Annual Report 2016/17

West Wimmera Groundwater Management Strategy

July 2016 to June 2017

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 2016 to 30 June 2017. 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 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 2016/17 period, groundwater extraction from the Tertiary Limestone Aquifer was less than half of the total licenced entitlement with a total extraction of 22,998 megalitres. 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.

A technical review of the West Wimmera Groundwater Management Strategy is underway. The review is examining the monitoring data, monitoring program and effectiveness of restrictions and the current suit of management tools. The review outcomes will be available in early 2018.

In 2016/17, GWMWater secured funding for a remote meter reading project from the Department of Environment, Land, Water and Planning with the objective to record and electronically deliver daily groundwater usage information from meters in the Neuarpur and Apsley zones, to the Victorian Water Register.

GWMWater is also examining the age of the groundwater resource utilised for the urban supply to Edenhope.

GWMWater looks forward to its continuing relationship with the West Wimmera GMA Implementation Committee and engaging with the local community in reporting the outcomes of these projects and continuing the implementation of recommendations within the strategy.

Signed

Mark Williams
Managing Director

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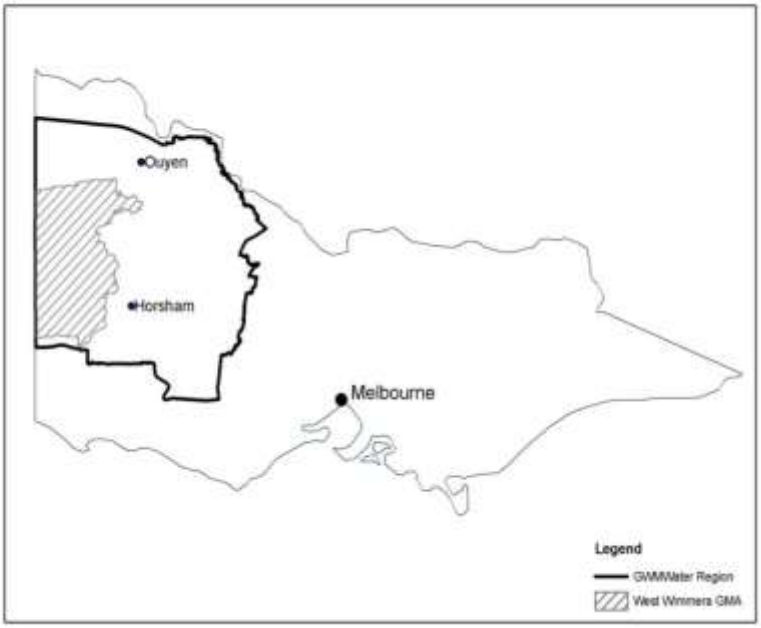
1. Introduction

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

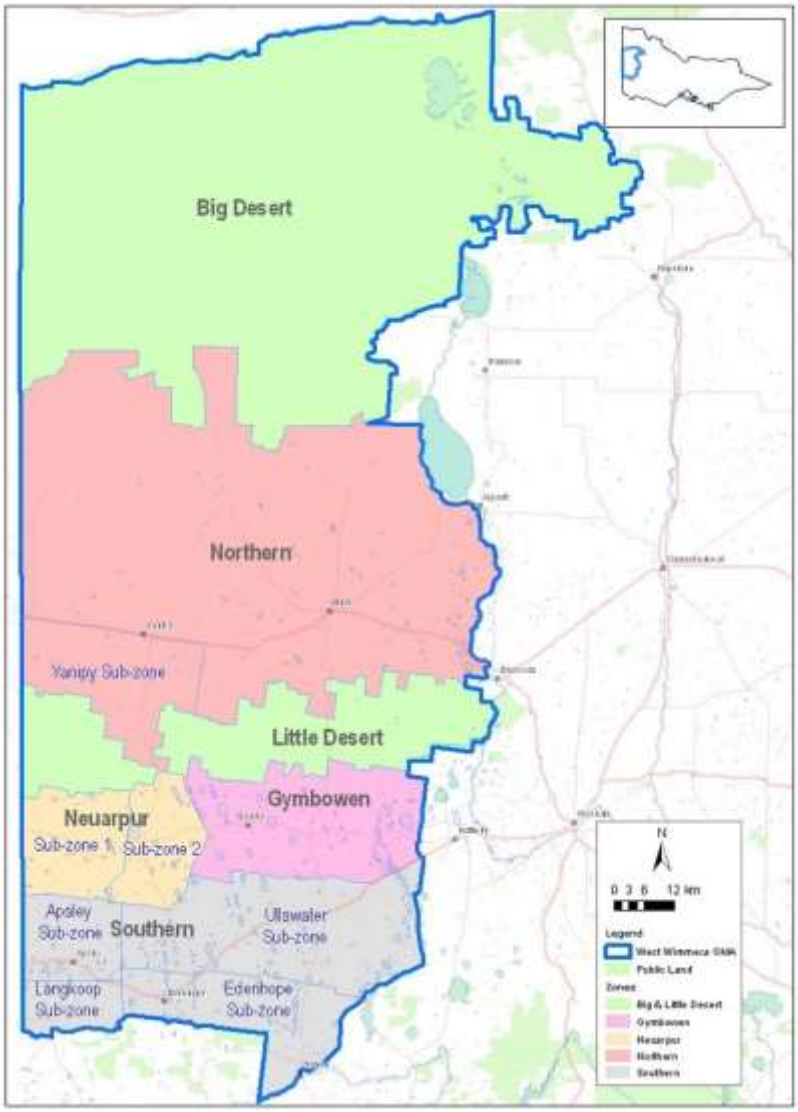


Figure 2: Zones of the West Wimmera GMA

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.

