Mid-Loddon Groundwater Management Area

Local Management Rules

Annual Report

For year ending 30 June 2015

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Foreword

Goulburn–Murray Water (GMW) is pleased to present the annual report for the Mid-Loddon Groundwater Management Area Local Management Rules (the Rules) for the 2014/15 season.

This report provides an overview of the groundwater management activities in the Mid-Loddon Groundwater Management Area and documents the successful operation under the Rules in the 2014/15 season.

A copy of this report is available for inspection at GMW's Tatura office, or for download from the GMW website.

Scott Ridges

A/MANAGER GROUNDWATER AND STREAMS

Date 25/09/15

Executive summary

The Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) were endorsed by Goulburn-Murray Water in July 2009.

The 2014/15 season marks the fifth year of operation under the Rules.

Allocations were 100 % in all zones of the Mid-Loddon GMA in 2014/15.

Metered use in the Mid-Loddon GMA in 2014/15 was 17,164.7 ML, which is 51% of licence entitlement.

There were seven temporary transfers for a total of 1,318 ML and four permanent transfers for a total of 3,800 ML in 2014/15. The substantial volume of permanent trade was mostly due to a single licence holder selling a large volume of licence entitlement.

Licence holders in the Mid-Loddon GMA are entitled to carryover a maximum of 30% of their licence entitlement. A total of 9,834 ML has been carried over into 2015/16.

Groundwater recovery levels have fallen since the wet conditions experienced in 2010/11, but are within historical ranges.

Groundwater monitoring and metering programs continue to be successfully applied to support the objectives of the Rules.

Contents

1 Introduction

1.1 Purpose

This annual report has been prepared to meet requirements of the Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) (GMW, 2009).

This report provides an overview of groundwater management activities undertaken in accordance with the Rules from 1 July 2014 to 30 June 2015.

1.2 Water Supply Protection Area

The Mid-Loddon GMA extends from Tullaroop Reservoir in the south to Mitiamo in the north, and includes the townships of Carisbrook, Bridgewater and Serpentine.

The Mid-Loddon GMA incorporates groundwater resources to all depths.

There are three management zones in the Mid-Loddon GMA, which are the Moolort, Laanecoorie-Serpentine and Jarklin Zones (Figure 1).

1.3 Local Management Rules

The Local Management Rules were approved for implementation on 1 July 2009.

The Rules aim to ensure groundwater resources in the Mid-Loddon GMA are managed in an equitable and sustainable manner. More specifically, the Rules seek to:

1. provide all groundwater users with access to the resource, including domestic and stock users;
2. enable development of the groundwater resources to realise the potential for its use in the region;
3. provide environmental benefits through management of groundwater resources and maintain the integrity of the aquifer system;
4. manage groundwater interference and intensively pumped areas to protect existing authorised users and the environment from unacceptable drawdown levels;
5. establish transparent trigger levels and restrictions;
6. provide mechanisms such as transfer of licence entitlement and carryover to allow flexible and adaptive management in response to changing demands, such as climatic conditions; and
7. establish an effective monitoring program and provide periodic communications that will inform groundwater users of the status of the resource.

Goulburn-Murray Water (GMW) is responsible for the implementation of the rules. An assessment of GMW's activities against the Rules is presented in Appendix A.

A copy of the rules can be downloaded from the GMW website http://www.g-mwater.com.au/.

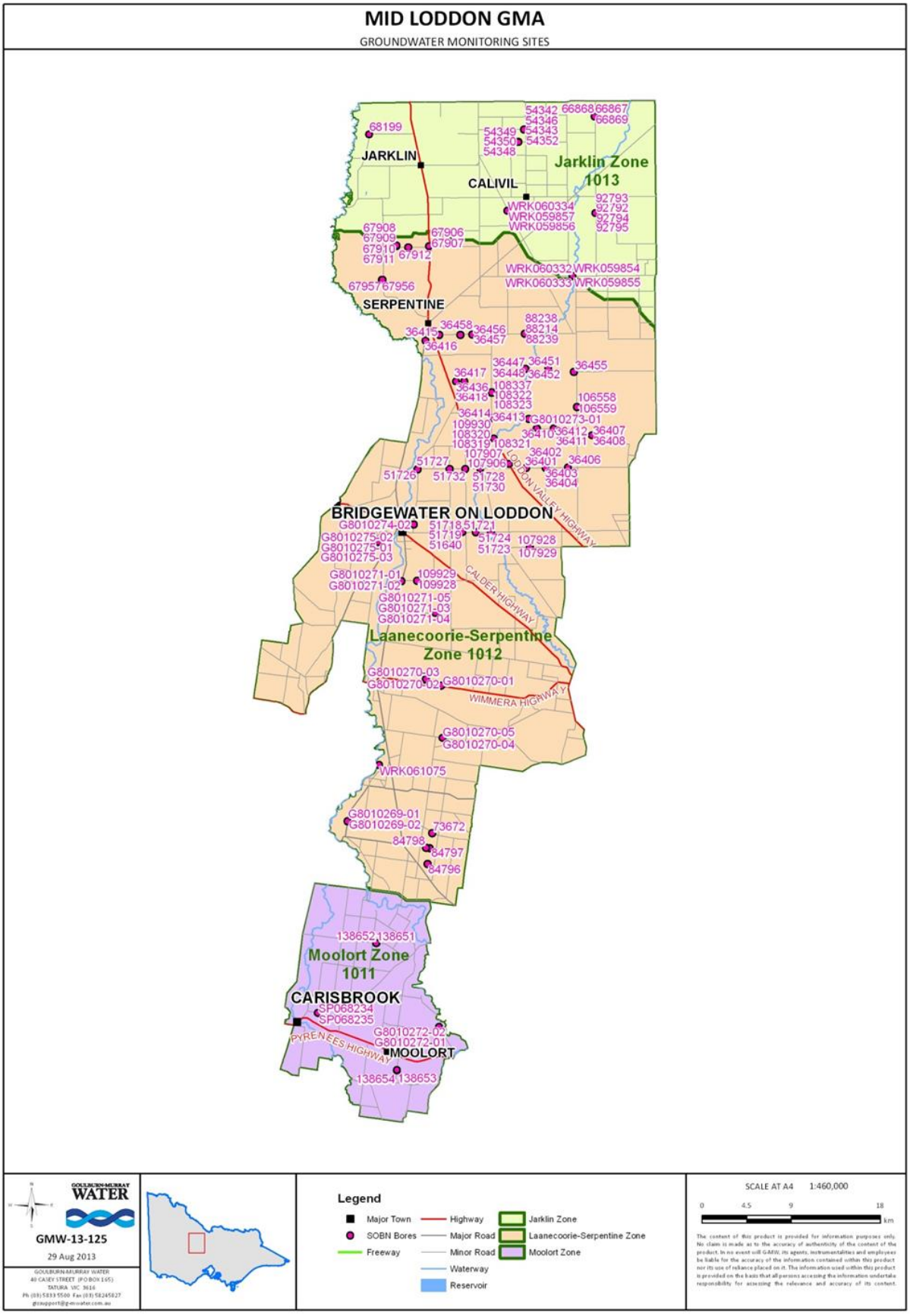


Figure 1 Mid-Loddon Groundwater Management Area

2 Groundwater management

2.1 Licence volume

The Minister for Water declared the Permissible Consumptive Volume in the Mid-Loddon GMA to be 34,037 ML/year in March 2013 (VGG, 2013).

