



Mid-Loddon
Groundwater Management Area
Local Management Rules

Annual Report
2011

Document Number: 3248830

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1 Introduction

The Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) were implemented from 1 July 2009 to ensure groundwater resources are managed in an equitable and sustainable manner.

This report has been prepared to provide groundwater users with an overview of implementation of the Rules from 1 July 2010 to 30 June 2011. It reports on items specified in Rule 10 including:

- groundwater extractions, including trading and carryover (Chapter 2);
- groundwater level response (Chapter 3);
- groundwater quality description (Chapter 4); and
- the need to amend any of the Rules based on policy developments, improved technical understanding of the aquifer system or validity of the Rules (Chapter 5).

1.1 Local Management Rules

The Rules were developed by a Goulburn-Murray Water appointed Groundwater Reference Committee which comprised groundwater users from the area, and extensively consulted with the wider community, Department of sustainability and Environment and the North Central Catchment Management Authority. The Rules were designed to be equitable, transparent and adaptive. A copy of the rules can be downloaded from the Goulburn-Murray Water website <http://www.g-mwater.com.au/>.

The Rules provide groundwater licence holders with greater flexibility to manage their entitlement and scope for future development through provisions for carryover and the permanent transfer of entitlement. The establishment of a cap on licensed volume and trigger levels and restrictions on annual extractions, if required, offers security of access to existing groundwater users. Further, the Rules consider environmental water requirements, risks to the aquifer and provide for land salinity benefits.

The Rules ensure that there is effective reporting and communication of the resource status, determined through appropriate monitoring. Importantly, a methodology for reviewing the Rules is prescribed to ensure that they remain current and appropriate.

1.2 Groundwater management area

The Mid-Loddon GMA lies within the Loddon River Catchment of the Murray Darling Basin. It covers an area of around 3,000 km², extending from Tullaroop Reservoir in the south to Mitiamo in the north, including the towns of Carisbrook, Bridgewater and Serpentine (Figure 1).

The GMA includes all major aquifers in this region, including the Newer Volcanic Basalts, Calivil Formation and Shepparton Formation. No depth limit has been specified for the GMA to ensure that all of these aquifers are included.

Three management zones have been established within the GMA:

1. Moolort Zone 1011
2. Laanecoorie-Serpentine Zone 1012
3. Jarklin Zone 1013

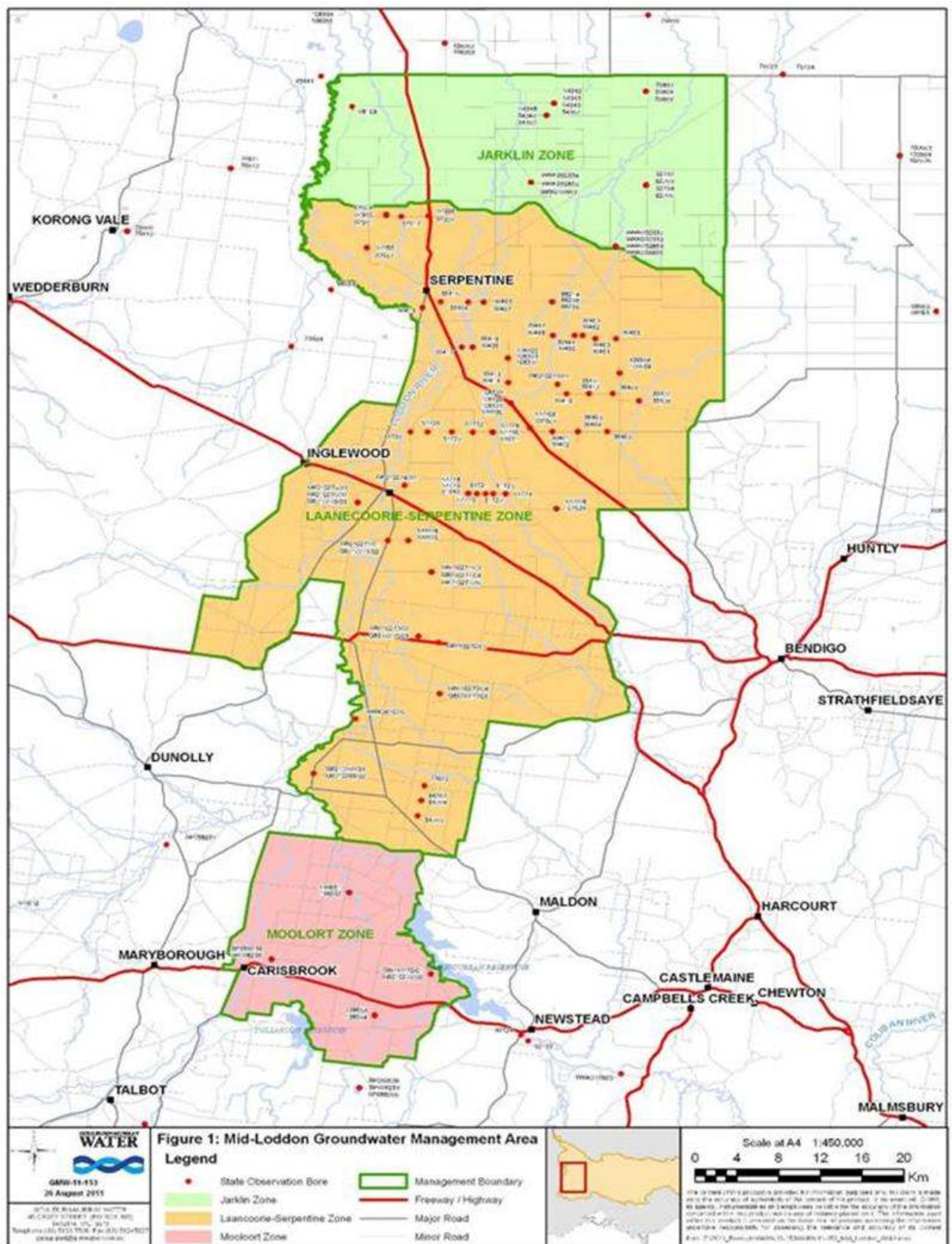


Figure 1 Mid-Loddon management zones and monitoring bores

2 Monitoring groundwater extractions

2.1 Licence volume

Licence volume in the Mid-Loddon Groundwater Management Area (GMA) is 34,036 ML/year. It has increased from 33,905 ML/yr when the Rules were written to account for an oversight in licence renewal (110 ML/yr) and licensing of dairy wash bores under the Department of Sustainability and Environment's Dairy Shed Water Licence Transition Program (22 ML/r). The distribution of entitlement is shown in Table 1.

