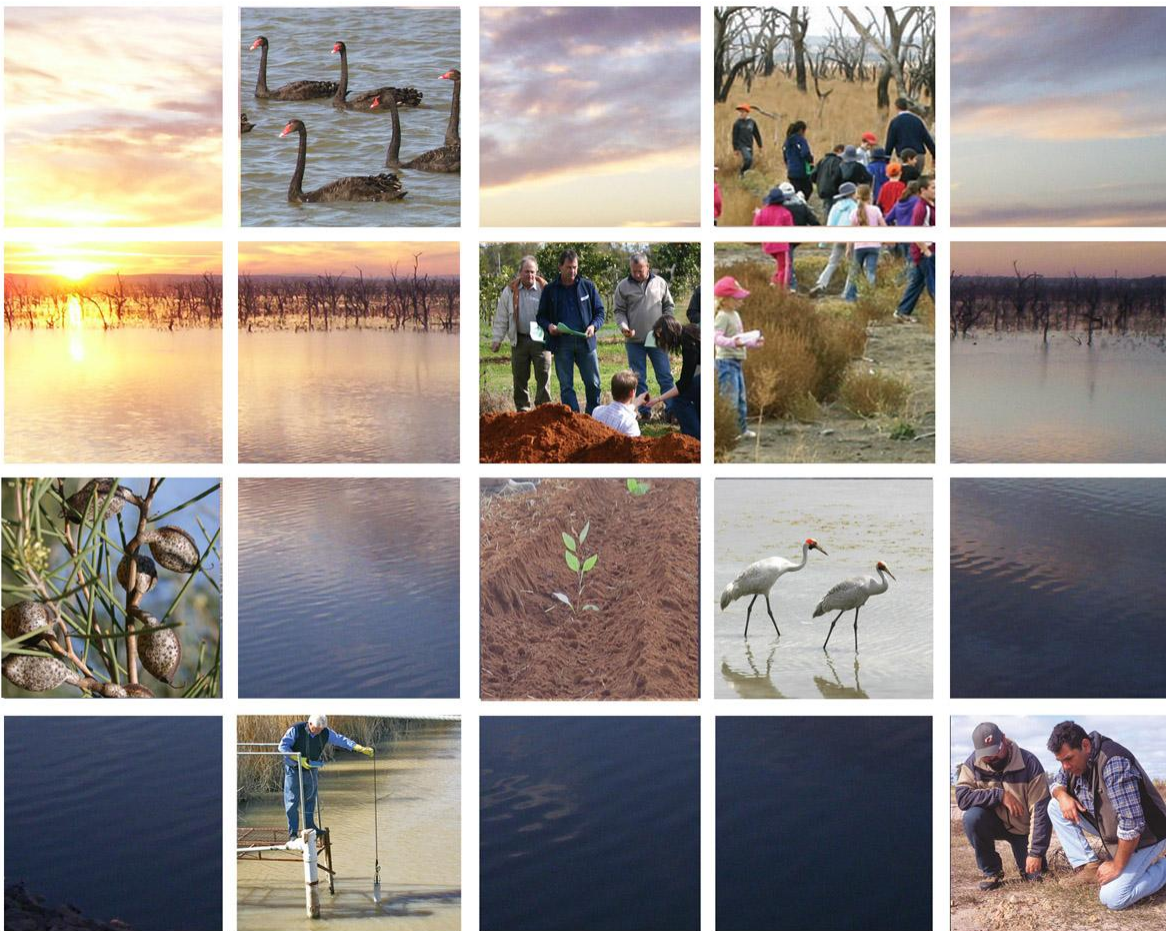


McWilliams Winery Groundwater Assessment



On Behalf of JJC Operations Pty Ltd
November 2012

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Author	Approved
1	1	First Draft	6/11/2012	Leonie Williams	
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BACKGROUND

Murrumbidgee Irrigation Limited (MI) has been collecting water resource information, including geological and hydrogeological data, in excess of 60 years. In October 2012, JJC Operations Pty Ltd approached MI on behalf of McWilliams Wines, to provide specialised advice on localised and regional hydrogeological conditions in relation to potential impacts on groundwater from the expansion of winery operations and re-use of treated wastewater on company related vineyards.

SCOPE OF WORKS

McWilliams Wines are currently undertaking an Environment Assessment (EA) for a planning approval to:

- Expand the winery operation from 30,000 tonne to 65,000 tonne;
- Build a new bottling facility; and
- Build a new waste water treatment plant (WWTP).

A development of this size requires McWilliams to obtain an EPA Licence from the Office of Environment and Heritage. Consequently by obtaining such a license, they are to commence a formal process of environmental monitoring, including groundwater monitoring. As part of the Environmental Assessment Process, McWilliams are required to report on the potential impacts a development of this nature could have on regional groundwater systems.

This report will focus upon providing a description of regional groundwater systems, historical and current aquifer behaviour and the potential influences of changes in groundwater characteristics at the following points of interest:

- at the winery site where the new Wastewater Treatment Plan (WWTP)t will be located and adjacent farms 127, 128 & 130, and;
- At the proposed irrigation site – 3 vineyards that McWilliams own approximately 8km west of the winery on Farms 195D, 196, 199B (located off Gum Creek Road).

Specifically this report will use baseline historical data collected by Murrumbidgee Irrigation Limited, NSW Office of Water and some in-situ testing requested by JJC Operations Pty Ltd on behalf of McWilliams, which will address the following:

- How deep are the aquifers?
- What is the quality of water from these aquifers?
- What direction of flow; and
- Any sensitive uses that need to be considered.
- What monitoring is currently undertaken?
- What bores are in place to monitor in the future?
- What additional bores might be required to monitor any potential effects from dam leakage and treated wastewater irrigation?

LITERATURE REVIEW

Murrumbidgee Irrigation Limited Licence Compliance Report (LCR) 2011-2012 and Bore Monitoring Data October 2012

Murrumbidgee Irrigation Limited (MI) operates under a Combined Water Supply Water Work Approval and Water Use Approval (40CA403245) issued by NSW Department of Primary Industries Office of Water (NOW) and Environmental Protection Licence 4561, in accordance with the Protection of the Environment Operations Act, 1997 administered by the NSW Environmental Protection Authority (EPA). These licences set the minimum standard for environmental management. The Company is required to monitor and provide data to both agencies on water resources and use across the MIA.

Information from the LCR and monitoring data in relation to groundwater has been used in this report.

NSW Natural Resource Atlas NSW Office of Water October 2012

The NSW Natural Resource Atlas is a database of natural resource information available for use by the general public. Information pertaining to regional monitoring and production bore logs (Including MI Bore Monitoring Network) and construction information has been extracted from this site in relation to Farms 127 & 128, 130, 195, 196, 199 and the winery production site off Jack McWilliams Road.

MapConnect Geosciences Australia October 2012

MapConnect is a database containing climate, soil, geological/geomorphological and hydrogeological data across Australia. It is an online assessment tool that draws from scientific data, mapping and reporting sources to develop coefficients in relation to site specific data. This database has been used to derive site specific evaluations on potential evapotranspiration, Average annual rainfall, MOLR Groundwater Recharge Estimates and chloride deposition in rainfall. Values provided by this data set have been used due to lack of available regional specific case-study data. It should be noted that in irrigation areas because the methods used to determine values do not account for the added difficulties associated with the wide range of crops and irrigation management, values are therefore expressed in terms of perennial plant use. Incorporation of such data in this report will be used to demonstrate possible infiltration values for rainfall in perennial vegetated areas but not take into account infiltration in varied irrigation settings.

Characterising Groundwater Behaviour & Development of Hydro Ecological Zones in the Murrumbidgee Irrigation Area- Volume 1 CSIRO October 2011

The overall aim of the “Development of a Hydro-ecological Modelling Environment to Provide Predictive Capacity to Assess Land Use Change in the Murrumbidgee Irrigation Area (MIA)” project is to develop tools to support Murrumbidgee Irrigation Ltd (MI) in its planning processes to avoid adverse effects of waterlogging and salinity in the MIA. Understanding of basic hydrogeological principles at McWilliams sites will be incorporated into this report.

Cropsol Water & Environment
Land Suitability Investigation to be provided to McWilliams Wines
October 2010

This report was prepared as part of the Environmental Assessment for the proposed Winery Expansion of McWilliams Wines at Hanwood, NSW, by Thomas-M. Stein, a consultant with Cropsol Water & Environmental.

This report is part of a larger Development Application, and covers:

- A summary water balance of the proposed vineyard areas.
- An assessment of the potential groundwater and surface water impacts associated with the storage of water and wastes, and the use of the treated winery wastewater in the vineyard areas.
- A statement of the suitability of soil structure to accommodate the application of treated wastewater.
- Suggested guidelines for future monitoring regimes within the vineyard to collect soil, irrigation and wastewater data.

Cropsol addresses a number of issues relating to the potential impacts of the expansion of the wastewater treatment plant and use of this water for crop watering on vineyards associated with the farm. Where applicable to impacts on groundwater at a localised and regional scale, information from Cropsol has been cross referenced with this report.

Lower Murrumbidgee Groundwater Sources- Resource Condition Assessment Report
NSW Office of Water
2010

This report is a condition assessment of the Lower Murrumbidgee groundwater sources undertaken by the NSW Office of Water. Some of the information from this composition has been used in the background of this report.

Lower Murrumbidgee Groundwater Resources- Groundwater Management Area 002
Groundwater Status Report
NSW Office of Water
2009

This report provides general information on Lower Murrumbidgee groundwater sources and availability to users undertaken by the NSW Office of Water. Some of the information in this overview has been utilised in the background of this report.

DESCRIPTION OF REGIONAL GEOLOGY AND HYDROGEOLOGY

A majority of the MIA region falls within the groundwater Management Area 002 which is comprised of the Lower Murrumbidgee groundwater resources- The Shepparton and Renmark Formations. For the purposes of this report the Shepparton Formation has also been subdivided into the Upper and Lower Shepparton formations (USF and LSF respectively). Figure1 below highlights the boundaries of the Lower Murrumbidgee Groundwater Management Area 002.



Figure 1 - Groundwater Management Zone 002- Lower Murrumbidgee (NSW, 2009)

The stratigraphical sequence of the MIA region varies from as early as the Middle Ordovician through to the Tertiary and Quaternary Epochs. Pre- tertiary formations are thought to have originated during the Middle-Late Ordovician through to the Upper Devonian.

Middle Ordovician units are comprised of anadaluite and chialstolite slated which contain graptolites associated with sandstone, quartzite, phyllite and schist with beds strongly folded, striking about N. 5° W, which are aligned parallel to the strike and dip steeply. Quartz reefs and lenses commonly intrude the beds with secondary minerals anadaluite, chialstolite, biotite and chlorite that have been induced by regional metamorphism (Wynn, 1962). Weathering of the middle Ordovician is well advance and areas of outcrop are usually only indicated by the presence of abundant quartz shed and ferruginous nodules.

The late Ordovician can be seen in outcropping in the North East, containing outcrops of quartzite, Phyllite, schist, slate, siliceous sandstone and fine conglomerate. Structurally the rocks are similar to the Middle Ordovician having been strongly folded. The sediments have a wide distribution and likely represent a tightly folded sequence ranging in age from middle to late Ordovician.

Silurian deposits, known as the Square Head Beds are comprised on conglomerate, conglomeratic Sandstone and Sandstone located near Square Head Mountain, Beness Mountain and east of the Cocopara Range (Wynn, 1962). The Cocoparra Group of the Upper Devonian are comprised on sandstone, conglomerate, quartzite and shale uncomfortably overlying Ordovician and Silurian sediments (Wynn, 1962). The Cocopara Group can be divided into a lower and upper formation consisting of the basal bed (lower sequence) of the Barrat Conglomerate (about 700 m thick) of medium to coarse lithology typified by a predominance of white reed-quartz pebbles. Subordinate pebbles are of quartzite, slate of rhyolite with a typical sandy matrix. The upper formation (thought to be 1097 m thick north of Ardlethan) consists of monotonous succession of sandstone, quartzite and conglomerate with minor red shale bands.

Representative beds of the upper formation can be viewed only in the Cocoparra Range and the Ardlethan Syncline.

Aquifer systems addressed in this report are of mainly tertiary and some quaternary origin. Tertiary sediments have a wide distribution but the majority are concealed by Quaternary aeolian and fluvial deposits.

GMA 002 is underlain by semi-consolidated flat lying Cainozoic sediments of mainly continental origin (NSW, 2009). The maximum thickness ranges from 170m in the east (at Narrandera) to about 400m at Balranald (Western end of the GMA). Cainozoic sediments overlie Palaeozoic and Mesozoic rocks that form basement rock. Sedimentary deposits are subdivided into three main units- the Shepparton Formation, the Calivil Formation and the Renmark Group. Figure 2 below, extracted from *Lower Murrumbidgee Groundwater Sources- Groundwater Management Area 002 Groundwater Status Report 2009*, NSW Office of Water provides a conceptual representation of Tertiary geological sections across GMA 002.

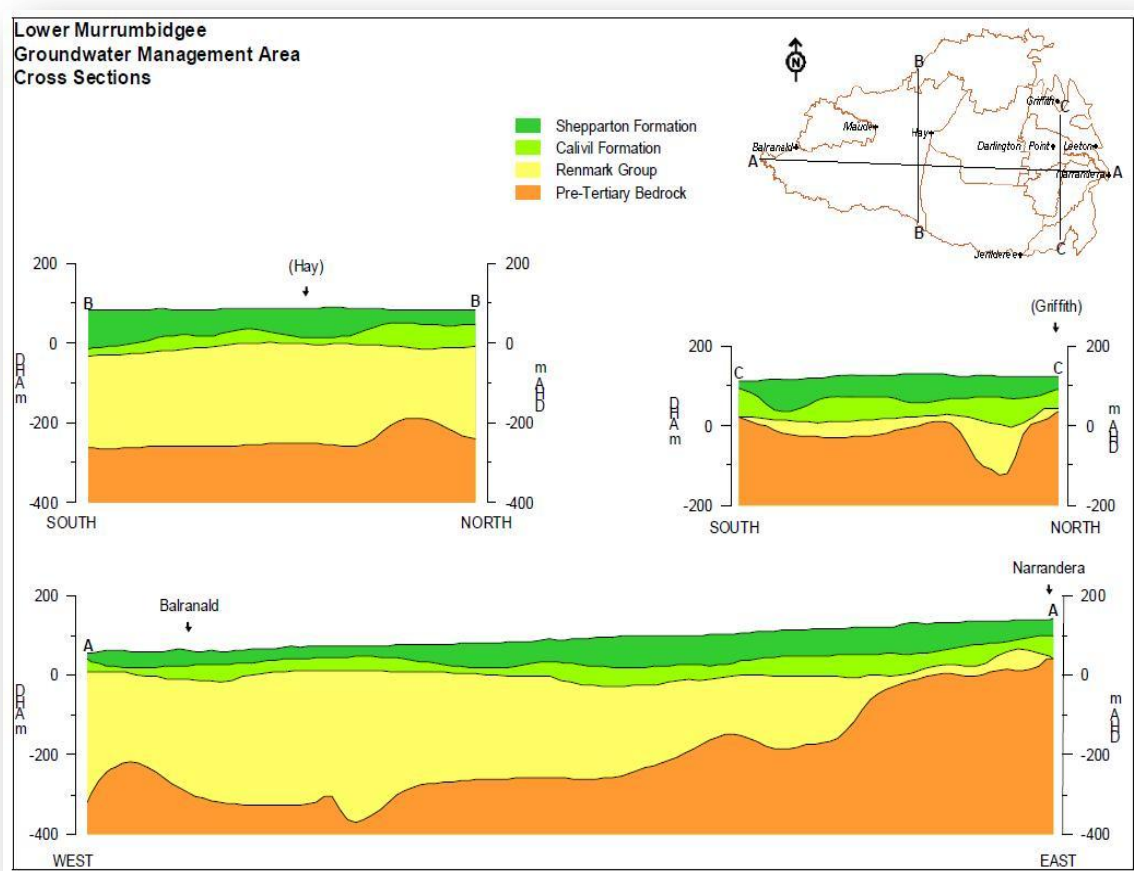


Figure 2- Groundwater Management Zone 002- Geological Sections (NSW, 2009)

As highlighted in Figure 2 above the Renmark group forms at the basal confined aquifer and is characterised by dark grey to black carbonaceous clay and dark brown lignite (NSW, 2009). It is also comprised of a thick sequence of grey, medium grained quartz sand which commonly comprises 30-50 % of the entire unit (NSW, 2009). Deep bores in the Griffith area (logs-249-252) have revealed two formations of unconsolidated sediments with the lower sequence being deposited under lacustrine conditions consisting of sand, gravel, pipe clay and brown coal ranging from Eocene to Pliocene (Wynn, 1962).

