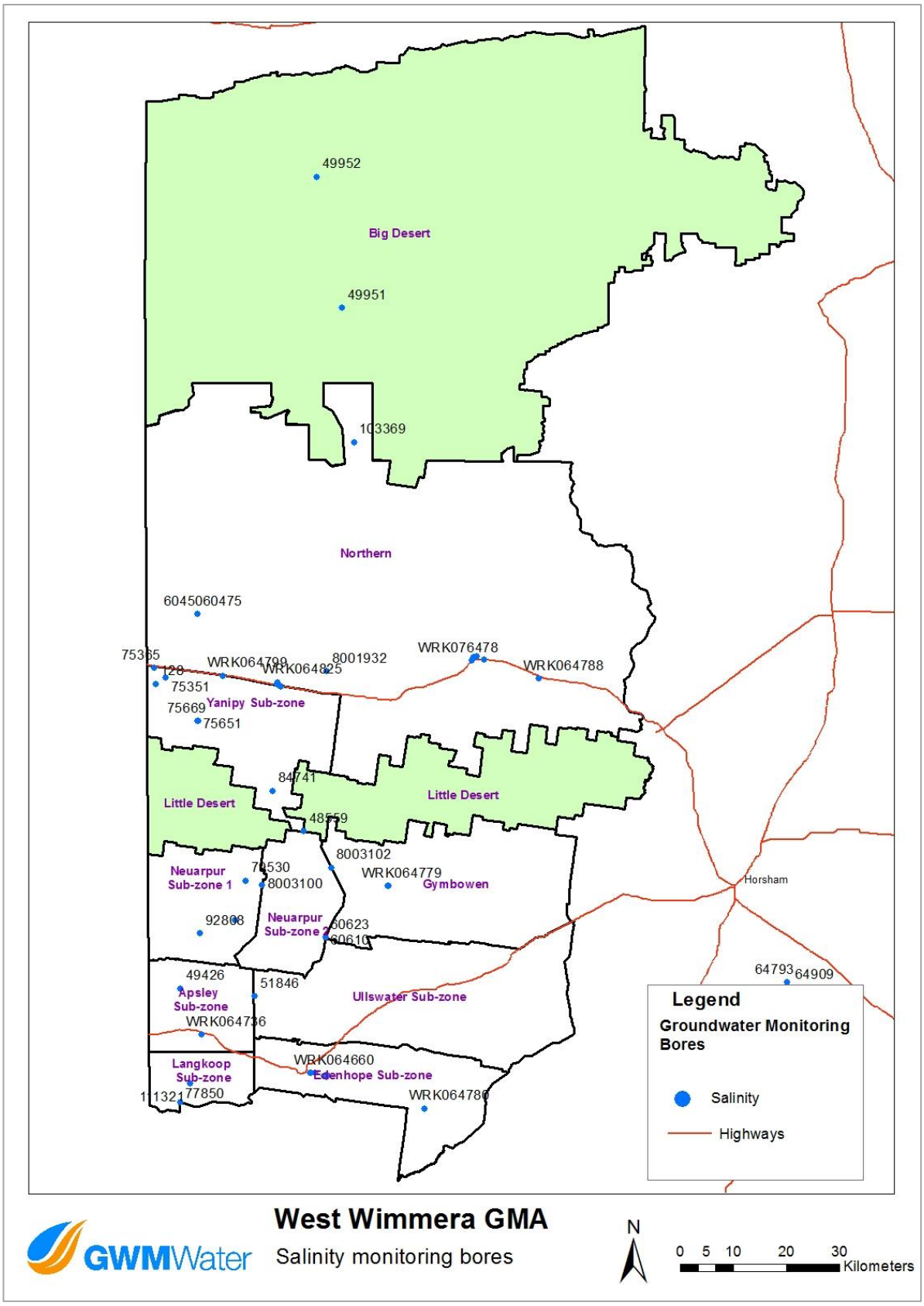
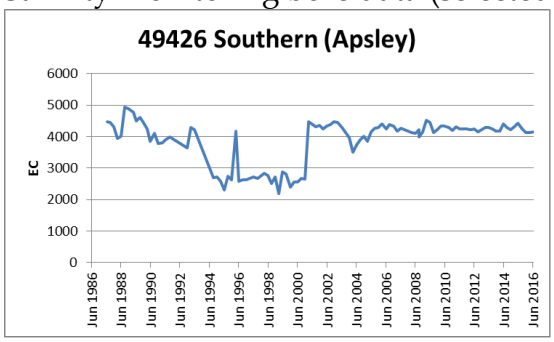
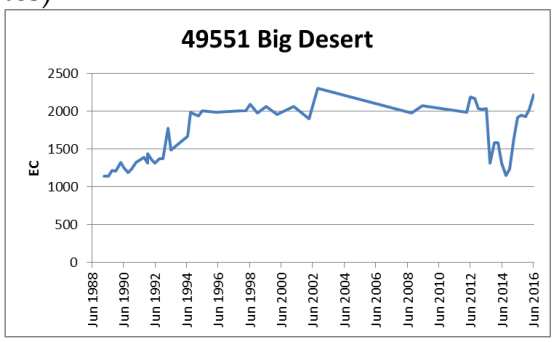
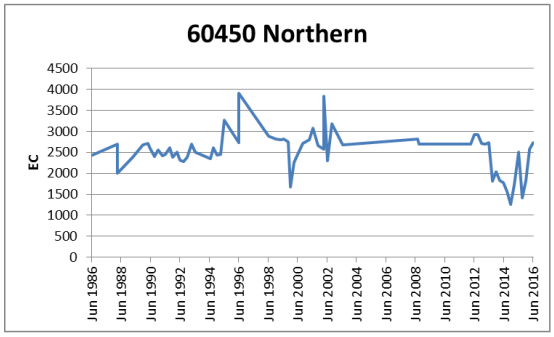
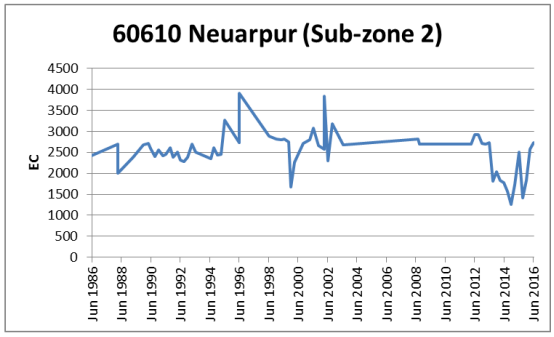
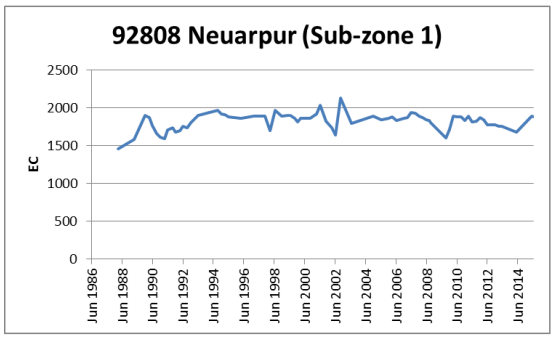
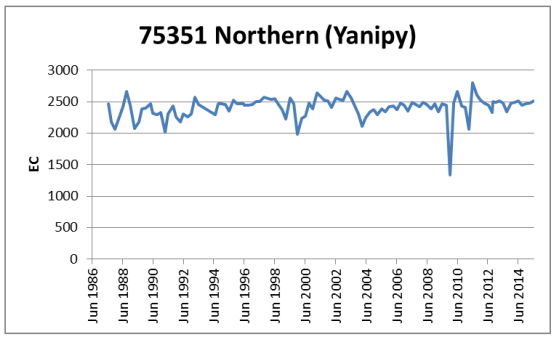
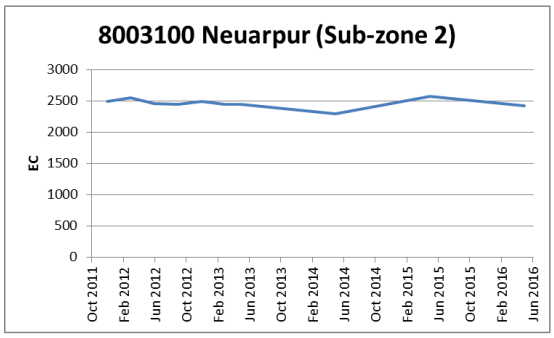
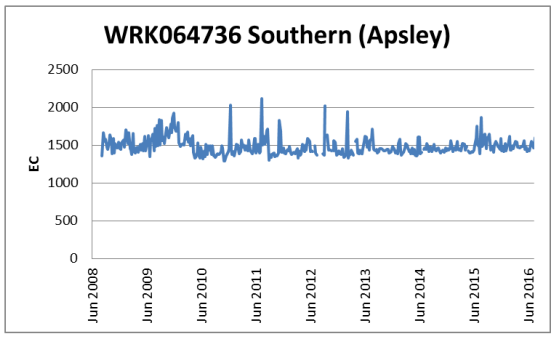
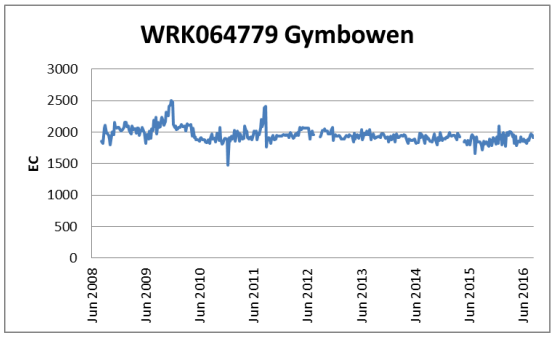