The current total Permissible Consumptive Volume (PCV) is 37,200 ML. It is to be amended to reflect the licence volume of 34,036 ML. No additional licence volume is to be issued in the area; however new development may occur through the transfer of existing groundwater licence entitlement.

Table 1 Licensed volume and metered extraction for the 2010/2011 season

Zone	Licensed volume (ML)	Metered use (ML)	% of licensed volume extracted
Moolort	2,957	212	7%
Laanecoorie-Serpentine	28,122	2,274	8%
Jarklin	2,957	241	8%
TOTAL	36,036	2,727	8%

2.2 Allocations

Allocations are a percentage of licensed entitlement volume that may be extracted in a given season.

Allocations in the Mid-Loddon GMA are determined from the average maximum groundwater recovery level three year rolling average compared to the trigger level.

Allocations were 100% in the 2010/11 season as the maximum groundwater recovery level three year rolling average (5.83 m) was above the trigger (11.5 m) (Figure 2).

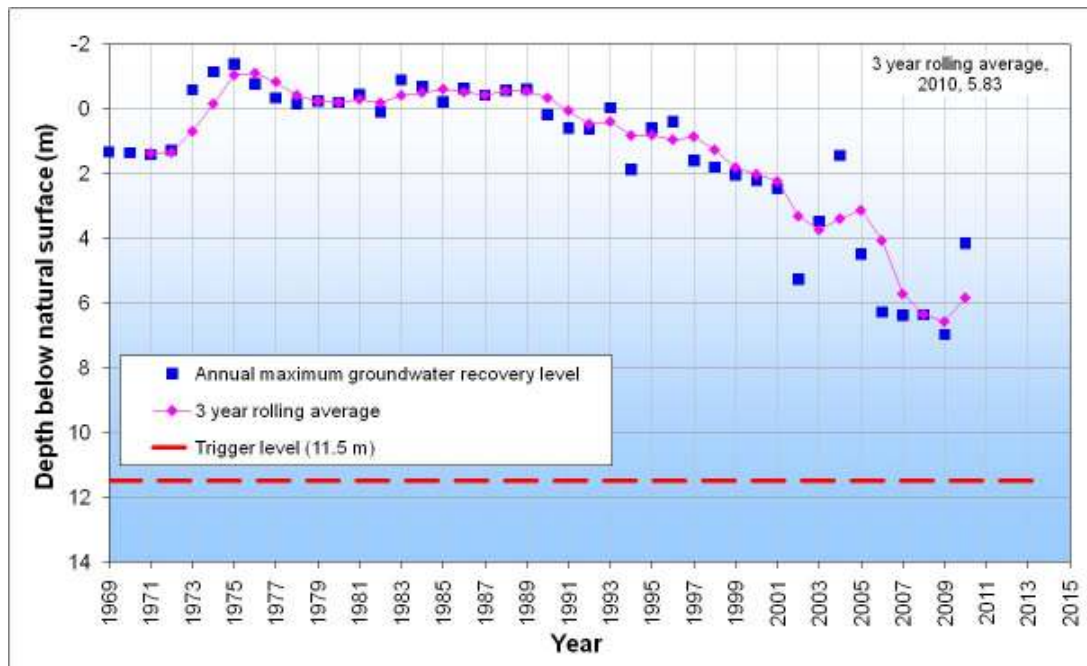
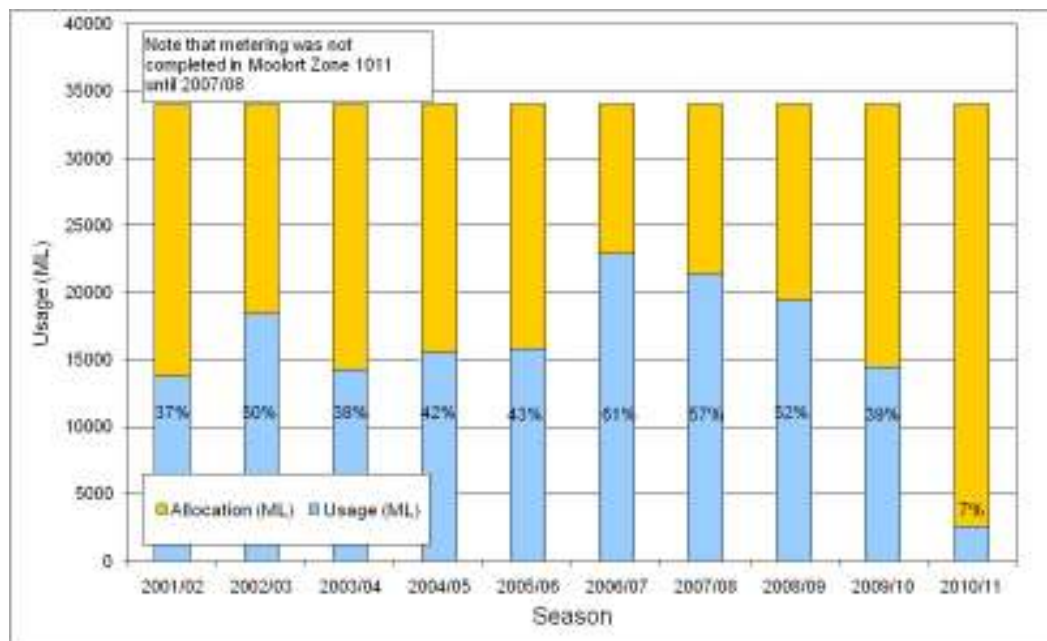


Figure 2 Maximum recovery level three year rolling average

2.3 Groundwater use

Metered groundwater extraction in the Mid-Loddon GMA in 2010/11 was 2,727 ML (Table 1). This is a reduction in licensed extraction compared to recent years as shown in Figure 3, which may be attributed to reduced demand on groundwater because of the flooding that occurred in the catchment.