The Cavil Formation is a semi-confined to confined middle aquifer deposited during 5-15 million years ago (Late to middle Miocene) and is dominated by pale grey, coarse quartz sand with lenses of pale grey to white laolintic clay. The higher portion of sand, in some areas up to 70% of the composition, makes it the most productive aquifer of GMA002. Thickness ranges from 50 to 70 m in the eastern part of the management area with a maximum thickness of up to 90 m (NSW, 2009).

The Shepparton Formation which is of Late Pliocene to Pleistocene age directly overlies the Calivil Formation and is comprised on complex assemblages of clays, silts and sand that were deposited in a fluvio-luustrine environment. The portion of sand is highly variable ranging from 20- 30%, with thickness of sediments varying in averages closer to 65m (NSW, 2009). For the purposes of this report the Shepparton Formation has been divided into the Lower and Upper Shepparton Formations.

The origin of quaternary sediments have been heavily debated between geologists postulating fluvial deposition during periods of high rainfall while the latter is the opinion that deposition has been mainly Aeolian and took place during arid phases. Sediments consist of largely sand, silt and clay and are traversed by numerous 'prior streams'- ancient river channels attained widths many times that of the present Murrumbidgee River containing deposits of sand, clay and some gravel (Wynn, 1962). Prior streams over this period took the form of distributaries, diverging from a central river in the vicinity of Narrandera.

Other regional rock types not associated with the hydrogeological data of this report but are of significance to the region include co-magmatic granites intruding into the Upper Devonian sediments of tentative age of Carboniferous. Flows of rhyolite and dykes of the Upper Devonian and necks of the porphyry exist north and east of Ardlethan. Also, located 13km West North West of Griffith is a small flow of basalt, which is fine grained, porphyritic in olivine and feldspar with regularly spaced columnar joints, partly or totally replaced by iddingsite (Wynn, 1962).

A summary of the water bearing units of GMA002 (Shepparton and Calivil/Renmark Formations) are highlighted in Figure 3.

Description	Shallow (Shepparton)	Deep (Calivil/Renmark)
Age of water (years)	up to 3,000	2,000-20,000
Water Quality (mg/L)	Variable, generally 1,500-7,000, fresher quality closer to river and within irrigation areas.	Generally less than 1,000 in eastern parts, approximately over 40% of GMA.
Yields (L/s)	Variable, generally between 0.1 – 10, occasionally >10.	Variable, generally 50 - 350 occasionally >350.
Groundwater flow direction	generally east to west	generally east to west
Hydraulic gradient	1:4,300 (eastern part of GMA) 1:5,000 (western part of GMA)	1:1,900 (eastern part of GMA) 1:7,200 (western part of GMA)
Estimated rate of flow (m/yr)	0.04-0.20	0.1-11.5
Hydraulic conductivity (m/d)	0.5-2.0 (groundwater model)	2.0-60.0 (groundwater model)
Specific Yield/Storage Coefficient	0.10-0.25 (groundwater model)	1.00E-05 to 5.00E-03 (groundwater model)
Average thickness	65 m	100 in the eastern parts, >100 in the west
Volume of groundwater in storage (x1,000 GL)	532.5 (assuming a porosity of 0.25)	1,515.6 (assuming a porosity of 0.25)
Recharge to storage ratio	1:1,400	1:6,000
Volume of fresh groundwater in storage (x1,000 GL)	19.8 (assuming 37% of aquifer only)	330.0 (assuming average aquifer thickness of 100 m in recharge areas and 40% of aquifer only)

Figure 3 - Groundwater Management Zone 002- Aquifer Characteristics (NSW, 2009)

The NSW Office of water commissioned a model of the Lower Murrumbidgee Groundwater Management Area, consisting of 3 geological formations representing the Shepparton, Calivil and Renmark aquifers.

REGIONAL INFLUENCES ON GROUNDWATER

Climate

It is important to rationalise regional and localised hydrogeological data and analysis by considering potential influences by climate and crop water usage on a regional and localised scale. This section of the report provides background data in relation to these influences on a regional scale. Correlations between regional and localised influences on groundwater are discussed in more detail in later sections of this report.

At a regional scale climatic data has been collected from CSIRO and MI's own meteorological stations. A list of regional weather stations is listed in Table 1.

Table 1 - MI and CSIRO Regional Weather Stations

Weather Station	Location	Type
Barren Box Station	Tabbita Irrigation District	Murrumbidgee Irrigation Site
Benerembah Station	Benerembah Irrigation District	Murrumbidgee Irrigation Site
Bringagee Station	Benerembah Irrigation District	Murrumbidgee Irrigation Site
Carathool Station	Wah Wah Stock and Domestic Irrigation District	Murrumbidgee Irrigation Site
Kooba Station	Yano Irrigation Area	Murrumbidgee Irrigation Site
Wamon Station	Yanco Irrigation Area	Murrumbidgee Irrigation Site
Yenda Station	Mirrool Irrigation Area	Murrumbidgee Irrigation Site
Hay Station	Town of Hay	CSIRO Site
Griffith Station	Hanwood	CSIRO Site

Table 2 - BOM Representative Weather Stations in the MIA

Weather Station	Location	Type
Griffith Station	Griffith Airport	BOM
Yanco Station	Yanco Agricultural Institute	BOM
Leeton Station	Leeton	BOM
Narrandera Station	Narrandera Airport	BOM
Carrathool Station	Carrathool	BOM

Weather stations presented in table 2 were used in the comparison of regional rainfall and groundwater data in this report. Figure 3 represents annual rainfall patterns for all stations in Table 2 from BOM rain gauge stations spanning the period 1958-2011.

Notable in Figure 4 is the drop in annual rainfall between 2000 and 2008 where annual rainfall was below 450mm (with the exception on 2005- 2006 at Narrandera where no data was available from this site). Figure 3 shows a rise in annual rainfall for 2009-2010 to between 400mm and 700mm. Figure 5 highlights individual annual rainfall data for Griffith BOM Station

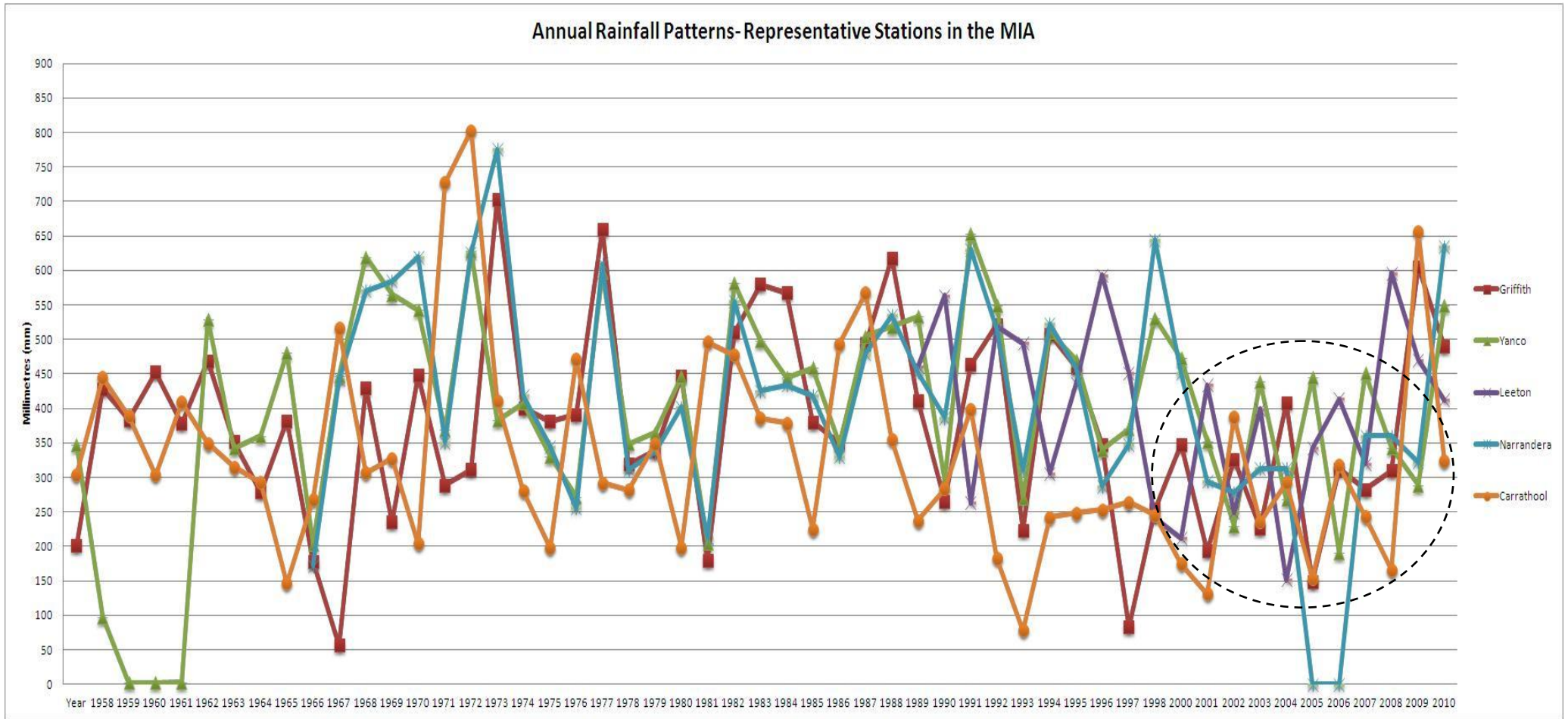


Figure 4- Annual Rainfall Patterns of representative BOM gauge stations in the MIA with some records ranging from 1958-2011.

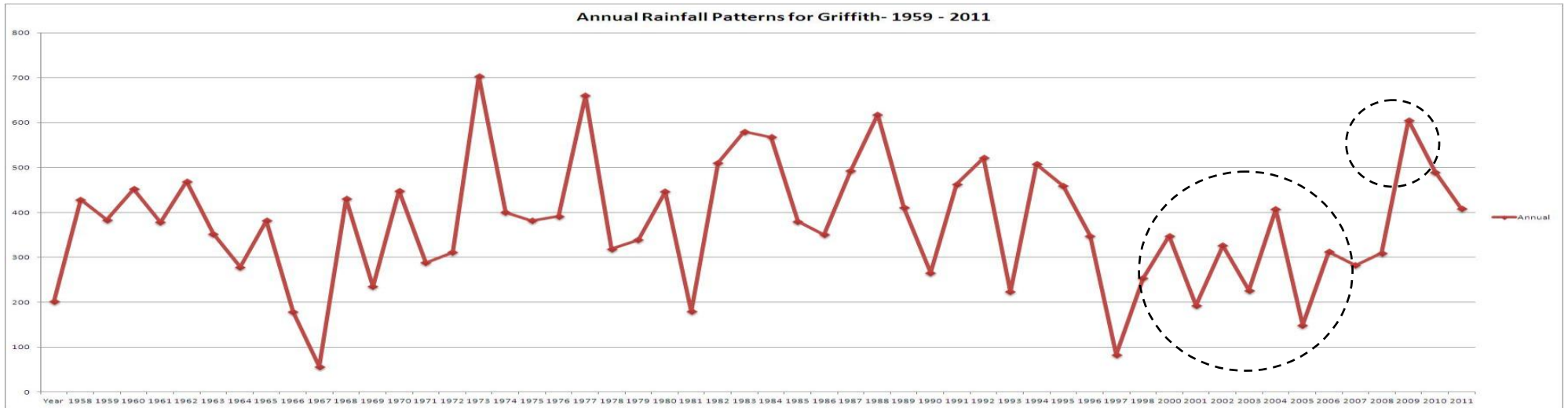


Figure 5- Annual Rainfall Patterns of Gauge Station at Griffith (Airport) from 1959-2011.

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	33.7	29.3	36.8	27.9	35.3	33.3	33.4	36.1	32.4	39.4	33.5	33.3	395.8
Lowest	0.0	0.0	0.0	0.5	1.2	0.3	1.1	2.2	2.2	0.0	0.0	0.0	148.8
5th %ile	2.9	0.2	0.1	2.4	2.1	6.1	3.7	4.1	6.1	5.9	0.1	0.2	182.2
10th %ile	3.5	0.8	1.2	4.5	3.7	10.6	5.4	5.1	7.7	10.0	3.8	1.2	224.5
Median	19.6	20.4	14.4	19.1	30.7	28.9	30.3	33.7	27.4	27.0	28.2	24.6	381.7
90th %ile	80.0	69.5	64.0	56.8	78.5	64.8	68.8	61.5	62.1	92.1	75.1	76.5	574.8
95th %ile	90.4	84.3	168.4	73.1	87.8	68.2	83.0	66.8	78.2	98.5	85.4	77.4	615.2
Highest	257.1	138.2	216.8	170.2	136.0	74.8	88.4	87.6	116.1	143.0	128.0	127.8	703.3

Figure 6- Monthly Rainfall statistics of BOM Gauge Station 75041 at Griffith (Airport) from 1959-2011.

A summary of evaporation statistics are provided in Table 3. As expected in temperate climates, average evaporation is at its lowest during the winter months and highest during summer months. Autumn and spring vary slightly in range by +/-10%.

Table 3- Average Evaporation and Evapotranspiration values for Griffith Region (BOM, 2012)

Season	Average Evaporation	Average Annual Evapotranspiration
Autumn	500-600 mm	400 mm
Spring	600-700 mm	400 mm
Summer	900-1000 mm	400 mm
Winter	100-200 mm	400 mm

Rainfall data from 2001-2011 and average evaporation statistics for the region have been used in comparison to baseline groundwater data discussed throughout this report.

Crop Water Usage

MI collects data related to crop water ordering, supply and use. This information is useful in correlating contributing factors such as irrigation to rise in groundwater levels, in observing water quality parameters within channel and drainage systems and comparing water usage with climatic data and fluctuations in groundwater levels. It should be noted that data has been presented at a broad scale, not taking into account variations in irrigation preferences (i.e. spray vs. drip systems) or specific farm based practices.