At 30 June 2015 the licence volume in the Mid-Loddon GMA was 33,831.1 ML/year (Table 1).

Table 1 Licence entitlement in the Mid-Loddon GMA

Zone	Licences	Licensed bores	Licence volume (ML)
Moolort	23	28	3,549.4
Laanecoorie-Serpentine	67	84	27,434.7
Jarklin	15	18	2,847.0
Total	105	130	33,831.1

NOTE: Data extracted from the Victorian Water Register 30 June 2015

Licence entitlement as at 30 June 2014 was 34,037 ML/yr. The 205.9 ML/yr reduction in licence entitlement to 30 June 2015 is attributed to licence cancellations and surrenders.

2.2 Groundwater allocations

Allocations are a percentage of licence entitlement that may be extracted in a given season. They are determined by comparing the three year rolling average of the annual maximum groundwater recovery levels from State observation bore 88214 against the trigger level stated in the Rules (Figure 2).

In September 2014 an allocation of 100% was announced for all groundwater licence holders in the Mid-Loddon GMA for 2014/15.

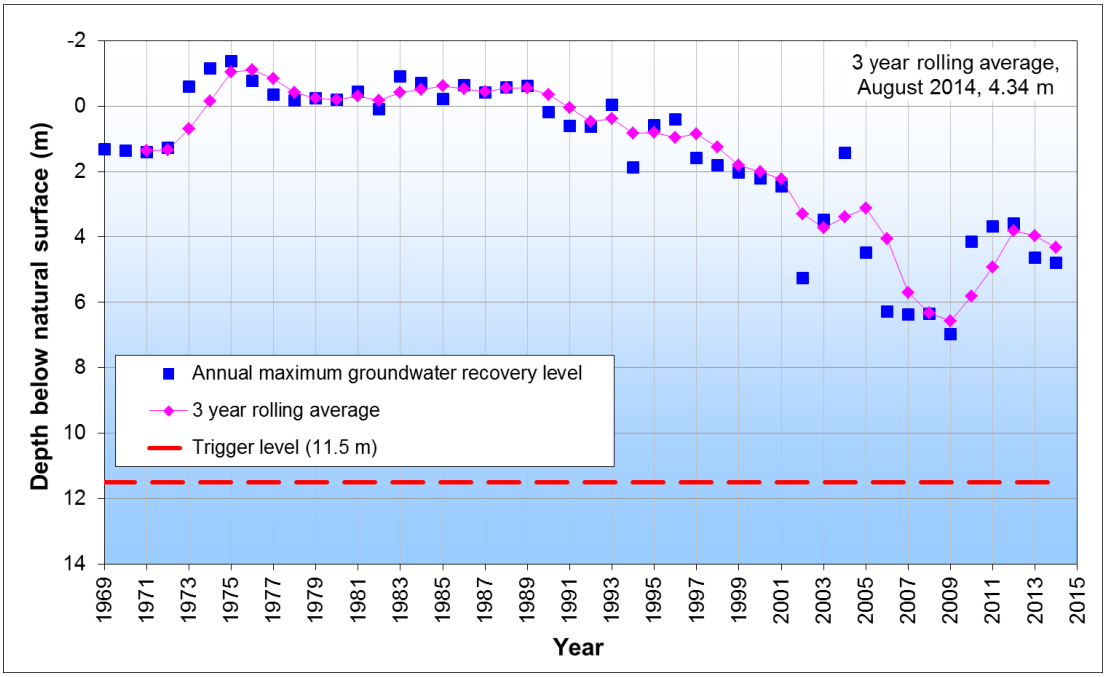


Figure 2 Groundwater levels in bore 88214 compared to the trigger level

2.3 Groundwater use

Metered use in the Mid-Loddon GMA in 2014/15 was 17,164.7 ML, or 51 per cent of licence entitlement. This is within the range of historical use (Figure 3).