Note % based on usage against Permissible Consumptive Volume of 32,000 for easy comparison between seasons.

Figure 3 Metered groundwater extraction for the 2010/2011 season

The greatest volume was extracted from the Laanecoorie-Serpentine Zone, which has the largest proportion of licensed entitlement. The percentage of licensed volume extracted from each zone was between 7% and 8% (Figure 4).

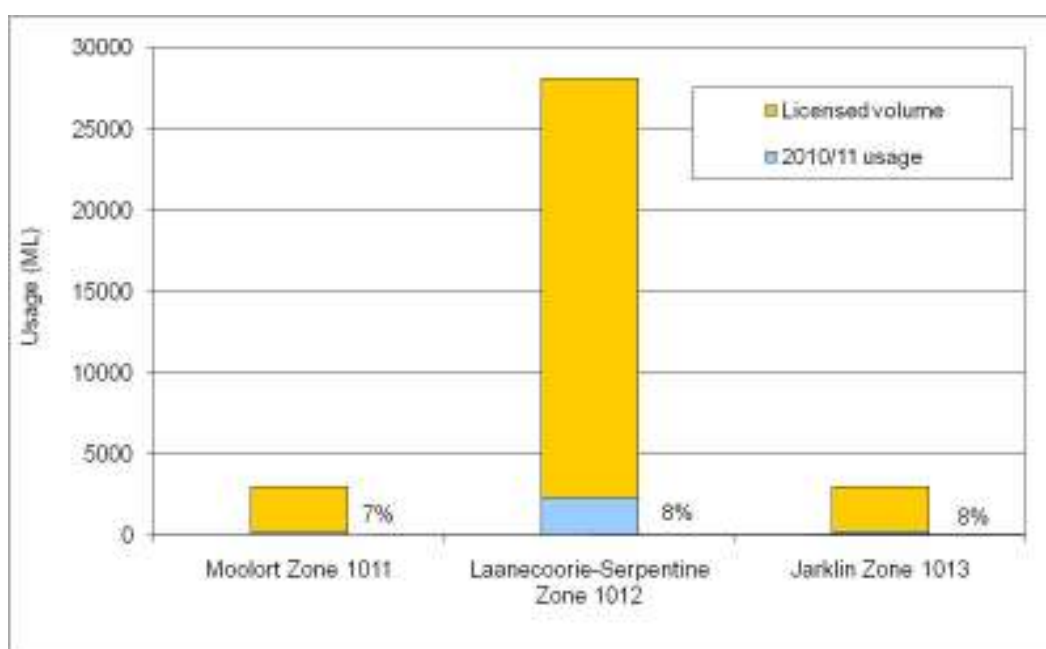


Figure 4 Licence volume and use per zone

All licensed bores are metered. Meters were read by Goulburn-Murray Water in January/February and May/June in the 2010/11 season.

2.4 Transfer of groundwater entitlement

The temporary and permanent transfer of groundwater entitlement is permitted in the Mid-Loddon GMA subject to prescribed conditions set out in the Rules.

The temporary and permanent transfer of entitlement is permitted between zones provided that the entitlement in the Laanecoorie-Serpentine zone does not exceed 28,000 ML/yr and the entitlement in the Jarklin Zone is not less than 3,000 ML/yr.

In the 2010/2011 season, one temporary transfer of 10 ML occurred within the Laanecoorie-Serpentine Zone 1012. There was no temporary transfer of groundwater entitlement between zones.

There were two permanent transfers of groundwater entitlement in 2010/11 totalling 226 ML; 104 ML was permanently traded within the Moolort Zone 1011 and 122 ML transferred within the Jarklin Zone 1013.

Compared to previous years, there was a marked reduction in temporary transfers in the 2010/11 season as shown in Figure 5. This is not surprising given the reduced demand on groundwater because of the flooding that occurred in the catchment.

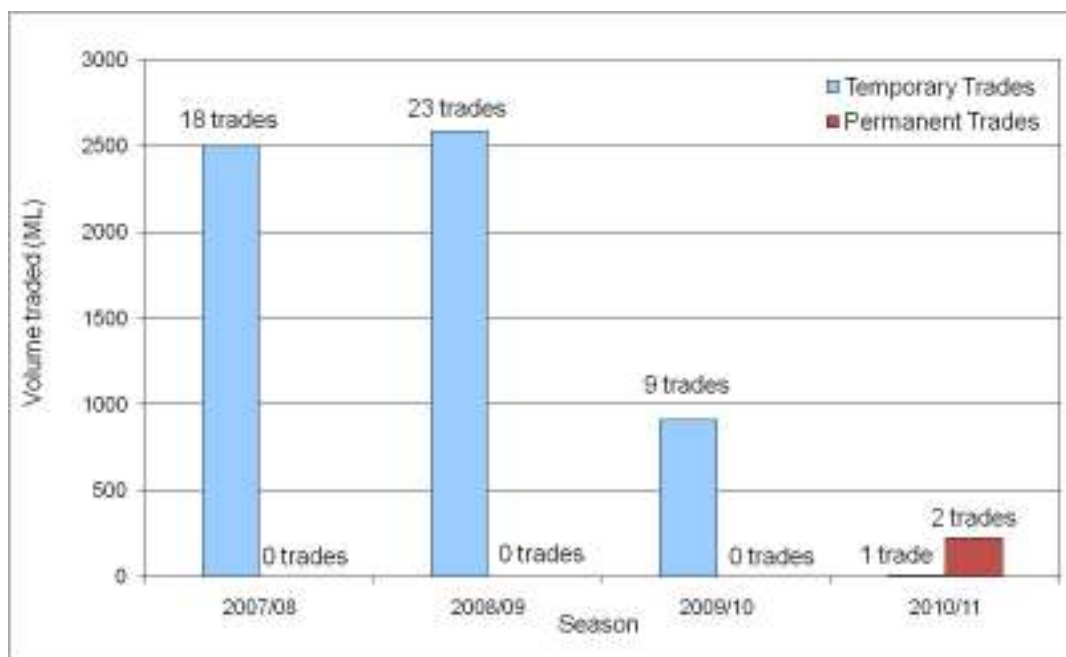


Figure 5 Temporary transfer of entitlement

Licence holders are reminded to ensure that they have written approval from Goulburn-Murray Water before extracting any groundwater in excess of their licence entitlement.