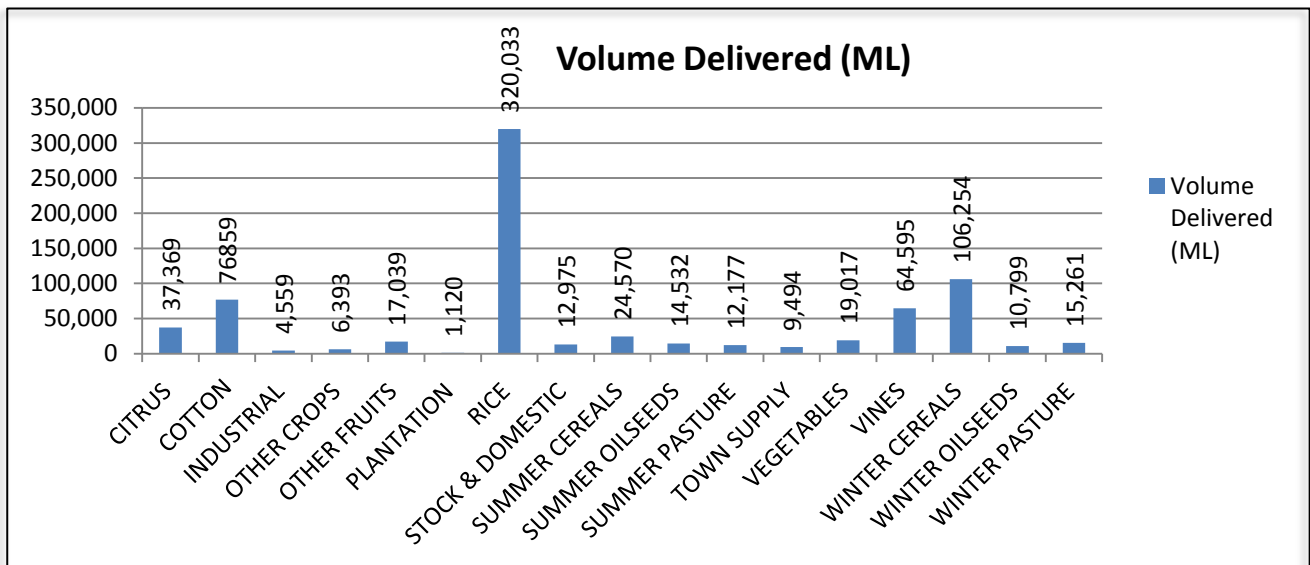


Figure 7 - Volumes (ML) of water delivered for Agriculture Use in the MIA by Crop Type.

A broad analysis of volume of water delivered by crop type shows that water for rice farming had the highest demand in 2011/12, followed by winter cereals, cotton and vines. Vines constituted 64,595 ML of total volumes delivered in 2011-2012. Of a total 753,046 ML Delivered in 2011-2012, 8.7% of total water deliveries were attributed to vines.

Table 5- Comparison of Monthly Average Rainfall, Evaporation and Crop Water Use in a better than average rainfall season

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Highest	257.1	138.2	216.8	170.2	136.0	74.8	88.4	87.6	116.1	143.0	128.0	127.8
Highest Ave. Crop Water Use	40	40	40	40	40				40	40	40	40
Ave. Evaporation	900	900	500	500	500	100	100	100	600	600	600	900
Ave. ETo	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3

When combined with monthly rainfall statistics in an above average rainfall season with a reduced controlled crop water usage of 40 mm (to reflect increased rainfall conditions) and reduced evaporation rates (due to increased rainfall and favourable climatic conditions) evaporation still exceed precipitation.

MONITORING NETWORK RATIONALE

Since 1996 more than 900 piezometers have been used for groundwater monitoring by MI in and adjacent to the Murrumbidgee Irrigation Area (MIA). However due to structural related age, maintenance, access issues and unforeseen damage the number of piezometers producing readings has gradually declined over this period. An overview of the Piezometer network used to provide hydrogeological data in this report is listed in Tables 6 and 7 below.

Table 6: Piezometers with a reading from 2007 - 2011

Read Piezometers	01-Sep-01	01-Sep-07	01-Sep-09	01-Sep-11
All	918	835	796	762
Calivil	27	22	21	27
Lower Shepparton Formation	389	331	319	325
Upper Shepparton Formation	502	482	456	410

Table 7: Piezometer statistics (*1)

Reading Type	Sep- 2010	Mar- 2011	Sep- 2011	Mar- 2012
Read	789	793	799	786
Dry	87	75	76	65
Flooded	0	2	0	15
Out*	57	63	58	67
Available**	876	870	875	866

*Out encompasses those which have been damaged by farm machinery etc

**Available is the total list including the positive flooded and dry readings

It should be noted that during March 2012 several piezometers were flooded. Therefore this data has not been included in the analysis. The location of Upper Shepparton Formation (USF) and Lower Shepparton Formation (LSF) piezometers in the MIA used for monitoring during September 2011/12 are highlighted within various groundwater maps in later sections of this report.

Groundwater levels for the Calivil Formation Piezometer are supplied by the NSW Office of Water. This information provides groundwater data for a further 50 regional piezometers in addition to 27 piezometers within the MIA owned by MI (Table 1). Piezometers from NSW Office of Water ranging from 35 m to 150 m were considered only, as the deeper layers are considered to be representative of the basal confined aquifer- the Renmark Formation. Groundwater pumping volumes for the region have not been considered in this report.

REGIONAL GROUND WATER CONDITIONS

For the purposes of this report, MI has incorporated historical data to develop groundwater maps using 2001 as the benchmark. Following 2001 there were drought conditions and significant changes in annual

rainfall patterns. This section of the report will make comparisons of data collected in from September 2001, 2009 and the current year 2011/12. This is reflected in maps contained in this section.

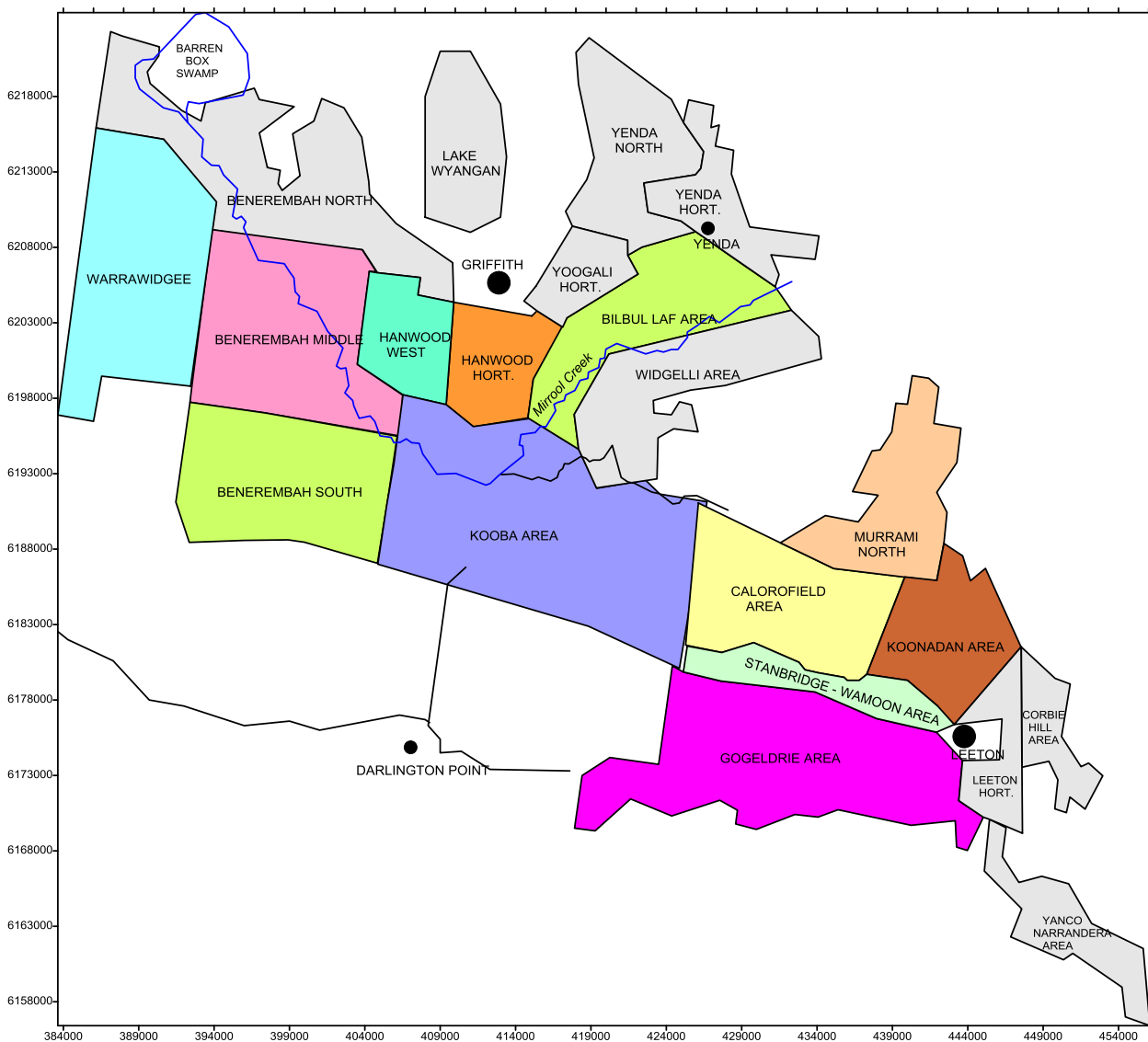


Figure 9: Hydrograph of average groundwater behaviour MIA USF zone, 2000 to 2012 (Van Der Lely, 2012)

Figure 9 shows the outline of the hydro-zones used for the analysis of the 2011/12 groundwater conditions presented in this report. Delineation of hydro-zones is based on consideration of the stratigraphical conditions within the MIA, in particular the extent of the Upper Shepparton Formation based on geological characteristics within those zones. Many hydro-zones are identified within the MIA; these are briefly referred to in Table 8 (a) to 8 (c) below.

Tables 8 (a) to 8 (c): Hydro-zones of the MIA with Brief Comment of Stratigraphy (Van Der Lely, 2012)

a) Where USF Aquifer is Present

Name	USF comment	LSF comment	Comment
Warrawidgee	Narrow prior streams	More widespread	Significant clay layers
Benerembah Middle	Narrow prior streams	More widespread	Significant clay layers
Benerembah South	Significant USF	Widespread	Variable
Hanwood West	Sands present	More widespread	Significant clay layers
Hanwood Hort.	Minor prior stream	Less significant	Significant clay layers
Bilbul LAF Area	Minor Mirrool Creek deposits	Minor sands only	Very significant clay
Kooba Area	Prior streams traversing	More significant	Some deep leakage

Calorofield Area	Sands present	Probably significant	No
Koonadan Area	Sands present	Not assessed	High WT area
Murrami North	Some sands present	Not present	Significant clay below
Stanbridge Wamoon	Prior stream area	Probably significant	Horticultural area
Gogeldrie Area	Sands variable ?	Probably significant	Significant clay layers

b) Where No USF Aquifer is Present

Name	LSF comment	Comment
Benerembah North	Some presence	Calivil F. Within 15m depth
Lake Wyangan	Some limited presence	Surficial permeability, undulating
Yenda North	Hardly any sands	Clay profiles
Yenda Horticulture	Hardly any sands	Clay profiles
Widgelli Area	Hardly any sands	Clay profiles
Corbie Hill area	No LSF	Hilly, surficial permeability
Wah Wah District	USF variable presence, LSF more significant	USF piezometers too small in number

c) Other Hydrozones (not analysed)

Name	USF comment	Comment
Yoogali horticulture	Some sands	Low permeability underneath
Leeton Horticulture	Sands at South Leeton	Variable
Yanco Narrandera	Sands near the River	Merging to foothills

The hydro-zones of group (a) are being reported here in terms of groundwater conditions. This report will not address group (b) hydro-zones as there have been no measurable piezometers in the USF. The LSF sands extend into north Benerembah, west to Wah Wah and east and south east to Yenda/Widgelli and North to Lake Wyangan, which are also depicted in the groundwater figures contained in this report.

The Lake Wyangan area and the Wah Wah District have been considered separately and reported independently from other LSF Hydro-zones. All analysis involving averages and other statistics will apply only to the USF hydro-zones. The hydro-zones of group (c) have been considered too small a size and deficient in data.

This section of the report will focus on an overall description of the characteristic and behaviour of the Shepparton and Calivil Formations at a regional level, with specific reference to the McWilliams Winery sites in later sections.

In the MIA, changes in groundwater levels happen at a broader scale due to the extent and location of the Shepparton Formation Aquifer. This aquifer system extends from somewhere between Narrandera and Leeton through to parts of Wah Wah. Causes and effects of increases in groundwater levels are witnessed on a broad scale in this aquifer and can occur from activities such as intensive irrigation, high rainfall and flood events. Therefore in theory what happens in Hanwood may eventually affect groundwater levels at Benerembah and vice versa. It is important to note that this may not necessarily be witnessed immediately. Lag time in groundwater rise and fall is experienced differently and can be site specific. Some of the drivers of lag time include localised stratigraphy, geological structures, aquifer thickness, permeability, hydraulic gradient, input (localised rainfall, flooding, and irrigation) and extraction.

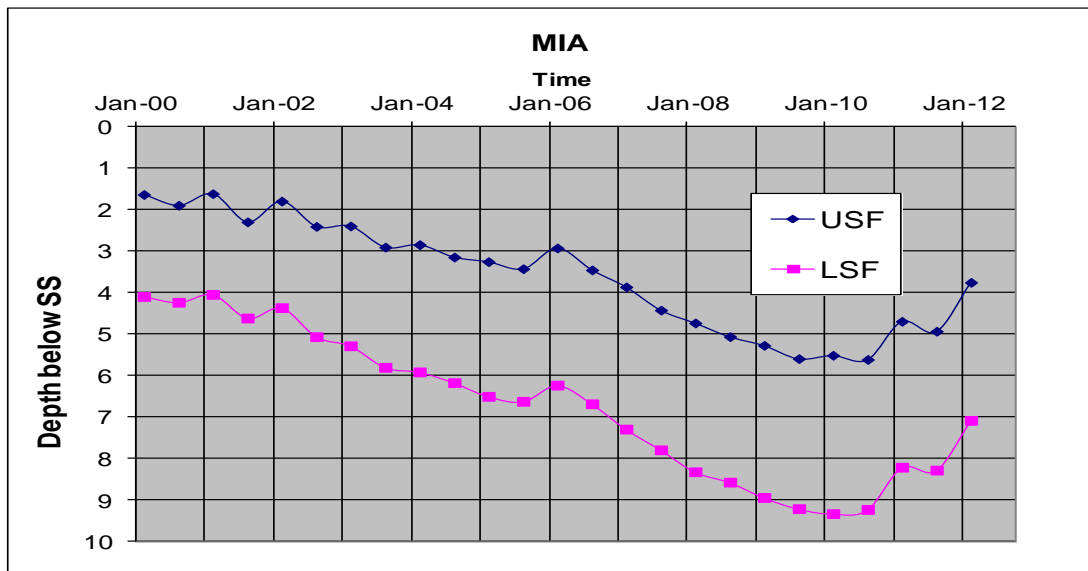


Figure 10: Hydrograph of average groundwater behaviour MIA USF zone, 2000 to 2012 (Van Der Lely, 2012)

Van Der Lely (2012) plotted the averages of standing water level measurements collected by MI for LSF and USF across the hydrozones with data spanning 12 years from 2000. As noted in Figure 10, water levels in the upper and lower Shepparton formations fluctuate simultaneously, suggesting that they are intrinsically linked and form part of an unconfined aquifer.