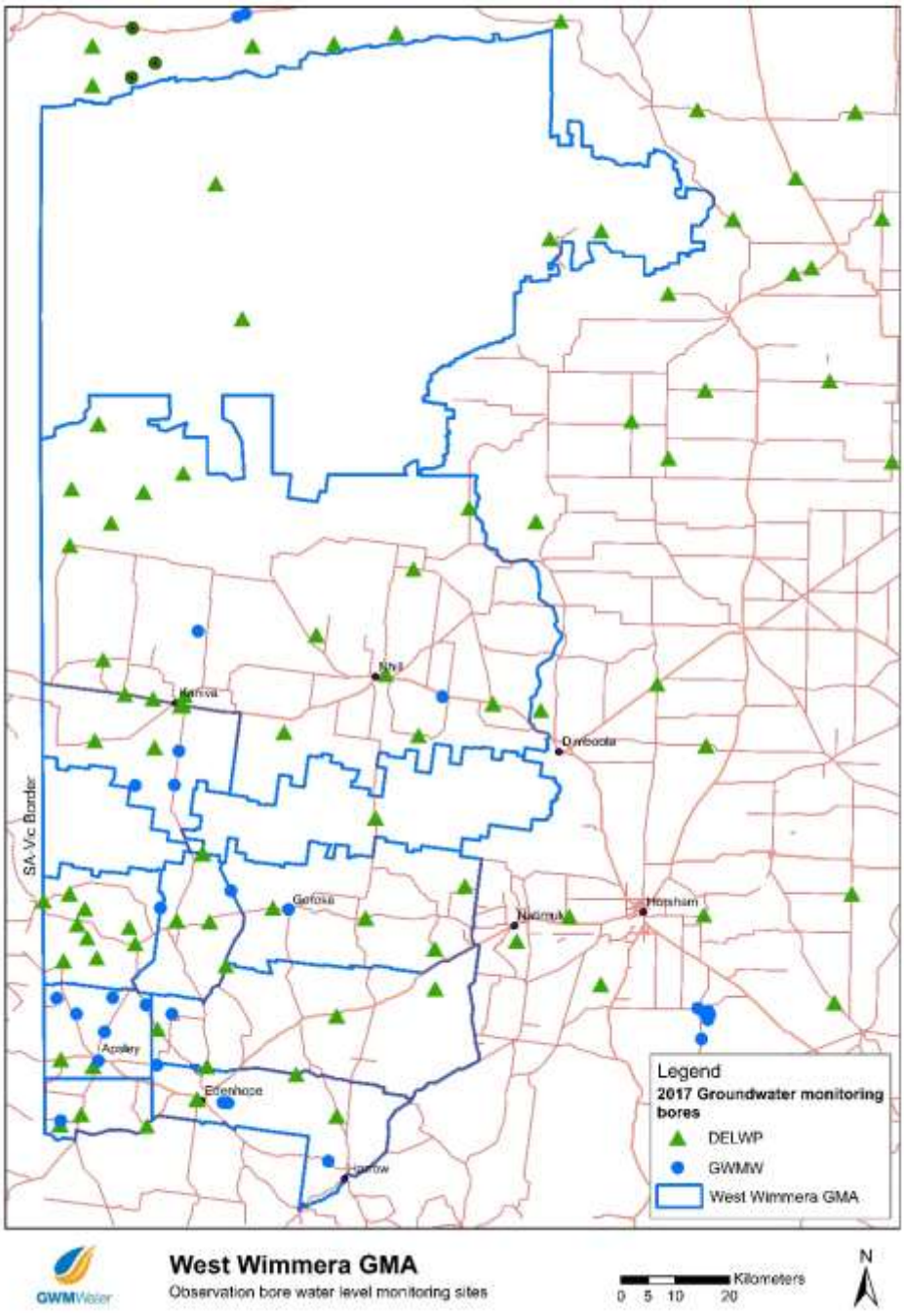
Table 1: Zone groundwater status and management objectives (Extracted from West Wimmera Groundwater Management Strategy, 2011)

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 2016/17 period in the GMA.

Figure 3: Observation bores monitored during 2016/17



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 2016/17 period.

Zone/sub-zone	Groundwater Status 2017	Comment
Big Desert	Stable	Little to no groundwater extraction
Northern	Generally stable	Yanipy sub-zone - seasonal trend of drawdown and recovery evident in bores located close to where there is a higher volume extraction for irrigation, and there is 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	Groundwater level in this zone are influenced by climatic conditions. Some bores, particularly in the Langkoop sub-zone, are indicating a declining trend, however the rate of decline since 2010 has reduced and a slight response in groundwater levels may be observed in some bores.
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.

Groundwater entitlement in Neuarpur Sub-zone 1 has been restricted since the 2011/12 water year. The initial restriction was to 96% of licenced entitlement and increased by 4% each year until 2015/16 when restrictions reached their planned maximum of 80% of licence entitlement. They have remained at this level of restriction in 2016/17.
The restriction declarations are made following the annual assessment of the observed behavior of groundwater levels measured via the network of observation bores in Neuarpur Sub-zone 1.

Figure 4 illustrates the average rate of change in groundwater level in Neuarpur Sub-zone 1. This graph has been created as a 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 avoids debate on representativeness and minimising 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 May each year has been determined and averaged for each observation bore 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 horizontal red line at 0m/year. Positive values (above the red line) indicate recovery in groundwater levels and negative values (below the red line) indicate a declining level compared to the previous year. The aim is to manage groundwater levels so that the average annual rate of change is 0 m/yr (on the red line) or better (above the red line) to allow for seasonal variance.

