



**Murrayville  
Groundwater Management Area  
Local Management Plan**

**July 2017**



## ENDORSEMENT

This groundwater Local Management Plan (LMP) has been developed for the Murrayville Groundwater Management Area (GMA). It provides the framework to manage groundwater resources in the Murrayville GMA and provides guidance and information to GWMWater's customers relating to the take and use of groundwater.

The development of the LMP has been guided by the Murrayville Local Management Plan Advisory Committee and consultation with customers and key stakeholders. The new plan replaces the Murrayville Area Groundwater Management Plan 2001 and will ensure that groundwater is managed to the current Victorian government policy.

The LMP recognises the values of the groundwater and the non-renewable nature of the resource, and provides clear rules for its use to ensure equitability and longevity.

GWMWater will continue to work with our customers, local communities and other stakeholders to ensure that the LMP is reviewed and updated where necessary to ensure it is consistent with the groundwater management policy framework and as understanding of the groundwater resources of the Murrayville area improves.

Signed

**Peter Vogel**  
Chairman

**Mark Williams**  
Managing Director

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### **Acknowledgements**

GWMWater would like to extend its appreciation to the Murrayville Local Management Plan Advisory Committee, the Mallee Catchment Management Authority, Department of Environment, Land, Water and Planning, the First Peoples of the Millewa-Mallee Aboriginal Corporation and the Murray Lower Darling Rivers Indigenous Nations for their input into the development of the Murrayville Local Management Plan (LMP) by way of input during LMP preparation, or comment during the consultation process. The feedback on groundwater resource management, values and issues has been invaluable.

The LMP recognises and acknowledges that the Traditional Owners have a deep connection to their lands and water. The LMP identifies the need to develop a greater understanding of the cultural objectives and values relating to groundwater in the Murrayville area during the implementation of the LMP.

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## 1. Glossary

<b>Term/Acronym</b>	<b>Description</b>
Act	Victorian <i>Water Act 1989</i>
Aquifer	A saturated geological material that when drilled into can yield useable quantity of water (groundwater).
Basin Plan	Basin Plan 2012, developed as a requirement of the Commonwealth <i>Water Act 2007</i> to manage the Murray-Darling Basin's water for the benefit of its users and the environment.
Border Groundwaters Agreement	An agreement entered into by the Governments of South Australia and Victoria to manage the shared groundwater resource within the Border Designated Area, a 40 kilometre wide strip centred on the border, extending its full length and divided into 22 zones (11 in each state).
Confined Aquifer	An aquifer that is bound above and below by an impermeable confining bed. The pressure in confined aquifers is usually greater than atmospheric pressure, resulting in water levels in bores rising above the top of the aquifer.
DELWP	Department of Environment, Land, Water and Planning
Entitlement	A right to take/use/extract water that may be limited by conditions (A take and use licence is an entitlement). Entitlement volume is the licence volume.
GMA	Groundwater Management Area
GWMWater	Grampians Wimmera Mallee Water Corporation (trading as GWMWater)
Licence	Licence issued to take and use groundwater under section 51 of the <i>Water Act 1989</i> .
Licence volume	The volume in megalitres that may be taken under a take and use licence.
PCV	Permissible Consumptive Volume. The volume of groundwater that the Minister for Water has declared may be extracted from a defined area in a season
Recharge	The process of replenishment of an aquifer due to infiltration from rainfall for from surface water. Recharge may also occur by leakage from overlying or underlying aquifer systems.
Residual drawdown	The difference in groundwater level between pre-pumping and post pumping (recovered) conditions.
Season	Period of 12 calendar months beginning on 1 July in any year and ending on 30 June in the following year.
Seasonal drawdown	The difference in groundwater level between pumping and non-pumping conditions during an irrigation season.
SDL	Sustainable Diversion Limit. Limit on the quantity of water that can be taken from the Murray Darling Basin water resources.
Trade	The transfer of a groundwater licence. Trade may be permanent or temporary.
WSPA	Water Supply Protection Area
Zone	A defined part of the groundwater management area

## 2. Introduction

The Murrayville Groundwater Management Area (GMA) is located in the Wimmera-Mallee Groundwater Catchment in northwest Victoria (Figure 1) and is part of the Murray Darling Basin (Figure 2). It is within the Wimmera Mallee (groundwater) water resource plan area under the Murray Darling Basin Plan (Basin Plan), thus management must be consistent with the Basin Plan <http://www.mdba.gov.au/basin-plan-roll-out/water-resource-plans> (last access July 2016)

The management area (Figure 3) covers 1,916 km<sup>2</sup>. It is centred on the town of Murrayville and abuts the South Australian border. Groundwater from the Upper Mid-Tertiary Limestone Aquifer (Murray Group Limestone) is the sole source of water for domestic and stock, town supplies and irrigation in the region and is highly valued.

This local management plan (LMP) replaces the statutory Murrayville Area Groundwater Plan 2001, which was revoked by the Minister for Water on 13 July 2017. GWMWater is responsible for administering and enforcing the Murrayville GMA LMP.

As illustrated in Figure 1, part of the Murrayville GMA falls within the Border Designated Area (SA/Vic Border Zones 10B and 11B) which is jointly managed by the South Australian and Victorian governments. Management arrangements for these zones are documented at <http://www.environment.sa.gov.au/managing-natural-resources/water-use/water-resources/border-groundwaters-agreement> (last access July 2016).

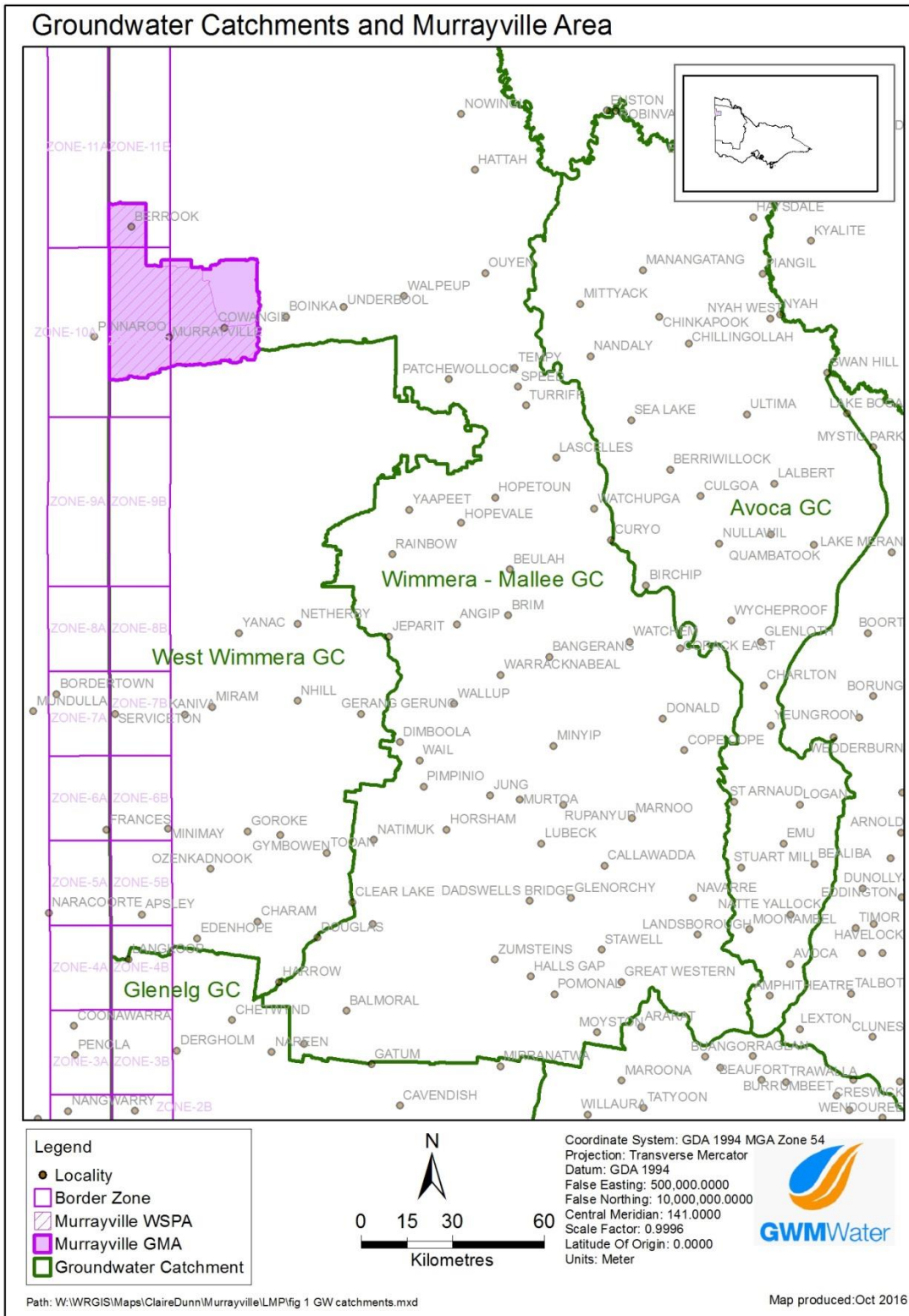
In the event of any conflict that arises from the management directions of this plan over the areas bounded by the Border Designated Area (also known as the Border Zone), the *Groundwater (Border Agreement) Act 1985* is the determining document.

### 2.1 Development of groundwater resources

The Murrayville area was first settled in 1909. The first bore was drilled in 1929 providing the township with a reliable water supply. In the early 1950's deep well pumps were installed on several properties allowing irrigation enterprises (small dairies) to establish, most of these ceased operation in the late 1960's. In the early 1990's irrigation expanded considerably with over 500 hectares of potatoes being grown under centre pivot irrigation and a smaller area of olives being established under drip irrigation. The original groundwater management plan for the Murrayville WSPA was approved in 2001, with the Permissible Consumptive Volume of 10,833 ML/year which allowed for an additional 6,410 ML to be licensed. The volume of water extracted in 1999 was approximately 2,300 ML for irrigation purposes and over the past 15 years the area of land under irrigation has expanded with the increase in licenced entitlement. The new developments have followed the requirements of the Mallee Irrigation Development Guidelines to manage any environmental impacts. Extraction of groundwater peaked at 6,600 ML in 2008 and now averages about 5,000 ML per year since. Groundwater levels have

generally responded as expected to the intensity of use, particularly where irrigation is concentrated (refer to 4.1 Characteristics of the Murray Group Limestone).