2.5 Carryover

Carryover provides licence holders with greater flexibility to manage their licence entitlement. Licence holders that do not use all their allocation may carryover up to a maximum of 30% of their licence volume for use in the next season.

The sum of individual licence holder carryover volumes at the end of season 2010/11 is 10,052 ML, which is 29.5% of the total licence volume, shown in Figure 6.

Recent changes to the *Water Act* 1989 mean there is no longer a requirement to apply to Goulburn-Murray Water before using carryover unless the conditions on the licence restrict the use of carryover (refer chapter 5.2.1). For example the maximum daily extraction rate on the licence may need to be increased in order to extract full entitlement and carryover.

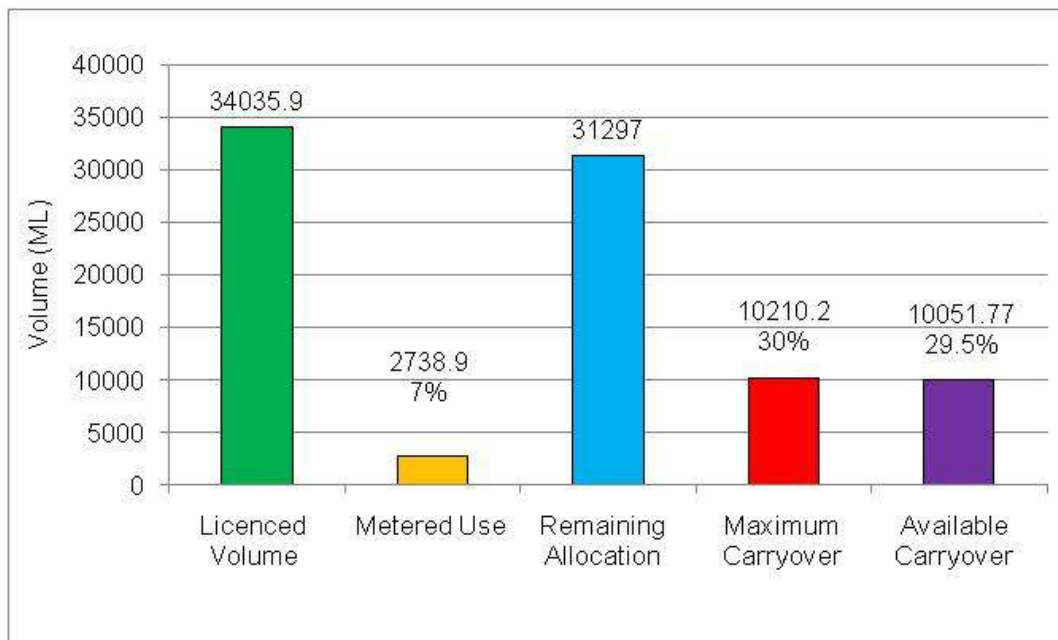


Figure 6 Carryover available for 2011/12

3 Monitoring groundwater levels

The Mid-Loddon GMA has an extensive network of groundwater monitoring bores that are monitored and maintained by the Department of Sustainability and Environment.

Groundwater levels are measured quarterly in February, May, August and November in over 100 State observation bores by the Department of Sustainability and Environment. Goulburn-Murray Water undertakes additional monitoring in key State observation bores identified in the Rules to capture monthly measurements.

Groundwater levels have risen across the Mid-Loddon GMA in 2010/11 in response to high recharge and reduced extractions (Figure 7). It should be noted that levels are still below those observed prior to the drought.

Plots of the change in groundwater levels over time from these key bores are presented in Appendix A. Goulburn-Murray Water also plots the change in groundwater level over time and posts it on its website <http://www.g-mwater.com.au/> for the benefit of customers.

The plots indicate that in the Moolort Zone 1011 groundwater recovery levels have risen dramatically by around 10 m around Locks Lane and around 2 m around the Baringhup-Havelock Road site since June 2010.

In the Laanecoorie-Serpentine Zone 1012 groundwater recovery levels have risen by around 5 m.

In the Jarklin Zone 1013 groundwater levels have risen by around 3 m.

Changes in the annual groundwater recovery levels represent a change in groundwater storage in the aquifer. Groundwater levels were declining from the mid 1990s to 2010 largely in response to below average rainfall. High rainfall and flooding in 2010/11 have resulted in rising groundwater levels.



Figure 7 Rainfall at Bridgewater

3.1 Aquifer margin

Additional monitoring has been undertaken along an east-west section of Rothackers Road to assess groundwater level response at the margins of the Mid-Loddon GMA. Groundwater levels from bores 36415, 36416 and 36458 show little seasonal variation suggesting they are not well connected to the Deep Lead (Appendix A).

3.2 North-south section

Groundwater levels from key bores along a north-south section are monitored monthly to assess aquifer response against historical observations. Figure 8 illustrates that the system response is consistent over time.

Increased drawdown in the Jarklin Zone is in response to increased extraction which has potential to improve drainage from the watertable aquifer.

