Mid-Loddon Groundwater Management Area Local Management Rules

Annual Report

For year ending 30 June 2016

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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 2015/16 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 2015/16 season.

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

Matt Pethybridge

A/MANAGER GROUNDWATER AND STREAMS

Date 4/10/16

Executive summary

The Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) were endorsed by Goulburn-Murray Water in July 2009. The 2015/16 season marks the seventh year of operation under the Rules.

Allocations were 100% in all zones of the Mid-Loddon GMA in 2015/16. Metered use was 25,249.3 ML, which is 74% of licence entitlement. This is the highest use ever recorded in the Mid-Loddon.

There were 15 temporary transfers for a total of 2,296 ML and 9 permanent transfers for a total of 3,450 ML in 2015/16. Most of the temporary and permanent transfers occurred in the Laancoorie-Serpentine Zone.

Licence holders in the Mid-Loddon GMA are entitled to carryover a maximum of 30% of their licence entitlement. A total of 8,572 ML has been carried over into 2016/17.

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 2015 to 30 June 2016.

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/.

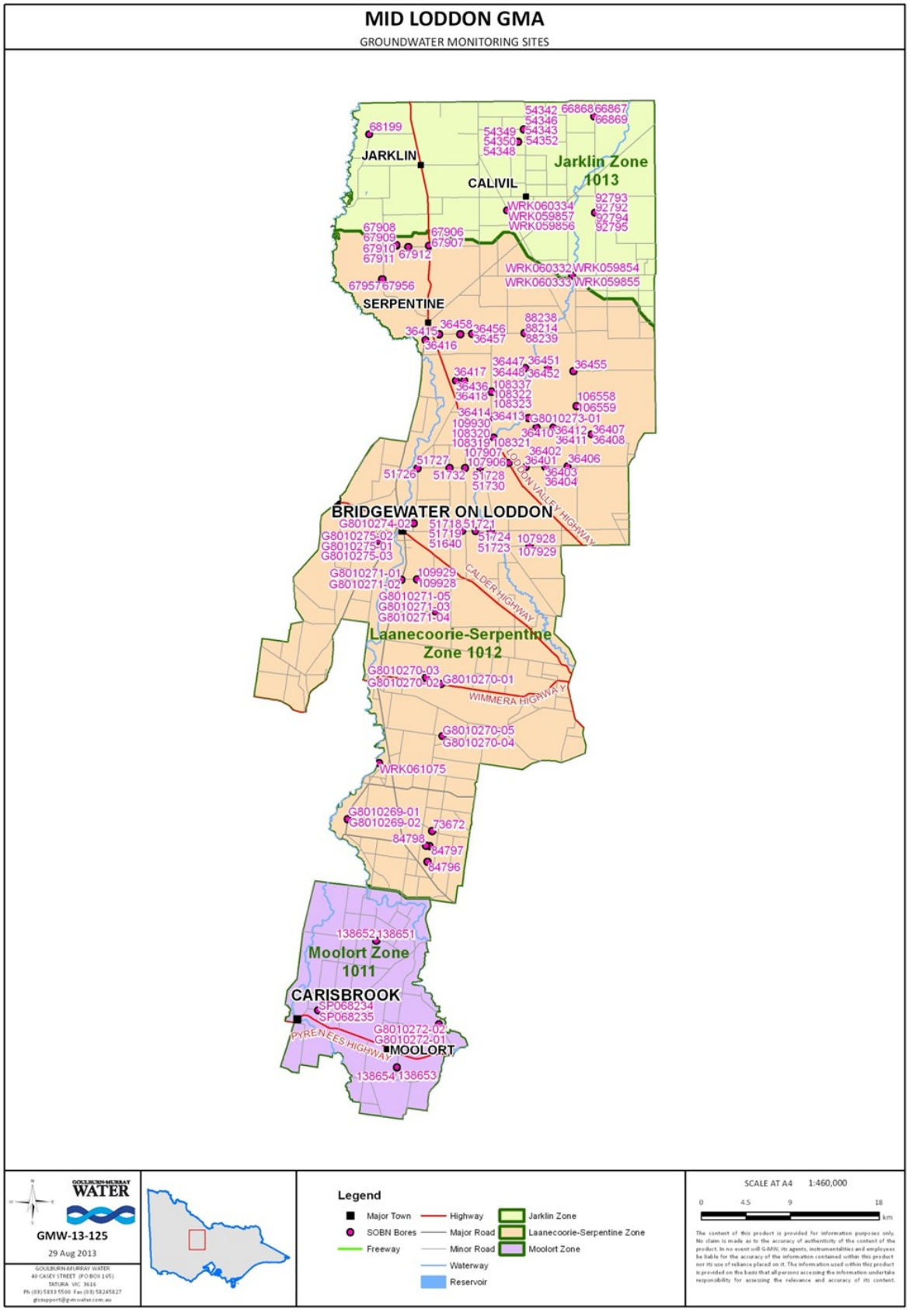


Figure 1 Mid-Loddon Groundwater Management Area

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 2016 the licence volume in the Mid-Loddon GMA was 33,927.1 ML/year (Table 1).

Table 1 Licence entitlement in the Mid-Loddon GMA

Zone	Licences	Licensed bores	Licence volume (ML)
Moolort	25	31	3,845.4
Laanecoorie-Serpentine	67	82	27,234.7
Jarklin	16	18	2,847.0
Total	108	131	33,927.1

NOTE: Data extracted from the Victorian Water Register 30 June 2016

Licence entitlement as at 30 June 2015 was 33,831.1 ML/yr. The 96 ML/yr addition in licence entitlement to 30 June 2016 was due to the reissue of a licence in the Moolort Zone.