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

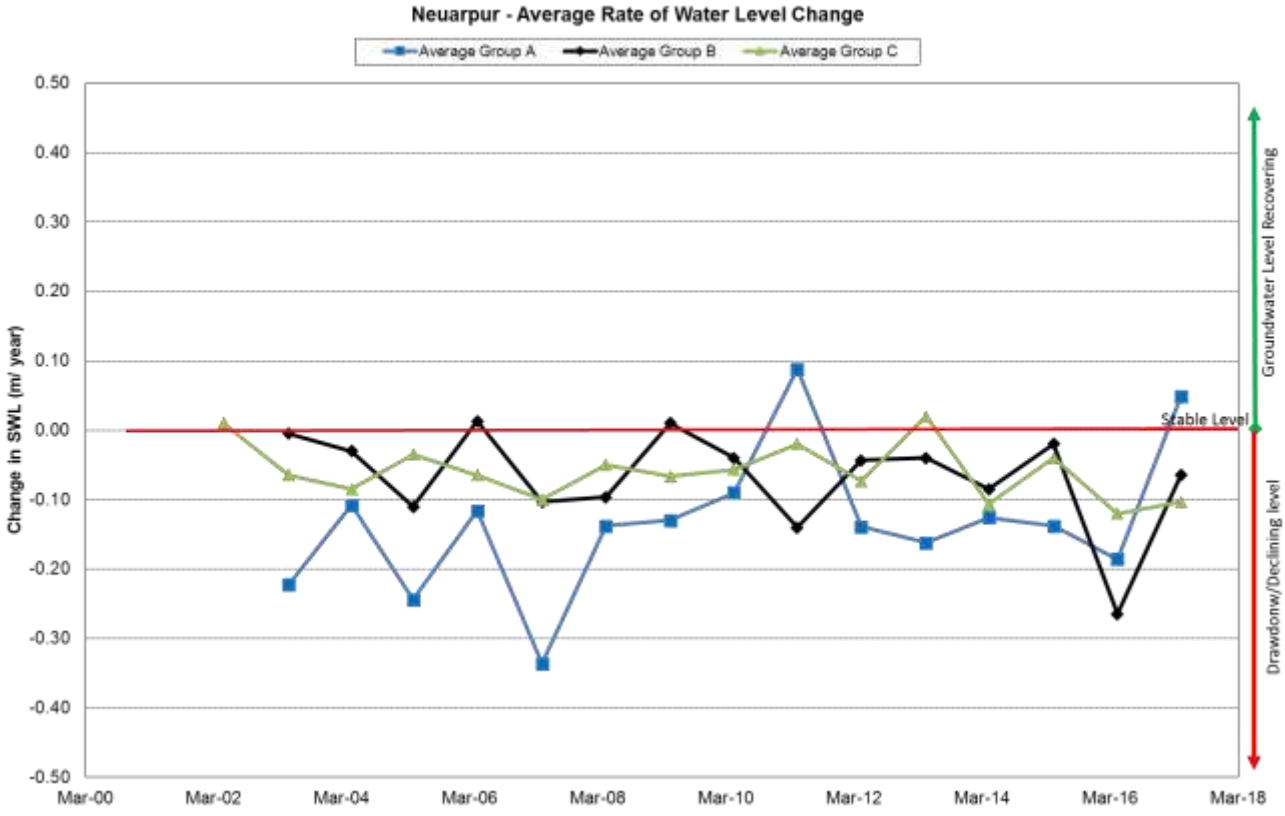
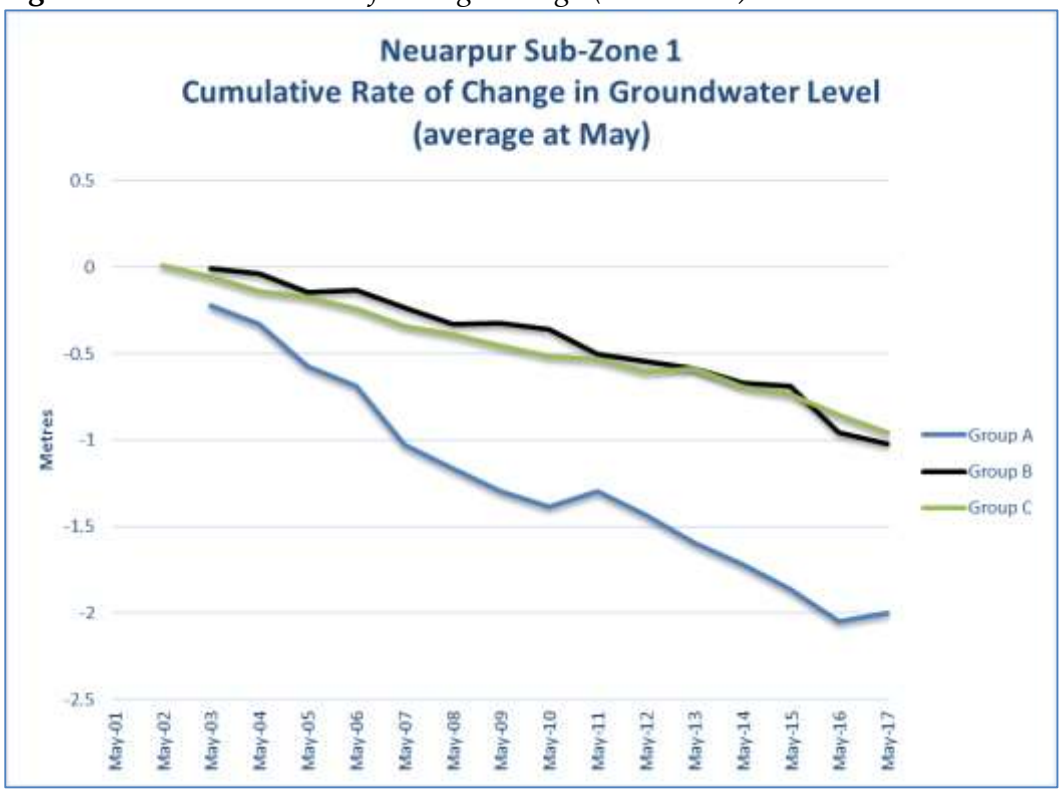


Figure 5 shows the cumulative rate of average change in groundwater level since 2002. While groundwater levels are declining where use is most concentrated, the rate of decline has eased slightly in recent years.

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 2017/18 irrigation season. Irrigators were advised of this decision in March 2017.

Figure 5: *Cumulative rate of average change (since 2002)*



3. Water Quality

The location of bores screened to the TLA which had been monitored regularly for salinity up until June 2016 as part of the SOBN contract are illustrated in Appendix 2. Annual sampling of those bores where field monitoring for salinity had ceased as part of the contract in 2016/17, will recommence where possible in 2017/18. 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 has not been identified as a resource management issue at this stage.