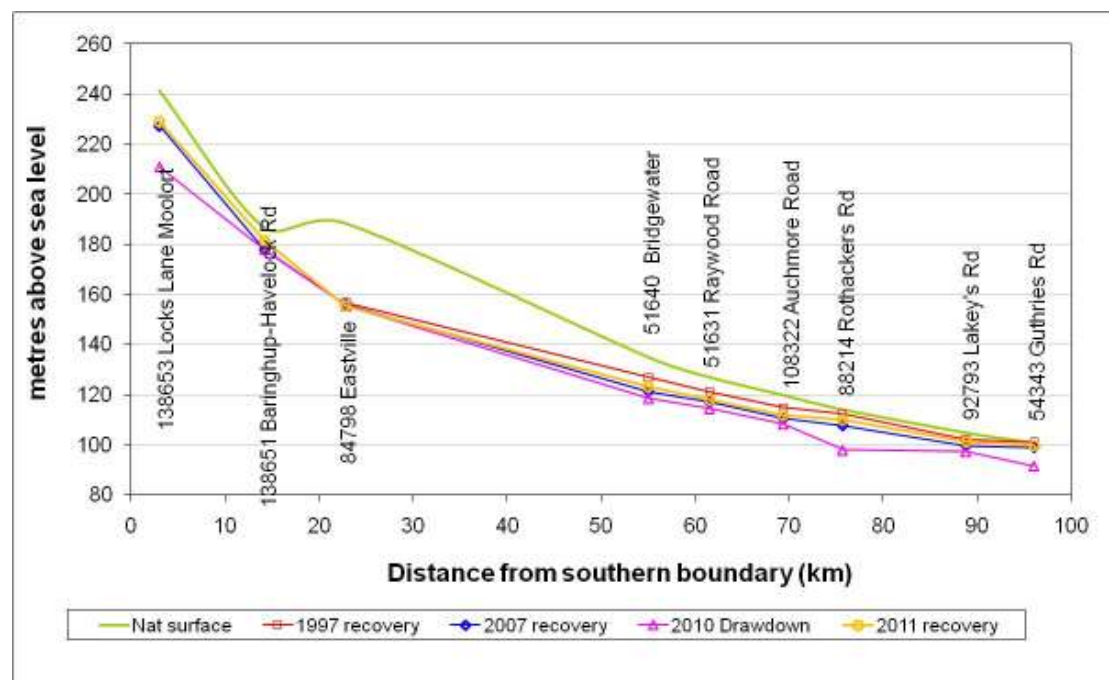


Figure 8 Groundwater level down valley from Moolort

4 Monitoring groundwater quality

4.1 State observation bores

State observation bores 88214 and 53343 are to be sampled and sent for analysis at a NATA accredited laboratory (Table 2).

Bore 54343 was not sampled as it is reported that it is not functioning correctly. Nested shallow bore 54342 was sampled, however it is believed that the bore may be blocked and the sample may not be representative of actual aquifer conditions.

Bores 88238 and 88239 are nested with bore 88214 and were also sampled to assist with assessing the interaction between aquifers.

Continued monitoring of groundwater chemistry over time will enable trends to be identified.

Table 2 Groundwater quality in Mid-Loddon GMA

Bore	Zone	Formation	Electrical Conductivity @ 25°C (µS/cm)
54342	Jarklin	Shepparton Formation	942
54343	Jarklin	Calivil Formation	N/A
88214	Laanecoorie-Serpentine	Calivil Formation	2730
88238	Laanecoorie-Serpentine	Shepparton Formation	6280
88239	Laanecoorie-Serpentine	Shepparton Formation	2850

4.2 Private bores

Goulburn-Murray Water provided sample bottles to all groundwater licence holders, and any stock and domestic users upon request, and measured groundwater salinity of returned samples. Twenty groundwater samples were returned for analysis.

Groundwater salinity was found to range between 200 and 8,500 EC (Figure 8). This is within expected ranges and shows that groundwater salinity increases to the north and can be high in the Bulabul catchment.

There is insufficient information to assess groundwater salinity trends.

A greater return rate would further improve the spatial understanding of groundwater salinity. Continued return of samples will enable trends in groundwater quality to be observed.

Groundwater users are strongly encouraged to return samples so that they can monitor any change in groundwater salinity from their bore each year.