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 1).

In September 2015 an allocation of 100% was announced for all groundwater licence holders in the Mid-Loddon GMA for 2015/16.

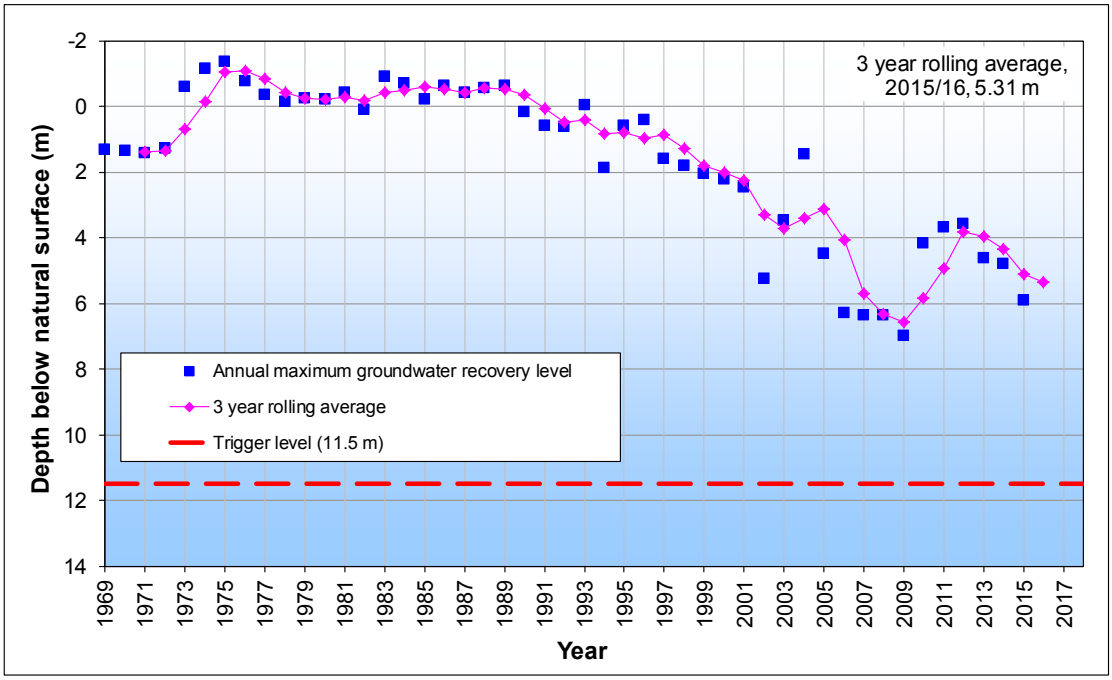


Figure 2 Groundwater levels in bore 88214 compared to the trigger level

2.3 Groundwater use

Metered use in the Mid-Loddon GMA in 2015/16 was 25,249.3 ML, or 74% of licence entitlement. This is the highest use ever recorded in the Mid-Loddon GMA (Figure 3).

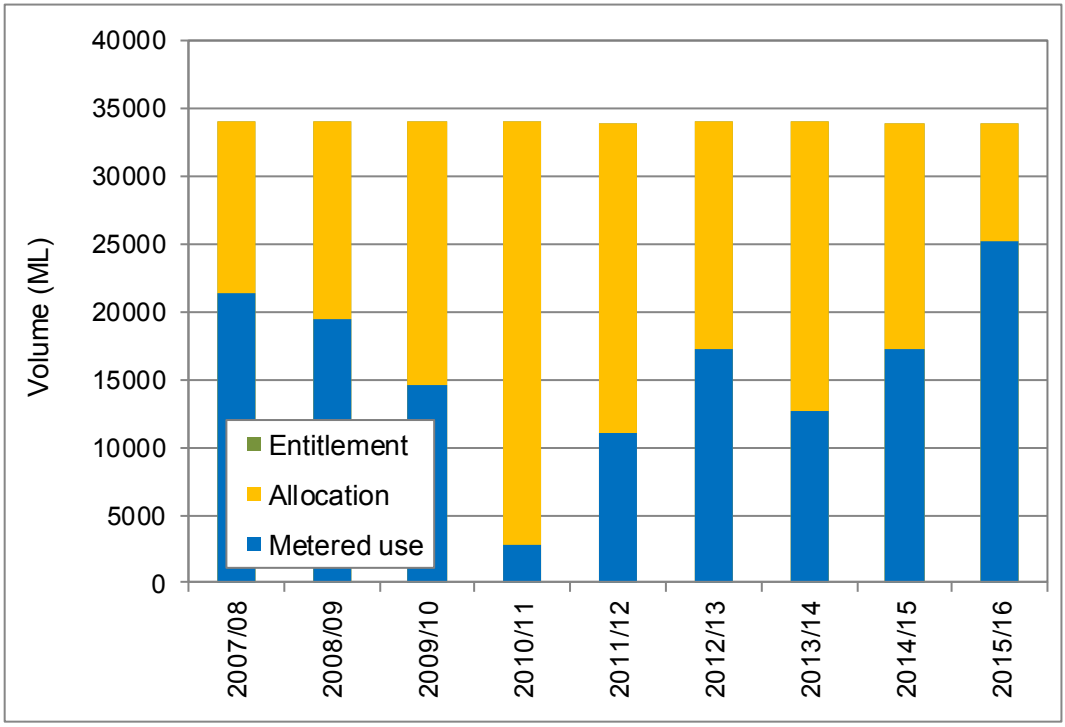


Figure 3 Metered use in the Mid-Loddon GMA

Metered use was highest in the Laanecoorie-Serpentine Zone, where most of the entitlement is held. Licence holders in the Moolort Zone used the greatest percentage of licence entitlement (Table 2).