In the Murrumbidgee Irrigation Area, water tables within two metres of ground surface level present immediate risks in salinity issues with potential to impact adversely on crop production.

Table 9: Average Standing Water Level in USF Regions of the MIA from 2001-2012 (Water level below ground level)

MONITORING REGION	AVERAGE 2001	AVERAGE 2009	AVERAGE Sep 2011	AVERAGE Mar 2012
Warrawidgee	2.96	5.63	4.87	3.90
Benerembah Middle	1.66	5.31	3.88	2.27
Benerembah South	2.38	6.53	5.71	3.99
Bilbul Area	1.73	4.13	3.62	2.81
Hanwood West	2.94	6.97	6.16	4.49
Hanwood Horticulture	2.45	2.90	4.70	3.38
Kooba Area	2.02	5.88	5.53	4.24
Murrami North Area	1.73	4.31	2.99	2.30
Calorofield Area	1.88	6.10	5.42	4.09
Koonadan Area	1.89	4.46	3.90	3.01
Stanbridge- Wamoon Area	3.32	6.59	6.56	5.89
Gogeldrie Area	3.49	7.30	6.86	5.56
Wah Wah District	11.84	12.87	13.42	13.40

Throughout this past year water levels have continued to rise on average at least 1 m a year from 2009-2012, this is likely attributed to high rainfall, flood events and increased irrigation due to favourable climatic patterns since 2010 (from drought to periods of rainfall).

Benerembah Middle has seen the largest rise of groundwater level in comparison to other regions over this period, which when correlated with rainfall data from Figure 4 and Crop Water Use data from Figures 7 and 8, can be attributed to an increase in water intensive crops, such as rice and cotton, as well as link to

favourable climatic patterns and water availability. Analysis of historical groundwater data undertaken by Van Der Lely (2012) and highlighted in Wynn (1962) also note the presence of “prior streams”, which act as direct recharge areas to aquifers in the Shepparton Formation, a major contributing factor to quicker than expected rises in groundwater levels in Benerembah, providing for increased infiltration of irrigation water into the USF.

This information suggests that groundwater level rise in Benerembah, Bilbul and Murrami North are close to approaching 2.5m from surface level. The stratigraphical sequences and aquifer characteristics of such vulnerable areas must be clearly defined to understand the impacts of irrigation on regional aquifer systems.

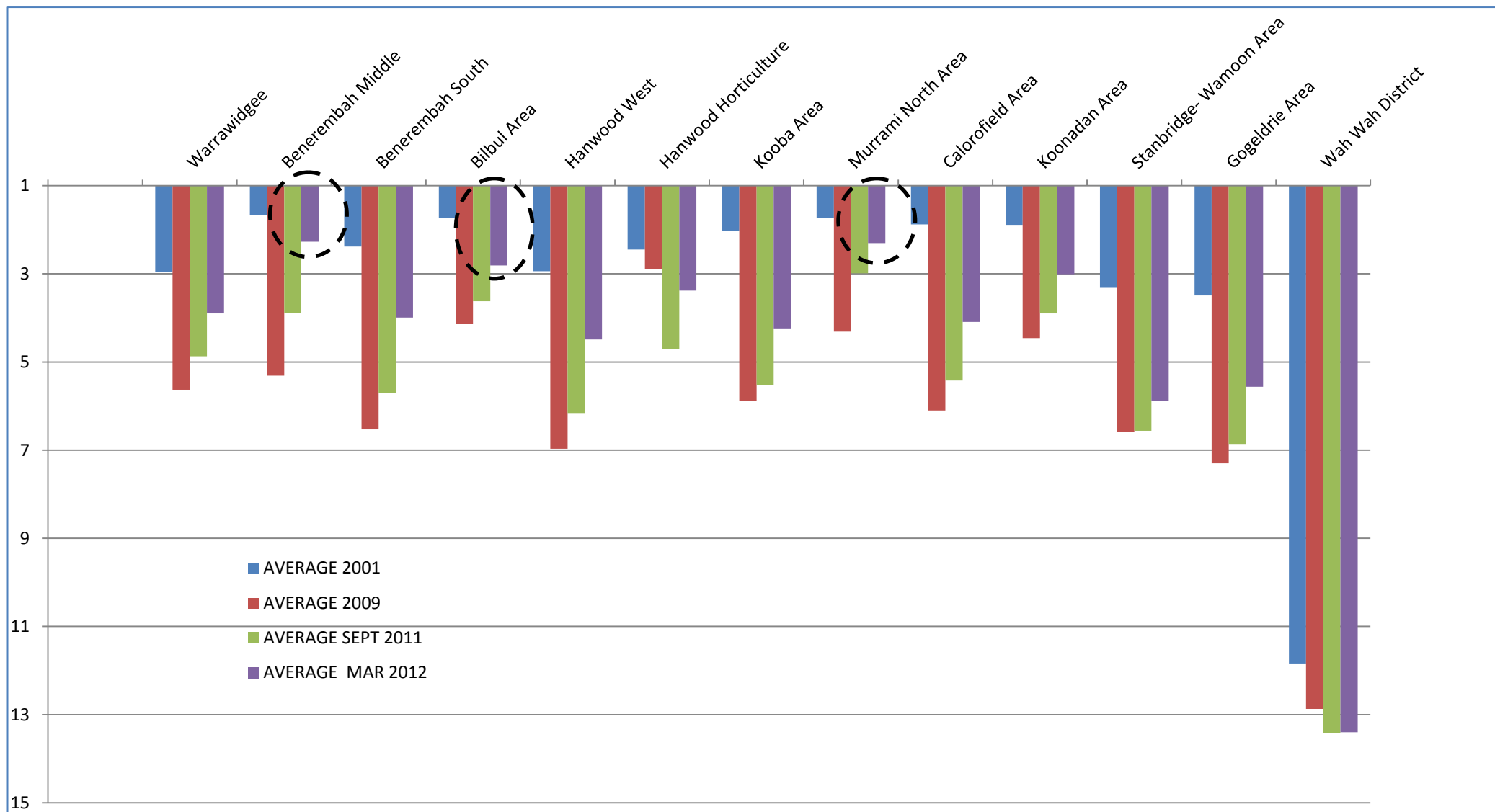


Figure 10: Hydrograph of average groundwater behaviour MIA Shepparton Formation, 2000 to 2012

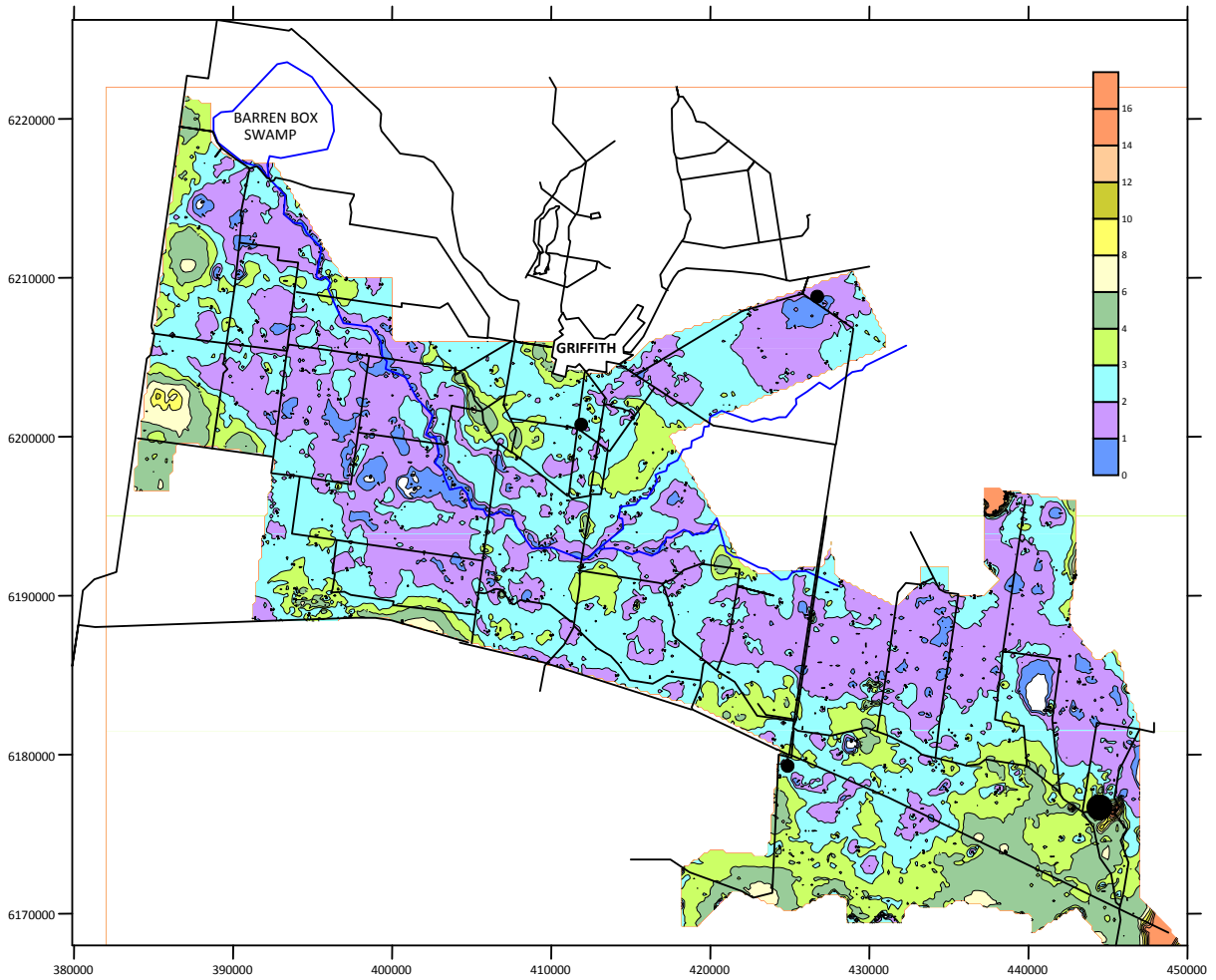


Figure 11: Groundwater Contours for the MIA USF for September 2001 (Van Der Lely, 2012)

Map 11 has been generated in Surfer through data supplied by MI and models developed by commissioned consultant Ary Van Der Lely (2012). These results show that in September 2001 close to 70% of the regions groundwater levels were between 0-2 m, with 20% of the regions levels between 3-4m below ground level. This is comparable and consistent with higher rainfall over 1994-1999 as shown in Figure 4.

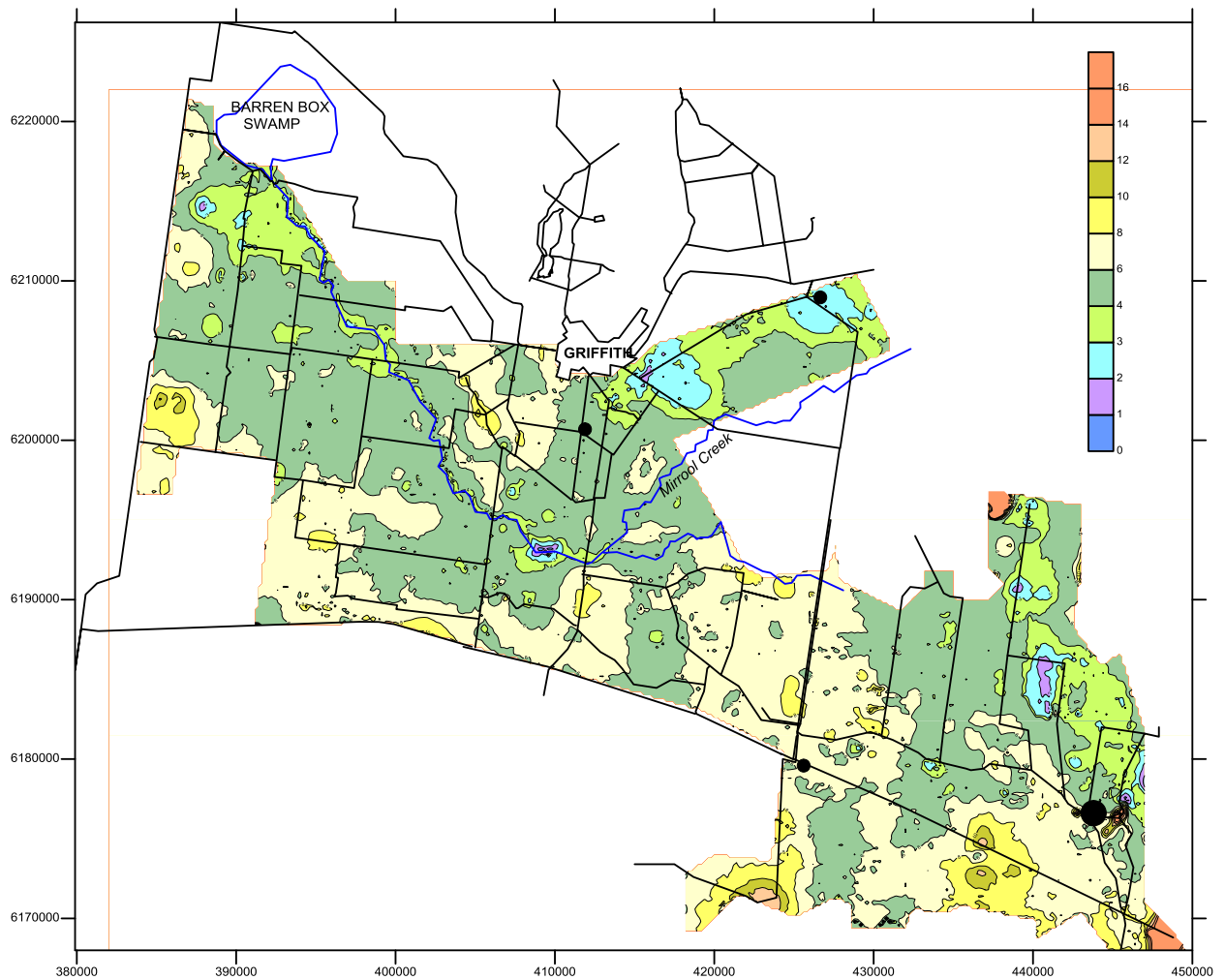


Figure 12: Groundwater Contours for the MIA USF, September 2009 (Van Der Lely, 2012)

Map 12 has been generated in Surfer through data supplied by MI and models developed by commissioned consultant Ary Van Der Lely (2012). These results show that in September 2009 close to 60% of the regions groundwater levels were between 3-5 m, with 40% between 6-10m below ground level. This is a significant difference to what is presented in Map 11, which is likely attributed to a decrease in rainfall during the drought (2000-2009), a reduction in water availability for rice growing (no rice grown in 2007-2008) and less water available for medium and low security crops.