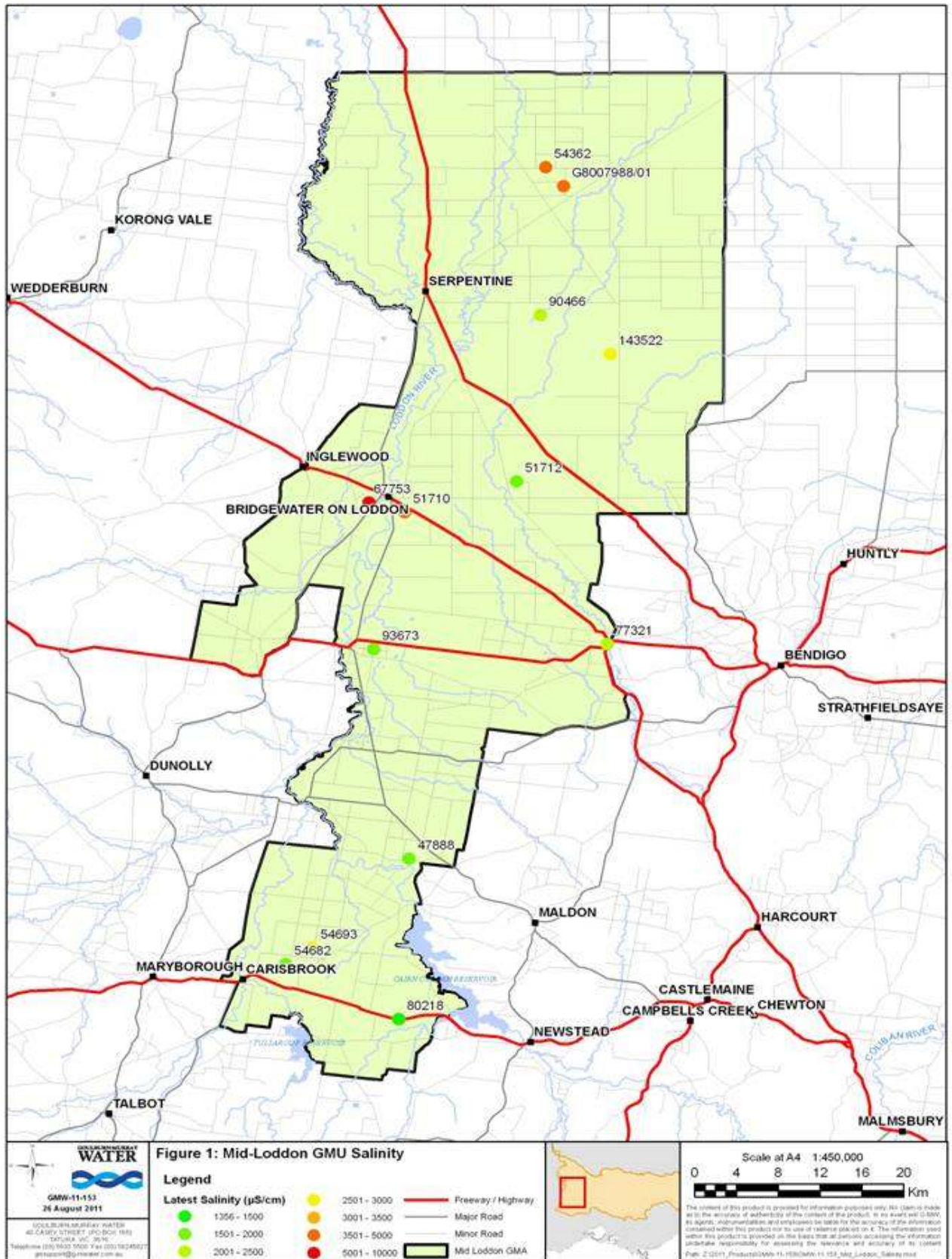


Figure 8 Groundwater salinity

5 Review of local management rules

Goulburn-Murray Water met with the Mid-Loddon GMA Groundwater Reference Committee on 31 August 2011 to review the Rules and consider the need for any amendments.

The ability to amend the Rules to reflect changes in policy or an increased technical understanding of the groundwater systems is one of the key strengths of the Rules. At the Groundwater Reference Committee meeting the following items were discussed:

- Resource status
- Technical investigations
- Policy development
- Any need to amend Rules

5.1 Technical investigations

5.1.1 Aquifer mapping

Goulburn-Murray Water commissioned a project to map the aquifer systems in the Loddon and Campaspe catchments as part of a resource appraisal in the upper Campaspe catchment (SKM, 2011a). The project is now complete and builds on work completed in the Mid-Loddon GMA to better define the extent of the aquifer systems.

5.1.2 Groundwater interaction with surface water

Goulburn-Murray Water continues to develop its relationship with the University of Melbourne through projects undertaken by students that seek to better describe the interaction between groundwater and surface water.

Tim Plain, an honours student, undertook measurements of seepage rates from the Loddon River to determine the relationship between the surface water and the underlying aquifer system.

Plain (2010) found that surface water leaks to the groundwater system from the Serpentine Creek at Dalziels Road and Loddon River at Boort-Hurstwood Road. Seepage measurements during 2010 suggest that the rate of flux is between 0.007 and 0.079 cm/d. The loss from the Loddon River between Laanecoorie Weir and Borung-Hurstwood Road was calculated to be between 150 and 200 ML/yr. The loss from Serpentine Creek from Serpentine to Dalziels Road was calculated to be between 6 and 8 ML/yr.

5.1.3 Groundwater dependent ecosystems

Goulburn-Murray Water is currently undertaking investigations to identify groundwater dependent ecosystems (GDE) in the Loddon and Campaspe catchments. GDEs are those ecosystems that utilise groundwater to meet some or all of their water needs.

Currently there is limited information on where GDEs exist or their water requirements in the Mid-Loddon GMA. This project will address some of the knowledge gaps and inform the review of the Rules.

5.1.4 Moolort Zone water balance

A groundwater management plan is being developed for the Loddon Highlands Water Supply Protection Area. To support the plan, a numerical groundwater model has been developed (SKM, 2011b). The model boundary has been extended to capture the extent of the basalt aquifer in the upper Loddon catchment, which included the Moolort Zone of the Mid-Loddon GMA.

The water balance found that the groundwater level would remain relatively steady for extraction of licence entitlement under average climatic conditions (Figure 9).

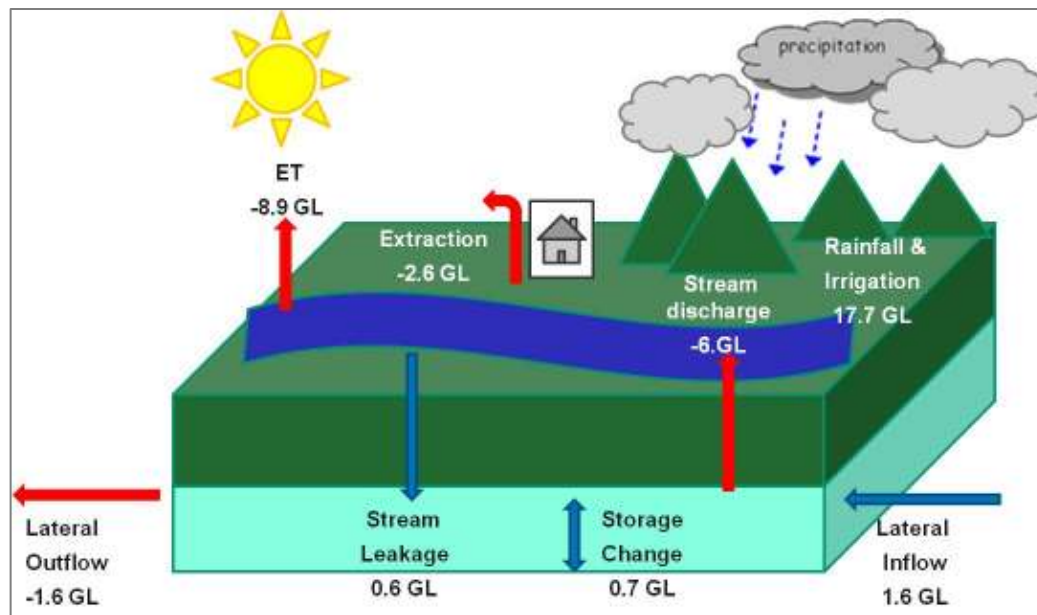


Figure 9 Water balance for Moolort Zone under average climatic conditions

5.1.5 Installation of new monitoring bores

G-MW has recently installed eight new monitoring bores in the Mid-Loddon GMA and surrounds as part of the Department of Sustainability and Environment's State Observation Bore Network Refurbishment Program (Table 3).