4. Water Availability and Use

There are currently 171 groundwater licences in the West Wimmera GMA for a total entitlement volume of 53,372 ML. This year (2016/17), 82 licences were active and extracted a total volume of 22,998 ML (see Table 3 for use by zone). Extraction for irrigation and commercial purposes accounted for 22,462 ML, while 536 ML was used for urban town supply. Use in the previous year (2015/16) was 22,658 ML (see Table 4 and Figure 7). 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.

***Table 3**: Summary of groundwater use by management zone 2016/17.*

Zone	No of licences	Permanent Entitlement Volume ML	Usage 2016/17 ML
Southern	35	5584	1,212
Gymbowen	9	752	209
Neuarpur	49	24,691	14,223
Northern	78	22,345	7,353
TOTAL	**171**	**53,372**	**22,998**

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 2016/17, 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 6 illustrates use as compared to the volume available for use over the past 15 years in the Neuarpur Zone. There had been a steady increase in use each year from 2010 to 2016 in the Neuarpur Zone, however with a similar area under irrigation in 2016/17 the recorded use was somewhat less (1,500 ML) due climatic factors (timing of rainfall and temperature).

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 6: *Neuarpur Zone water use, licence entitlement volume and allocation over time.*

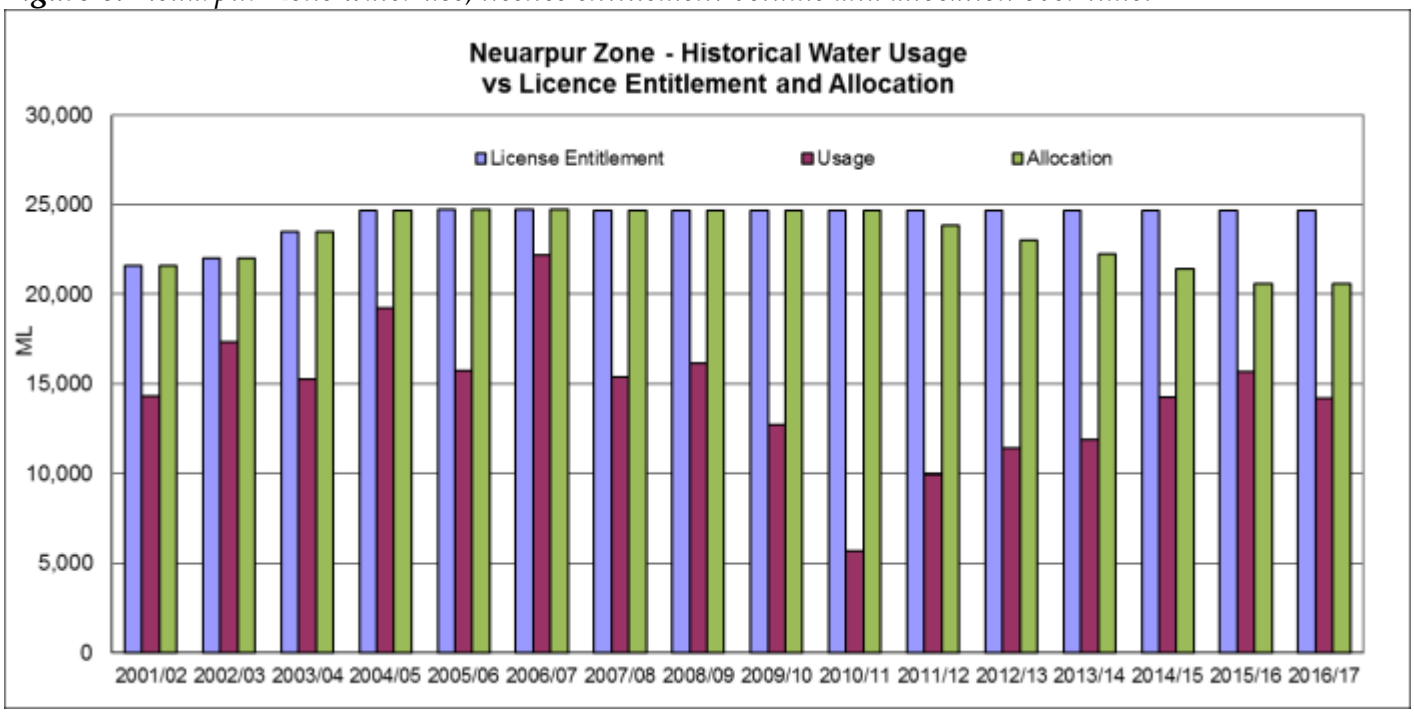
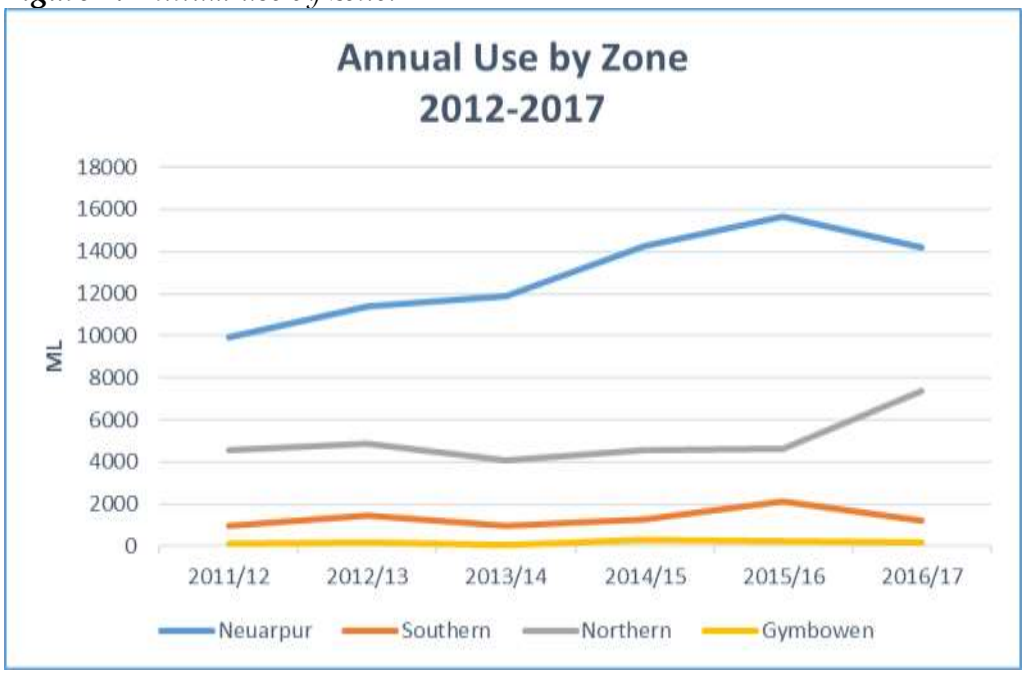