**Figure 1:** Murrayville GMA location within GWMWater’s area of operation.



**Figure 2: Murray Darling Basin Water Resource Plan Areas, the Border Designated Area and Murrayville Groundwater Management Area (GMA)**

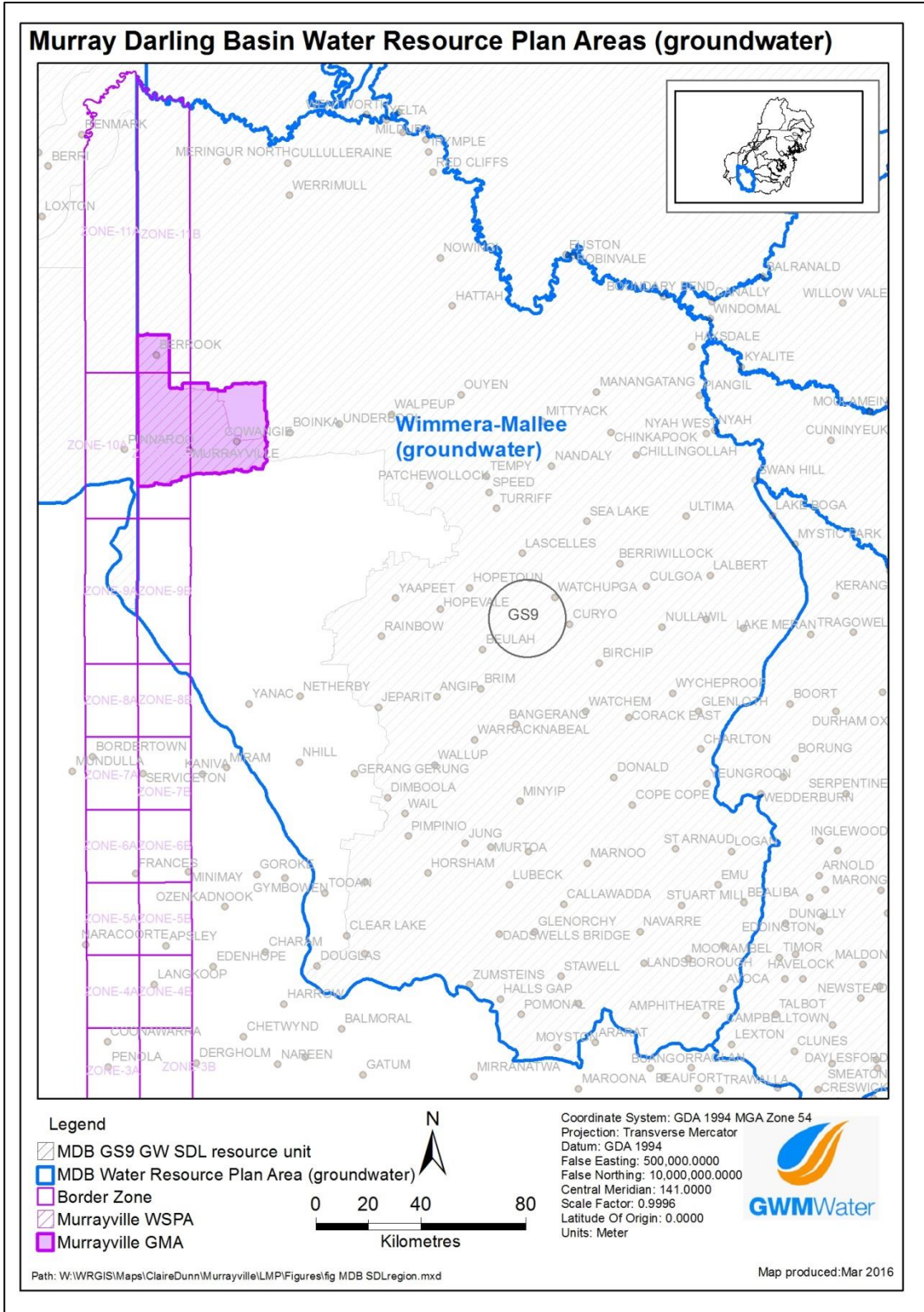
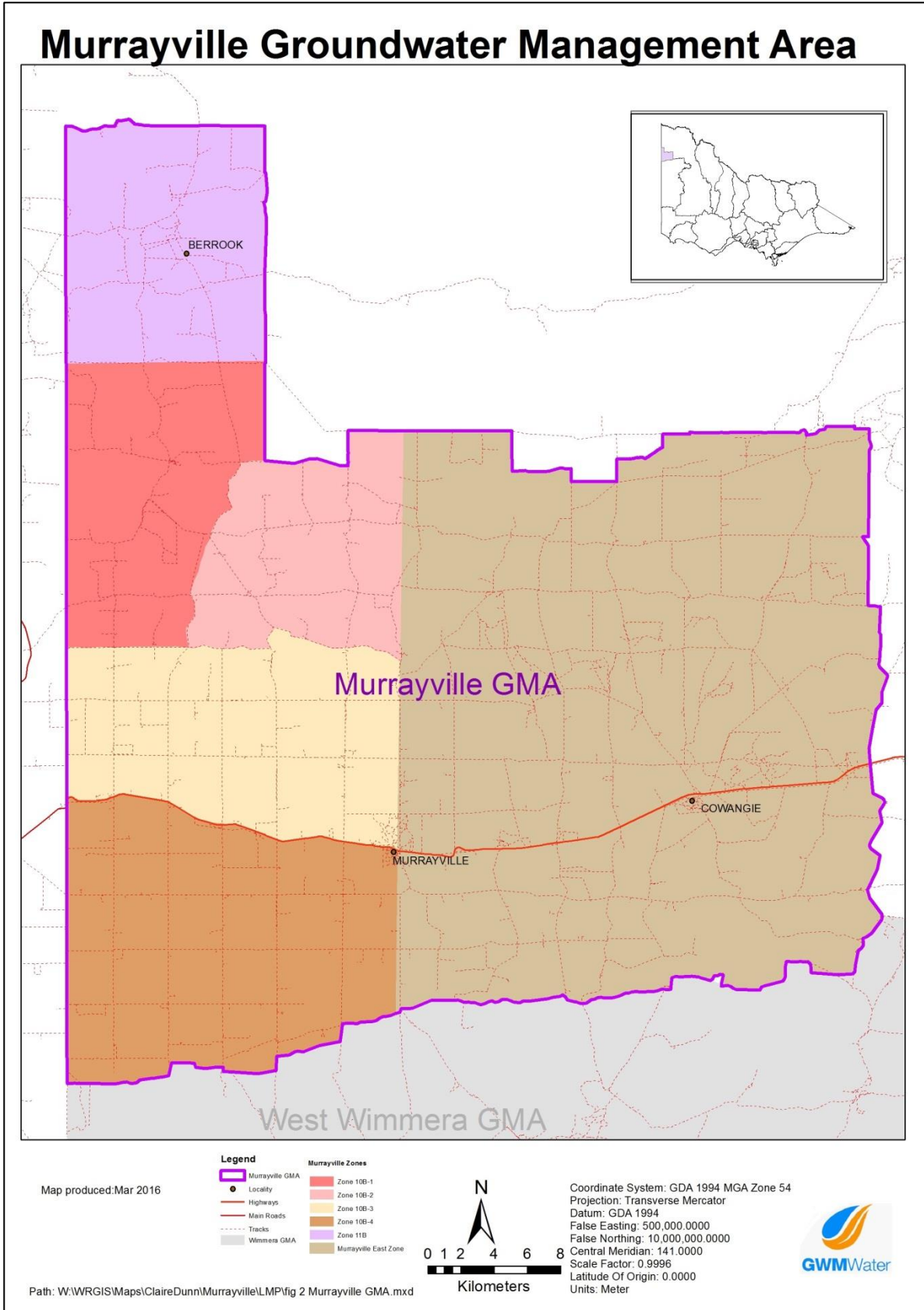


Figure 3: Murrayville Groundwater Management Area (GMA)



### 3. Management objectives

The key objective of the Murrayville LMP is to ensure the equitable sharing of available water between licensed users, while protecting the environment and acknowledging its non-renewable nature ensuring, as much as practicable, the long-term sustainability of the water resource.

GWMWater and the local advisory committee will continue discussions with Traditional Owners to understand and identify cultural objectives and values relating to groundwater in the Murrayville GMA. Appropriate amendments will be made to the local management plan as an outcome of these discussions.

Furthermore the LMP aims to:

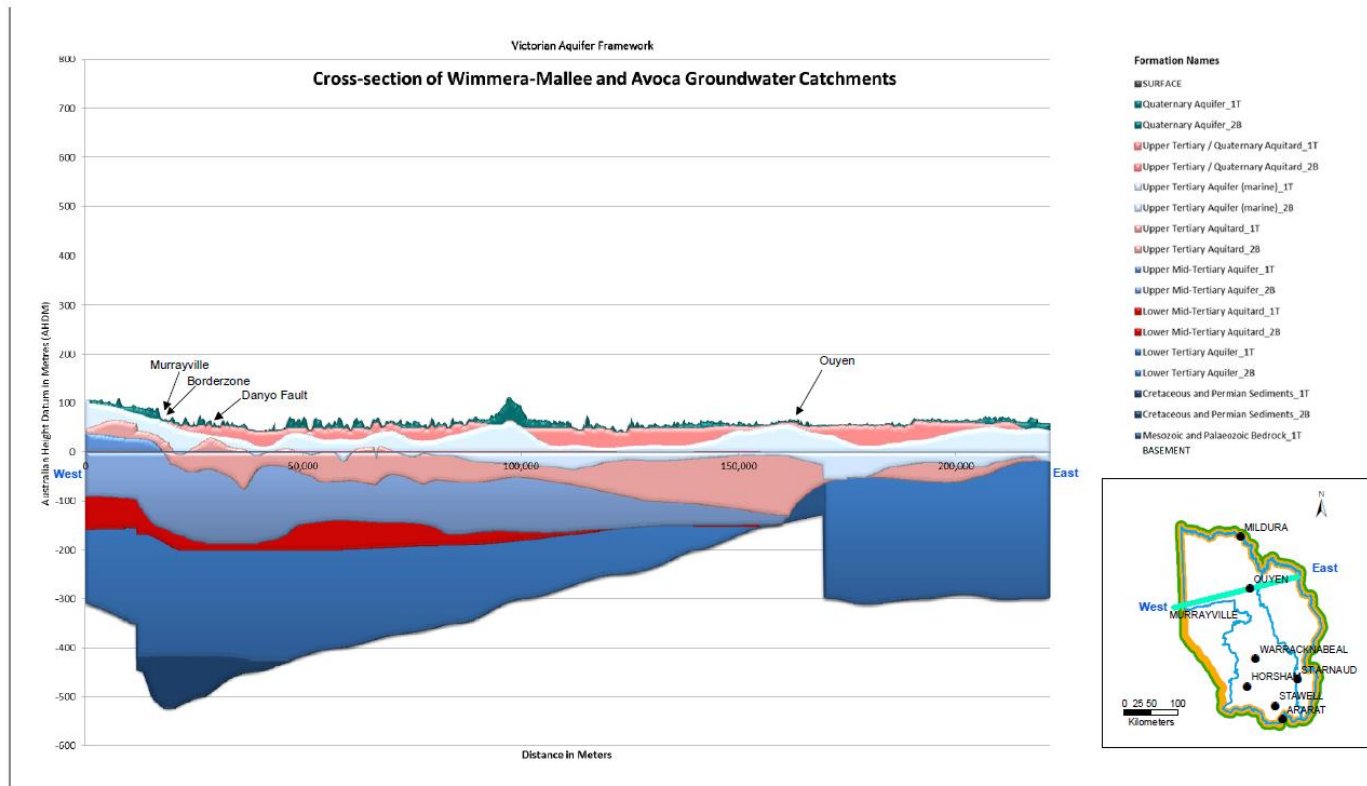
- Manage groundwater resources with an adaptive local management plan;
- Provide a quantity of water for irrigation purposes whilst preserving the integrity of the resource for future essential purposes of domestic, stock and urban water supply;
- Encourage and facilitate water trading and provide more flexibility for current and prospective licence holders;
- Manage the rate of decline in potentiometric water level allowing a maximum residual drawdown of 0.65 metres per year or 6.5 metres in the ten years to 2026;
- Comply with the Murray Darling Basin Plan;
- Be consistent with the Border Groundwaters Agreement; and
- Reflect current State Government groundwater policy.