This complements the existing network by providing additional information on the groundwater interaction with surface water and groundwater quality and aquifer response to pumping in the Jarklin Zone.

Table 3 New State observation bores installed

BORE ID	Bore Location	Screened Interval (m)	Screened Formation
WRK061075	Marshall Rd, Laanecoorie	8.3 - 11.2	Shepparton Formation
WRK059854	Dingee Serpentine Road, Yallook	79.2 - 81.9	Renmark Group
WRK059855		29.3 - 32.2	Shepparton Formation
WRK060332		59.2 - 62.2	Calivil Formation
WRK060333		16.4 - 17.1	Shepparton Formation
WRK059856	Rays Rd, Calivil	71.9 - 74.6	Calivil Formation
WRK059857		47.1 - 50.1	Shepparton Formation
WRK060334		18.9 - 20.0	Shepparton Formation

Figure 10 shows three new nested State observation bores along Rays Road, Calivil. The bores are screened in aquifers at different depths so that the interaction between the aquifers can be assessed.



Figure 10 New observation bores along Rays Road, Calivil

These bores will be monitored on a monthly basis for a period of two years, after which, Department of Sustainability and Environment and G-MW will assess the future frequency of monitoring.

5.2 Policy development

5.2.1 Carryover

An amendment to the Victorian Water Act 1989 in 2010 allows the Minister for Water to make a declaration for licence holders in a particular management area to use carryover volumes subject to the conditions outlined in the declaration.

5.2.2 Murray Darling Basin Plan

The impacts of the impending Murray Darling Basin Plan are not yet well known.

5.2.3 Dairy shed water licence

The Department of Sustainability and Environment Dairy Shed Water Licence Transition Program was undertaken to ensure water used in the dairy shed, such as water for washing yards, milking equipment, platforms and other plant is licensed. This includes water from streams, catchment run-off, groundwater and other sources.

There was an amnesty period to licence the water used in the dairy shed. All applications have now been processed and a total of three licences were issued totalling 22 ML in the Mid Loddon GMA.

5.2.4 Secure Allocation Entitlement Framework

The Department of Sustainability are undertaking a project to called SAFE (Secure Allocation Entitlement Framework) which is considering management boundaries across the State. Any change to the Mid-Loddon GMA boundary should consider the outcomes from this project.

5.3 Any need to amend the Rules

The Groundwater Reference Committee noted that there may be some opportunity for improvement in the Rules, but there was a consensus that there is no need to adjust the Rules at present. Rather, these opportunities should be investigated as part of the comprehensive programmed review of the Rules in 2014.