***Table 4**: Summary of groundwater use by management zone since 2011/12*

Zone	Licence Entitlement ML	Use (ML)					
		2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Neuarpur	24,691	9,947	11,410	11,868	14,246	15,676	14,223
Northern	22,345	4,040	4,901	4,053	4,589	4,611	7,353
Southern	5,539	831	1,440	975	1,294	2,102.5	1,212
Gymbowen	752	29	164	69	291	268.5	209
TOTAL	**53,327**	**14,847**	**17,915**	**16,965**	**20,420**	**22,658**	**22,998**

***Figure 7:** Annual use by zone.*



4.1. Summary of groundwater trading 2016/17

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 14 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.

Three permanent trades of water entitlement for a total volume of 746 ML occurred during 2016/17.

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 several licensees in 2016/17.

4.3. Technical review of West Wimmera Groundwater Management Strategy

In mid-December 2016, GWMWater contracted a consulting group to undertake the Technical Review of the West Wimmera Groundwater Strategy. The aim of the review being to examine the monitoring data (groundwater level, quality and use), the monitoring program (bore location and frequency of monitoring) and the effectiveness and ongoing need for restrictions, particularly in Neuarpur Sub-zone 1.

Due to unforeseen circumstances, the original consultant was unable to meet GWMWater's requirements for this project. The Technical Review project has since been awarded to another consulting group who have recently produced high quality work for GWMWater, and we are confident will achieve the successful completion of this project. The current consultant will deliver a draft report in December 2017.

4.4. Remote meter reading (telemetry) project

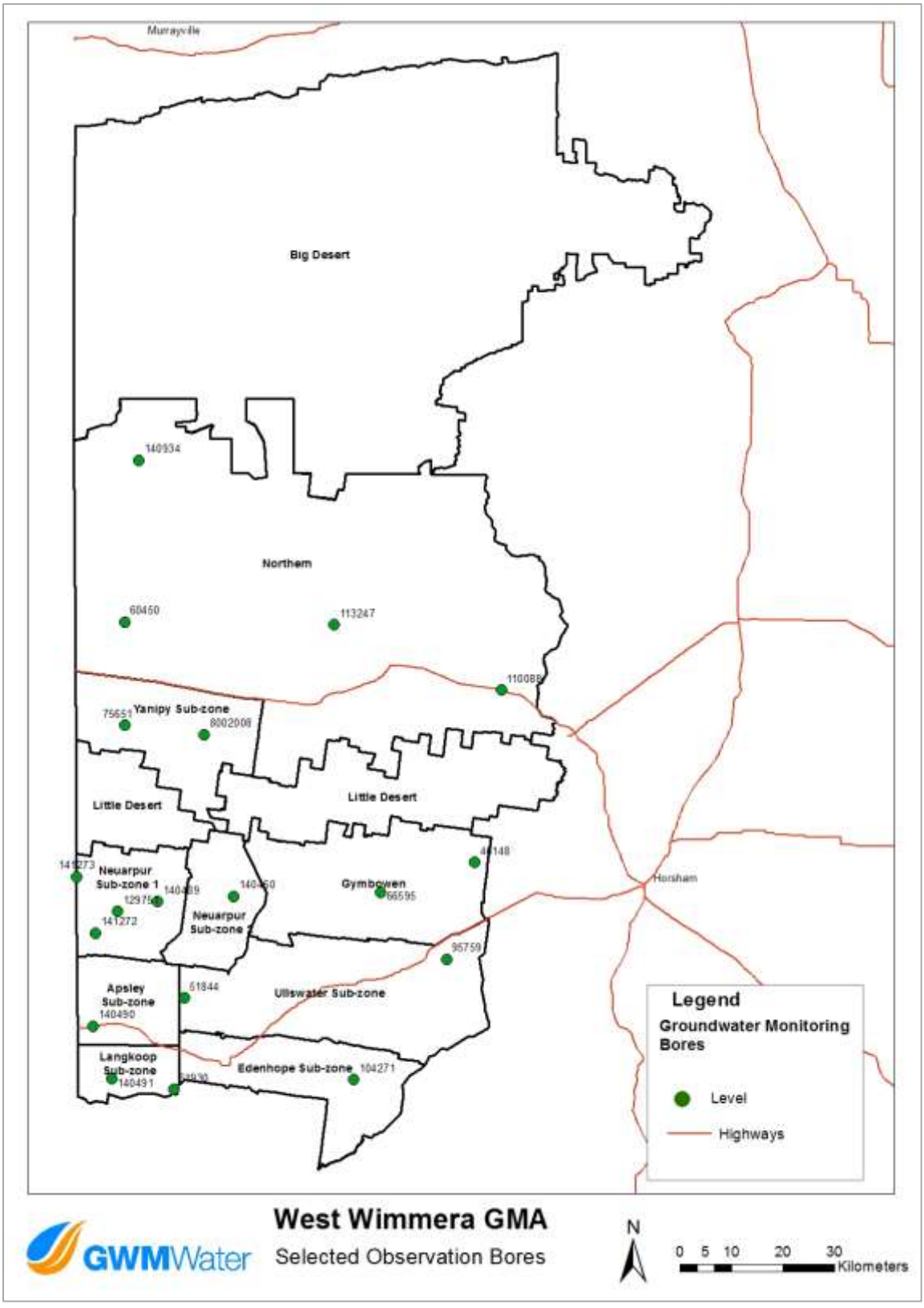
In 2016/17 GWMWater secured funding for the installation of remote telemetry devices on all groundwater meters within Neuarpur sub-zone 1 and 2, and the Apsley sub-zone. The Neuarpur/Apsley Remote Telemetry Project is a joint initiative of the Department of Environment, Land, Water and Planning and GWMWater, with the objective to record and electronically deliver daily groundwater usage information into the Victorian Water Register.