Table 2 Metered use in the Mid-Loddon GMA in 2015/16

Zone	Licence volume (ML)	Metered use (ML)	% Licensed volume used
1011 Moolort	3,845.4	3,496.3	91%
1012 Laanecoorie-Serpentine	27,234.7	20,102.1	74%
1013 Jarklin	2,847.0	1,650.9	58%
Total	**33,927.1**	25,249.3	**74%**

2.4 Rainfall

Rainfall data from the Bureau of Meteorology (BoM) weather station at Bridgewater indicates that rainfall during 2015/16 was below average (Figure 4).

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.

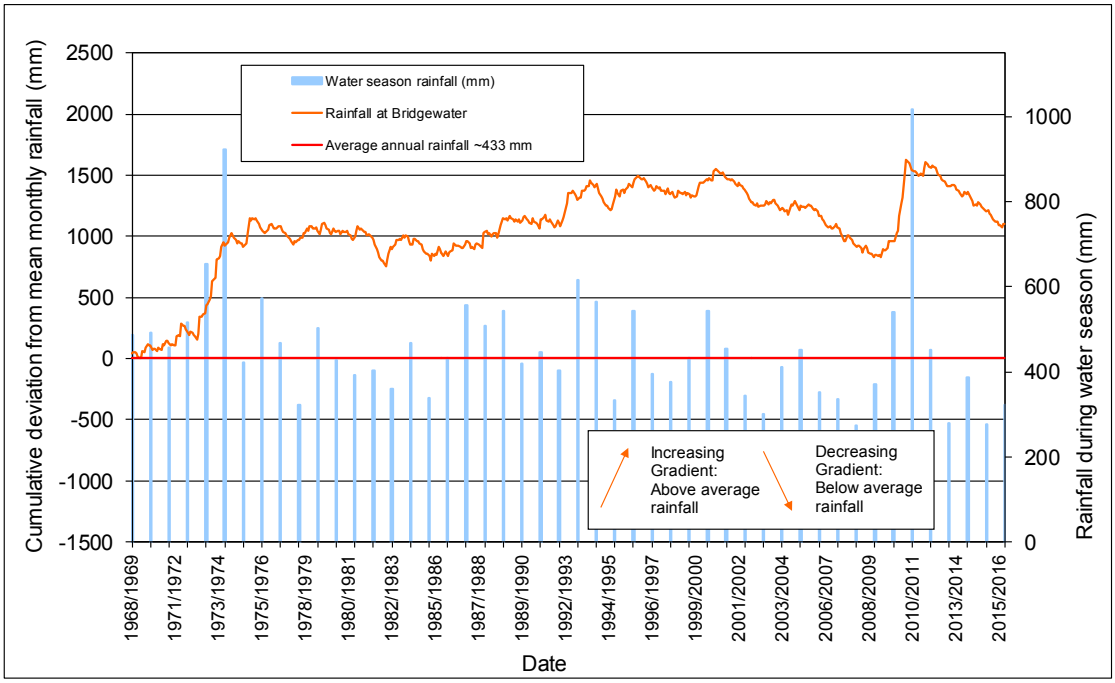


Figure 4 Monthly rainfall data for Bridgewater Post Office (BoM station 081058)

2.5 Transfer of entitlement

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

There were 15 temporary licence transfers for a total of 2,296 ML and 9 permanent licence transfers for a total of 3,450 ML/yr in 2015/16 (Figure 5).