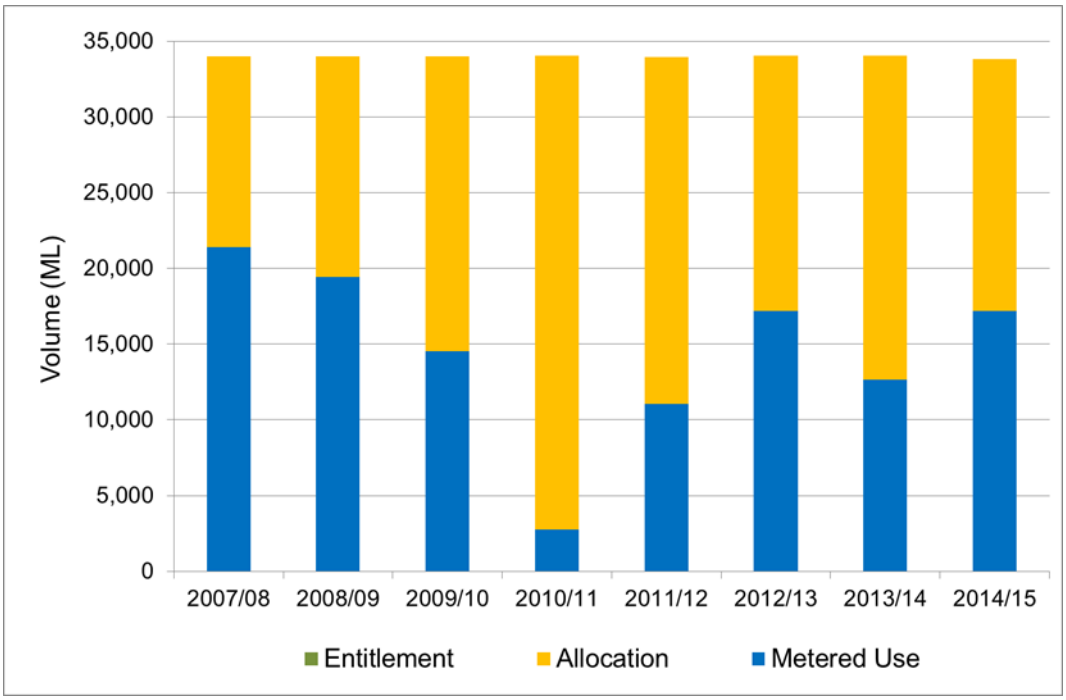


Figure 2 Metered usage in the Mid-Loddon GMA

Usage was greatest in the Laanecoorie Zone, where most of the entitlement is held. There was a higher percentage of entitlement used in the Moolort and Laanecoorie Zones compared to the Jarklin Zone (Table 2). This is because licence holders in the Jarklin Zone typically have access to surface water and will generally use it first when it is available because the water salinity is lower and to reduce pumping costs.

Table 2 Metered use in the Mid-Loddon GMA in 2014/15

Zone	Licence volume (ML)	Metered use (ML)	% Licensed volume used
Moolort	3,549.4	1,963.4	55%
Laanecoorie-Serpentine	27,434.7	13,974.2	51%
Jarklin	2,847.0	1,227.1	43%
Total	33,831.1	**17,164.7**	**51%**

2.4 Rainfall

Rainfall data from the Bureau of Meteorology (BoM) weather station at Bridgewater indicates that rainfall during 2014/15 was below average (Figure 3).

Since high rainfall events in 2010/11, the cumulative deviation from the mean monthly rainfall indicates that rainfall has mostly been below average. The drier conditions have resulted in reduced recharge to the groundwater system.

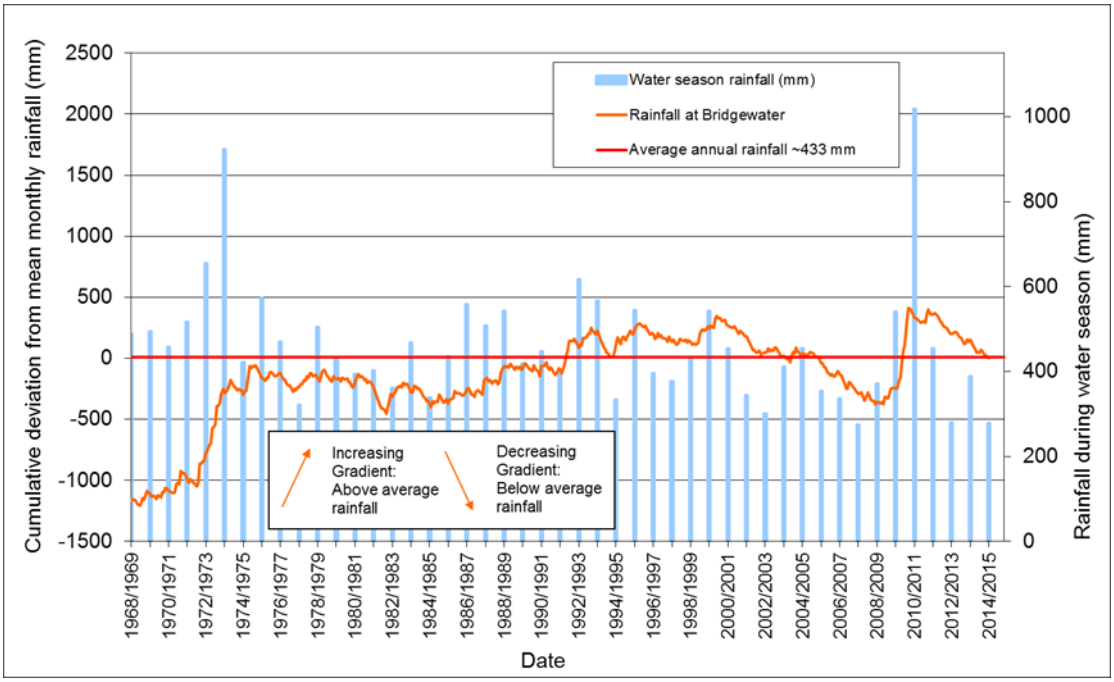


Figure 3 Monthly rainfall data for Bridgewater Post Office (BoM station 081058)

2.5 Transfer of entitlement

The Rules allow groundwater licence holders to temporarily or permanently transfer licence entitlement.

There were 7 temporary licence transfers for a total of 1,318 ML and four permanent licence transfers for a total of 3,800 ML in 2014/15 (Figure 4). The substantial volume of permanent trade was mostly due to a single licence holder selling a large volume of licence entitlement.