6 References

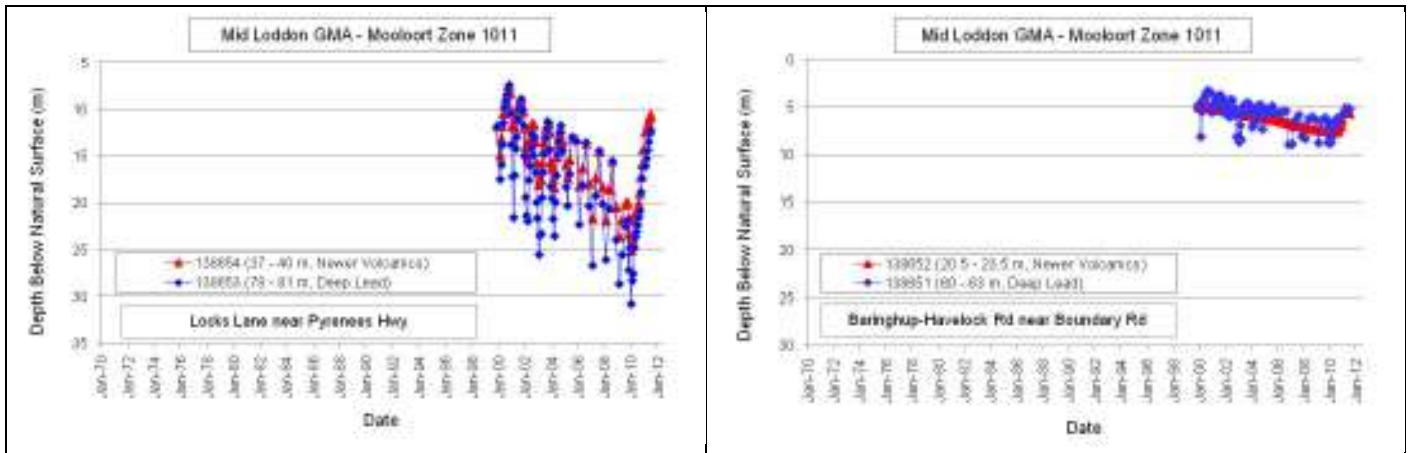
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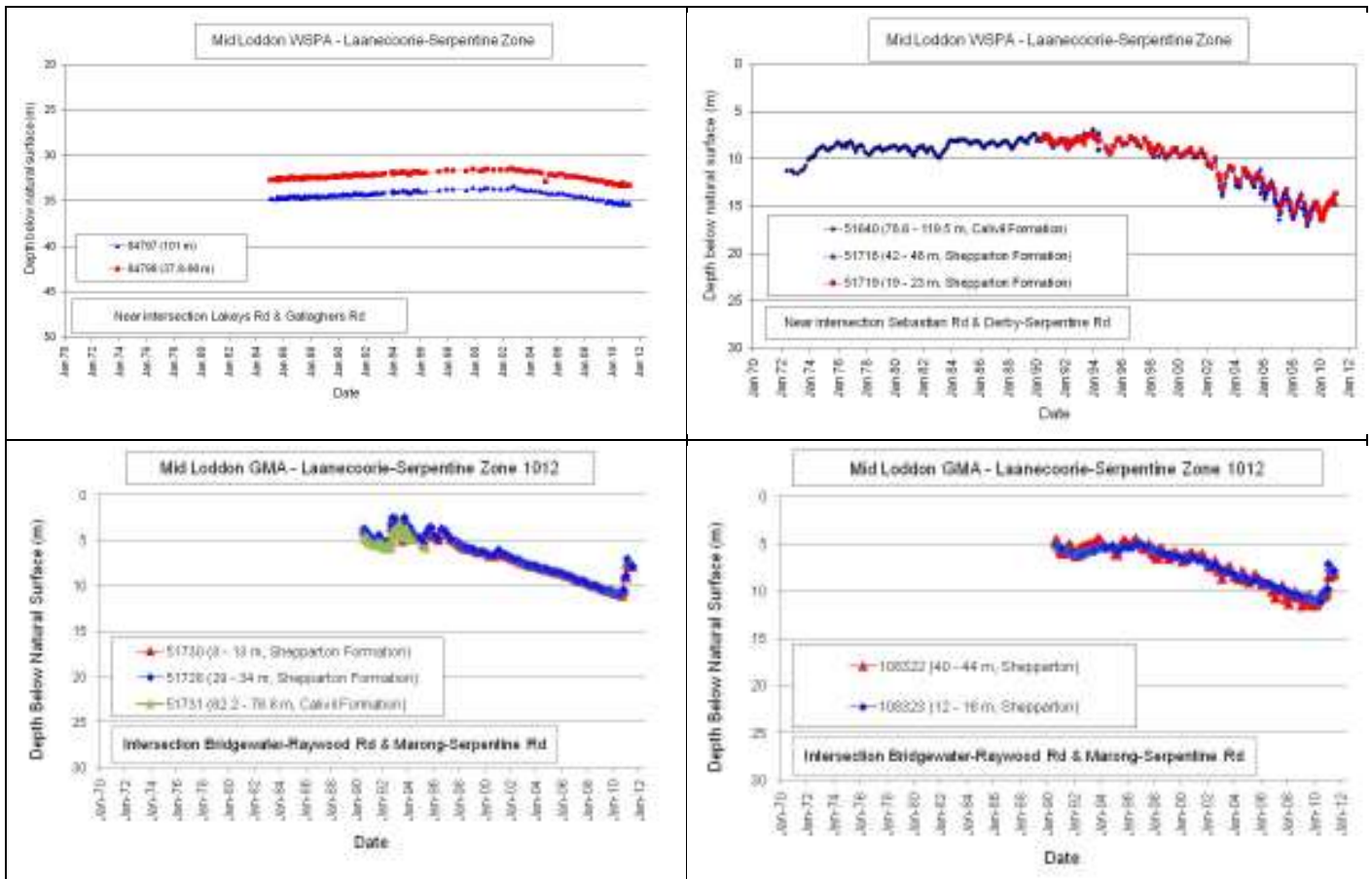
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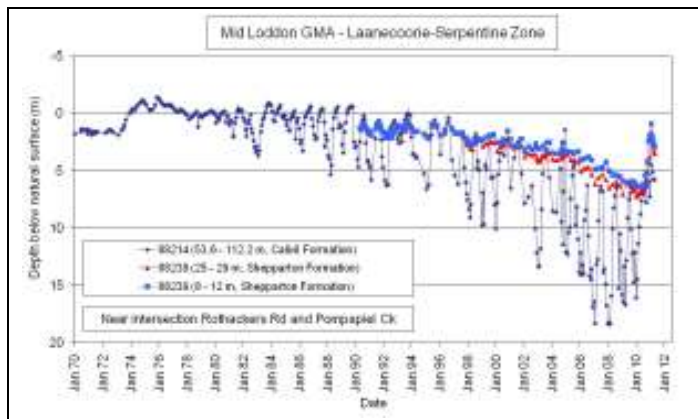
Appendix A

Moolort Zone 1011

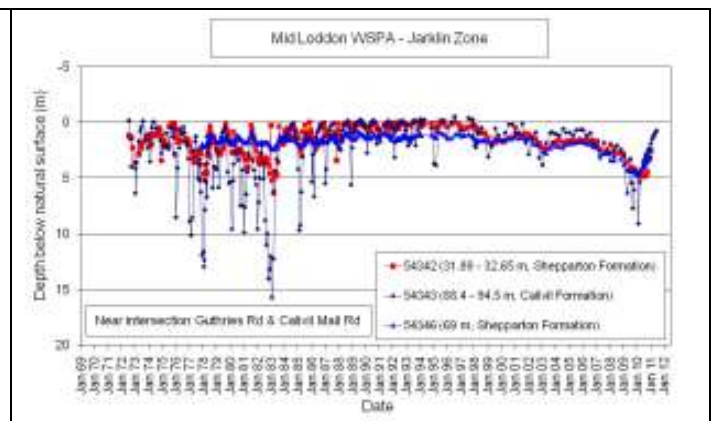
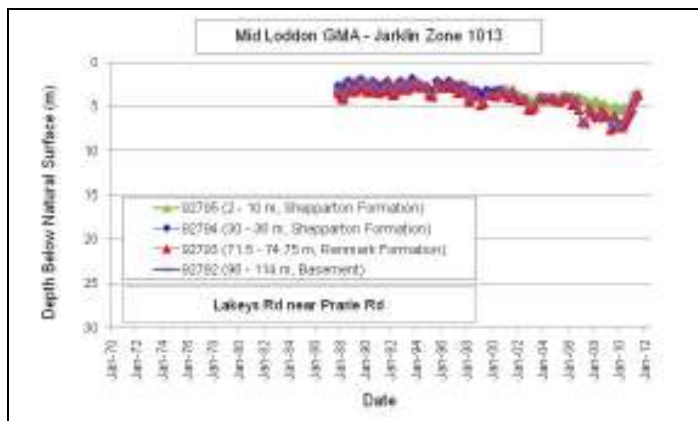


Laanecoorie-Serpentine Zone 1012





Jarklin Zone 1013



Shallow monitoring bores along Rothackers Road