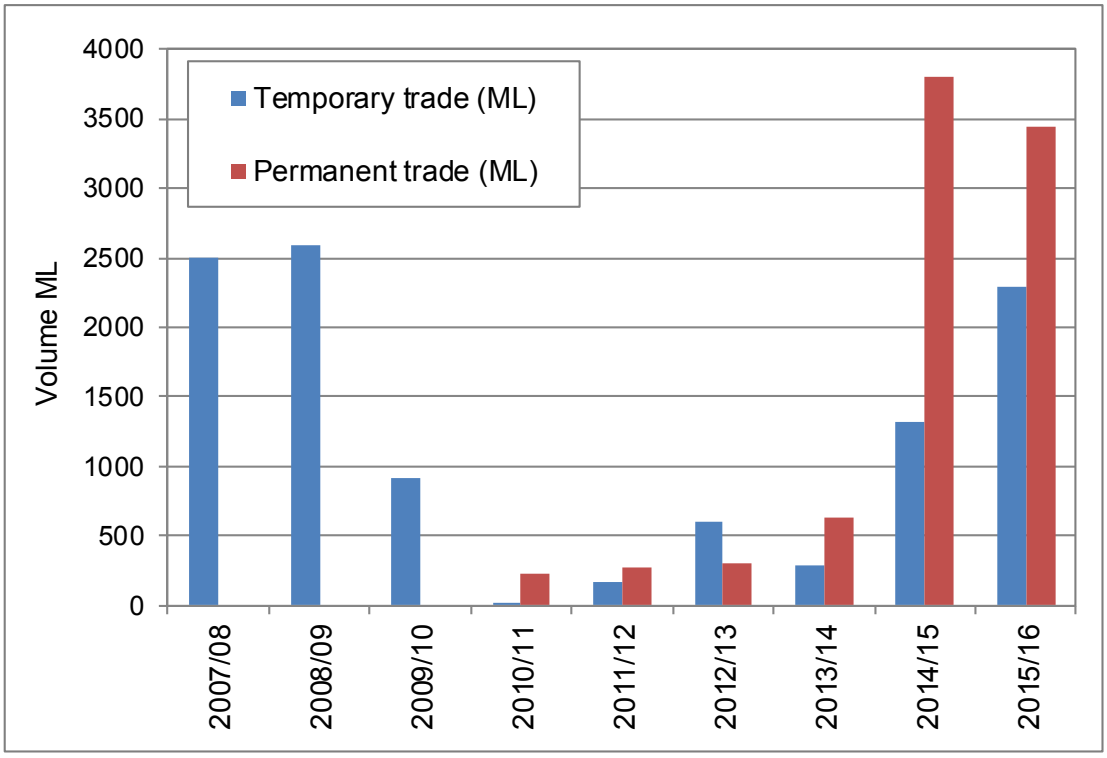


Figure 5 Licence transfer activity in the Mid-Loddon GMA

Most of the temporary and permanent transfers occurred in the Laanercoorie-Serpentine Zone. (Table 3). There was 200 ML/yr permanently transferred out of the Laanecoorie-Serpentine Zone into the Moolort Zone.

Table 3 Licence transfers in the Mid-Loddon GMA 2015/16

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)
1011 Moolort	2	78	5	545	2	100	3	300
1012 Laanecoorie-Serpentine	12	2,118	8	1,401	6	3,172	5	2,972
1013 Jarklin	1	100	2	350	1	178	1	178
Total	**15**	**2,296**	**15**	**2,296**	**9**	**3,450**	**9**	**3,450**

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 9,834 ML of carryover available to licence holders in the Mid-Loddon GMA in the 2015/16 season.

At the conclusion of the 2015/16 season, groundwater licence holders in the Mid-Loddon GMA were able to carryover 8,572 ML into the 2016/17 season.

2.7 Domestic and stock bores installed

GMW processed 2 bore completion reports for bores constructed for domestic and stock purposes in the 2015/16 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. Groundwater drawdowns levels in 2015/16 were near historic lows.

In the Moolort Zone groundwater recovery levels have fallen around 4 m between 2011 and 2015 at nested bores 138654 and 138653 (Figure 6). Seasonal drawdown of around 14.8 m was observed in deep lead bore 138653 at Locks Lane in 2015/16. This is greater than previous seasonal drawdown and may be attributed to increased local pumping. In comparison, groundwater levels from nested bores 138652 and 138652 indicate that groundwater recovery levels have remained relatively steady and seasonal drawdown is less than 5 m.

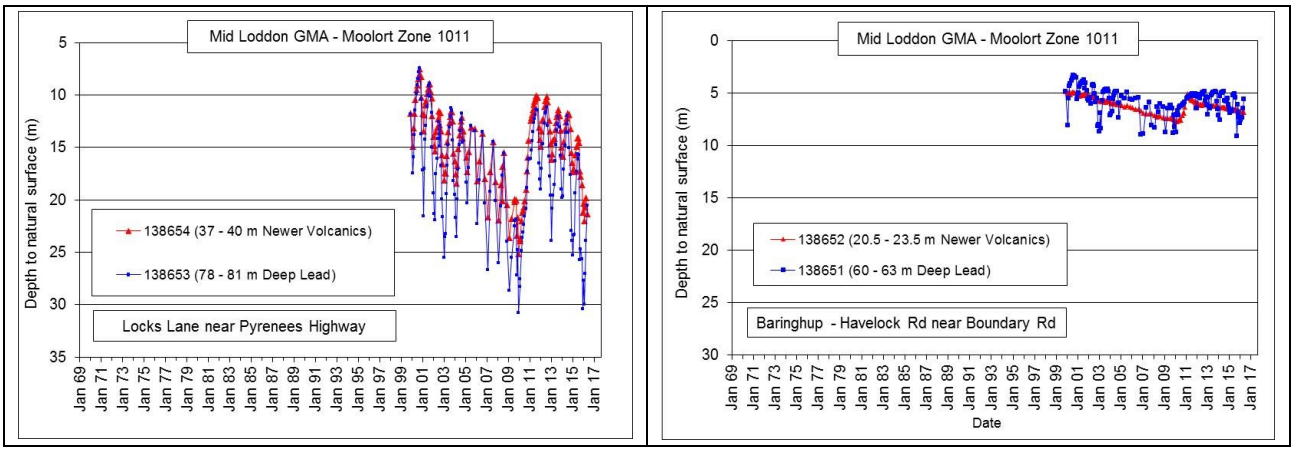


Figure 6 Groundwater levels in the Moolort Zone

In the Laanecoorie-Serpentine Zone groundwater recovery levels have fallen by up to 2 m between 2011 and 2015. Seasonal drawdown of around 7.8 m was observed in deep lead bore 88214 on Rothackers Road in 2015/16, which is an area of intensive groundwater pumping (Figure 7). Elsewhere, seasonal drawdown is typically less than 5 m.