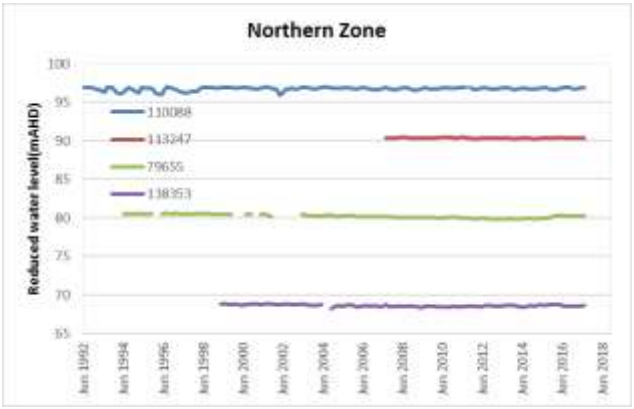
Groundwater usage captured through this project will be used in conjunction with regional groundwater level information to better inform the relationship between groundwater extraction and changes in groundwater level.

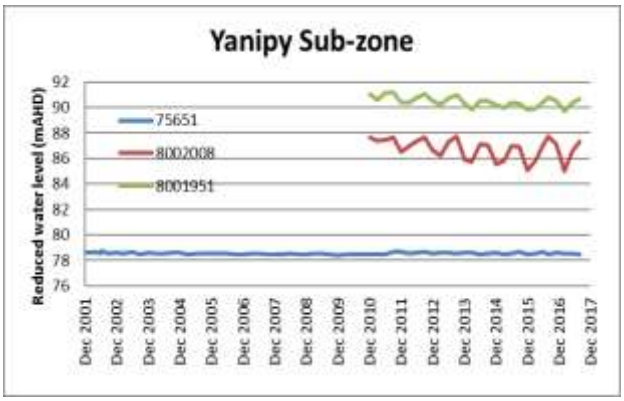
The ability for groundwater licence holders to access the usage information via the internet has not been included in the original scope of the project, but will be investigated by GWMWater.

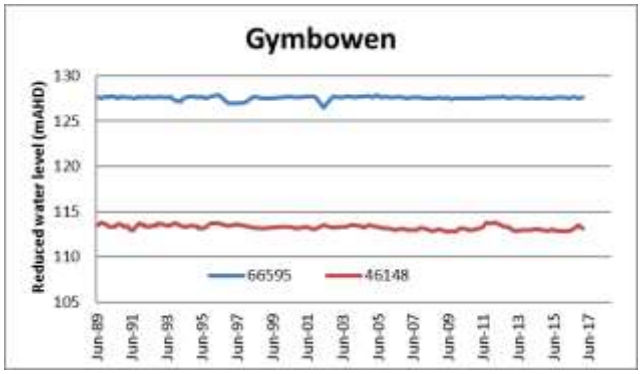
The remote telemetry devices are scheduled for installation in late 2017.

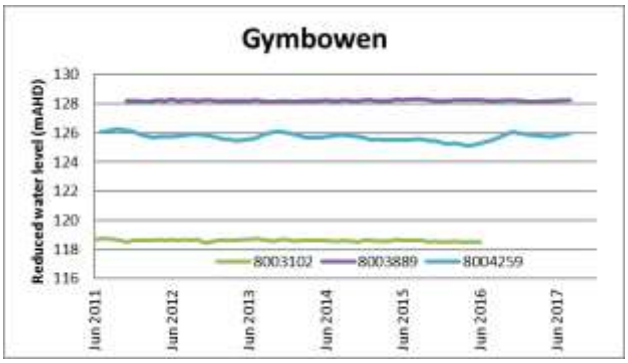
Appendix 1
Selected observation bores and hydrographs




Northern Zone
Reduced water level(mAHD)
110088
113247
79655
118353


Yanipy Sub-zone
Reduced water level (mAHD)
75651
8002008
8001951


Gymbowen
Reduced water level (mAHD)
66595
46148


Gymbowen
Reduced water level (mAHD)
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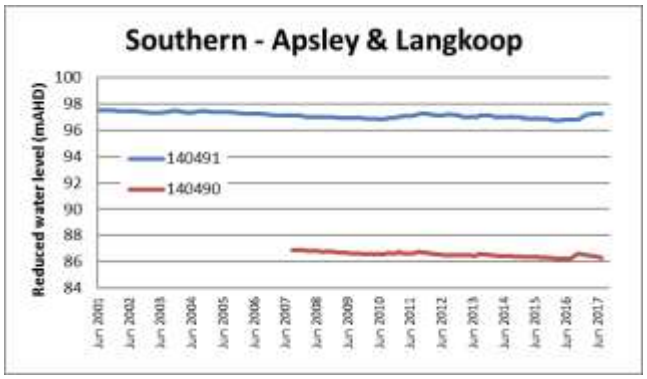
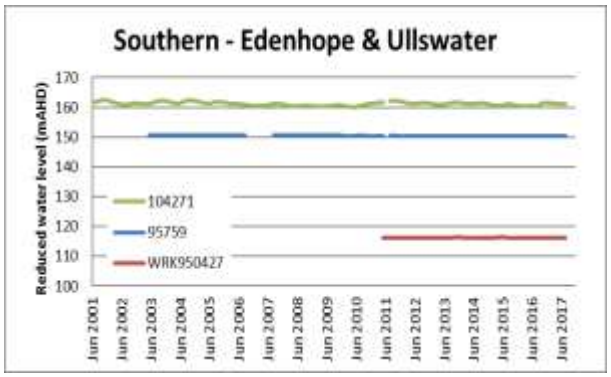
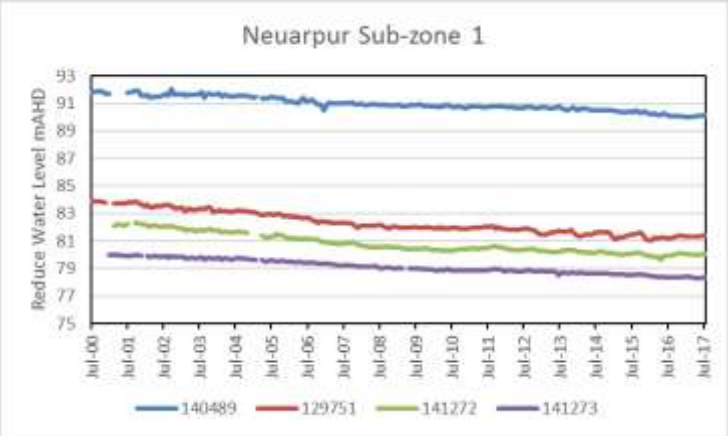
8003889
8004259