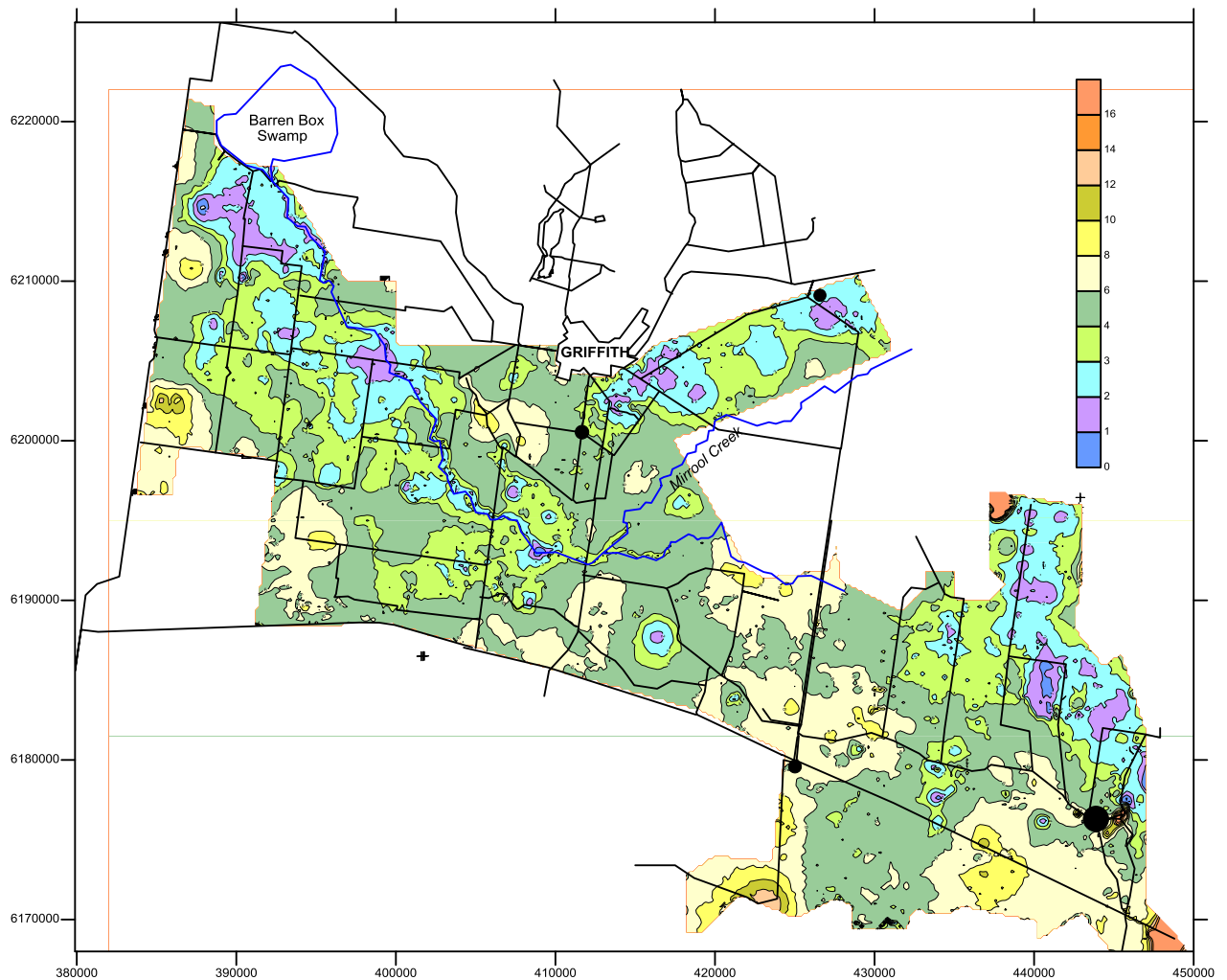


Figure 13: Groundwater Contours for the USF for September 2011 (Van Der Lely, 2012).

For September 2011 higher groundwater levels of the Koonadan/ Murrumbidgee, Benerambah and Bilbul hydro zones ranged from 1-6m. This is comparative to a rise in rainfall and allocations across the region, moving from an 8-10 year period of drier conditions (drought) into wetter conditions. As a result there was an increase in rice growing in these regions due to favourable conditions and water availability which was not present in 2007-08 (Highlighted in Figure 11). The rise in the groundwater table across these regions in particular can be considered to be linked to a number of factors such as higher than average rainfall within a short time scale, a similar increase in irrigation patterns simultaneously, and the stratigraphy of the regions where the groundwater level was between 1-3 m from ground surface.

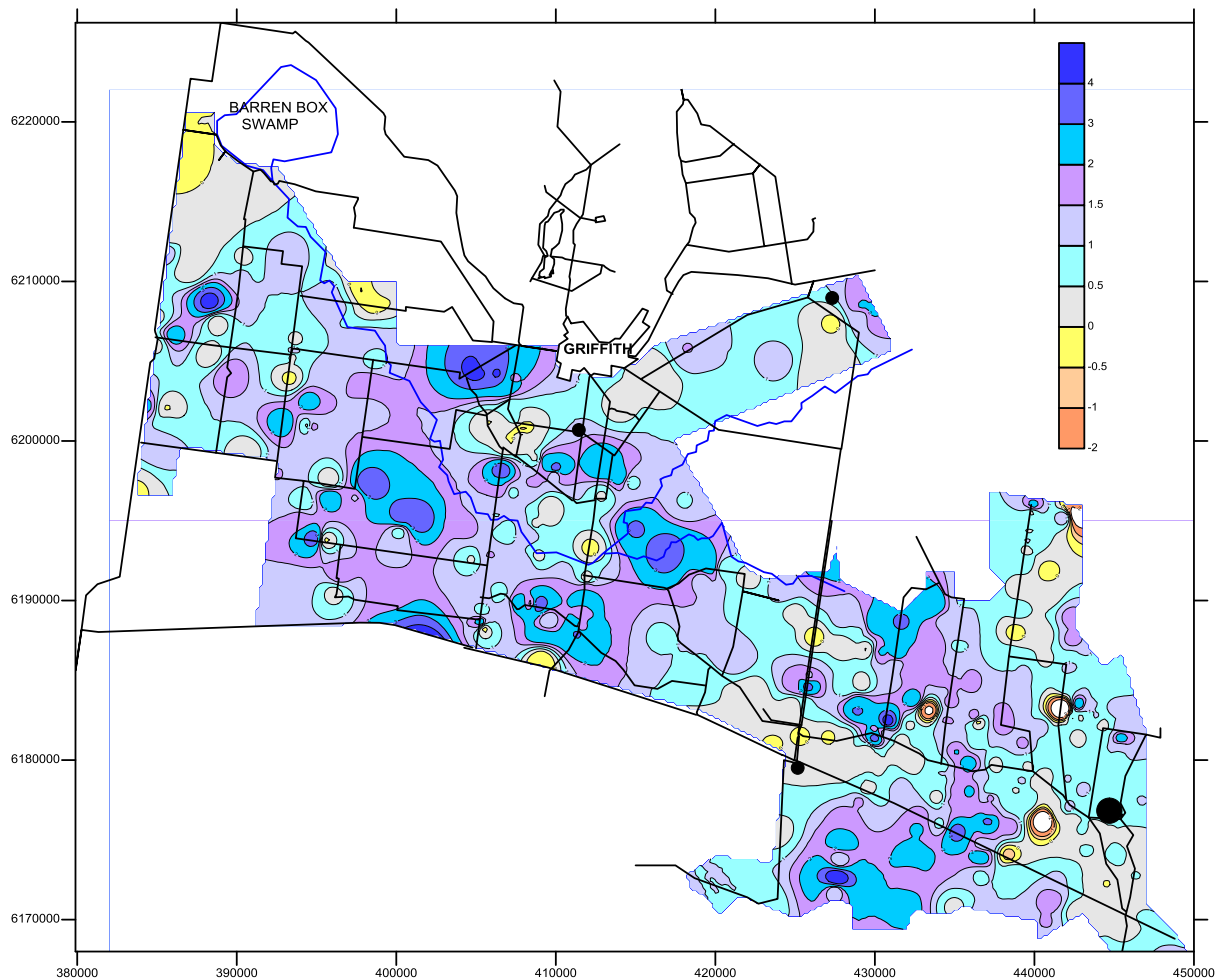


Figure 14: Regional Groundwater Rises in the MIA (in metres) in the USF from September 2011 to March 2012 (Van Der Lely, 2012)

Figure 14 shows the rise of groundwater levels in the USF (in metres) from September 2011 to March 2012. The average increase across the mapped region was 1.28 metres (Van Der Lely, 2012). The area of greatest concern as discussed previously in this report was identified in the Benerembah Middle hydro-zone where groundwater level rise was above average. The Yenda area shows large increases as expected but there are few piezometers in that area to record and provide a localised observation suitable for modelling. A uniform rise across the regions for March 2012 may indicate impacts in groundwater level rise from flooding, with the addition of larger than expected volumes of water than normally present at that time of the year over a shorter period of time.

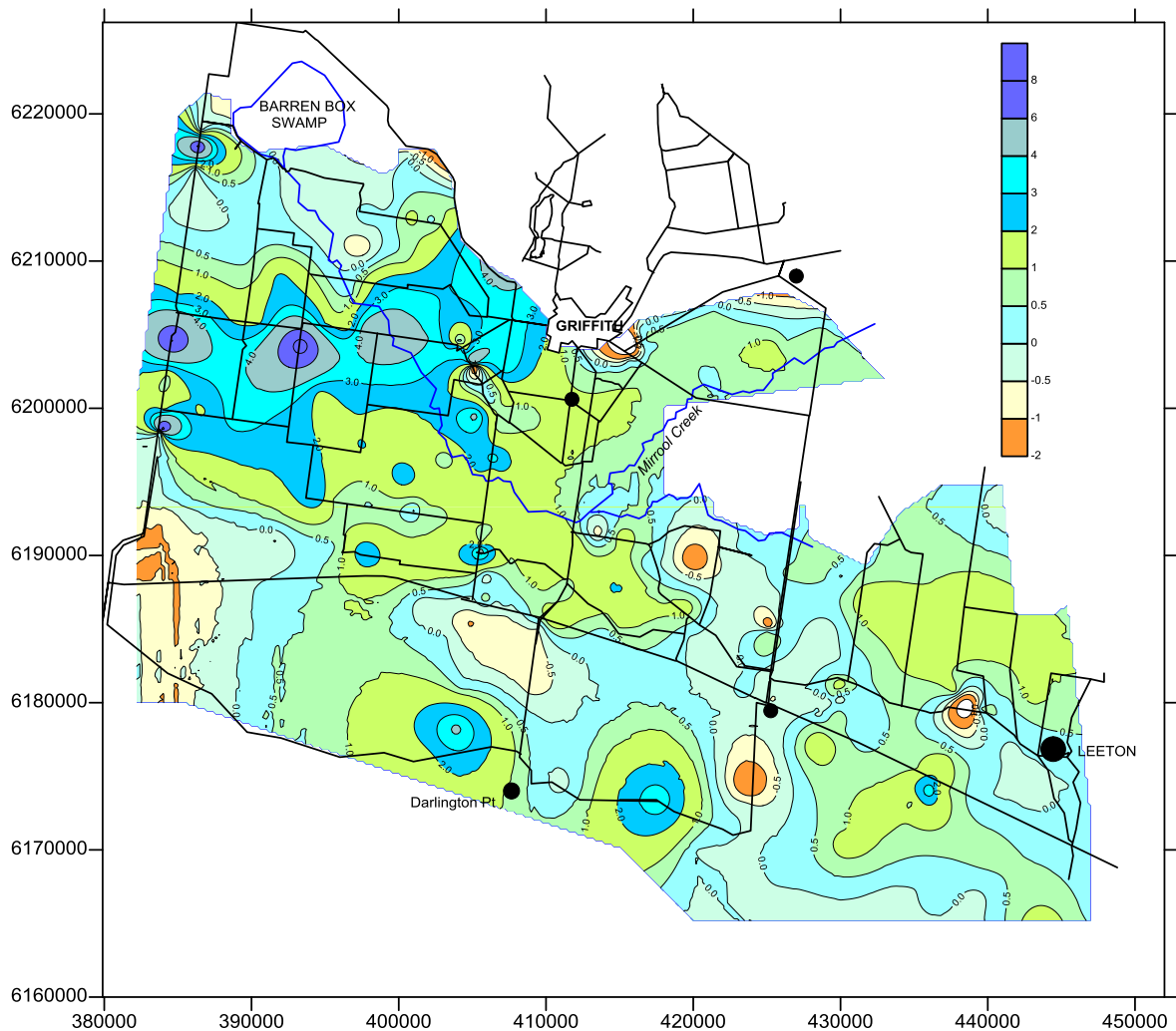


Figure 15: Rise in groundwater pressures in the MIA LSF for the period Sept. 2009 to Sept. 2011 (Van Der Lely, 2012).

Figure 15 applies to the MIA as well as the zones to the south (Kooba Station) and the area of North Benerembah where no USF aquifers occur. The average change within the USF defined area of the MIA LSF was 0.93 metres. It is shown that the area with the highest increase is in the Benerembah area. Whilst the explanation may be considered speculative, it is noted that during 2010/11 the rainfall was well above average both during winter and summer. This would have had an effect on the rates of deep groundwater pumping from the Calivil Formation. This pumping was quite intensive during the drought period of 2002-09, but it could be speculated that a significant reduction would have occurred in 2010-11 due to increased rainfall. That in turn would have had an effect on the LSF groundwater pressures as the USF and LSF are intrinsically linked. Van der Lely (2012) concludes that if the above is correct then it is also likely that there is a degree of connection between the LSF and the Calivil Formation in Benerembah becoming less so in the Mid Benerembah and Warrawidgee areas including Hanwood west (considered to be poor).

The Kooba Station area south of the MIA did not show rises in groundwater pressure as found for the MIA hydro-zones. From this it appears reasonable to conclude that the impact of groundwater conditions in the MIA is not being transferred to the south (Van Der Lely, 2012).