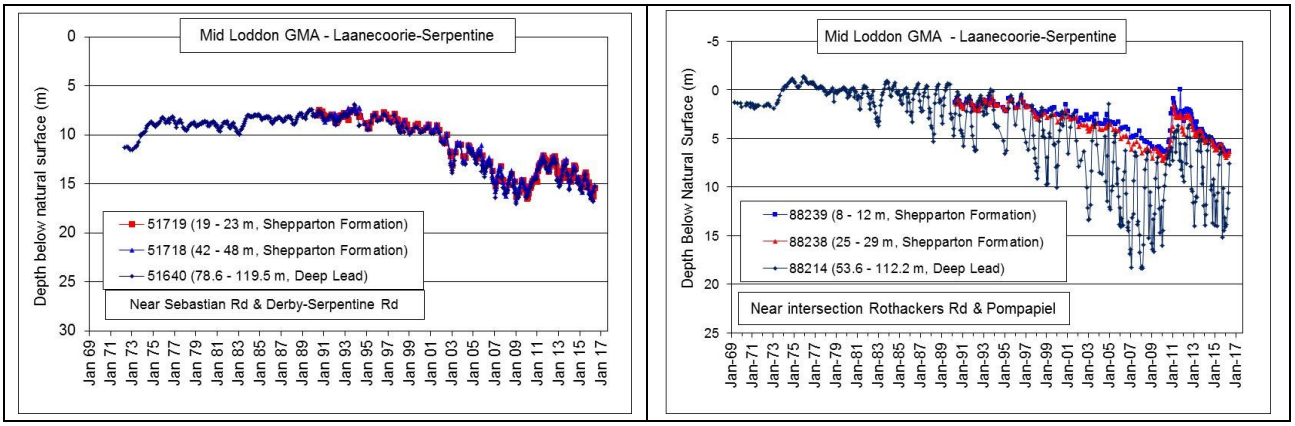


Figure 7 Groundwater levels in the Laanecoorie-Serpentine Zone

In the Jarklin Zone, groundwater recovery levels have fallen by up to around 2 m between 2011 and 2015 (Figure 8). Lower groundwater levels in this area can provide improved drainage and reduced waterlogging and land salinity problems.

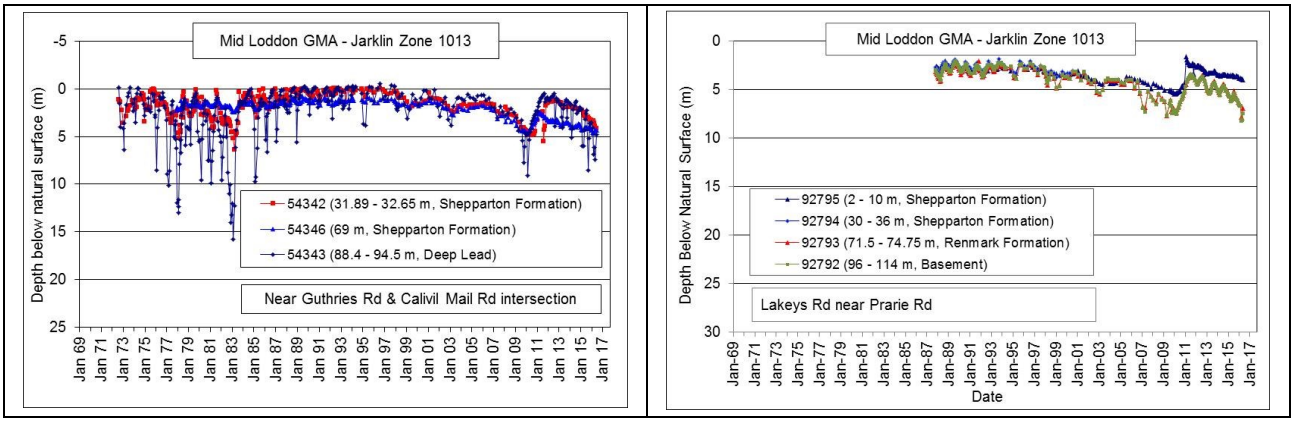


Figure 8 Groundwater levels in the Jarklin Zone

Groundwater levels from key State observation bores along a north-south section show that the aquifer response is consistent with historical observations (Figure 9).