Southern - Apsley & Langkoop
Reduced water level (mAHD)
140491
140490


Southern - Edenhope & Ullswater
Reduced water level (mAHD)
104271
95759
WRK950427

Southern 61930
Reduced water level (mAHD)


Neuarpur Sub-zone 1
Reduce Water Level mAHD
93
91
89
87
85
83
81
79
77
75
Jul-00
Jul-01
Jul-02
Jul-03
Jul-04
Jul-05
Jul-06
Jul-07
Jul-08
Jul-09
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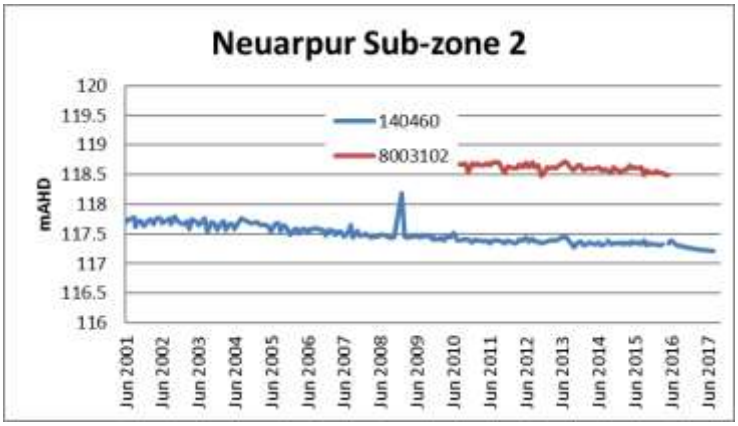
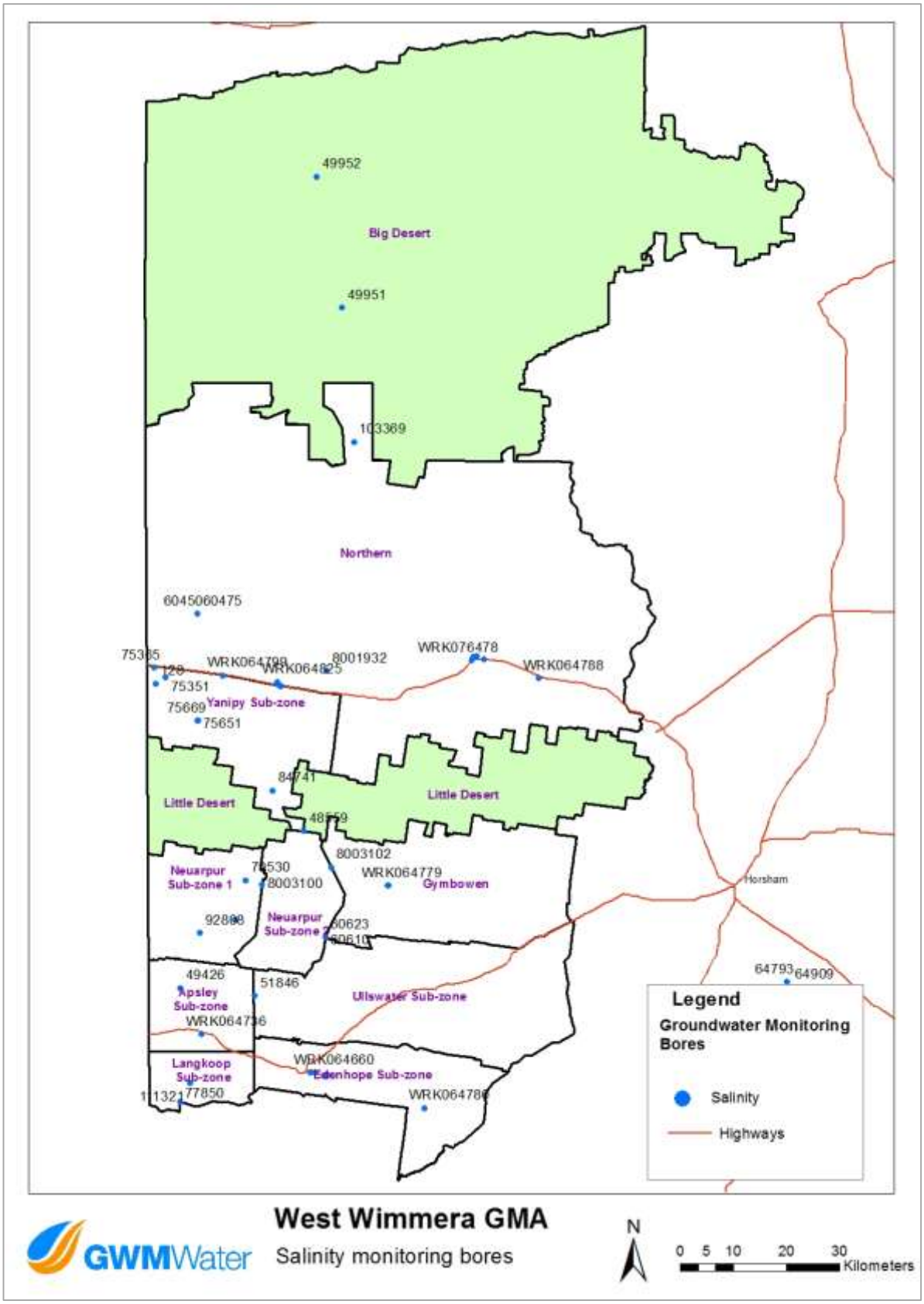
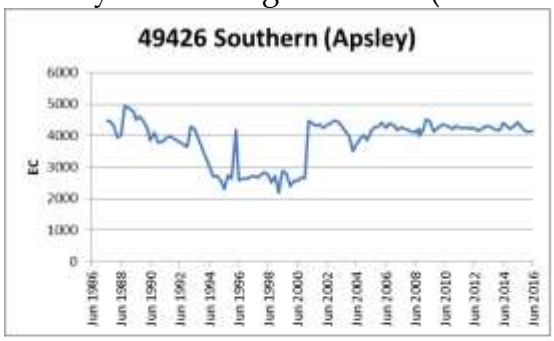