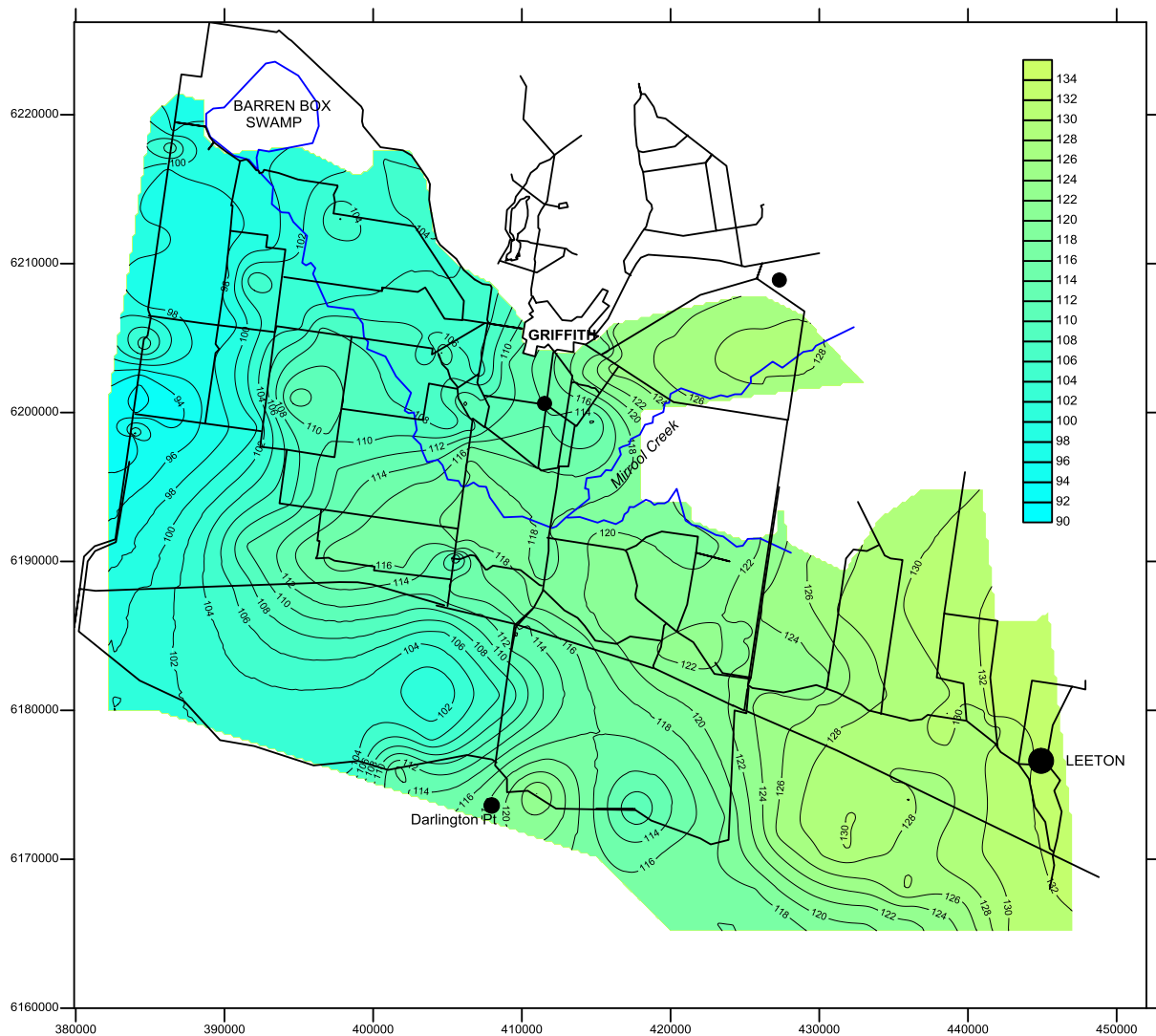


Figure 16: AHD contours of the MIA LSF September 2011 (Van Der Lely, 2012).

The AHD contours for September 2011 are the same as reported in previous years (Van Der Lely, 2012). The deep trough starting in the horticultural areas near Hanwood and extending westwards is clearly observed. This combined with the high groundwater levels from Yoogali southwards suggest that faulting in this area could be preventing escape of high groundwater pressures in the Bilbul and Yenda areas (Van Der Lely, 2012). This could be attributed to synclinal changes in structure where the Griffith Syncline and the Cocoparra Syncline may have altered preferential groundwater flow paths. This is due to the nature of the fold which in turns affects the availability of water. For example a broad, gentle fold can create a relatively shallow, confined aquifer that extends over a large area. However this could also be a good source of water if sufficient recharge can occur through the confining layer or if the aquifer can transmit enough water from areas where the confining layer is absent. More investigation into this will need to be undertaken by MI at a later stage.

Another theory for this change in groundwater behaviour could be attributed to the buried valleys built over time through the deposition of alluvium after synclinal changes. Alluvial deposits are divided into 4 categories based on manner of occurrence: Water courses, abandoned or buried valleys, plains and intermontane valleys. Abandoned or buried valleys are valleys that are no longer occupied by the streams that formed them. Although such valleys may resemble water courses in permeability and quantity of groundwater storage, their recharge and perennial yield is usually less. In some places gravel and sand beds form important aquifers under these plains in other places they

are relatively thin and have limited productivity. More investigation into this will need to be undertaken by MI at a later stage.

The lower AHD levels in the Kooba area are at least partially explained by groundwater pumping from the Calivil Formation where semi-confined conditions are present between the Calivil and Shepparton Formations.

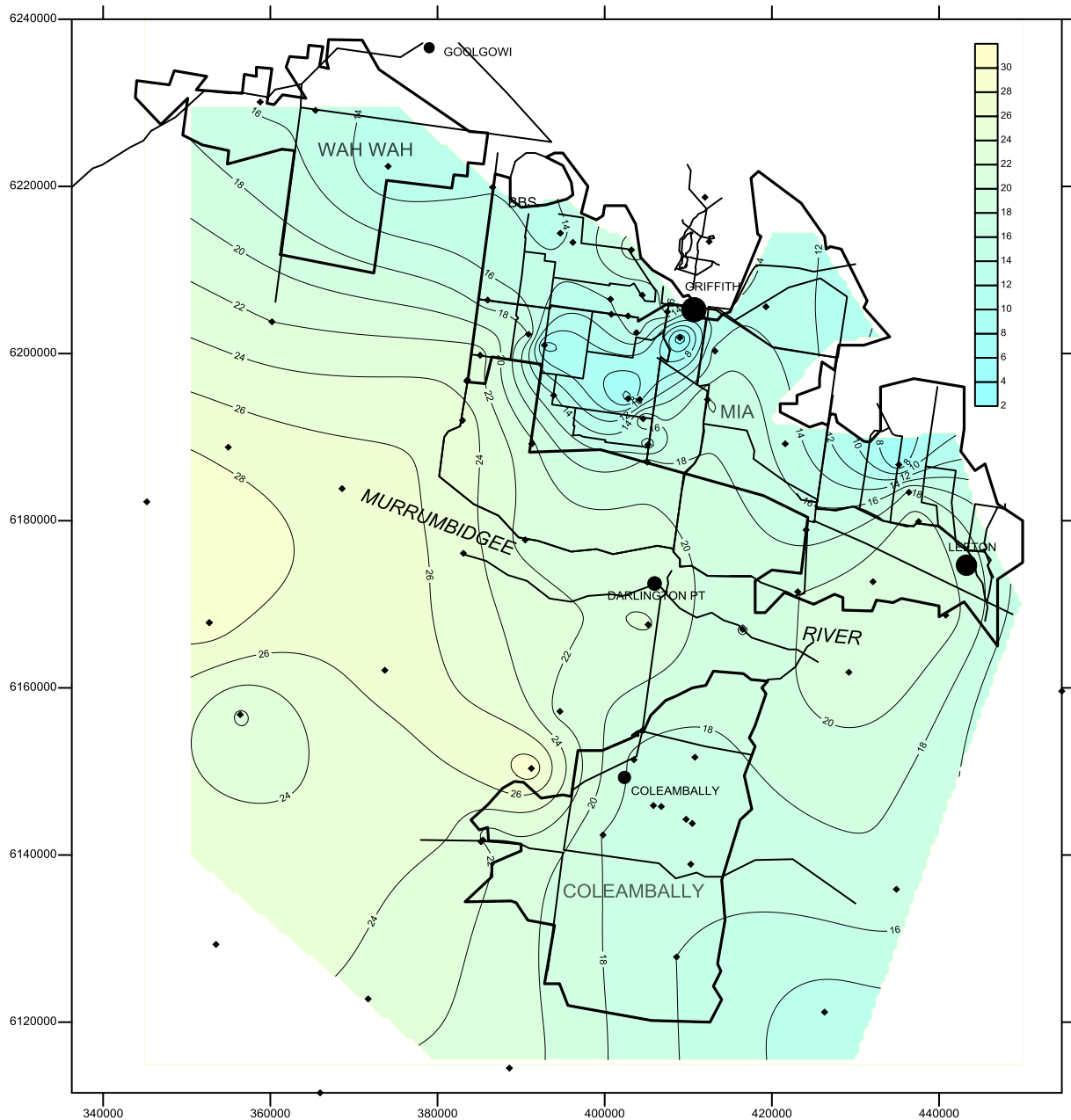


Figure 17: Calivil Formation groundwater contours MIA, Wah Wah and Coleambally September 2011 (Van Der Lely, 2012).

The Calivil Formation groundwater contour maps have been prepared using drill log, AHD and level data from deep (>35m) piezometers controlled by Murrumbidgee Irrigation and NSW Office of Water Observation Piezometers, with depths ranging from 50-120 metres. Both autumn (February) and winter (end August, early September) standing water level data have been used.

Figure 17 shows that standing water levels are still much deeper than historical values about 20 metres below the land surface near Darlington Point, gradually moving towards 2-4 metres at lower hydraulic areas at Benerembah, Yoogali, Bilbul and Murrami areas.

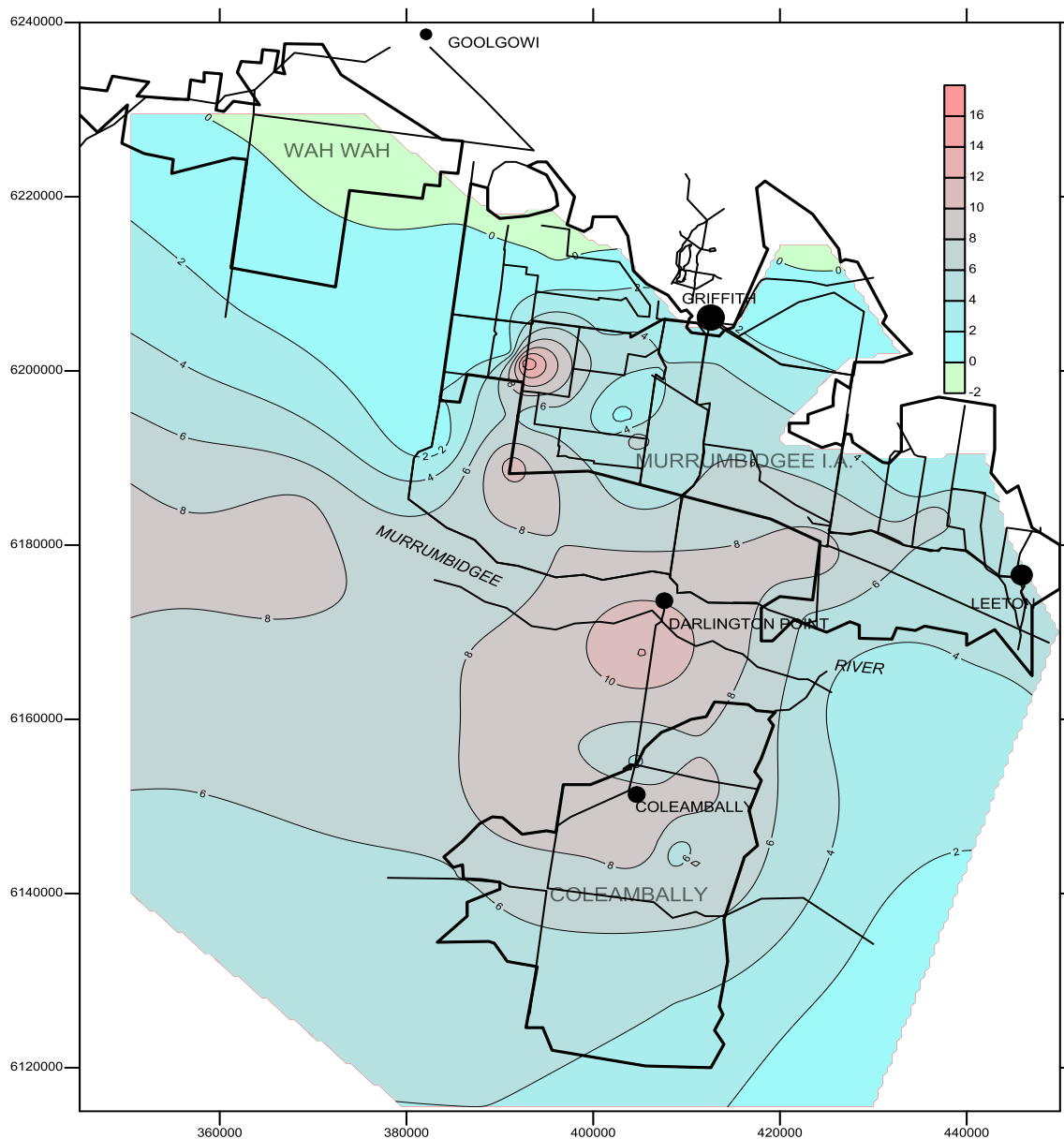


Figure 18: Rise in Calivil Formation pressure levels September 2009 to September 2011, MIA, CIA and WWID areas (Van Der Lely, 2012).

Figure 18 shows that in vast areas of Coleambally and to the west the pressure levels have recovered significantly over this two year period with rise in the groundwater table of 10-14 metres, a likely consequence of recharge in the Calivil and Shepparton formations from high rainfall, localised flooding and increased recharge through associated flows in the Murrumbidgee River. It is also likely that pumping rates have declined due to such events and less irrigation demand is required in wetter periods (double the LTA rainfall of 412 mm from 1962-2010 to 739 mm in 2011). Figure 18 also highlights parts of Yenda and Wah Wah where groundwater levels have decreased by 2 m, likely as a result of favourable farming conditions in wetter years and an increase in rice farming from that of 2007-2008. A very high recovery is also recorded for parts of the Benerembah district and other parts of the MIA, confirming earlier comments about this area.

GROUNDWATER IN THE HANWOOD AND BILBUL REGION

McWilliams Winery and Farms are located within the Hanwood Horticulture, Hanwood West and Bilbul LAF hydrozones. Standing water levels in these zones presently range from 0.5-2.0 m. Prior to the floods in March 2012; water levels observed in September 2011 were in the range of 1.0 to 6.0 m below surface level.

Figure 19 below highlights groundwater contours for both Hanwood and the Bilbul hydrozones for September 2011. As noted below groundwater levels in the vicinity of the McWilliams Winery and Vineyards.