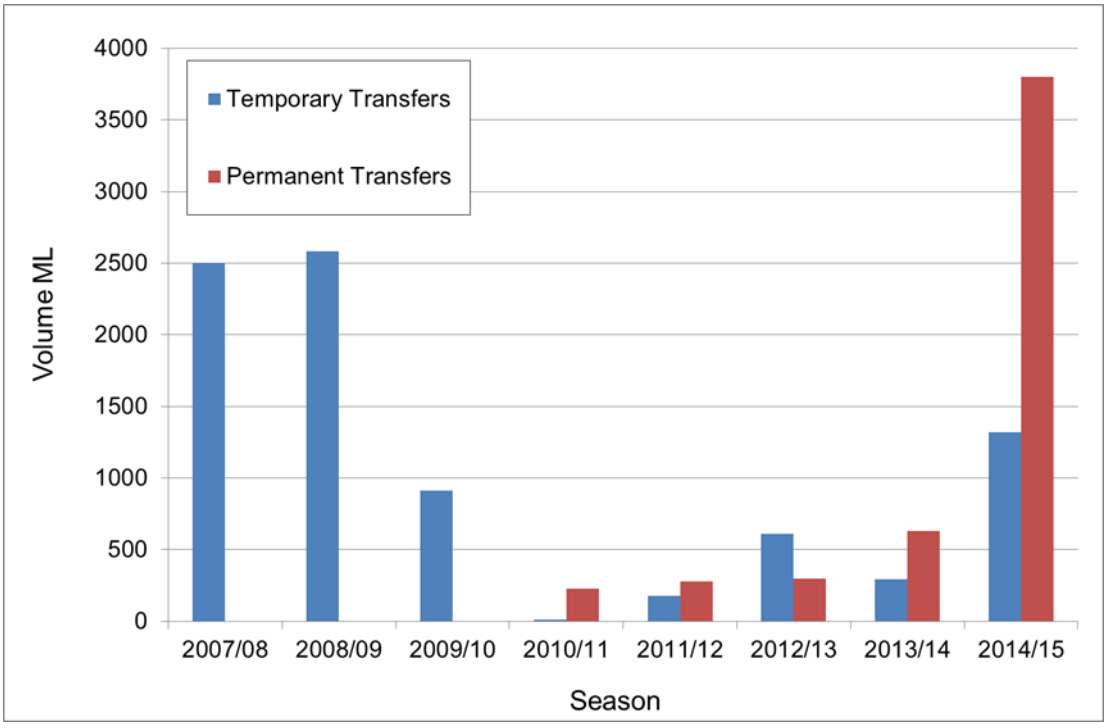


Figure 4 Licence transfer activity in the Mid-Loddon GMA

Most of the water was transferred within the same zone. There was 200 ML/yr permanently transferred out of the Laanecoorie-Serpentine Zone into the Moolort Zone (Table 3).

Table 3 Licence transfers in the Mid-Loddon GMA 2014/15

Zone	Temporary				Permanent			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)
Moolort	1	2	1	2	0	0	1	200
Laanecoorie-Serpentine	5	1,212	5	1,212	4	3,800	3	3,600
Jarklin	1	104	1	104	0	0	0	0
Total	**7**	**1,318**	**7**	**1,318**	**4**	**3,800**	**4**	**3,800**

2.6 Carryover

Licence holders in the Mid-Loddon GMA are permitted to carryover up to a maximum of 30% of their licence entitlement for use in the next season.

There was 9,691 ML of carryover available to licence holders in the Mid-Loddon GMA in the 2014/15 season.

At the conclusion of the 2014/15 season, groundwater licence holders in the Mid-Loddon GMA were able to carryover 9,834 ML into the 2015/16 season.

2.7 Domestic and stock bores installed

GMW processed 9 bore completion reports for bores constructed for domestic and stock purposes in the 2014/15 season in the Mid-Loddon GMA.

3 Monitoring program

3.1 Groundwater levels

The Department of Environment, Land, Water and Planning (DELWP) monitored 123 bores in the Mid-Loddon GMA on a quarterly basis in February, May, August and November as part of the State Observation Bore Network (Figure 1).

GMW conducted monthly infill monitoring of 25 key State observation bores identified in Schedule 1 of the Rules (Appendix B).

The monitoring record indicates that groundwater levels rose during the wet period in the early 1970's and remained high until the mid 1990s. The increase in the seasonal fluctuations represents an increase in groundwater extraction over time. From the mid 1990s to 2009 groundwater recovery levels (i.e. highest groundwater level each year) fell, largely in response to reduced rainfall recharge. Groundwater levels recovered strongly in response to the wet conditions experienced in 2010/11. Since 2011 groundwater recovery levels have been declining, again largely in response to reduced rainfall recharge. The current groundwater levels and drawdowns are within the historical range.

In the Moolort Zone groundwater recovery levels have fallen by around 1.5 m between 2011 and 2014. Seasonal drawdown of around 13 m was observed in deep lead bore 138653 at Locks Lane in 2014/15 (Figure 4). This is typical for this area within the Moolort Zone where there is a concentration of groundwater pumping.

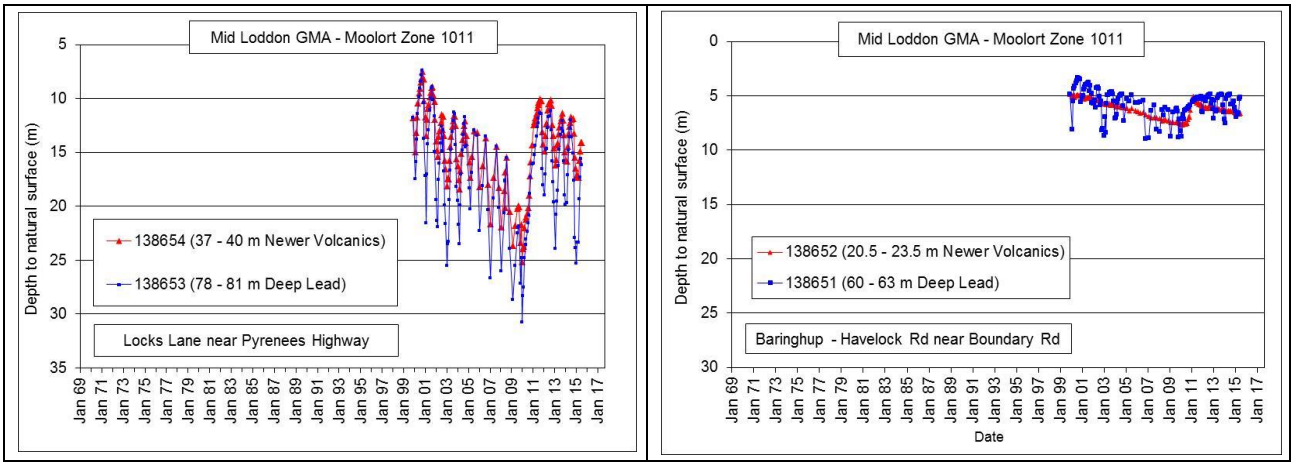


Figure 5 Groundwater levels in the Moolort Zone

In the Laanecoorie-Serpentine Zone groundwater recovery levels have fallen by around 1.4 m between 2011 and 2014. Seasonal drawdown of around 8.7 m was observed in deep lead bore 88214 on Rothackers Road in 2014/15, which is typical for this area (Figure 6).