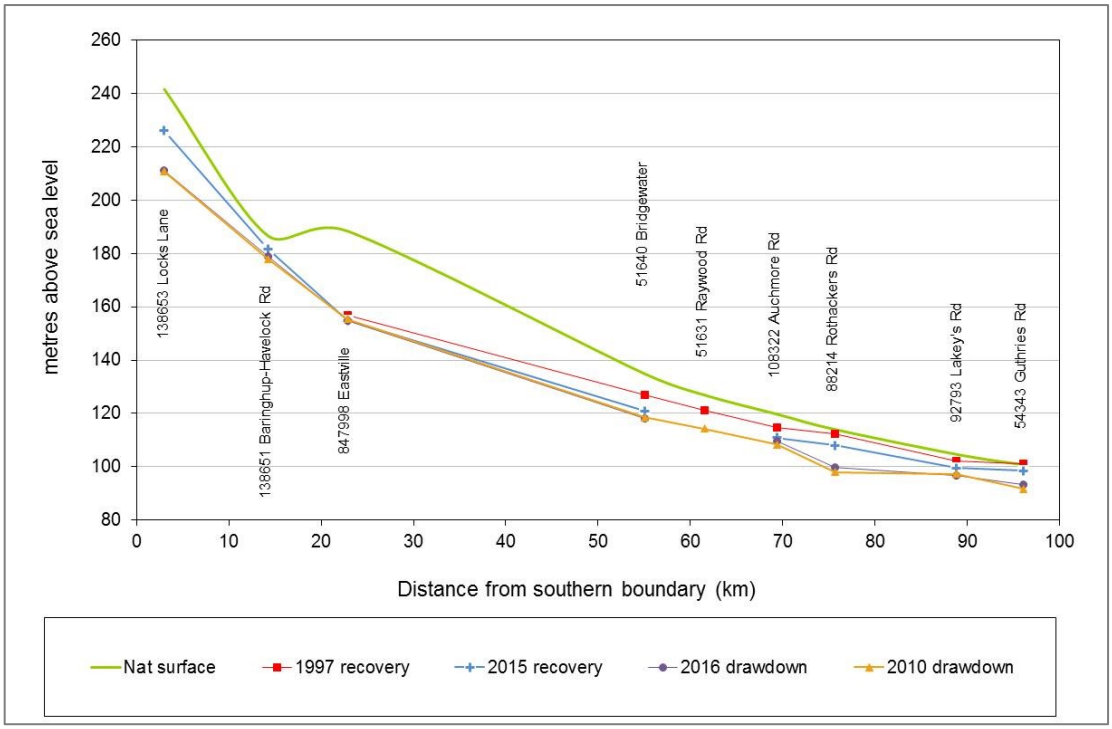


Figure 9 Groundwater level along a north-south section of the Mid-Loddon GMA

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. 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. The data indicates that groundwater salinity levels are relatively stable, although the most recent values are higher (Figure 10).Ongoing annual sampling of these key bores will enable any trends in groundwater quality to be observed.

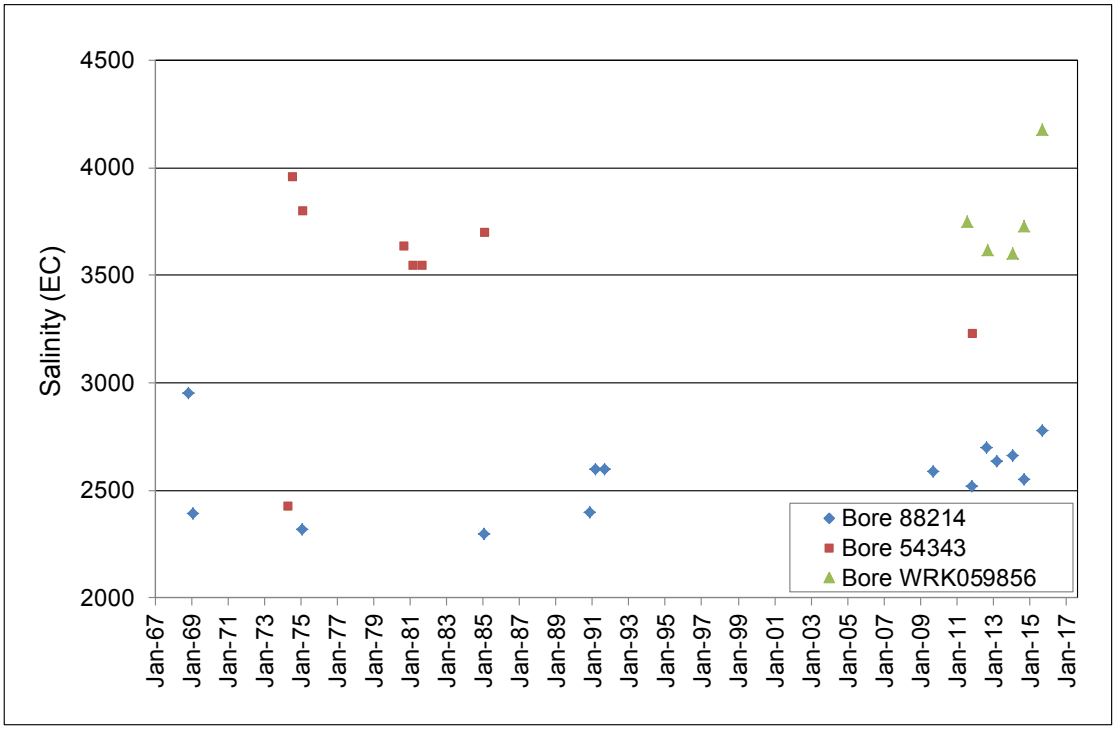


Figure 10 Groundwater salinity in key monitoring bores in the Mid-Loddon GMA

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 2015/16 season, 136 sample bottles were sent out and 35 samples (25%) 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	5	1,229 – 3,190
1012 Laanecoorie-Serpentine	26	727 – 5,620
1013 Jarklin	4	3,340 – 3,860

3.3 Metering

All operational licenced bores in the Mid-Loddon GMA were metered as of 30 June 2016.

There was 12 new meters either installed or replaced across and 19 maintenance activities reported in 2015/16 (Table 5).

All meters were read at least twice throughout the 2015/16 season, with a total of 244 meter reads undertaken.

Table 5 Metering activities in the Mid-Loddon GMA in 2015/16

	Year to 30 June 2016
Number of meters installed/replaced	12
Meters which had maintenance	19
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 2015/16.

4 Future management considerations

4.1 Groundwater Reference Committee

GMW met with the Mid-Loddon Groundwater Reference Group on 16 March 2016 to report on the resource status, discuss groundwater trading in area of intensive groundwater pumping and progress on the review of the Rules.

4.2 SOBN review

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

DELWP completed the review of the SOBN in 2015/16 which has resulted in a reduction in the number of bores to be monitored in the future.

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.