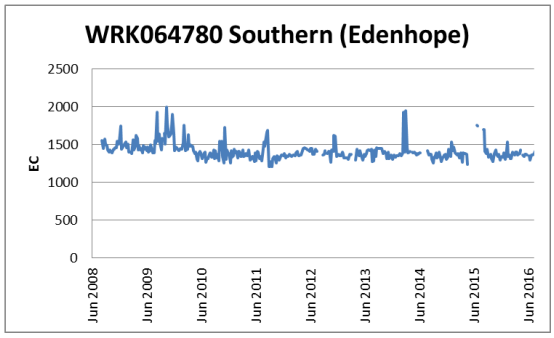
Jun 2014
Jun 2015
Jun 2016


Southern 61930
Reduced water level (mAHD)
127
126
125
124
123
122
121
Jun 1990
Jun 1992
Jun 1994
Jun 1996
Jun 1998
Jun 2000
Jun 2002
Jun 2004
Jun 2006
Jun 2008
Jun 2010
Jun 2012
Jun 2014
Jun 2016


Neuarpur Sub-zone 1
Reduced water level (mAHD)
93
91
89
87
85
83
81
79
77
Jun 1997
Jun 1999
Jun 2001
Jun 2003
Jun 2005
Jun 2007
Jun 2009
Jun 2011
Jun 2013
Jun 2015
129751
140489
141273
141272


Neuarpur Sub-zone 2
mAHD
120
119.5
119
118.5
118
117.5
117
116.5
116
Jun 2001
Jun 2002
Jun 2003
Jun 2004
Jun 2005
Jun 2006
Jun 2007
Jun 2008
Jun 2009
Jun 2010
Jun 2011
Jun 2012
Jun 2013
Jun 2014
Jun 2015
Jun 2016
140460
8003102

Appendix 2
Salinity monitoring



Salinity monitoring bore data (selected sites)