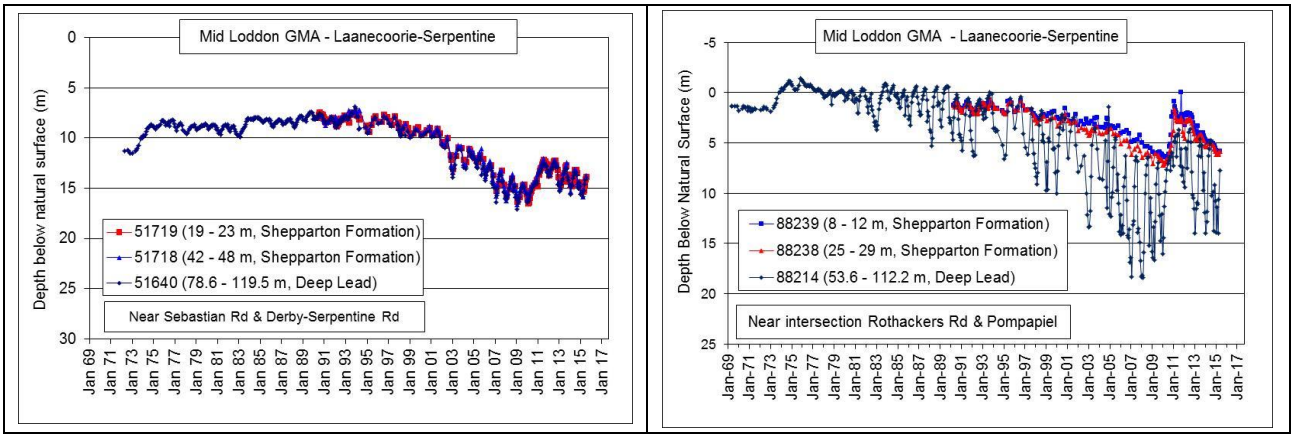


Figure 6 Groundwater levels in the Laanecoorie-Serpentine Zone

In the Jarklin Zone, groundwater recovery levels have fallen by around 1.7 m between 2011 and 2014 (Figure 7). Lower groundwater levels in this area can provide improved drainage and reduced waterlogging and land salinity problems.

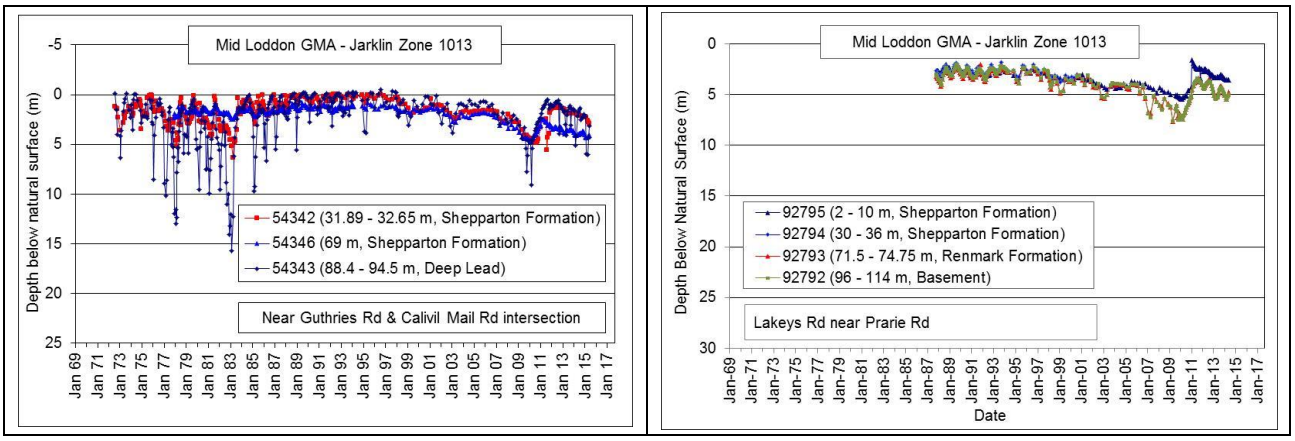


Figure 7 Groundwater levels in the Jarklin Zone

Groundwater levels from key State observation bores along a north-south section show that the aquifer response is consistent with historical observations (Figure 8).

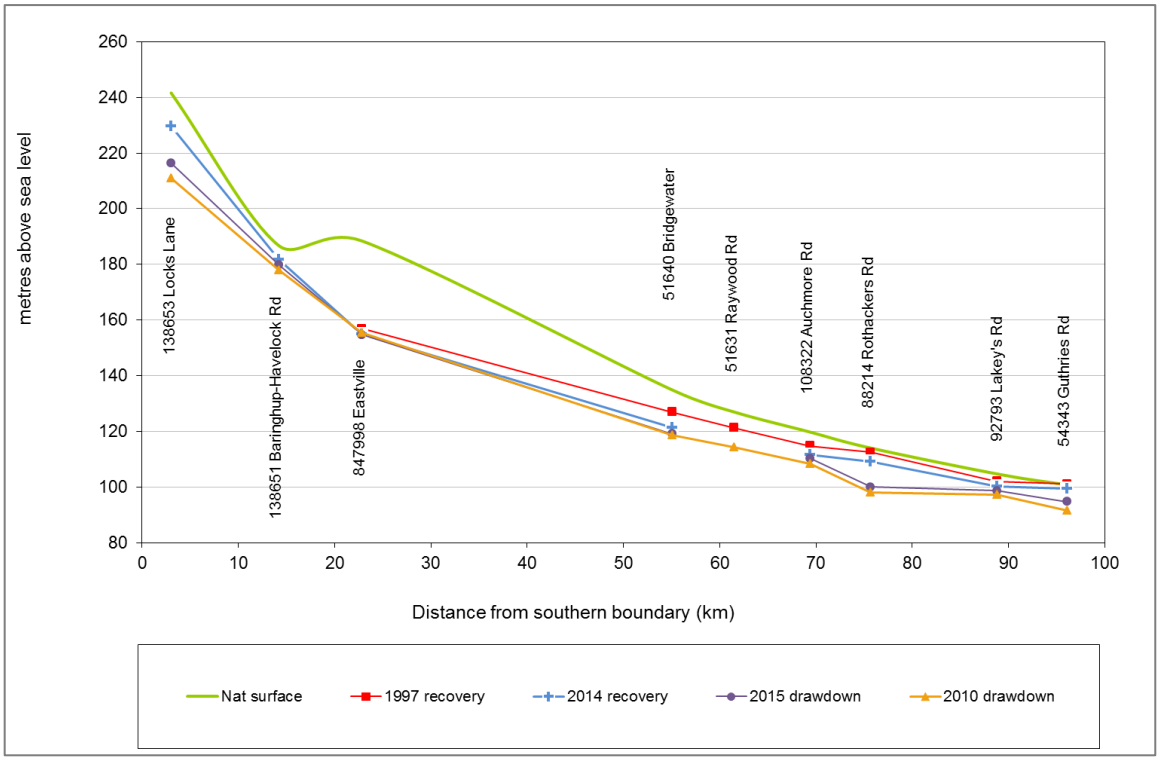


Figure 8 Groundwater level along a north-south section of the Mid-Loddon GMA

3.2 Groundwater quality

Sampling from State observation bores

Groundwater quality has been recorded from State observation bores 88214 in the Laanecoorie-Serpentine Zone and WRK059856 in the Jarklin Zone (**Error! Reference source not found.**). Both bores are screened in the Deep Lead aquifer. Issues have been reported with the reliability of the water level readings of bore 53434 in the Jarklin Zone, so bore WRK059856 has been sampled as a replacement. Ongoing annual sampling of these key bores will enable any trends in groundwater quality to be observed. The data indicates that groundwater salinity is levels are relatively stable (Figure 9).