## 4. Water system

The Murrayville area consists of five main hydrogeological units (aquifers and aquitards or confining layers) as identified and described in the Victorian Aquifer Framework at <http://www.depi.vic.gov.au/water/groundwater/understanding-groundwater> (last access March 2016). As represented in Figure 4, the units in order of increasing depth below the surface are:

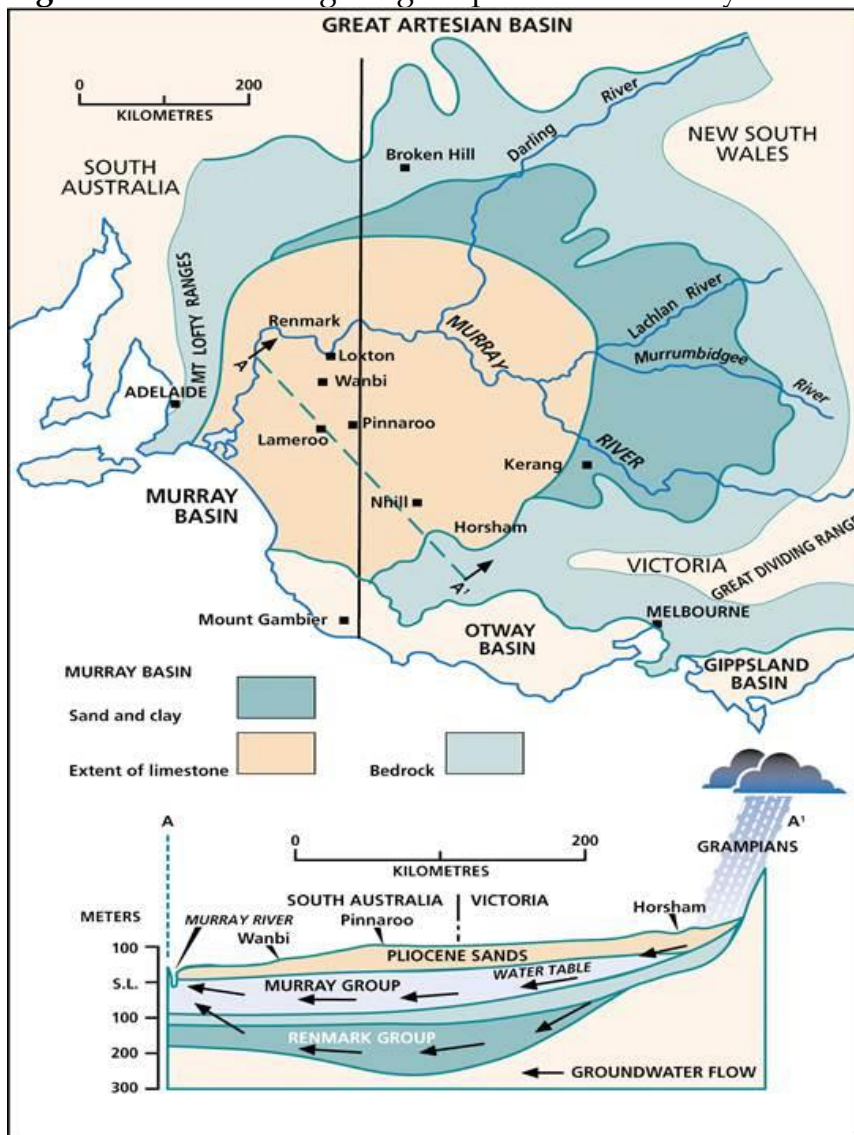
- The **Upper Tertiary (Parilla) Aquifer**; generally an unconfined aquifer, unsaturated in the western parts of the GMA. The unit comprises of unconsolidated to weakly cemented fine to coarse sand and is generally 50m in thickness. The groundwater flow is generally towards the north. Groundwater salinity ranges between 1,000 and 35,000 mg/L TDS, generally increasing from the west to the east.
- The **Upper Tertiary Aquitard**; consisting of the Bookpurnong Beds, commonly occurs as a low permeability unit between the Upper Tertiary (Parilla) Sands aquifer and the underlying Upper Mid-Tertiary Limestone Aquifer. It comprises poorly consolidated plastic silts, clays and sands up to 30m in thickness.
- The **Upper Mid-Tertiary Limestone Aquifer**; consists of the Murray Group Limestone in the Murray Basin. Generally occurs as a confined aquifer in the Murrayville GMA. It consists of consolidated, fine to coarse bioclastic limestone. The thickness of the unit is up to 130m. Within the GMA, the Murray Group Limestone Aquifer is found between depths of 70m and 200m. Groundwater gradients are low (0.0001 m/m) in the north westerly direction. Salinity of groundwater is generally 600 to 1,500 mg/L TDS, decreasing in quality from the west to the north east. This is the most extensively used aquifer.
- The **Lower Tertiary Aquitard**, consists of the Ettrick Formation and occurs between the Murray Group Limestone and the underlying Tertiary Confined Sand Aquifer. The unit is approximately 15 m in thickness and comprises a glauconitic marl and clay.
- The **Tertiary Confined Sand Aquifer** consists of the Renmark Group. It is a confined aquifer underlying the Lower Tertiary Aquitard. The unit comprises unconsolidated sands, silts and clay around 150m in thickness. Groundwater gradients are low in the direction north-west and west. The salinity of groundwater ranges from 500 to 3,000 mg/L TDS.

**Figure 4:** Cross-section representation of hydrogeological units



The most extensively used aquifer is the Murray Group Limestone Aquifer. This unit is part of the Murray Basin aquifer sequence and the area covered by this aquifer is represented in Figure 5. There is also extensive use of this aquifer for irrigation purposes to the west of the Murrayville GMA in South Australia. To the east of the GMA the aquifer is primarily used for domestic and stock water supply since the quality is generally not suitable for irrigation purposes. National Parks are located to the north and south of the GMA hence the groundwater resource is not highly developed in these areas.

**Figure 5:** Generalised geological plan of the Murray Basin



Source: *Groundwater in the Murray Mallee*, 1991

For the purpose of the Murray Darling Basin Plan, the Murrayville GMA is considered to be part of the Wimmera-Mallee Sedimentary Plain SDL resource unit (GS9) which forms part of the Wimmera-Mallee (groundwater) water resource plan area (GW3) (refer to Figure 2). The Basin Plan describes this SDL resource unit as all groundwater from the land surface to 200

metres below the surface or 50 meters below the base of the Tertiary sediments, whichever is deeper.

#### **4.1 Characteristics of the Murray Group Limestone**

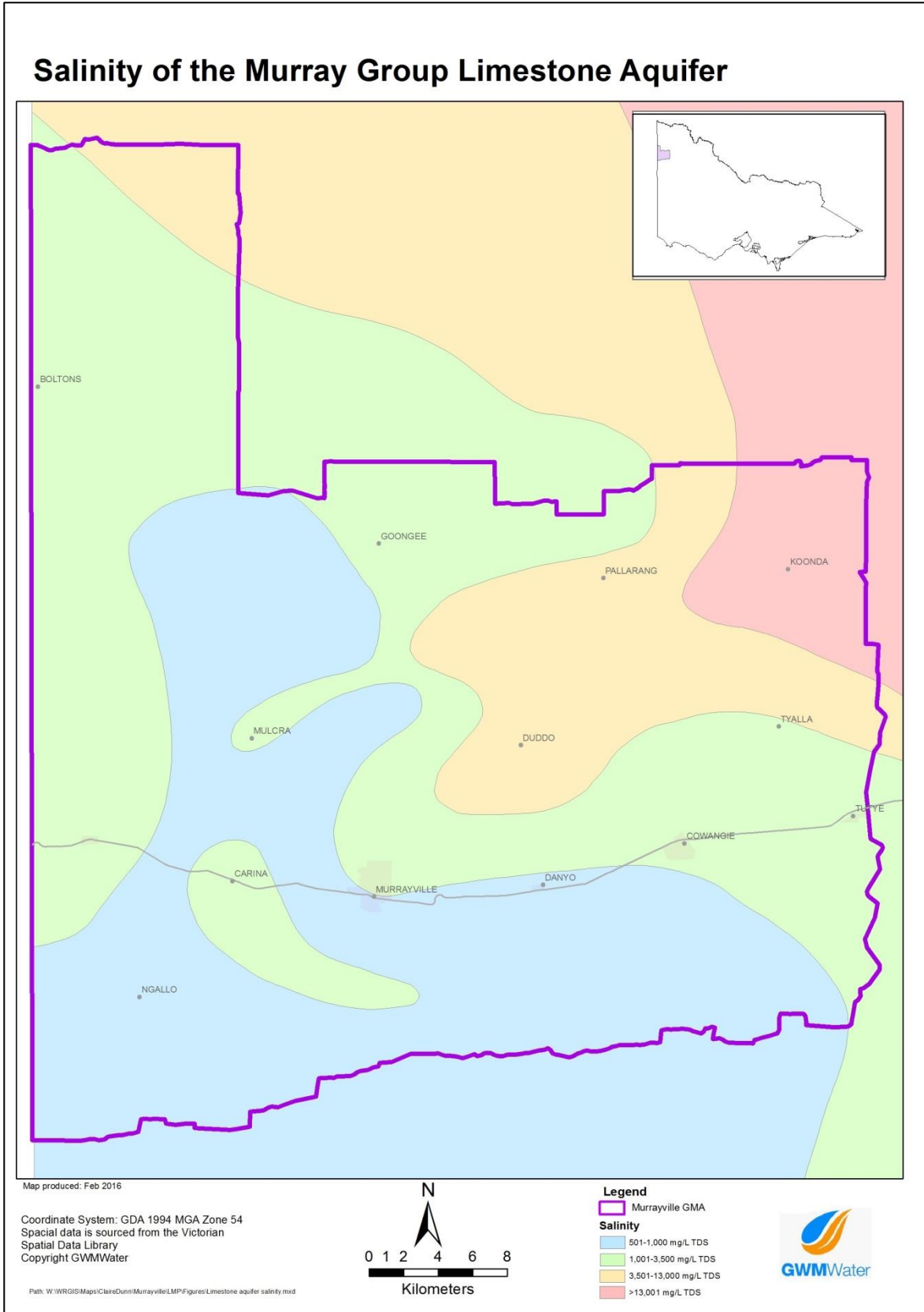
The Murray Group Limestone aquifer (MGL) is confined in the Murrayville area and is distant from the recharge areas of south western Victoria where rainfall is much higher. The vertical recharge and through-flow of the aquifer are considered very low and should be taken as zero (BGARC, 2010).

In the Murrayville GMA and neighbouring South Australian Mallee region there is a large area where the salinity is below 1,500 mg/L TDS and the water can be utilised for irrigation. (Refer to Figure 6). Research has shown that this good quality water was recharged through the deep sandy soils of the Big and Little Deserts around 20,000 years ago when the climate was much wetter than it is today (Leaney & Herczeg, 1999). Outside this area, much of the MGL yields water that has a salinity level unsuitable for irrigation. This is primarily because the slowly moving groundwater dissolves soluble salts as it passes through the aquifer.

Due to the confined nature of the MGL, sizable rates of short term seasonal drawdown of up to 14 m in water level can occur with moderate rates of extraction for irrigation. As the total volume of water in storage is significant (noting the aquifer is up to 100m in thickness) the MGL is being managed as a non-renewable resource and some amount of residual drawdown utilising a small proportion of groundwater storage is permitted.

Since irrigation commenced in both the Murrayville area, and across the border in South Australia, groundwater levels have declined where concentration of irrigation development is greatest, with a cone of depression observed centred on the Peebinga district of South Australia. The greatest drawdown occurred in Spring 2014 and was recorded as 8 m below the water levels observed in the late 1990s when large scale irrigation first commenced. This has also been observed in bores located adjacent to Peebinga, closer in proximity to irrigation activity in South Australia than in the Murrayville GMA. Away from the areas of concentrated activity the groundwater levels are relatively stable.