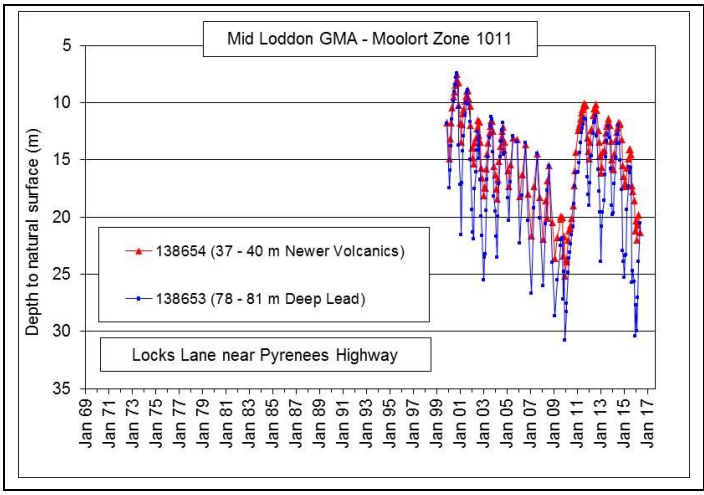
Appendix A – Assessment of activities against Rules

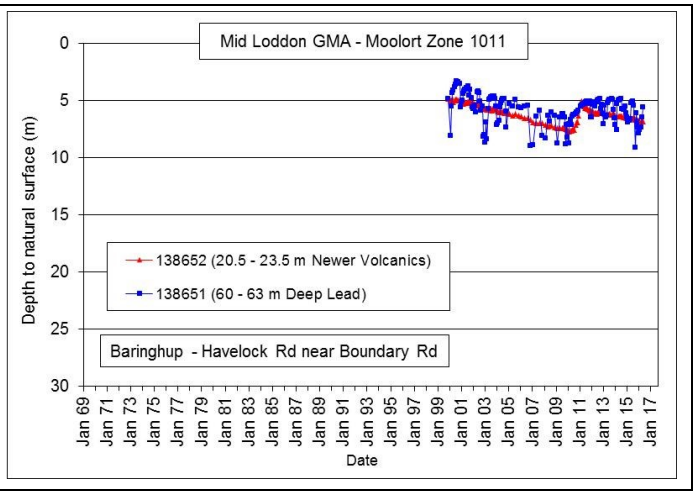
Rule	Activity	Compliant?
1. Cap on licence entitlement	The Minister for Water declared the Permissible Consumptive Volume in the Mid-Loddon GMA to be 34,037 ML/year in March 2013.	Yes
2. Managing groundwater interference	GMW processed all groundwater licence applications in accordance with Rule 2 and 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 2015. 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 15 transaction for temporary transfer and 9 transactions for permanent transfer in 2015/16. 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 2015/16.	Yes
10. Annual reporting	GMW has prepared this annual report for the 2015/16 season and posted it on its website.	Yes
11. Provide effective communication	GMW met with the Mid-Loddon Groundwater Reference Group on 16 March 2016 to report on the resource status, discuss groundwater trading in area of intensive groundwater pumping and progress on the review 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

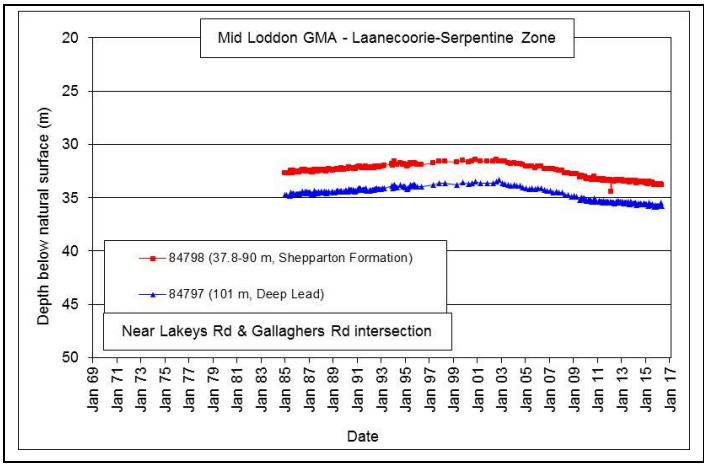
Hydrographs for key monitoring bores. Groundwater level information on other State observation bores can be obtained from the Water Measurement Information System website at http://data.water.vic.gov.au/monitoring.htm