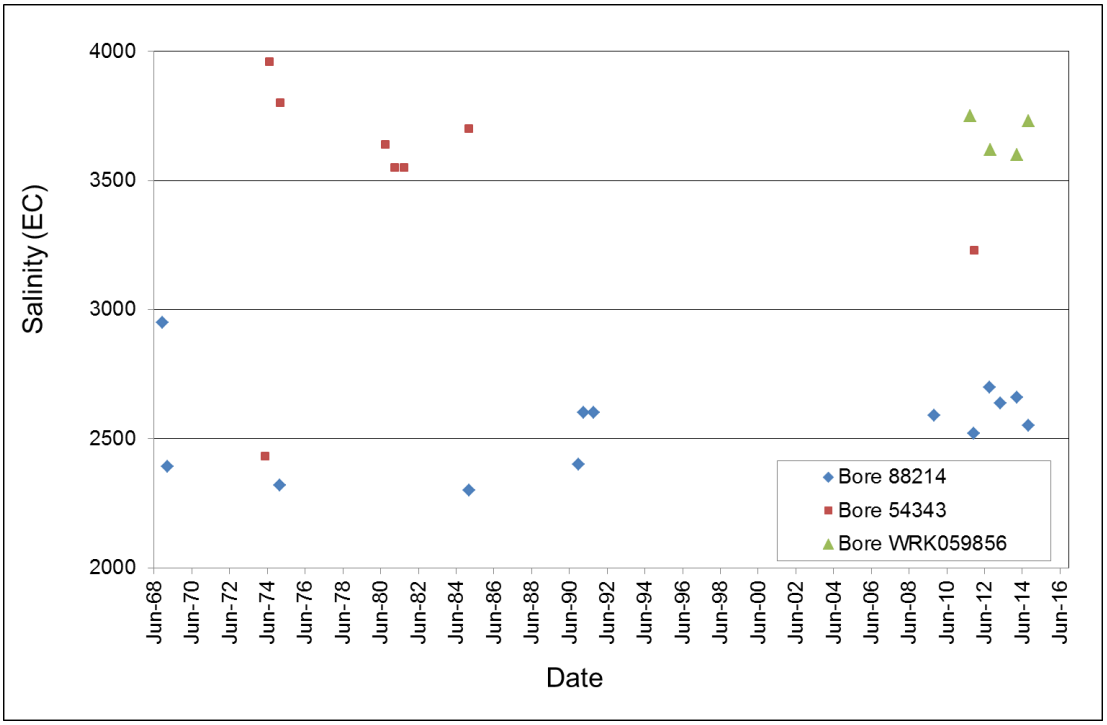


Figure 9 Groundwater salinity in key monitoring bores in the Mid-Loddon GMA

Sampling from private bores

GMW provides all groundwater licence holders in the Mid-Loddon GMA with a sample bottle and a reply paid envelope to submit a groundwater sample for salinity analysis. In the 2014/15 season, 128 sample bottles were sent out and 22 samples (17%) were returned for analysis.

Groundwater salinity in each zone is within expected ranges (Table 4). The data suggests that groundwater is more saline in the north. Continued return of samples assists with identifying any trends in groundwater salinity. A greater return rate would further improve the spatial and temporal understanding of groundwater salinity in the Mid-Loddon GMA.

Groundwater users are strongly encouraged to participate in this program so that they can identify any changes in groundwater salinity at their bore that might impact on their business.

Table 4 Salinity results from private bores

Zone	Number of samples returned	Salinity range EC (µS/cm)
1011 Moolort	3	1,690 – 3,170
1012 Laanecoorie-Serpentine	18	1,376 – 3,390
1013 Jarklin	1	3,770

3.3 Metering

All operational licenced bores in the Mid-Loddon GMA were metered as of 30 June 2015.

There was 11 new meters either installed or replaced across the GMA and 6 maintenance activities reported in 2014/15 (Table 5).

All meters were read at least twice throughout the 2014/15 season, with a total of 244 meter reads undertaken.

Table 5 Metering activities in the Mid-Loddon GMA in 2014/15

	Year to 30 June 2015
Number of meters installed/replaced	11
Meters which had maintenance	6
Total number of meters in GMA	122
Number of meter reads in season	244

3.4 Licence compliance

There were no prosecutions or convictions relating to groundwater matters in the Mid-Loddon GMA in 2014/15.

There were two incidents of unauthorised take and use of groundwater. These incidents have been investigated and GMW has taken action in accordance with the National Framework for Compliance and Enforcement of Systems for Water Resource Management (DSEWPC, 2012). This includes verbal and written notification not to take water without authorisation; a direction to apply to transfer entitlement to account for usage; and providing information on groundwater licence transfer options.

4 Future management considerations

4.1 Groundwater Reference Committee

GMW met with the Mid-Loddon Groundwater Reference Group on 29 October 2014 to report on the resource status and review the implementation of the Rules.

At the meeting it was noted that the Rules are now due for review.

GMW will undertake the following activities as part of the review:

1. Review of technical information
2. Review of policy changes
3. Groundwater user survey
4. Public meeting to discuss findings and way forward

This was the last meeting of the Mid-Loddon Groundwater Reference Group pending the outcomes from the review.

4.2 SOBN review

The State Observation Bore Network (SOBN) is owned and managed by DELWP.

DELWP currently monitors around 2,300 bores across Victoria on a quarterly basis to provide valuable information on groundwater resources.

DELWP is undertaking a detailed review of the SOBN which aims to identify opportunities to make the network more cost effective.

GMW will seek its customers' views on future groundwater monitoring needs through its Regional Water Services Committees and the Groundwater Reference Committee.

5 References

BoM, 2015, Climate Statistics for Australian Sites – Bridgwater (Post Office) station number 081058. Bureau of Meteorology. Retrieved 20 August 2015, http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=081058

Goulburn-Murray Water, 2009. Mid-Loddon Groundwater Management Area Local Management Rules. Goulburn-Murray Water, Tatura, Victoria.