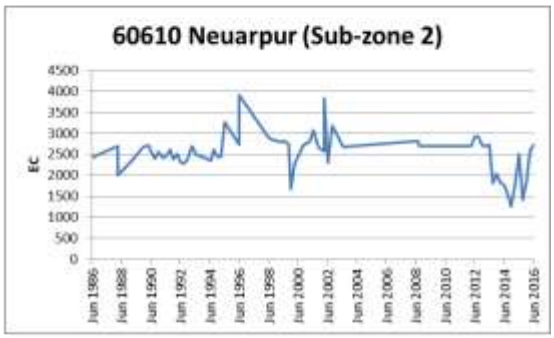
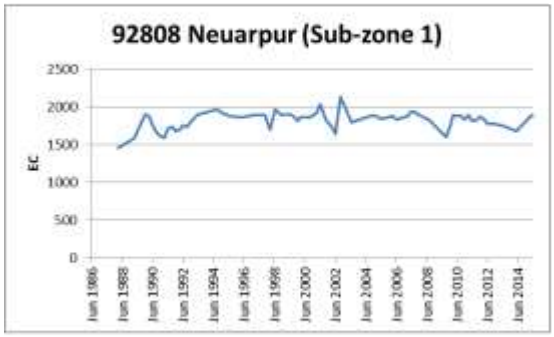
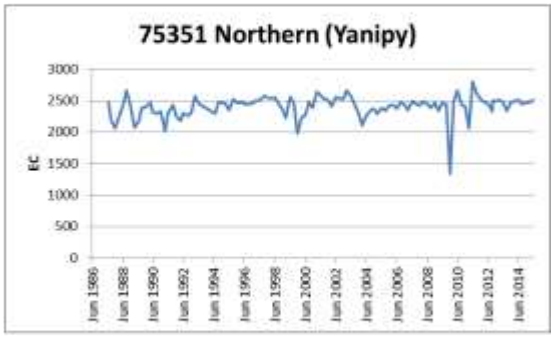
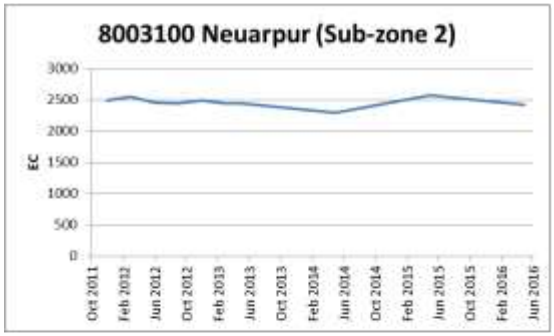
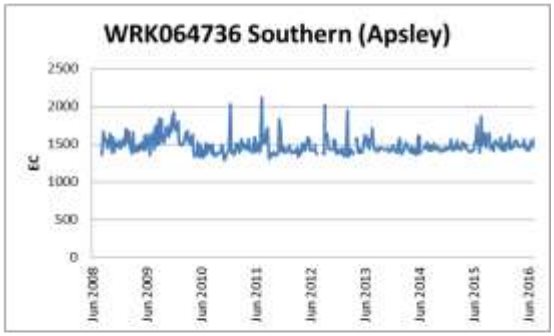
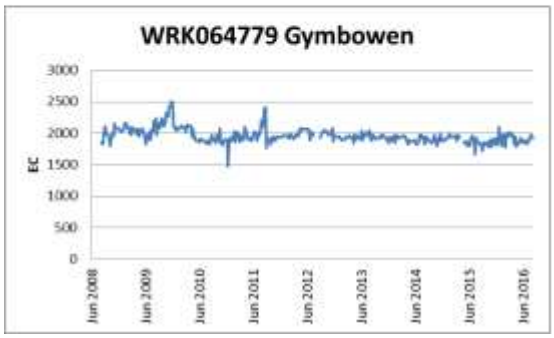
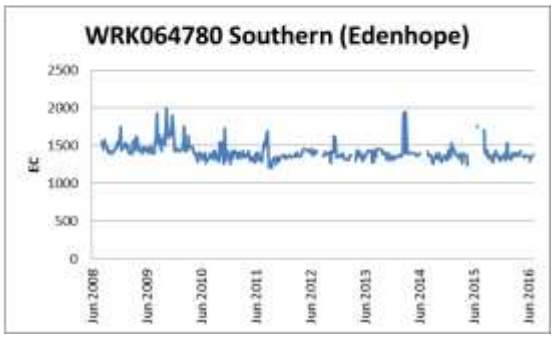
141272
141273


Neuarpur Sub-zone 2
mAHD
120
119.5
119
118.5
118
117.5
117
116.5
116
140460
8003102
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
Jun 2017

Appendix 2
Salinity monitoring



Salinity monitoring bore data (selected sites)