Figure 6: Groundwater salinity of the MGL



## 4.2 Groundwater dependent ecosystems

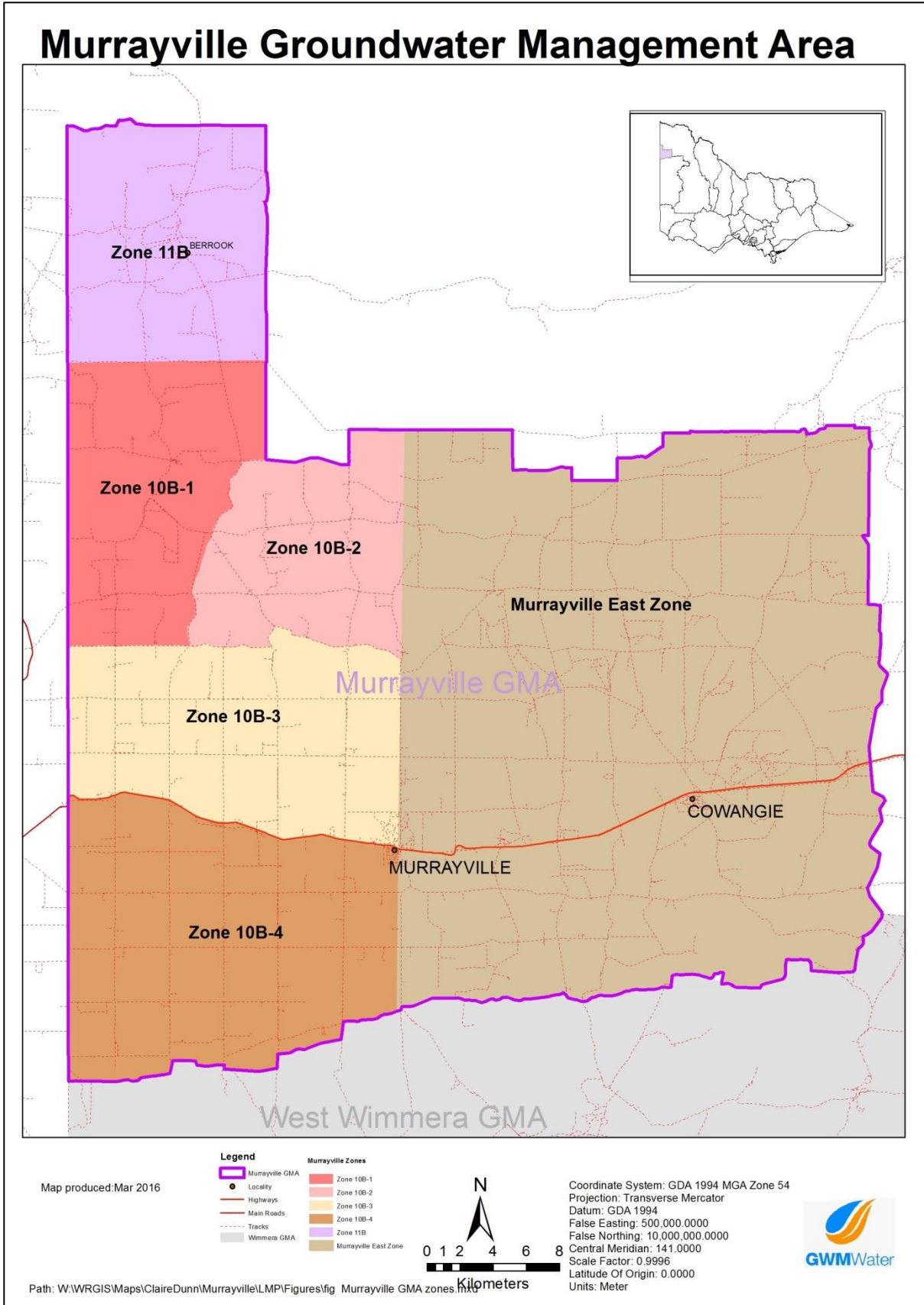
Groundwater dependent ecosystems (GDEs) are those ecological systems that utilise groundwater to meet some or all of their water requirements. The MGL and the deeper Tertiary Confined Sand aquifer are too deep below the surface to support any terrestrial vegetation or wetlands.

General information on GDEs is available through the National Atlas of Groundwater Dependent Ecosystems <http://www.bom.gov.au/water/groundwater/gde/index.shtml>; and the GIS layers of Potential Groundwater Dependent Ecosystem mapping for the Mallee CMA (via the Victoria Government Data Directory <https://www.data.vic.gov.au/> (last accessed March 2016). These sources identify the presence of a small number of wetlands in the east of the area. These are ecosystems that rely on the surface expression of groundwater from the Upper Parilla Sand Aquifer.

## 5. Management Zones

This LMP consolidates some previous zones described in the WSPA to six zones for the Murrayville GMA. The current zoning arrangement now aligns with the zones of the Border Designated Area. Zones 10B-1, 10B-2, 10B-3 and 10B-4 of the Murrayville GMA combine to form Border Zone 10B; Zone 11B is within Border Zone 11B; Murrayville East Zone is outside the Border Designated Area. The LMP zones are illustrated in Figure 7. With LMP zones aligning with Border Zones, there is greater consistency for reporting and licence administration with the Victorian Water Register and also water trade policies. Outside the border zone the water quality generally becomes poorer with TDS often greater than 3,000 mg/l and bores are not as high yielding as those to the west. This zone is known as Murrayville East zone.

Figure 7: Management zones of the Murrayville GMA



## 6. Caps

### 6.1 Basin Plan SDL

The groundwater resources of the Murrayville GMA occur within the Murray Darling Basin Wimmera-Mallee Sedimentary Plain groundwater SDL resource unit. The Murray Darling Basin Authority Basin Plan (Schedule 4) (see <https://www.legislation.gov.au/Details/F2012L02240>, last accessed May 2016) sets a long-term average SDL for the Wimmera-Mallee Sedimentary Plain (GS9) of 190.7 GL per year. The SDL includes all groundwater use, and is not limited to licensed groundwater use within the SDL area.

### 6.2 Border Groundwaters Agreement

The *Groundwater (Border Agreement) Act 1985* and subsequent amendments provide the mechanism for managing, sharing and protecting the groundwater resources in the Designated Area established by the Agreement. The Border Designated Area is a 40-kilometre wide strip centred on the border of South Australia and Victoria and divided into several management zones. The Agreement includes management prescriptions which define the permissible annual volumes (PAV), permissible rate of groundwater level lowering and permissible level of salinity for each zone. Zones 10B and 11B are located within the Murrayville GMA. The PAV for zone 10B is 6,720 ML and Zone 11B has a PAV of 1,823 ML.

### 6.3 Murrayville GMA Permissible Consumptive Volume

Under the *Water Act 1989* the Minister declares the Permissible Consumptive Volume (PCV) which sets the limit to the volumes that can be taken for an area or water system, for a defined period of time.

A PCV of 10,833 ML/year was determined during the development of the Murrayville Area Groundwater Management Plan (2001) for the Murrayville WSPA. This was based on the principles detailed in the 2001 management review by the Border Groundwaters Agreement Review Committee (BGARC, 2001) to calculate the annual allowable volume. However, the Murrayville GMA described in this LMP is larger than the previous WSPA as it incorporates land and associated licenced entitlement that existed in the unincorporated area east of the boundary of the original WSPA. It is intended that the licensed entitlement (121.3 ML) of the annexed area be added to the current PCV.

The Permissible Consumptive Volume for the Murrayville GMA is 11,005 ML/year (declared July 2017). The PCV applies to the area covered in Figure 3, for all formations below the surface. Domestic and stock usage is not included.

Importantly, the PCV represents a component of the Basin Plan Wimmera-Mallee Sedimentary Plain SDL. Therefore, any change to the PCV may need to be considered in the context of the broader Basin Plan.

## 7. Licensed groundwater entitlement and use

The following provides a summary of licensed entitlement in the Murrayville GMA. Further detailed information may be obtained from the Victorian Water Register <http://waterregister.vic.gov.au/>. Domestic and stock (D&S) bores are not licensed and the number of bores and volumes are an estimate (based on 2ML per bore per year).

**Table 1:** Murrayville licence entitlement summary at 2016.

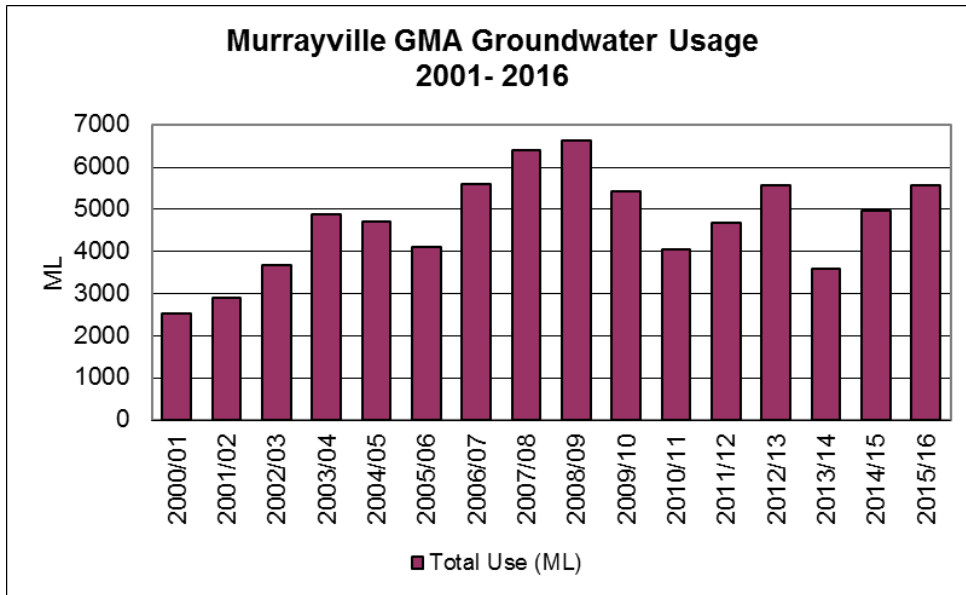
	Use				
	Irrigation	Industrial/ Commercial	Urban	Total Licence Volume	D&S (Estimate)
<b>No. of licences</b>	25	8	2	<b>35</b>	250
<b>Volume (ML's)</b>	9,038.5	201.3	515.0	<b>9,754.8</b>	500.0

Historical usage, reported as a per cent of entitlement volume, is indicative of the entitlements that have been activated in the area and therefore the water market potential. Entitlement volume and use since 2005/06 is tabulated below and use since 2001 is graphed (Figure 8).

**Table 2:** Historical water use and groundwater entitlement volume.

Year	Number of licences	Licensed Entitlement (ML)	Total use (ML)	Use of entitlement volume (%)
2005/06	30	10,114.3	4,099	40.53
2006/07	30	10,114.3	5,587	55.23
2007/08	38	10,114.3	6,404	63.32
2008/09	38	9,755.1	6,638	68.05
2009/10	38	9,755.1	5,415	55.51
2010/11	39	9,754.8	4,058	41.60
2011/12	35	9,754.8	4,667	47.84
2012/13	35	9,754.8	5,568	57.08
2013/14	35	9,754.8	3,586	36.76
2014/15	35	9,754.8	4,961	51.50
2015/16	35	9,754.8	5,581	57.21
<b>Average</b>			<b>5,142</b>	<b>52</b>

**Figure 8:** Historical groundwater use.



## 8. Rules

### 8.1 Annual allocations or restrictions

The PCV describes the maximum volume of water that can be extracted under licence from the Murrayville GMA (11,005 ML). This LMP does not place any additional specific restrictions on taking groundwater, although groundwater take and use licenses do allow for GWMWater to restrict extraction if required. This might be, for example, if the resource condition threshold is exceeded (refer to the Border Groundwaters Agreement prescriptions for zones 10B and 11B), or if drawdown is greatly affecting access to groundwater by adjacent domestic and stock users. Refer to Appendix 2.

Within this Murrayville LMP there is a management objective to manage the rate of decline in groundwater levels allowing a maximum residual drawdown of 6.5 metres in the ten years to 2026. This objective is consistent with the current Border Groundwaters Agreement prescriptions for Permissible Potentiometric Surface lowering rates (or rate of drawdown that must not be exceeded) for the management zones within the Murrayville area (0.65m per year).

If required, restriction decisions will be made based with an adaptive management approach to progressively increase restrictions until groundwater levels have recovered to a satisfactory level.

If restrictions are necessary, GWMWater will notify licensees prior to the commencement of the season to be restricted.

## 8.2 Issue, renewal or transfer (trade) of licences

GWMWater may approve a new or amended licence application, or an application to transfer groundwater entitlement providing matters under the *Water Act 1989*, policies regarding managing take and use licences, the Border Groundwaters Agreement, the Victorian Mallee Irrigation Development Guidelines have been considered and the following conditions are satisfied:

- i. The PCV for the Murrayville GMA (11,005 ML/year) must not be exceeded as a result of any new application.
- ii. The Permissible Annual Volume for a Border Zone must not be exceeded as a result of any new application, including temporary and permanent transfers.
- iii. The management zone limits tabled below must not be exceeded as a result of any new application, including temporary and permanent transfers.