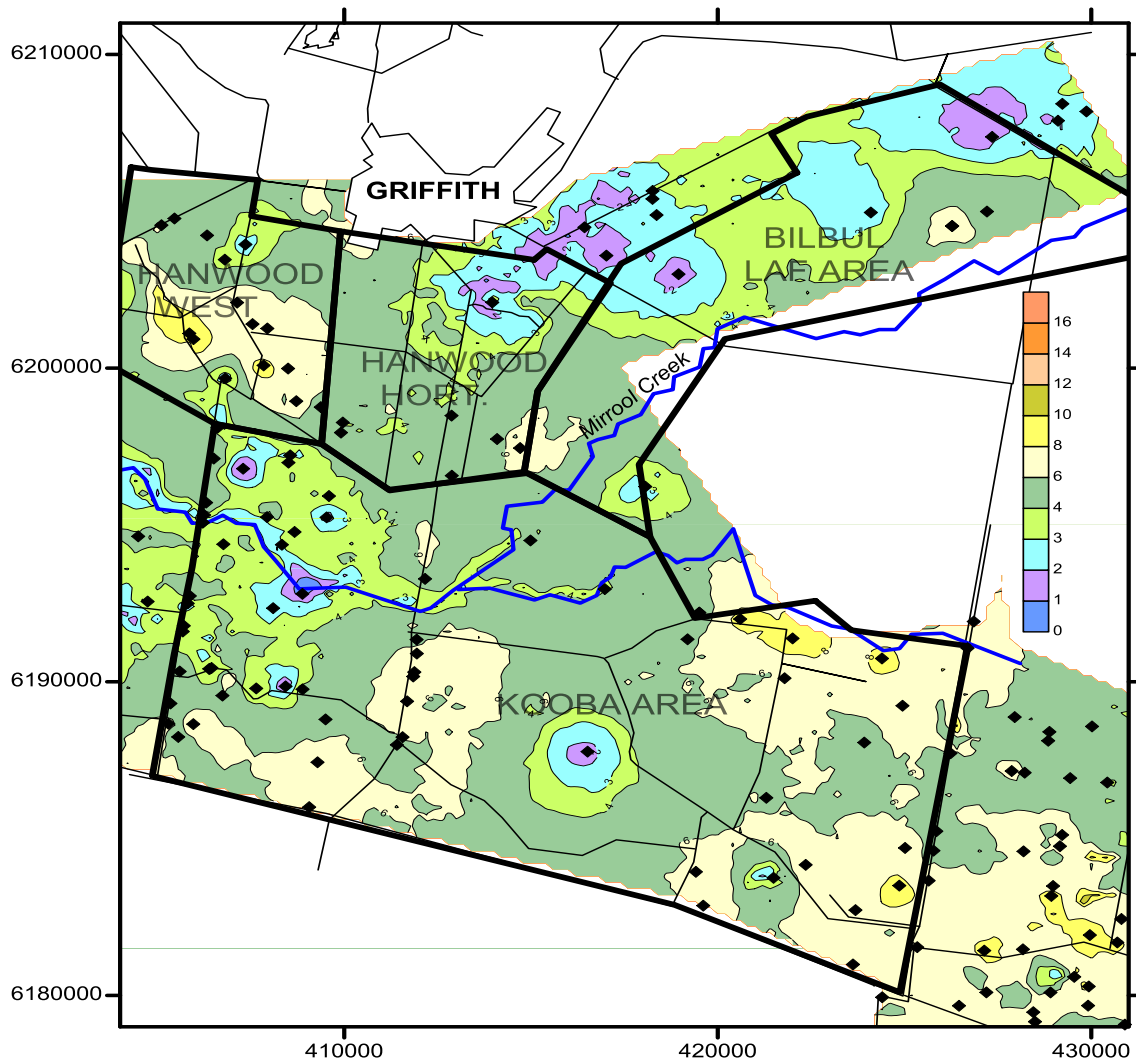
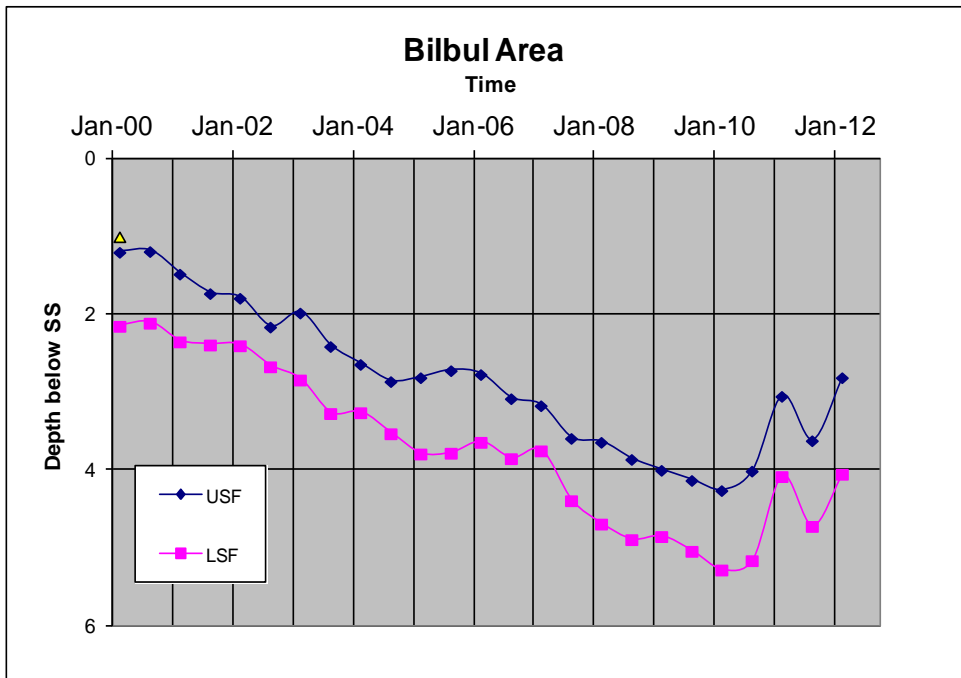
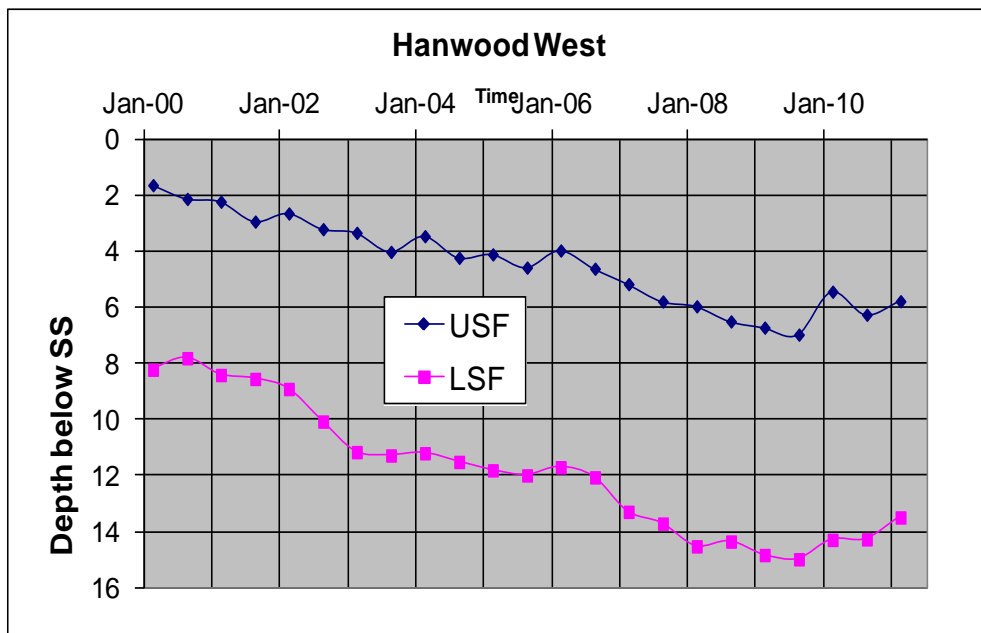


Figure 19: Detailed groundwater contour map for Hydrozones South of Griffith Township, September 2011 (Van Der Leyly, 2012)



Figures 20 and 21: Hydrographs of the USF for the Bilbul Area and Hanwood West 2001 to 2012 (Van Der Leyly, 2012)



It is noted that the difference between LSF and USF groundwater levels is high in Hanwood west, and less so in the Kooba area. In the Bilbul area this difference is also small. In all graphs it is clear that the LSF and USF are intrinsically linked (Van Der Lely, 2012). In all graphs it is also shown that during the drier periods (drought years) there was a steady decline in the groundwater table over 8 years until a noticeable recovery took place from 2008-2010. Variations in levels at times over this period may be attributed to pumping regimes, crop types and small rainfall events at specific times in each region. Notably of concern in all regions is the proximity of the USF to surface level and the need for targeted monitoring and management of groundwater resources in these regions.

There are a number of Piezometers which have been drilled within the Shepperton Formation within vicinity of Farm 195, 196 and 199. A map and summary of 17 of the closest Piezometers have been used to provide relevant hydrogeological data and are represented in Figure 22 and Table 10 below.

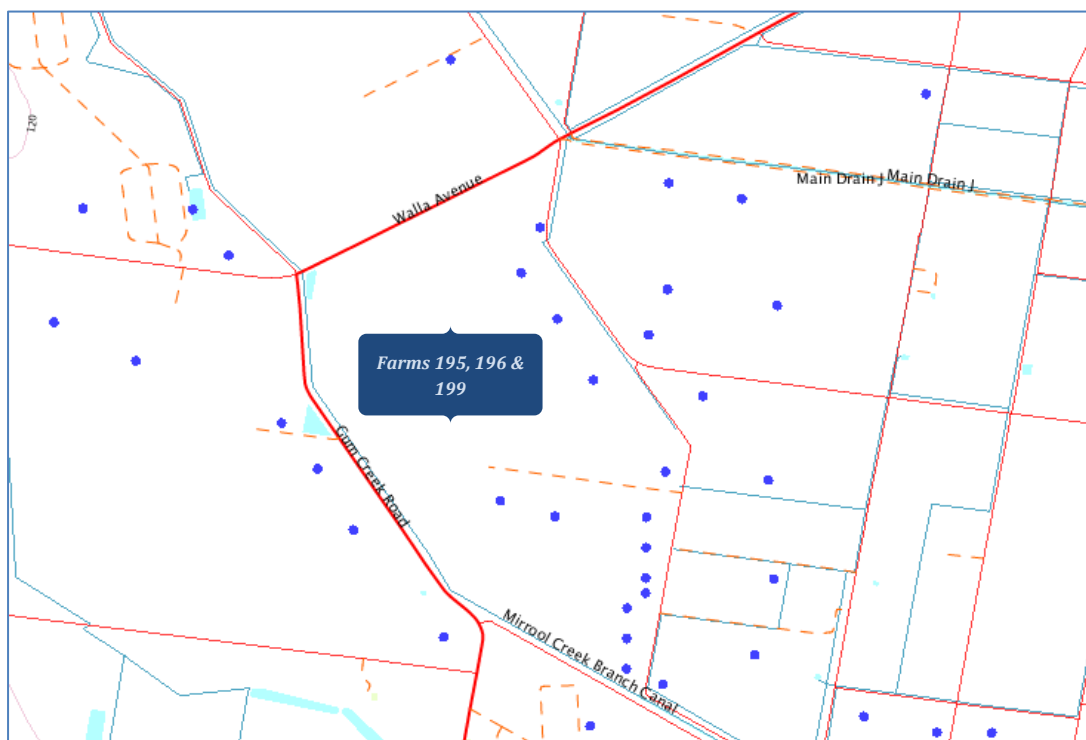


Figure 22- Map of Farms 195, 196 and 199 and proximity of current bore network

Table 10- Aquifer details of 17 bores adjacent to Farms 195, 196 and 199

Bore ID	Formation	Total Depth (m)	Water Bearing Unit (m)	Aquifer Thickness (m)	
GW407845	Upper Shepperton	10.80	8.54	10.37	1.83
GW406630	Upper Shepperton	10.50	6.41	10.37	3.96
GW407848	Upper Shepperton	11.60	10.07	11.29	1.22
GW410548	Upper Shepperton	29.59	4.88	6.10	1.22
	Lower Shepperton		26.23	28.37	2.14
GW408641	Upper Shepperton	14.34	6.10	9.15	3.05
GW406869	Upper Shepperton	9.30	8.24	9.15	0.91
GW407116	Upper Shepperton	9.40	7.93	9.46	1.53
GW407111	Upper Shepperton	9.70	7.93	9.76	1.83
GW406634	Upper Shepperton	28.90	7.02	9.46	2.44
	Lower Shepperton		25.93	28.37	2.44
GW406638	Upper Shepperton	9.40	7.02	9.46	2.44
GW407895	Upper Shepperton	11.00	8.24	10.68	2.44
GW408472	Upper Shepperton	22.60	5.49	9.46	3.97
	Lower Shepperton		17.39	22.27	4.88
GW407816	Upper Shepperton	9.72	7.93	9.46	1.53
GW408461	Upper Shepperton	14.00	9.76	14.64	4.88
GW408464	Upper Shepperton	14.80	10.07	14.34	4.27
GW407054	Upper Shepperton	12.80	10.98	12.81	1.83
GW408468	Upper Shepperton	15.40	10.07	13.12	3.05

Geological logs suggest that the Upper Shepperton Formation unconformably ranges from 4.88 m - 14.64m. The aquifer thickness of this unit ranges from 0.91 m -4.88 m. Information on the Lower Shepperton Formation is present at three Piezometer GW410548, GW406634 and GW408472 Ranging from 17.39 m – 28.37 m with an aquifer thickness ranging from 2.14m -4.88 m.

Ten bores in the vicinity of McWilliams Winery and Farm 129 were assessed in relation to this report. Geological logs suggest that the Upper Shepperton Formation unconformably ranges from 3.97 m – 12.00 m. The aquifer thickness in this area unit ranges from 0.3 m- 5.53 m, thicker at this site than that of the vineyard. Information on the Lower Shepperton Formation is identified in GW411048, occurring between 27.00 m -31.00 m suggesting an aquifer thickness of 4.00 m at this site. GW404039 is likely drilled into the Calivil Formation of which in this particular bore is suggested to be 22m.

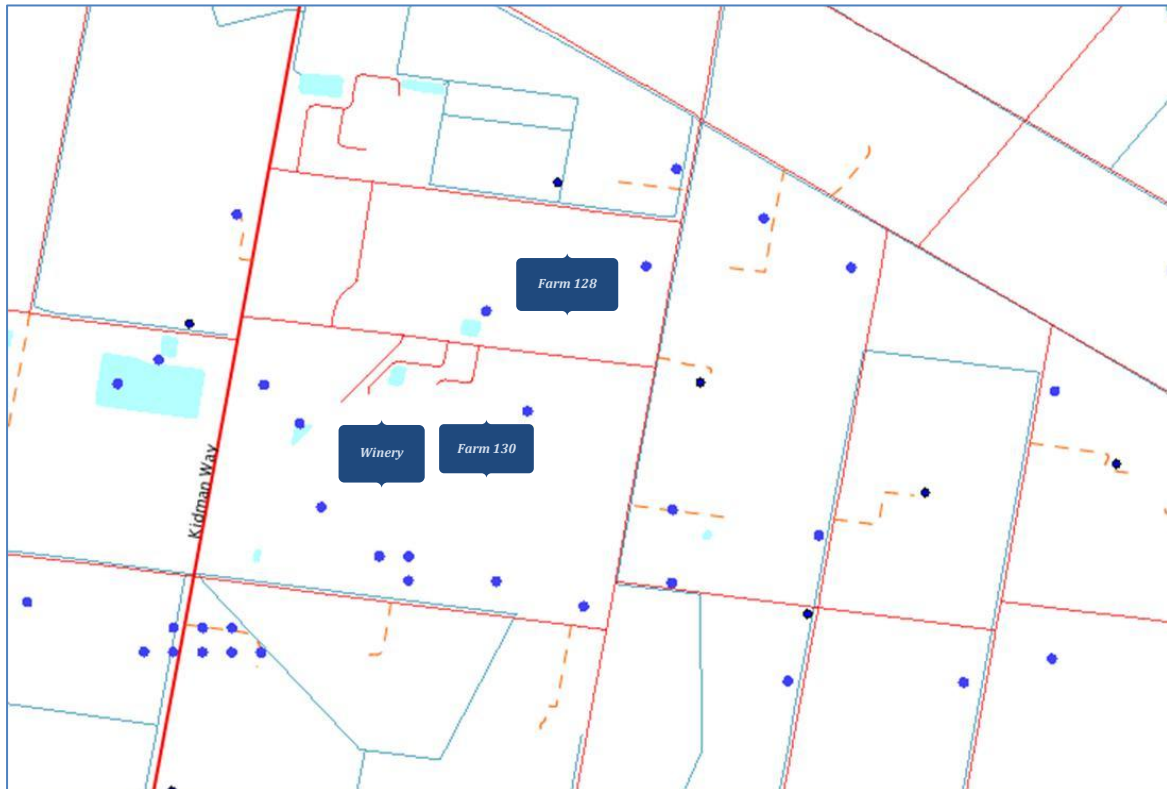


Figure 23- Map of Winery and Farms 128 and 130 and proximity of current bore network

Table 11- Aquifer details of 17 bores adjacent to Winery and Farms 128 and 130

Bore ID	Formation	Total Depth (m)	Water Bearing Unit (m)		Aquifer Thickness (m)
GW406423	Upper Shepperton	7.32	6.41	7.93	1.52
GW411048	Upper Shepperton	33.00	7.00	12.00	5.00
	Lower Shepperton		27.00	31.00	4.00
GW408405	Upper Shepperton	9.50	3.97	9.50	5.53
GW408164	Upper Shepperton	9.10	3.97	6.41	2.44
GW407336	Upper Shepperton	9.66	7.32	10.07	2.75
GW408170	Upper Shepperton	9.60	3.97	9.60	5.63
GW408434	Upper Shepperton	9.40	4.27	9.40	5.13
GW406229	Upper Shepperton	7.60	4.5	4.88	0.30
GW43038	Upper Shepperton	9.00	7.00	8.50	1.50
GW404039	Calivil (?)	116.00	94.00	116.00	22.00

GROUNDWATER QUALITY AND CONTAMINATION

Electrical Conductivity

Electrical Conductivity (EC) assists in providing information on the salinity of groundwater. In terms of aquifer characteristics it can be useful to determine which formation water is originating from and can provide valuable information on groundwater recharge areas. It can be a tool loosely used to monitor the effects of groundwater level rise and fall and salinity issues associated with this and its potential impacts on farming.