Victorian Government, 2013. Victorian Government Gazette No. G10 Thursday 7 March 2013. Victoria Government, Melbourne, Victoria.

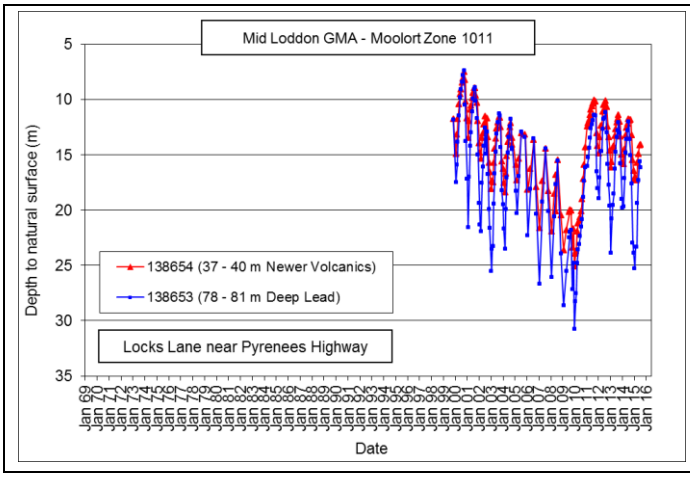
Appendix A – Assessment of activities against Rules

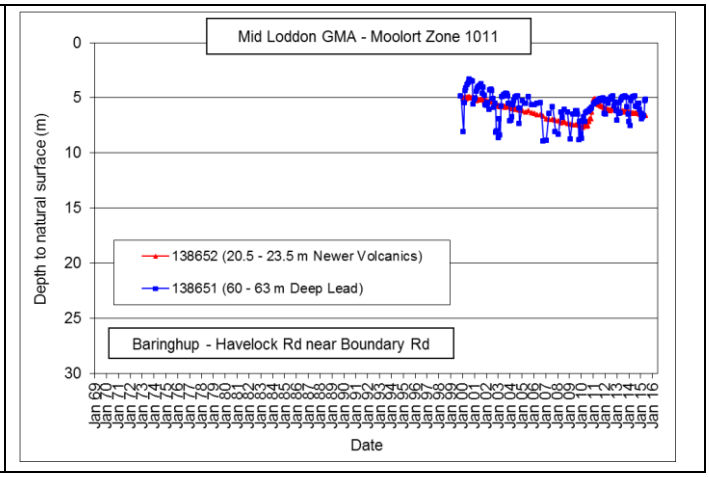
Rule	Activity	Compliant?
1. Cap on licence entitlement	The Minister for Water declared the Permissible Consumptive Volume in the Mid-Loddon GMA to be 34,037 ML/year in March 2013.	Yes
2. Managing groundwater interference	GMW processed all groundwater licence applications in accordance with Rule 2 and section 40 of the Act.	Yes
3. Managing intensity of groundwater extraction	GMW processed all groundwater licence applications in accordance with Rule 3.	Yes
4. Managing groundwater levels	GMW announced allocations of 100% for all groundwater licence holders in September 2014. GMW announced allocations by listing them on their website, sending letters to all licence holders and placing public notices in local newspapers.	Yes
5. Transfer of groundwater licence entitlement	GMW processed one transaction for temporary transfer and four transactions for permanent transfer in 2014/15. All transfers were compliant with conditions in Rule 5.	Yes
6. Carryover	Carryover up to 30% of licence volume was available to licence holders.	Yes
7. Monitoring groundwater levels	GMW obtained monthly readings from State observation bores listed in Schedule 1 of the Rules where practicable.	Yes
8. Monitor groundwater salinity	Groundwater salinity was analysed from State observation bores 88214 and WRK059856. Bottles were sent to all licensed groundwater users and salinity measured in returned samples. Licence holders were advised of the results.	Yes
9. Record meter readings	Meters are fitted to all operational bores in the Mid-Loddon GMA. Meters were read in January/February and May/June during 2014/15.	Yes
10. Annual reporting	GMW has prepared this annual report for the 2014/15 season and posted it on its website.	Yes
11. Provide effective communication	GMW met with the Mid-Loddon Groundwater Reference Group on 29 October 2014 to report on the resource status and review the implementation of the Rules.	Yes
12. Review of local management rules	A review of the Mid-Loddon GMA Local Management Rules is currently being undertaken	Yes

Appendix B – Hydrographs

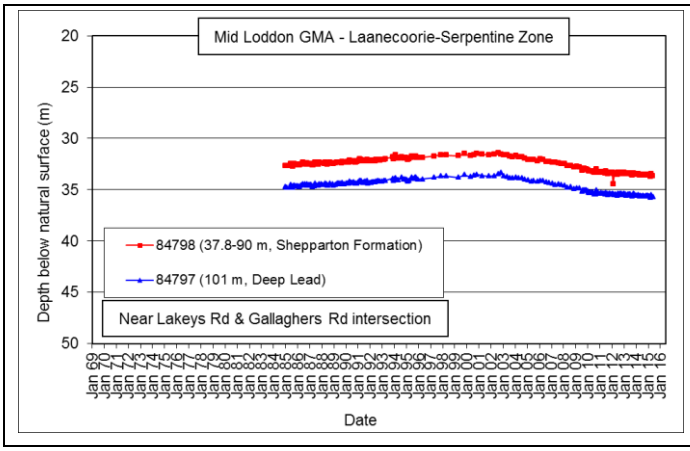
Hydrographs for key monitoring bores. Groundwater level information on other State observation bores can be obtained from the Water Measurement Information System website at http://data.water.vic.gov.au/monitoring.htm