Management Zone	Annual Zone Limit (ML/year)
10B-1	2,265
10B-2	1,370
10B-3	2,140
10B-4	2,830
11B	1,720
Murrayville East	2,412

- iv. Entitlement may be transferred permanently or temporarily within or between zones provided the management zone limits are not exceeded
- v. The land to which the water is traded has an irrigation and drainage management plan approved through the process outlined in the Mallee Catchment Management Authority’s Victorian Mallee Irrigation Development Guidelines.
- vi. An application relating to the transfer or conveyance of land on which the water is taken under a licence is able to be transferred to the successor in the Title of that land and is exempt from the rules above.

## 8.3 Specified minimum separation of licensed extraction bores

To protect the groundwater resource and existing users from the potential impacts of new developments and transfers, a minimum separation distance of 2 km between extraction bores is required. This separation distance, together with the zone extraction limits, are intended to regulate the intensity of extraction.

This rule does not apply to bores being constructed for the purposes of replacing an existing bore, where the new location is within 100 metres of the original groundwater bore and is sourced from the same aquifer.

## 8.4 Licence Condition - Carryover

The provision for Carryover is subject to decision and subsequent declaration by the Minister for Water. The Carryover Declaration for the Murrayville GMA 2017 was made under section 62A of the *Water Act 1989* in July 2017. Carryover replaces the licence condition known as the *three year rolling average*.

The MGL has significant storage, and so conceptually, there exists the capacity for carryover of unused groundwater entitlement with minimal impact on users or the resource into the longer term, relative to current practice.

Carryover is authorised in the Murrayville GMA with the following conditions:

- Unused (and untraded) groundwater may be carried over from one year to the next, and not subsequent years, up to a maximum of 30% of licence volume;
- GWMWater will advise individual licence holders of the carryover volume available to them;
- The trade of carryover water will not be permitted
- The use of Carryover in any given year will be capped at PVC limits so as not to cause exceedance of the PCV or Border Zone limits.

Appendix 3 provides further details regarding Carryover.

## 8.5 Metering

GWMWater meters all extraction bores associated with irrigation and commercial groundwater licences.

GWMWater will read meters on licensed bores at least once annually and record annual usage in the Victorian Water Register by 30 June of each year. It is the responsibility of the licence holder to monitor their groundwater usage to ensure their usage is within their licensed entitlement. If they deem they require more water than they are licenced to take, it is their responsibility to secure a licence transfer and obtain confirmation from GWMWater before taking more water.

## 9. Domestic and Stock supply

Under section 8 of the *Water Act 1989*, landholders have the right to take groundwater from a bore for their own domestic and stock (D&S) use without a take and use licence. Landholders must apply to GWMWater for a works licence to construct and install a bore for D&S use. D&S bores are registered in the state groundwater database when a bore construction licence is issued and updated when a bore completion report is returned. GWMWater is able to consider impacts on known (D&S) bores when making licensing decisions. For this reason D&S users, with older bores are encouraged to ensure that their bore(s) are registered.

## **9.1 Reimbursement for Lowering/Deepening of Domestic and Stock Pumps and Bores**

The development of irrigation within the Murrayville and adjacent Mallee Prescribed Wells area in South Australia has led to significant seasonal water fluctuations in some areas. The drop in groundwater level has resulted in problems with supply to groundwater bores used for domestic and stock purposes given they are usually drilled to a shallower depth. The program established through the 2001 Murrayville Groundwater Plan has reimbursed landholders for some of the costs incurred in the lowering of pumps and bores as a result of a drop in water level. The Murrayville WSPA annual reports indicate that in the period 2001 to 2012, 28 pumps had been lowered, however, none have required adjustment in the last four years. This program will continue in accordance with the guidelines for the Reimbursement for the Lowering/Deepening of D&S Pumps and Bores which have been developed for use in the broader GWMWater region and will be managed by GWMWater.

## **9.2 Decommissioning redundant and failed bores**

The groundwater resource may be threatened by the presence of failed or failing groundwater bores, particularly where the MGL is overlain by the saline Upper Tertiary Parilla sand aquifer. The older bores drilled into the limestone aquifer area are likely to deteriorate as the steel casing corrodes, allowing water from the saline Parilla to enter the fresher limestone aquifer and cause contamination.

Proper capping and decommissioning of old bores is important to protect the water quality of the MGL. While decommissioning of failed and redundant bores is the responsibility of landholders, GWMWater will assist where possible.

## 10. Water Quality

The considerable depth to the aquifer, the upwards pressure of the aquifer and the overlying aquitard mean that the MGL is relatively protected from most vertical processes that could have the potential to affect groundwater quality in the area.

A long-term threat to the Murrayville area is the naturally occurring lateral movement of more saline water from the east. It is possible that pumping for irrigation may increase the water level gradient and therefore increase the rate of groundwater movement. However, monitoring and the current rates of extraction have not provided any evidence of this to date. This risk is managed by monitoring as described in Section 11.

Downward leakage from the saline Parilla Sands aquifer via rusted or collapsed bore casing to the relatively fresh limestone aquifer remains a potential threat (as discussed in section 9.2 Decommissioning of redundant and unused bores).

## 11. Monitoring

The condition of the groundwater resource will be monitored by GWMWater and DELWP using the State Observation Bore Network (SOBN). This will include groundwater level monitoring across the management area, as well as salinity monitoring at selected SOBN bores and some spatially distributed regularly pumped D&S bores. All monitoring data will be regularly reviewed by GWMWater to ensure management is meeting the objectives of this plan.

The frequency and location of groundwater level and salinity monitoring will be determined by GWMWater. Groundwater monitoring information is available via DELWP Water Measurement Information System at <http://data.water.vic.gov.au/monitoring.htm> (last accessed 2 May 2016).

Data will be reviewed regularly, and reported annually. Quarterly groundwater level updates will be placed on the GWMWater website at [www.gwmwater.org.au](http://www.gwmwater.org.au).

Monitoring sites (water level and quality) are tabulated in Appendix 1.

Through operation of this plan, there may be instances where bore condition is deemed to not provide suitable data or information then an individual bore may be substituted by another one or removed from Appendix 1, Table 1.

## 12. Annual reporting

By 1 October each year an annual report will be prepared and made publicly available. This report will summarise and provide updates on the groundwater resource status, licensed groundwater use and trade activity for the previous season and summarise any other implementation or review activities of this LMP. The annual report may also flag any need to amend or update this LMP. The document will be available on GWMWater's website [www.gwmwater.org.au](http://www.gwmwater.org.au).

## 13. Review

The local management plan may need to be adapted in response to policy changes in groundwater resource management or with improved understanding of the aquifer system and appropriate management arrangements. GWMWater will undertake a review of the LMP after five years from its first date of approval, or sooner if warranted. Any significant changes to the LMP must be based on sound technical understanding of the issues and will be subject to consultation.

## 14. References

- Border Groundwaters Agreement Review Committee (2001) *Five Year Management Review 1996-2000*.
- Border Groundwaters Agreement Review Committee (2010). *Management Review Tertiary Limestone Aquifer in Province 3 of the Designated Area*.
- DEPI (2014). Local Management Plan Guidelines
- GWMWater (2015). Murrayville WSPA Annual Reports 2004-15
- GWMWater (2015), *Technical Note Resource condition threshold - Murrayville Groundwater Management Area*
- Leaney FWJ and Herczeg AL (1999). *The Origins of Fresh Groundwater in the SW Murray Basin and its Potential for Salinisation, CSIRO Tech Report 7/99*
- Mallee Catchment Management Authority. (2016) *Draft Victorian Mallee Irrigation Development Guidelines 2016*.
- Murrayville Groundwater Supply Protection Area Consultative Committee (2001). *Murrayville Groundwater Supply Protection Area Management Plan 2001*.

## 15. Contact details

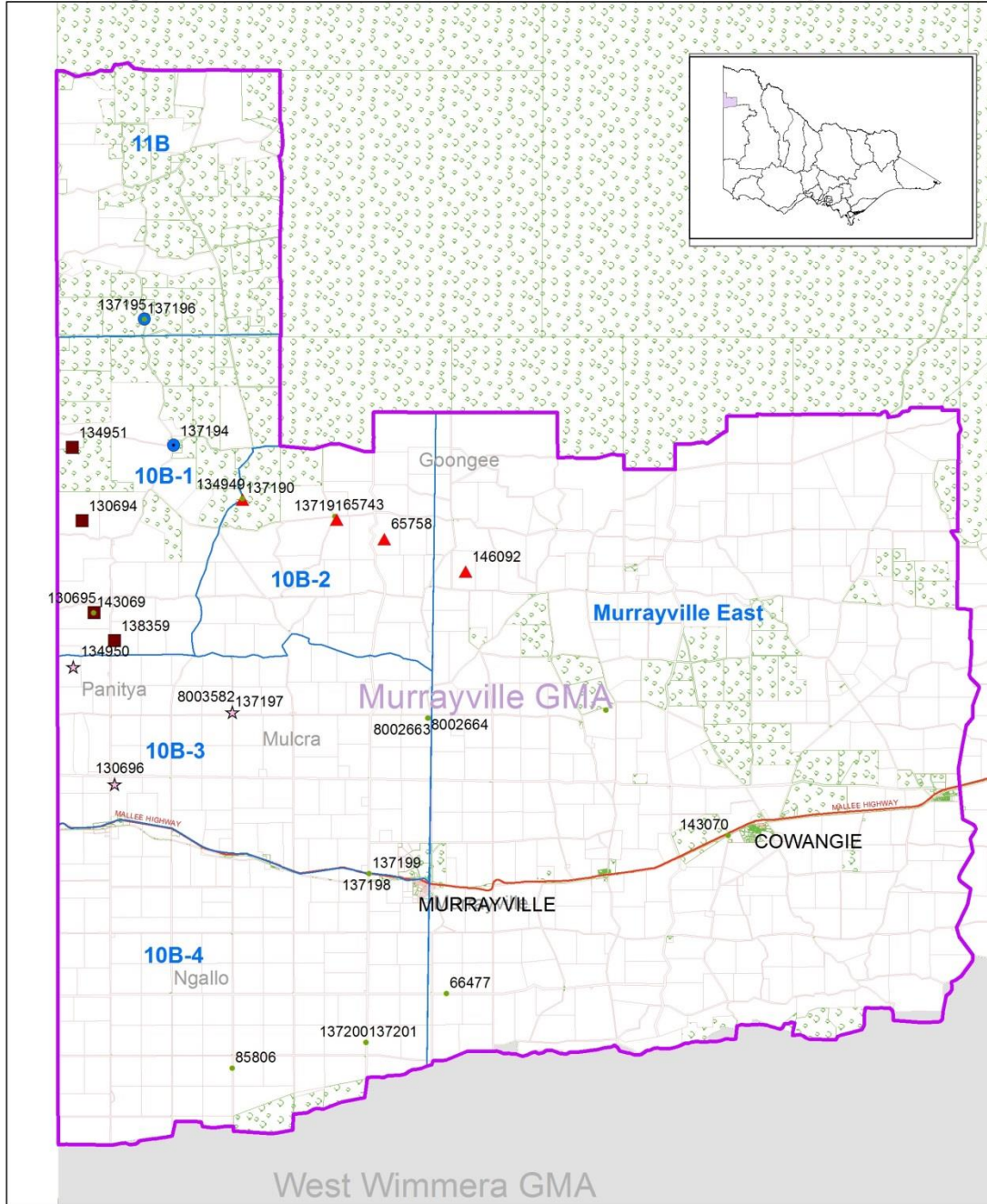
GWMWater  
11 McLachlan St  
(PO Box 481)  
Horsham 3402  
Local Ph.: 1300 659 961  
Email: [info@gwmwater.org.au](mailto:info@gwmwater.org.au)  
Website: [www.gwmwater.org.au](http://www.gwmwater.org.au)