Data plotted below are EC levels monitored by MI in 3 years over an eight year period. In January 1998 and January 2002 EC levels in bores remained relatively the same. Levels in bores G152 and G375 are indicative of monitoring bores drilled into the deeper Calivil Formation where groundwater is more saline due to age. Bores with EC values below 2000 us/m are likely to be representative of the Upper Shepperton Formation where recharge occurs more directly and frequently with rainfall and localized flooding. A higher reading in bores G378, G1732 and G375 indicated that these bores may represent the Lower Shepperton Formation where recharge may be delayed and indirectly provided via downward vertical leakage from the Upper Shepperton Formation with some vertical leakage upwards from the Calivil Formation during periods of changes in groundwater pressures (i.e. drought and extraction) - exchanging of groundwater in both directions between aquifer formations.

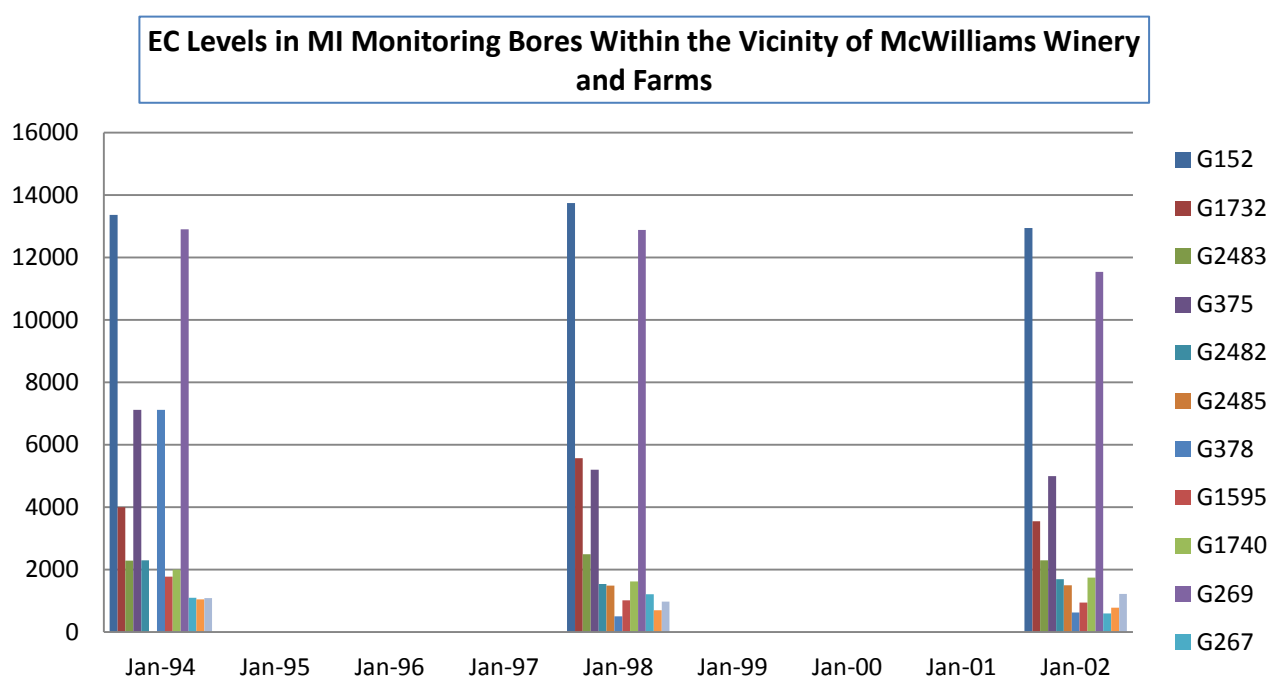


Figure 24- EC levels in MI Monitoring Bores, McWilliams Winery Sites

Impact of elevated EC levels in groundwater surrounding the McWilliams Winery Site and Associated Farms would be of concern if long term use of elevated EC in treated Wastewater or leakage from storage ponds was to occur periodically over time. Monitoring should be implemented on a 6 month basis (March and September) in the LSF and USF to understand seasonal fluctuations in groundwater EC in conjunction with crop watering and rainfall for best practice farm management.

General Analytes and Metals

MI are currently undertaking water quality assessments for TOC, EC, major cations, major anions and heavy metals in a suite of MI monitoring bores around the McWilliams Winery. Results of these investigations will be made available towards the end of November 2012. It is expected that these results will not reveal anything unusual in relation to the chemicals associated with the winery production.

Potential Groundwater Contamination Points

There is a number of factory type operations associated to areas adjacent to the McWilliams Winery Site and Farm 127, 128 and 130- of these include Baiada Hanwood (Factory and Irrigation Farm) and smaller scaled wineries and fruit packaging business. Determination of any current point source contamination levels is difficult to ascertain without baseline data from a number of regional bores and intimate knowledge on the sources for contaminants and preferential contaminant paths. In the absence of this data, this report will use a simple well radius calculation and some known aquifer parameters to determine some guidelines for the implementation of monitoring bores at both sites for McWilliams, should license requirements stipulate they be implemented in the future. November 2012 Water Quality sampling results will be used to formulate recommendations in water quality monitoring parameters in relation to McWilliams proposed expansions.

Well Radius

Potential contamination issues at both sites were determined using the following calculation for well radius based on 100 day and 500 day scenario for residence time. This calculation determines the separation distance requirements for production and domestic supply bores from point of contamination in each of the formations described in this report. This calculation adopts a residence time for a homogenous contaminate in a homogenous matrix and does not specifically allow for difference between contaminate composition and porosity fluctuations in the aquifer. These figures should be used as a guide only for the placement of monitoring bores.

Calculation

$$x_u = \frac{Tti}{b\theta} + \left(\frac{Qt}{\pi b\theta} \right)^{1/2}$$

T (m²/day)	Transmissivity
θ	Matrix Material
b (m)	Aquifer Thickness (average of all bores)
i	Hydraulic Gradient
q (m³/day)	Flow From Production Bores
t (days)	Depth (Average of all Bores)
T (m²/day)	Days

Table 12- Contaminate Transport Scenario Modeling for 100 days and 500 days

Formation	100 Days	500 Days
Upper Shepperton Formation	3.4 m	13.4 m
Lower Shepperton Formation	3.9 m	15.03 m
Calivil Formation	7.44 m	21.7 m

For bores located in the Upper Shepperton Formation based on an average aquifer thickness of 1.5 meter with a hydraulic gradient of 2 meters , a separation distance radius of 3.4 meters for 100 days and 13.4 meters for 500 days from contamination point would be required.

For bores located in the Lower Shepperton Formation based on an average aquifer thickness of 2.5 meters and with a hydraulic gradient of 2 meters, a separation distance radius of 3.9 meters for 100 days and 15.06 meters for 500 days from contamination point would be required.

For bores located in the Calivil Formation based on an average aquifer thickness of 22 meters (based on GW404039) and a hydraulic gradient of 6 meters, a separation distance radius of 7.44 meters for 100 days and 21.7 meters for 500 days from contamination point would be required.

Monitoring Bore Network

There is currently quite an extensive network of existing MI and NOW monitoring bores that could easily be utilised by McWilliams to fulfil groundwater monitoring requirements. Tables 13 and 14 highlight a selection of existing bores that could be utilised for monitoring across all sites. Those most representative could be obtained from bores highlighted in orange.

Table 13- Existing Monitoring bores with the potential to be utilized by McWilliams for monitoring- Farms 195, 196 and 199

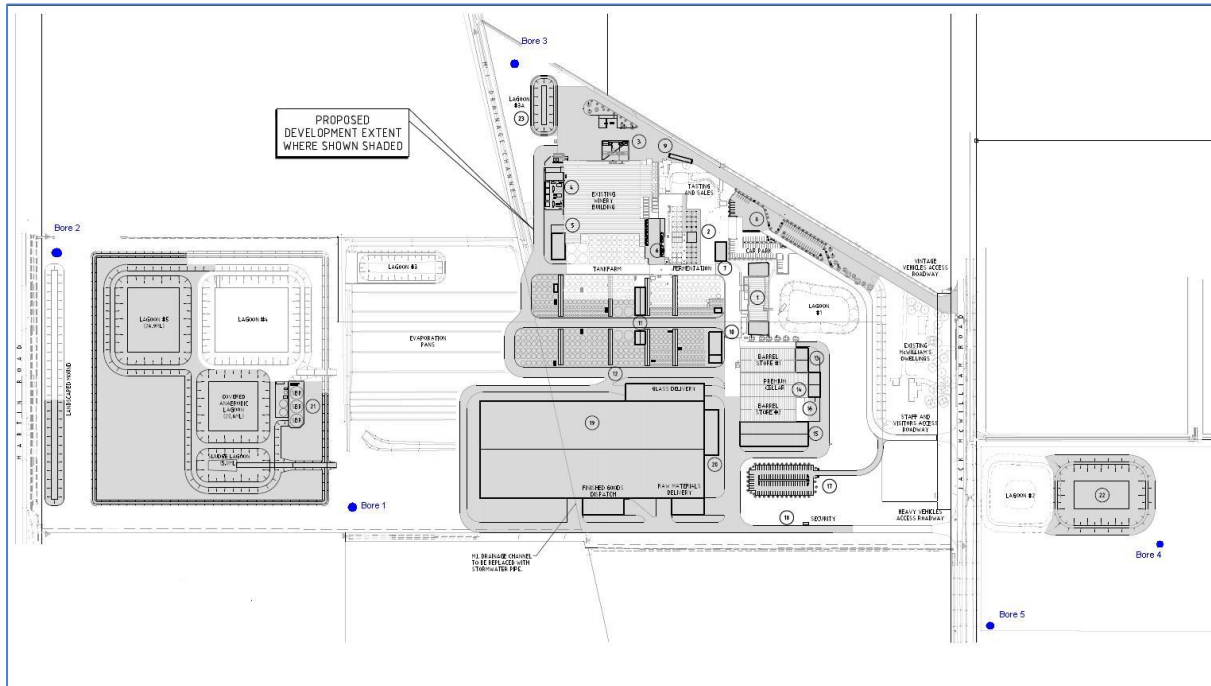
Bore ID	Formation	Loction	Total Depth (m)	Water Bearing Unit (m)	
GW407845	Upper Shepperton	Vineyard	10.80	8.54	10.37
GW406630	Upper Shepperton	Vineyard	10.50	6.41	10.37
GW407848	Upper Shepperton	Vineyard	11.60	10.07	11.29
GW408641	Upper Shepperton	Vineyard	14.34	6.10	9.15
GW406869	Upper Shepperton	Vineyard	9.30	8.24	9.15
GW407116	Upper Shepperton	Vineyard	9.40	7.93	9.46
GW407111	Upper Shepperton	Vineyard	9.70	7.93	9.76
GW406638	Upper Shepperton	Vineyard	9.40	7.02	9.46
GW407895	Upper Shepperton	Vineyard	11.00	8.24	10.68
GW407816	Upper Shepperton	Vineyard	9.72	7.93	9.46
GW408461	Upper Shepperton	Vineyard	14.00	9.76	14.64
GW408464	Upper Shepperton	Vineyard	14.80	10.07	14.34
GW407054	Upper Shepperton	Vineyard	12.80	10.98	12.81
GW408468	Upper Shepperton	Vineyard	15.40	10.07	13.12

Table 12- Existing Monitoring bores with the potential to be utilized by McWilliams for monitoring- Winery and Farms 128 and 130

Bore ID	Formation		Total Depth (m)	Water Bearing Unit (m)	
GW406423	Upper Shepperton	Winery & Adjacent Farms	7.32	6.41	7.93
GW408405	Upper Shepperton	Winery & Adjacent Farms	9.50	3.97	9.50
GW408164	Upper Shepperton	Winery & Adjacent Farms	9.10	3.97	6.41
GW407336	Upper Shepperton	Winery & Adjacent Farms	9.66	7.32	10.07
GW408170	Upper Shepperton	Winery & Adjacent Farms	9.60	3.97	9.60
GW408434	Upper Shepperton	Winery & Adjacent Farms	9.40	4.27	9.40
GW406229	Upper Shepperton	Winery & Adjacent Farms	7.60	4.5	4.88
GW043038	Upper Shepperton	Winery & Adjacent Farms	9.00	7.00	8.50

Some considerations for the drilling of new bores at the expanded winery site are highlighted in Figure 25 below. Discussions of the locations of new sites should take into consideration the location of existing monitoring bore networks. Monitoring bores should be targeted to reflect the Upper Shepparton Formation- possibly ranging from 3.5 meters to 10 meters in depth.

Figure 25- Potential New Monitoring Bores at the Winery Expansion Site



RECCOMENDATIONS

Given the data highlighted in this report it is likely that the expansion of the McWilliams Winery site, if constructed efficiently, will have little or no impact on groundwater levels or groundwater quality. If efficient crop water practices are adopted at farms and EC levels are monitored onsite, risks associated with groundwater level and quality can be managed to have little or no effect on current conditions.

Therefore it is recommended that McWilliams consider the following:

- New pond is lined to ensure minimal exchange between storage ponds and aquifers. The pond should not be located within 50m of MI Infrastructure.
- The drilling and/or utilisation of a minimum of 5 new bores at the expanded winery site and utilisation of existing monitoring bores surrounding the Winery Site and Adjacent Farms within the well radius values recommended in section 7 of this report.
- Monitoring bores to be monitored on a biannual basis (March and September) for Electrical conductivity (EC) and Standing Water level (SWL) in the Upper Shepparton Formation.
- Implementation of automated systems can be achieved through SCADA and data/ EC level loggers and are recommended for the 5 new winery bores.

- Consideration in integrated monitoring approaches (including sharing of information) on existing groundwater bores to be explored with MI and NOW.
- Consideration of future recommendations on biannual water quality monitoring (March and September) at the above mentioned bores, pending outcomes of the November 2012 Water Quality Sampling.
- Recording and monitoring of water volumes, crop water usage figures and EC levels associated with farms irrigated with treated wastewater for utilisation in the correlation of groundwater monitoring data and reporting.
- Independent analysis of hydrogeological data on an annual basis in accordance with future license requirements.

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