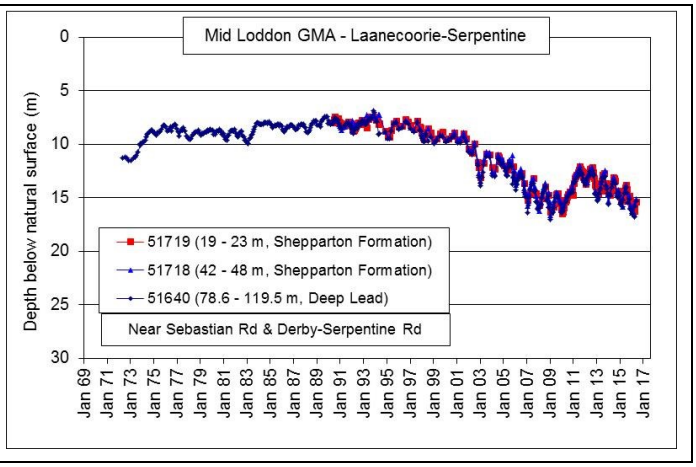
Moolort Zone 1011

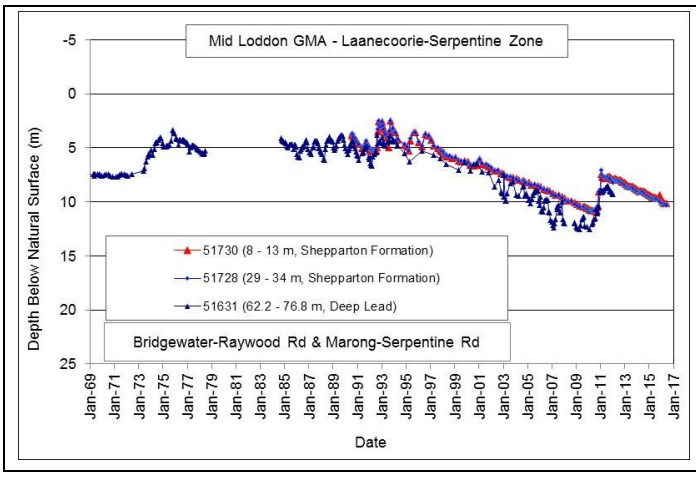


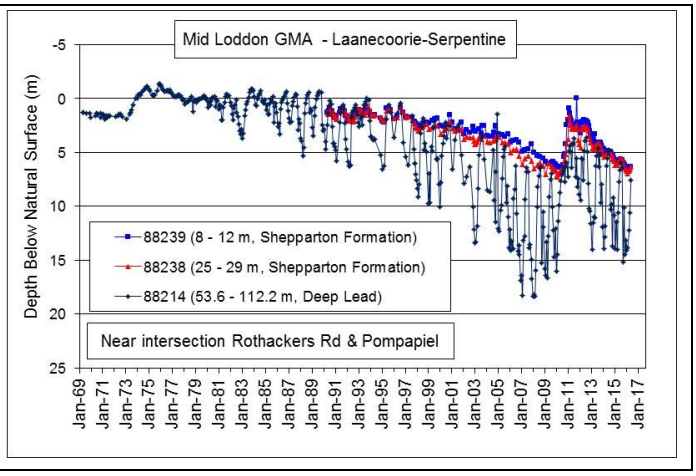


Laanecoorie-Serpentine Zone 1012

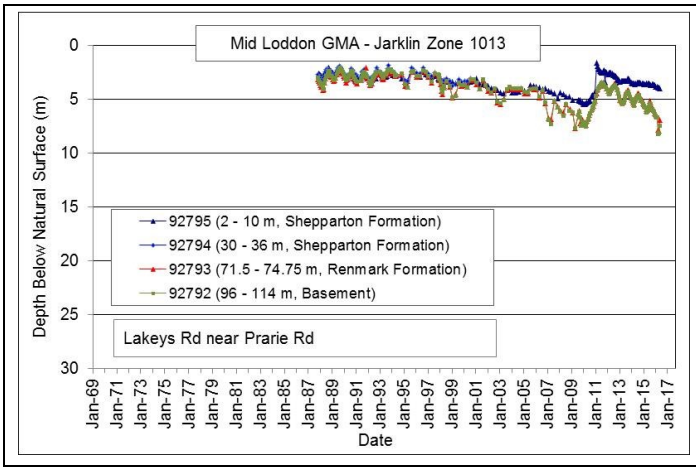


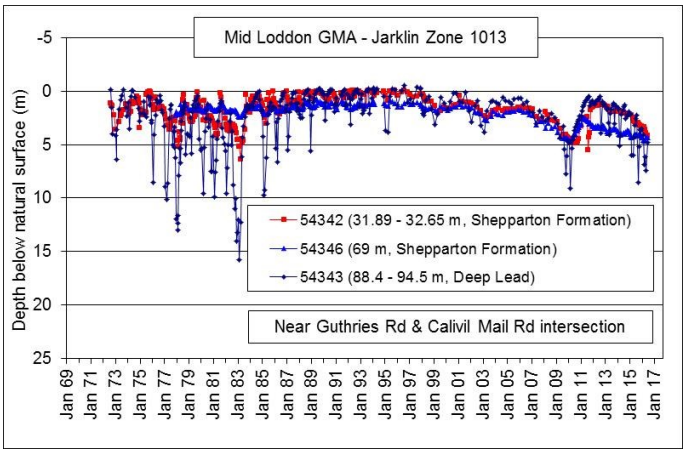






Jarklin Zone 1013





Appendix C – Groundwater chemistry

Groundwater chemistry from nested State observation bores

Analyte	Bore	88214	WRK059856
	Date	14/10/2015	14/10/2015
Turbidity	NTU	6.7	25.5
Alkalinity (Bicarbonate as CaCO3)	mg/L	207	232
Alkalinity (Carbonate as CaCO3)	mg/L	14	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	<1	<1
Alkalinity (total) as CaCO3	mg/L	221	232
Ammonia as N	mg/L	0.11	0.17
Anions Total	meq/L	25.7	36.6
Cations Total	meq/L	25.5	39.7
Chloride	mg/L	692	986
Electrical conductivity @ 25°C	µS/cm	2780	4180
Ionic Balance	%	0.31	3.97
Kjeldahl Nitrogen Total	mg/L	0.1	0.2
Nitrate (as N)	mg/L	0.01	0.01
Nitrite (as N)	mg/L	<0.01	<0.01
Nitrogen (Total Oxidised)	mg/L	0.01	0.01
Nitrogen (Total)	mg/L	0.1	0.2
pH	pH_Units	8.43	7.42
Sodium	mg/L	444	667
Sulphate Turbidimetric	mg/L	83	202
TDS	mg/L	1500	2180
Total Organic Carbon	mg/L	<1	<1
Lead	mg/L	<0.001	<0.001
Arsenic	mg/L	<0.001	0.007
Cadmium	mg/L	<0.0001	<0.0001
Calcium	mg/L	13	59
Chromium (III+VI)	mg/L	<0.001	<0.001
Copper	mg/L	<0.001	0.018
Iron	mg/L	<0.05	1.42
Magnesium	mg/L	65	91
Manganese	mg/L	0.058	0.267
Mercury	mg/L	-	-
Nickel	mg/L	<0.001	0.006
Phosphorus	mg/L	0.02	0.04
Potassium	mg/L	8	10
Zinc	mg/L	<0.005	<0.005