## Appendix 1 - Groundwater Monitoring

**Table 1: Groundwater level monitoring - quarterly (minimum) monitoring**

Bore ID	Easting MGA	Northing MGA	Zone	Total depth (m)
130694	498241	6117252	54	90
130695	498866	6112313	54	62
130696	499972	6103090	54	74
134949	506861	6118401	54	67
134950	497763	6109386	54	78
134951	497711	6121188	54	71
137190	506860	6118436	54	40
137191	511815	6117481	54	41
137194	503141	6121294	54	82
137195	501567	6128082	54	81
137196	501567	6128080	54	32
137197	506290	6106951	54	45
137198	513655	609827	54	82
137199	513655	6098282	54	37
137200	513489	6089208	54	100
137201	513486	6089211	54	37
138359	499966	6110800	54	90
143069	498861	6112313	54	41
143070	532951	6100348	54	123
146092	518846	6114520	54	78
65743	511918	6117309	54	84
65758	514477	6116274	54	90
66477	517817	6091828	54	126
8002663	516820	6106635	54	108
8002664	516825	6106635	54	45
8002665	526395	6107065	54	60
8003582	506292	6106950	54	100
85806	506304	6087838	54	120
8003854	526620	6107225	54	124
8003923	522401	6113194	54	96

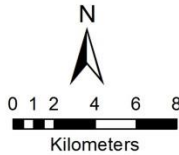
# Murrayville GMA - Observation bores (selected)



Map produced: Mar 2016

- Legend**
- Murrayville GMA
  - Locality
  - Highways
  - Main Roads
  - Tracks
  - Wimmera GMA

- Observation bores**
- ▲ Goongee
  - Manya North
  - ★ Mulcra
  - Panitya North
  - Other



Coordinate System: GDA 1994 MGA Zone 54  
 Projection: Transverse Mercator  
 Datum: GDA 1994  
 False Easting: 500,000.0000  
 False Northing: 10,000,000.0000  
 Central Meridian: 141.0000  
 Scale Factor: 0.9996  
 Latitude Of Origin: 0.0000  
 Units: Meter



Path: W:\WRGIS\Maps\ClaireDunn\Murrayville\LMP\Figures\fig Murrayville GMA obs bores.mxd

**Groundwater salinity monitoring**

**Table 2:** Annual (minimum) sampling of pumped private bores.

Bore ID	Bore Type	Easting MGA	Northing MGA	Zone
54642	D&S	503849	6100476	54
61571	D&S	525256	6106319	54
WRK064773	Irrigation	517261	6109678	54
61595	D&S	517428	6103944	54
65740	D&S	514436	6116340	54
65743	D&S	513578	6116903	54
66479	D&S	525593	6091846	54
66509	D&S	519520	6091205	54
71074	D&S	538721	6113228	54
77201	D&S	503171	6119368	54
82232	D&S	511372	6110840	54
82243	D&S	504821	6106178	54
85832	D&S	499372	6087817	54
85857	D&S	508335	6094795	54
87517	D&S	531903	6116677	54
97181	D&S	542065	6098203	54
97184	D&S	544481	6102073	54
97194	D&S	532760	6095968	54
98361	D&S	509971	6087778	54
105355	D&S	545408	6095552	54
WRK064562	Irrigation	515946	6097173	54
138360	D&S	500021	6111078	54
141209	D&S	519490	6116998	54
8002325	D&S	523921	6116678	54
WRK064823	Irrigation	507041	6109148	54
WRK064694	Irrigation	519051	6116404	54
WRK064706	Irrigation	498166	6107628	54
8002072	D&S	520351	6100368	54
8002073	D&S	512131	6106934	54
8002075	D&S	508951	6106938	54
8002076	D&S	506521	6115648	54
8002142	D&S	535236	6122562	54
97307	D&S	542632	6108929	54
8003705	D&S	499330	6100301	54
61605	D&S	518970	6112445	54
61585	D&S	516700	6113348	54

Bore ID	Bore Type	EC sampled by	Easting MGA	Northing MGA	Zone
134949	Observation	Hydrasleeve	506861	6118401	54
137195	Observation	Hydrasleeve	501567	6128082	54
137198	Observation	Hydrasleeve	513655	609827	54
8003582	Observation	Hydrasleeve	506292	6106950	54
8003854	Observation	Hydrasleeve	526620	6107225	54
8003923	Observation	Hydrasleeve	522401	6113194	54
49676	Observation	Sensor (DELWP)	502716	6135881	54
66477	Observation	Sensor (DELWP)	517817	6091828	54
137197	Observation	Sensor (DELWP)	506290	6106951	54



## Appendix 2 – Drawdown Threshold

### *GWMWater Technical Note*

#### **Resource condition threshold - Murrayville Groundwater Management Area**

Author: Clare Dunn, Senior Groundwater Planner  
Andrew Barton, Manager Water Resources

#### ***Preamble***

*The Murrayville LMP Advisory Committee (meeting held 14 October 2015 –Item 5.2) endorsed the drawdown threshold of 0.65 m per year included in the draft Local Management Plan based on the assessment described within this Technical Note.*

#### **Purpose**

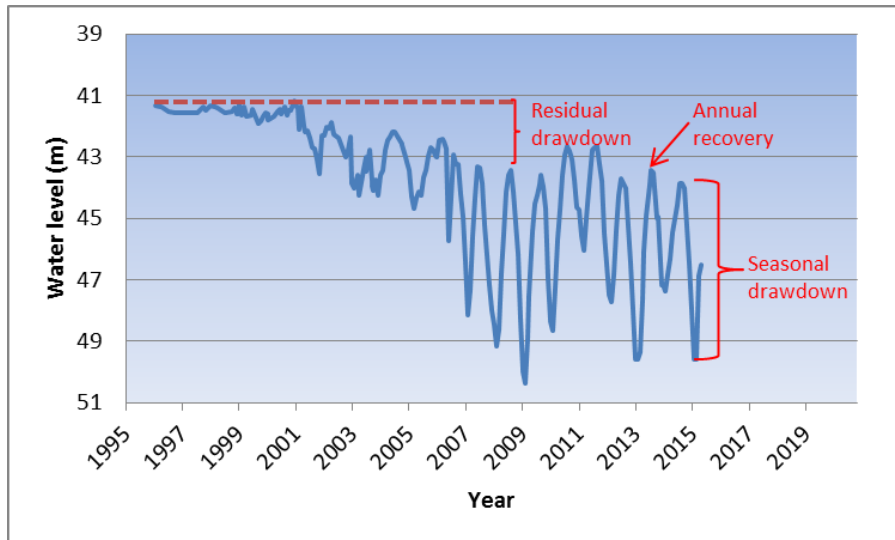
This Technical Note describes how the drawdown threshold may be interpreted, and the proposed management arrangements should the threshold be met.

#### **Background**

Within the draft Murrayville Local Management Plan (LMP) there is a management objective to manage the rate of decline in groundwater levels allowing a maximum residual drawdown of 6.5 metres in the ten years to 2026 (based on a five year rolling average). This objective is consistent with the Border Groundwaters Agreement prescriptions for Permissible Potentiometric Surface lowering rates (or rate of drawdown that must not be exceeded) for the management zones within the Murrayville area which is 0.65m per year. The 0.65m threshold has been adopted outside the Border Designated Area for consistency. Groundwater use outside this area is limited. The threshold for Murrayville East could be revised in the future the based on improved data should groundwater use increase.

#### **Discussion**

A network of observation bores exists in the Murrayville area which is monitored throughout the year to record the response of the aquifer to groundwater extraction. The data collected is generally presented graphically in what is commonly referred to as a hydrograph (plot of depth to water or water level (m) over time), as represented below with some useful terms.



Assessment of hydrographs has been undertaken to group observation bores for analysis against the threshold. The purpose of grouping the observation bores was to assist with the creation of “average” graph(s) to represent the average rate of change in groundwater level in a management zone or local area based on annual recovery. The bores have been grouped by a combination of location, and assessment of hydrographs showing similar variation in trends and magnitude of seasonal drawdown.

Four groups have been established based on this methodology:

1. Border to Mulcra
2. Manya North
3. Panitya North
4. Goongee

This methodology averages the assessment of resource and is therefore not dependent on any one bore. This helps avoid debate on representativeness and minimises bias based on bore location. Figure 1 illustrates the hydrograph for the bores in the Panitya North area (Zone 10B-1) as an example. Groundwater level is expressed as depth to water (metres from top of bore casing) rather than water elevation (mAHD) so that data from more than one bore can be more easily viewed.

Hydrographs of bores grouped for the remaining key observation bores, as well as the associated grouping and analysis is provided in Attachment 1.

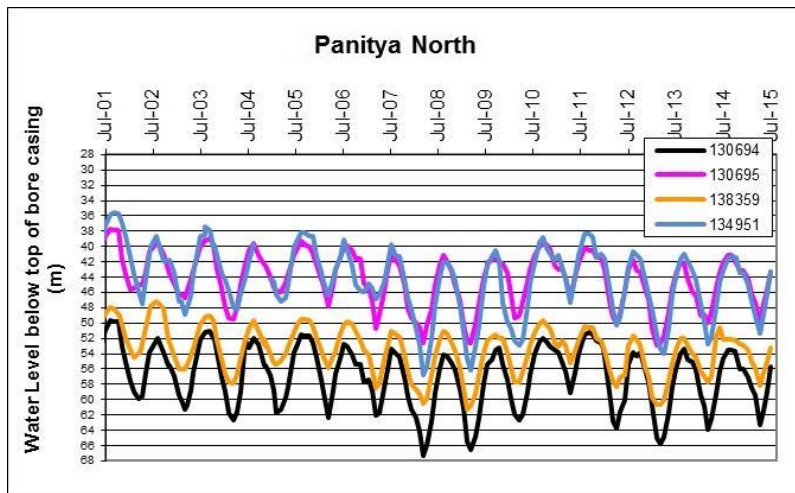


Figure 1: Depth to water (m) as measured at observation bores in the Panitya North (Zone 10B-1) area.

Assessment has been made of the average annual rate of change in groundwater level in the areas being represented based on the annual recovery level, Figure 2 illustrates an example for Panitya North. To provide some flexibility and avoid an overly reactive response to falling groundwater levels due to seasonal factors, a rolling average has been applied based on measured groundwater recovery over a five year period (Figure 3). This shows the major trend, with the target being an average recovery level represented by a positive rate of change or recovery in groundwater levels (above the red line) or less than 0.65 m decline. Values above the red line indicate recovery in groundwater levels and values below the red line indicate levels are falling.

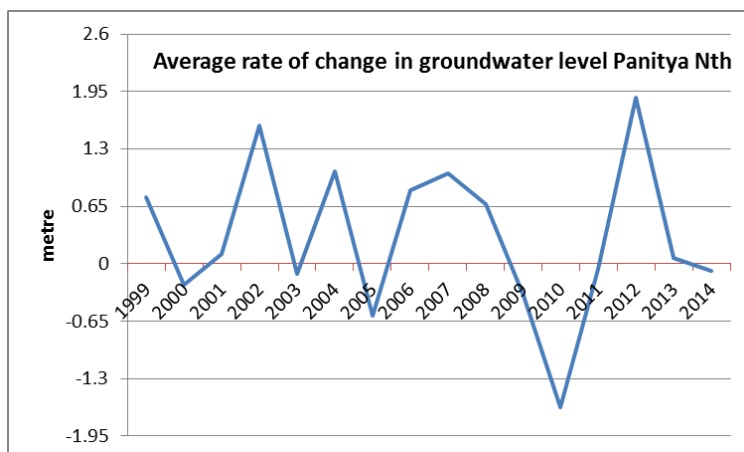


Figure 2: Average rate of change in groundwater level based on annual recovery figures.