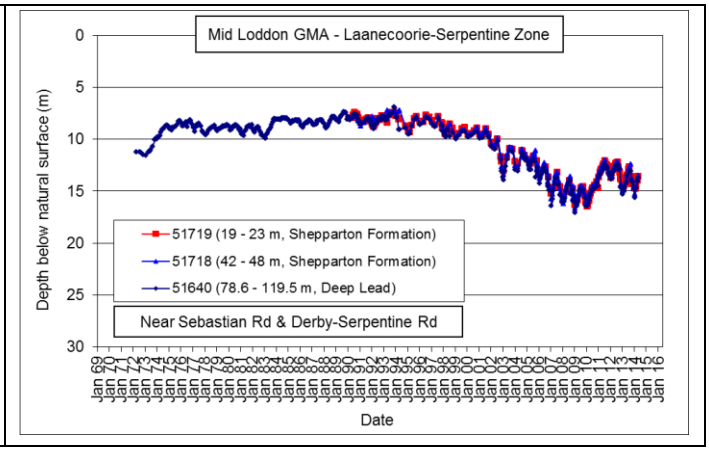
Moolort Zone 1011

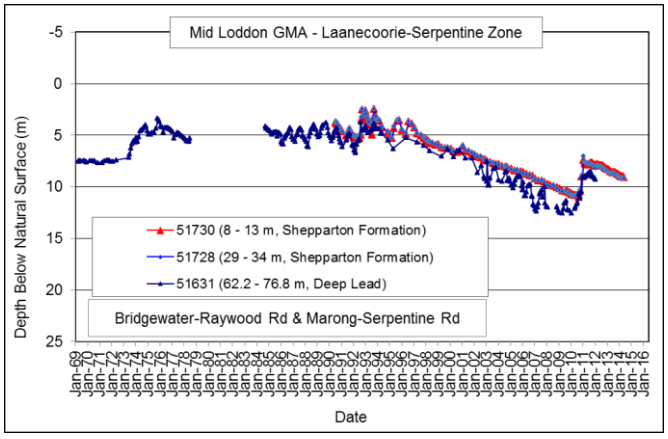


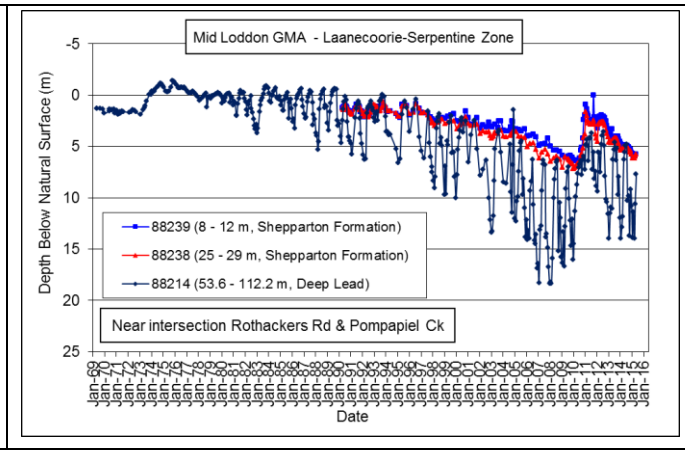


Laanecoorie-Serpentine Zone 1012

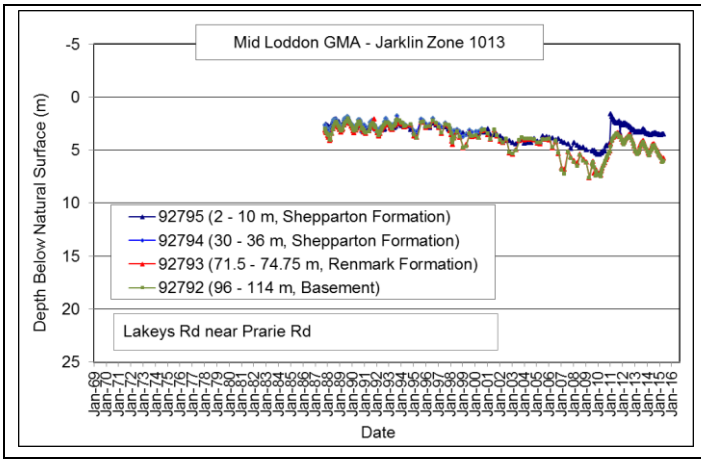


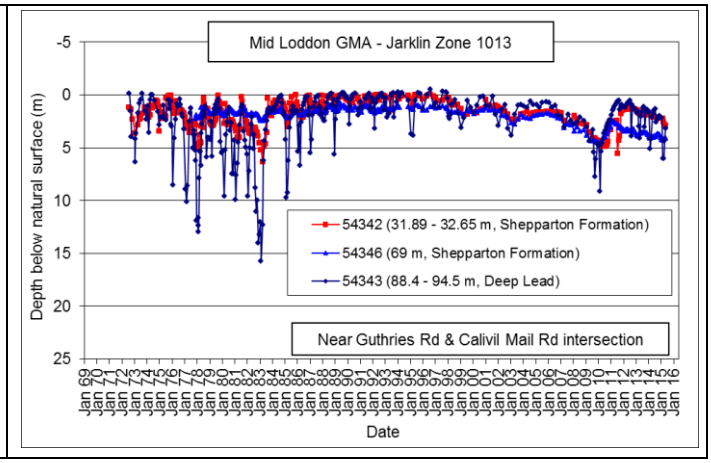






Jarklin Zone 1013





Appendix C – Groundwater chemistry

Groundwater chemistry from nested State observation bores

Analyte	Bore	88214	WRK059856
	Date	18/12/2014	18/12/2014
pH Value	pH Unit	8.51	7.33
Electrical Conductivity @ 25°C	µS/cm	2550	3730
Total Dissolved Solids @180°C	mg/L	1430	2020
Turbidity	NTU	37.6	13.4
Bicarbonate Alkalinity as CaCO3	mg/L	177	212
Carbonate Alkalinity as CaCO3	mg/L	20	<1
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1
Total Alkalinity as CaCO3	mg/L	197	212
Sulfate as SO4 - Turbidimetric	mg/L	73	171
Chloride	mg/L	691	1020
Calcium	mg/L	16	59
Magnesium	mg/L	62	84
Potassium	mg/L	8	9
Sodium	mg/L	395	583
Arsenic	mg/L	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001
Chromium	mg/L	<0.001	<0.001
Copper	mg/L	<0.001	<0.001
Iron	mg/L	<0.05	0.35
Lead	mg/L	<0.001	<0.001
Manganese	mg/L	0.069	0.103
Nickel	mg/L	0.001	0.002
Zinc	mg/L	<0.005	0.007
Mercury	mg/L	<0.0001	<0.0001
Ammonia as N	mg/L	0.06	0.11
Nitrite as N	mg/L	<0.01	<0.01
Nitrate as N	mg/L	0.02	0.02
Nitrite + Nitrate as N	mg/L	0.02	0.02
Total Kjeldahl Nitrogen as N	mg/L	<0.1	<0.1
Total Nitrogen as N	mg/L	<0.1	<0.1
Total Phosphorus as P	mg/L	0.03	0.04
Ionic Balance	%	3.46	1.57
Total Anions	meq/L	25	36.6
Total Cations	meq/L	23.3	35.4
Total Organic Carbon	mg/L	1	<1