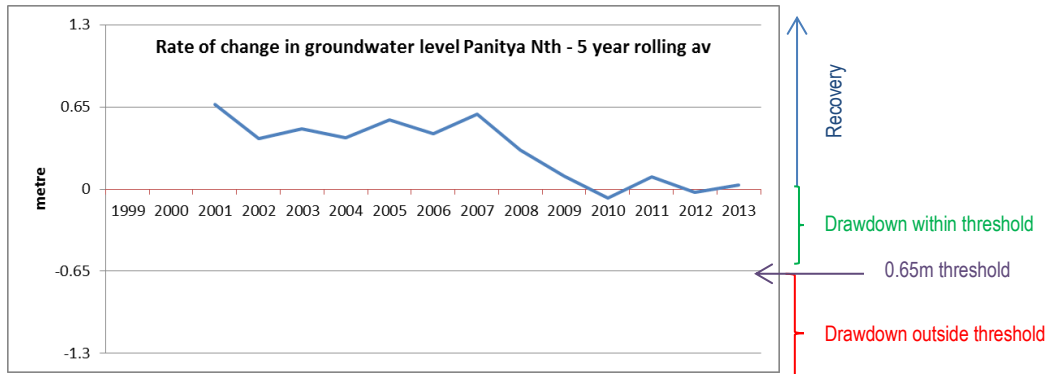


Figure 3: Rate of change in groundwater level using five year rolling average.

### Management response

It is proposed that once the 0.65 m threshold is reached, an assessment is to be made to determine the factor(s) that have influenced the increased rate of change in groundwater level such as localised intensity of use, unseasonable conditions or otherwise. Should the trigger be reached in two successive years (based on the five year rolling average) then the Board of GWMWater may declare seasonal restrictions in the applicable zone(s) to return the groundwater to within the threshold level (for two consecutive years) based on the five year rolling average.

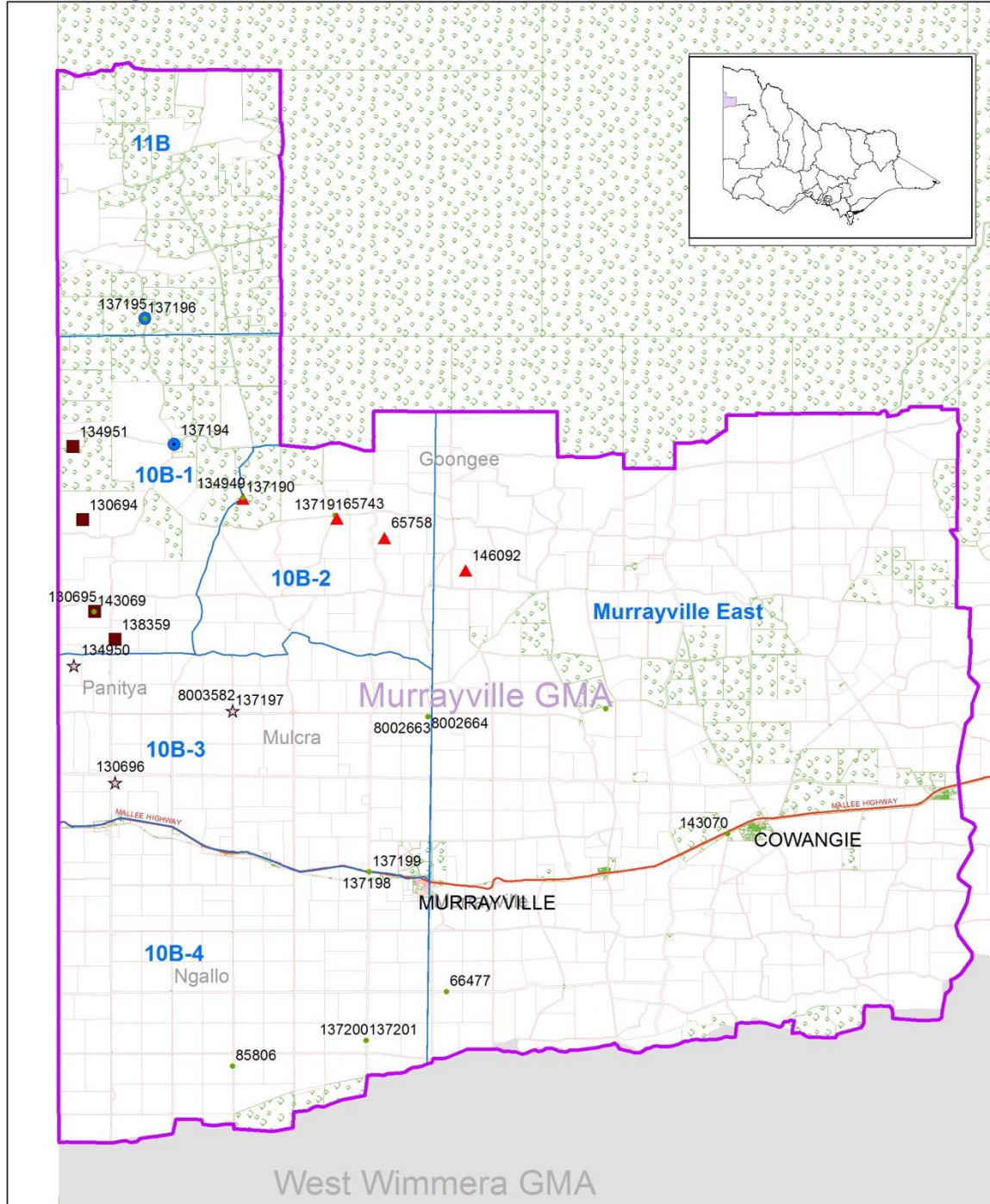
Being a shared resource with South Australia, prior to making any restrictions the GWMWater Board would consider actions being undertaken across the border in South Australia. GWMWater would be reluctant to restrict use within its jurisdiction if use is not similarly restricted in adjacent SA Border Zones.

GWMWater and DELWP are working with the Border Groundwaters Agreement Review Committee to review the restriction policies in place in South Australia and that any Victorian based restriction policies are complementary and do not disadvantage Victorian based users.

*Last update 28 July 2016*

Attachment 1

# Murrayville GMA - Observation bores (selected)



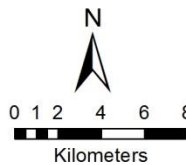
Map produced: Mar 2016

**Legend**

- Murrayville GMA
- Locality
- Highways
- Main Roads
- Tracks
- Wimmera GMA

**Observation bores**

- ▲ Goongee
- Manya North
- ★ Mulcra
- Panitya North
- Other

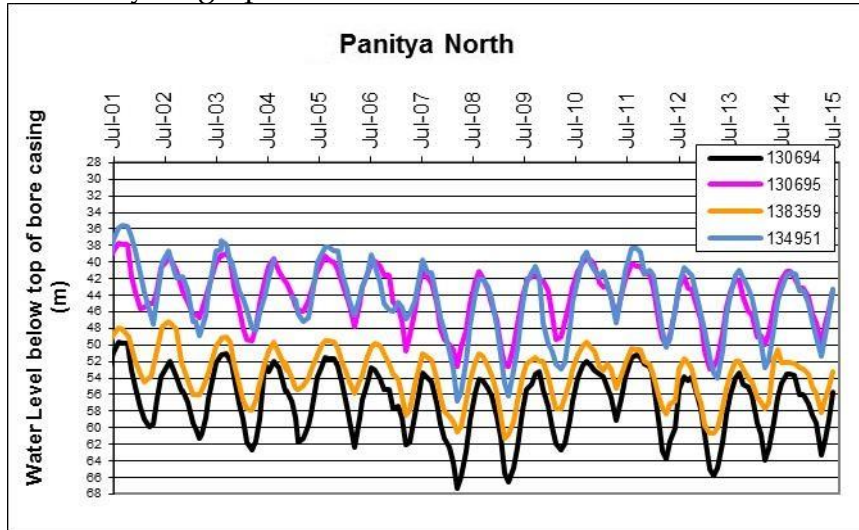


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 False Northing: 10,000,000.0000  
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 Scale Factor: 0.9996  
 Latitude Of Origin: 0.0000  
 Units: Meter

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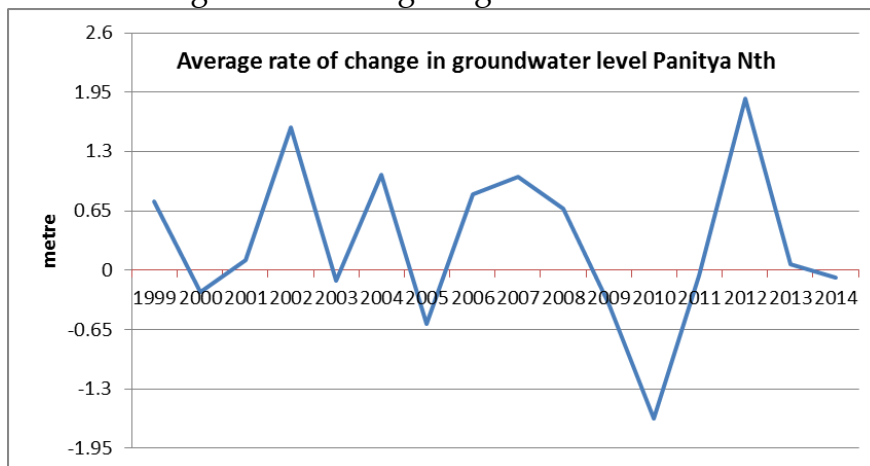
## Panitya North

### 1. Hydrograph

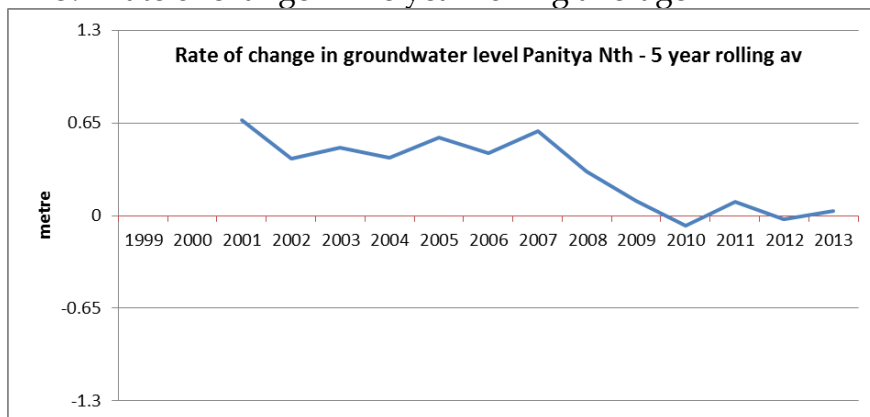


The water levels shown on these graphs are based on the distance (m) below top of bore casing as a measurement point rather than relative to AHD so data can be more easily viewed.

### 2. Average rate of change in groundwater level

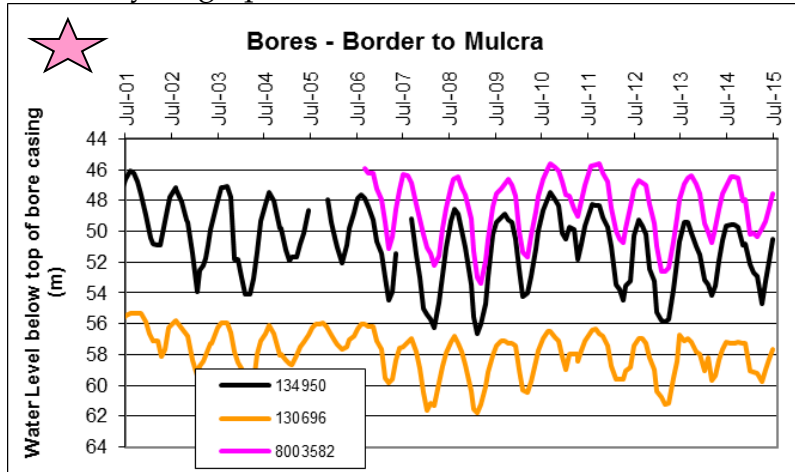


### 3. Rate of change - five year rolling average



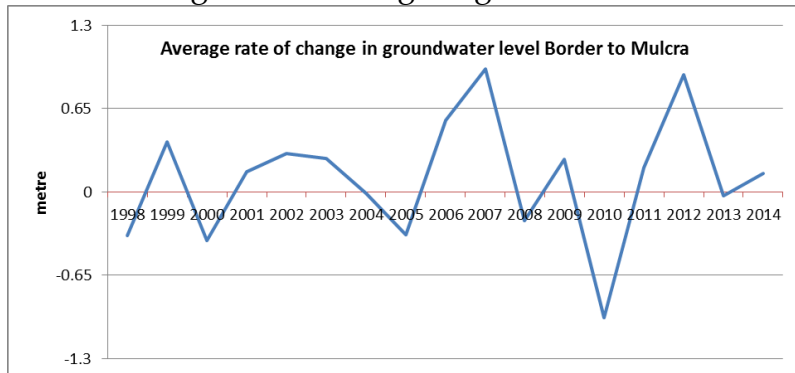
**Border to Mulcra bores (Zone 10B-3)**

1. Hydrograph

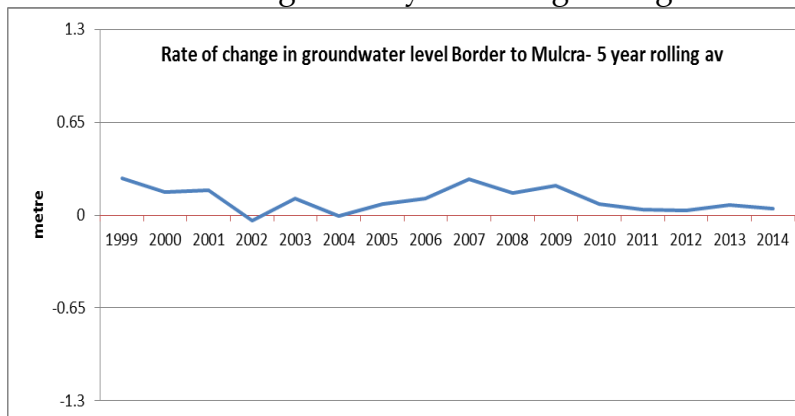


The water levels shown on these graphs are based on the distance (m) below top of bore casing as a measurement point rather than relative to AHD so data can be more easily viewed.

2. Average rate of change in groundwater level

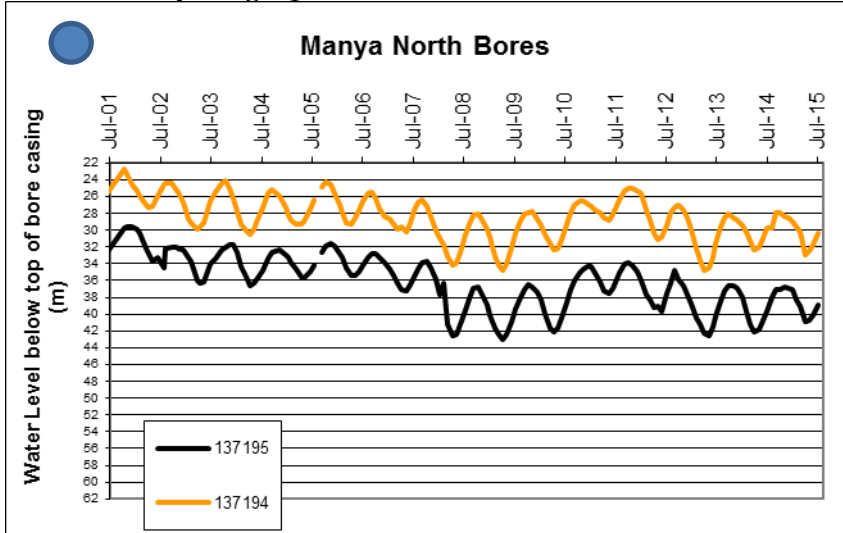


3. Rate of change – five year rolling average



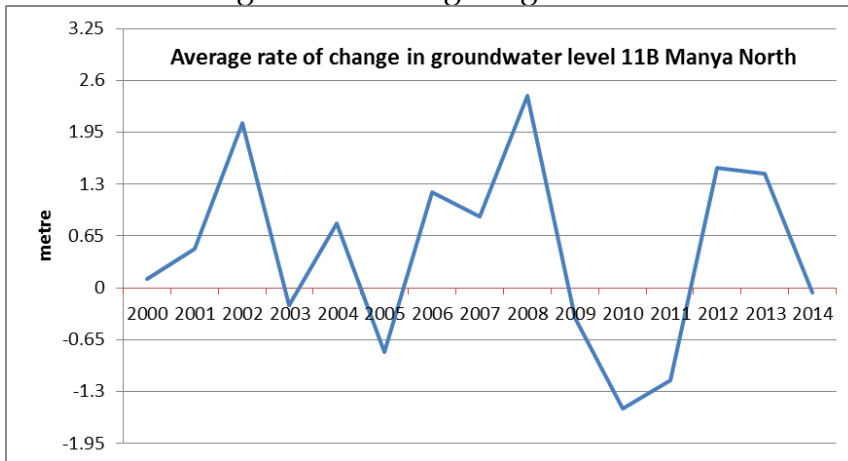
## Manya North

### 1. Hydrograph

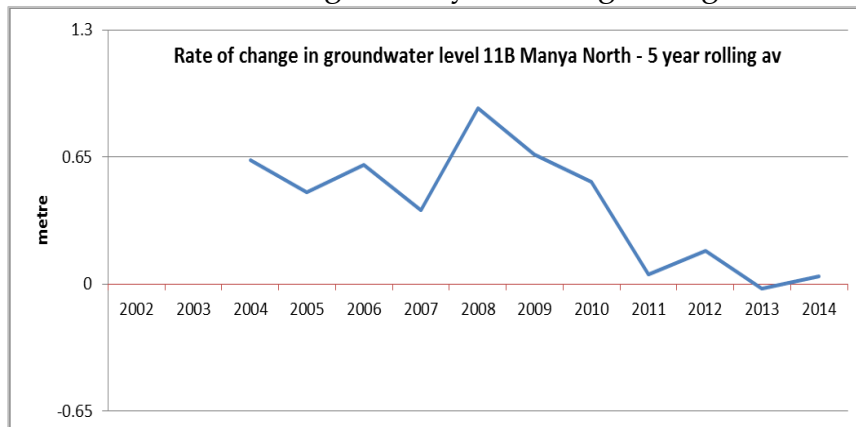


The water levels shown on these graphs are based on the distance (m) below top of bore casing as a measurement point rather than relative to AHD so data can be more easily viewed.

### 2. Average rate of change in groundwater level

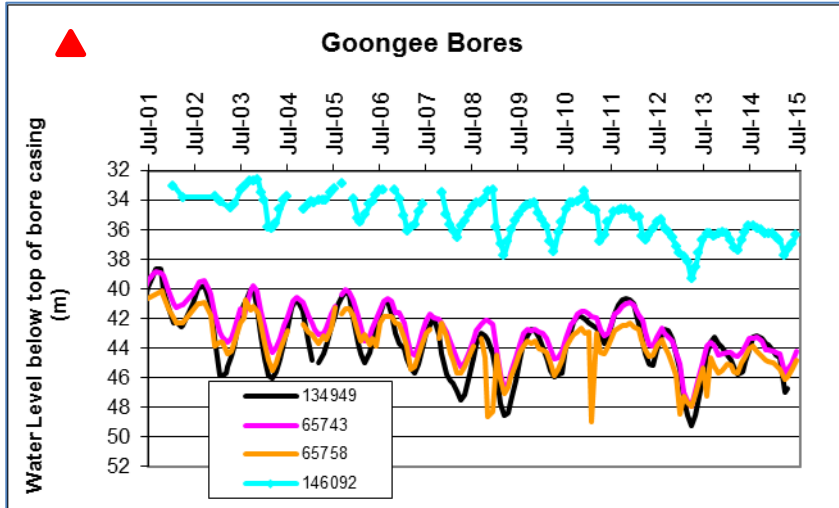


### 3. Rate of change - five year rolling average



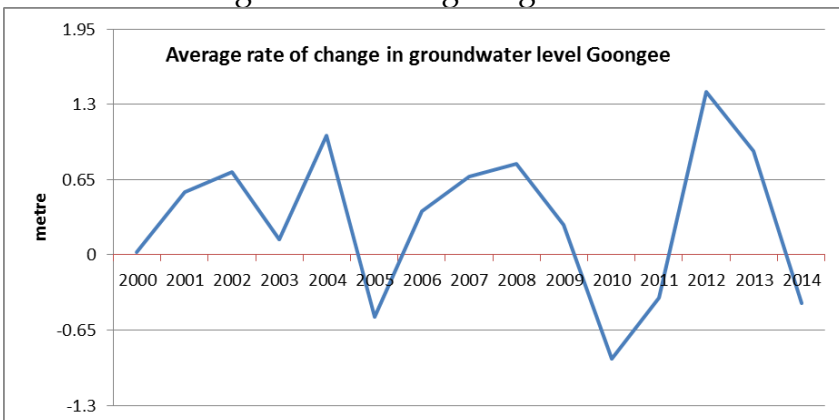
## Goongee

### 1. Hydrograph

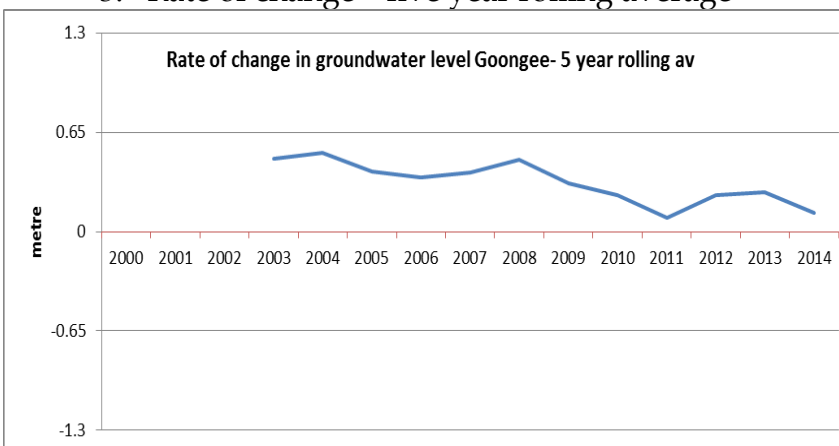


The water levels shown on these graphs are based on the distance (m) below top of bore casing as a measurement point rather than relative to AHD so data can be more easily viewed.

### 2. Average rate of change in groundwater level



### 3. Rate of change – five year rolling average



← 0.65 m Threshold

### Appendix 3 – Carryover

The provision for Carryover is subject to decision, and subsequent declaration by the Minister for Water. A maximum of 30% of unused entitlement volume may be carried over from one season to the next. Carryover is not permitted to accumulate above 30% of entitlement volume and will be assessed each year.

The MGL aquifer has significant storage and so there exists the capacity for carryover of unused groundwater entitlement.

The use of carryover:

1. Offers greater flexibility for licence holders to manage their entitlement in response to variable seasonal conditions
2. Treats all entitlements more equitably, by not forcing licence holders to use their entitlement inefficiently under a ‘use it or lose it’ approach.
3. Does not result in any long term increased use of the resource.

Carryover is authorised in the Murrayville GMA with the following conditions:

- Unused (and untraded) groundwater may be carried over from one year to the next, and not subsequent years, up to a maximum of 30% of entitlement volume;
- GWMWater will advise individual licence holders of the carryover volume available;
- The trade of carryover water will not be permitted
- The use of Carryover in any given year will be capped at PVC limits so as not to cause exceedance of the PCV or Border Zone limits

#### *Example of accounting for carryover*

Licence entitlement ML	Maximum possible carryover (30% of entitlement volume) ML	Usage for year X ML	Available Carryover from year x to the following year ML	Volume available for use the following year (available carryover + entitlement)	Comment
180	54	120	54	234	Maximum possible carryover is 30% of licence entitlement hence 54ML
180	54	132	48	228	Maximum possible carryover is not available due to use in year x
180	54	180	0	180	100% of entitlement used in year x, so no carryover available for following year
180	54	0 use but 180 ML traded out as temporary transfer	0	180	Volume traded out is accounted for as use, whether used or not by the transferee