



**GWM**Water

**Annual Report for  
Water Quality  
2008-2009**

## GWMWater

### 2008 - 2009 Annual Report for Water Quality

The past year has proven to be challenging for GWMWater with regard to providing our customers, both rural and domestic with a secure and good quality water supply. The effects of the long running drought have been all too evident across our region. As storage levels have decreased the quality of the raw water supplied to our towns and rural customers has also decreased.

GWMWater has demonstrated absolute commitment to reversing this trend by increasing the speed at which the Wimmera Mallee Pipeline Project is constructed. Approximately 3,500 kilometres of pressurised pipeline has been installed over the reporting period, compared with 3,400 kilometres the previous year. In conjunction to the construction of the Wimmera Mallee Pipeline Project GWMWater has also undertaken to construct new raw water storages at all towns connected to the pipeline.

The improvements which the new supply arrangements can offer are now becoming evident as seen by the large decreases in the electrical conductivity, turbidity and disinfection by-product concentrations found in GWMWater's drinking water supplies. It is expected that as more towns are connected to the Wimmera Mallee Pipeline further improvements in the quality of the water supplied to customers will be realised.

At the end of the reporting period the Grampians reservoirs were holding 4.8 per cent, however, there have been signs of improving conditions ahead. With the planned completion of the Wimmera Mallee Pipeline Project within the next reporting period GWMWater is confidently looking forward to a secure water supply and improvements in water quality.

A handwritten signature in black ink, appearing to read "Jeff Rigby".

**Jeff Rigby**  
Managing Director

31/10/2009

*Section 23 of the Safe Drinking Water Act 2003 requires Grampians Wimmera Mallee Water Corporation (GWMWater) to make available for inspection by the public the results of any water quality monitoring program conducted on any drinking water supplied by GWMWater. Customers and members of the public may access drinking water quality data by contacting GWMWater either by telephone on 1300 659 961 or by the internet at [www.gwmwater.org.au](http://www.gwmwater.org.au).*

<b>Revision</b>	<b>Revision Date</b>	<b>Details</b>	<b>Authorised</b>
1	24/08/2009	Draft for board approval	Greg Whorlow
2	14/09/2009	Draft for DHS approval	Greg Whorlow
3	15/10/2009	Final copy for publication	Greg Whorlow
4	16/10/2009	Managing Director approval	Jeff Rigby

## Table of Contents

1.0	Introduction.....	1
1.1	Safe Drinking Water Act 2003 .....	1
1.1.1	Background .....	1
1.1.2	Purpose and Outline .....	1
1.1.3	Definitions .....	2
1.1.4	Safe Drinking Water Regulations 2005 .....	2
1.2	Australian Drinking Water Guidelines 2004 .....	3
1.3	Characterisation of the System.....	4
1.3.1	Source of water .....	4
2.0	Quality Management System .....	11
2.1	Water Treatment.....	11
2.2.1	Bulk Water Distribution System .....	13
2.2.2	Cyanobacteria and Algal Toxins .....	13
2.2.3	Electrical Conductivity .....	13
2.2.4	Disinfection By-Products.....	15
2.2.4	Disinfection By-Products.....	15
2.3	Water Storage Manager .....	16
2.3.1	Coliban Water .....	17
2.3.2	Wannon Water .....	17
3.0	Water Quality Performance Standards .....	18
3.1.1	Results .....	19
3.1.2	Actions Undertaken in Relation to Non-Compliance .....	20
3.2	Chlorine-based Chemicals .....	23
3.2.1	Results .....	23
3.2.2	Actions Undertaken in Relation to Non-Compliance .....	24
3.3	Ozone-based Chemicals .....	32
3.3.1	Results .....	32
3.4	Aluminium .....	33
3.4.1	Results .....	33
3.5	Turbidity .....	35
3.5.1	Results .....	35
3.5.2	Actions Undertaken in Relation to Non-Compliance .....	35
3.6	Fluoride.....	38
3.6.1	Results .....	38
3.6.2	Actions Undertaken in Relation to Non-Compliance .....	38
3.7	Other Algae, Pathogen, Chemical or Substances.....	40
3.7.1	Results and Actions Taken in Relation to Non Compliance.....	40
4.0	Chemicals of Concern .....	41
4.1	Chlorine Dioxide-based Chemicals .....	41
4.1.1	Results .....	41

4.1.2 Actions Undertaken in Relation to Non-Compliance .....	41
4.2 Arsenic .....	44
4.2.1 Results .....	44
4.2.2 Actions Undertaken in Relation to Non-Compliance .....	44
4.3 Copper.....	46
4.3.1 Results .....	46
4.3.1 Actions Undertaken in Relation to Non-Compliance .....	46
4.4 Lead .....	48
4.4.1 Results .....	48
4.4.2 Actions Undertaken in Relation to Non-Compliance .....	48
4.5 Manganese.....	50
4.5.1 Results .....	50
4.5.2 Actions Undertaken in Relation to Non-Compliance .....	50
5.0 Non-Standard Aesthetic Parameters .....	52
5.1 Hydrogen Ion Concentration, pH.....	52
5.1.1 Results .....	52
5.1.2 Actions Undertaken in Relation to Non-Compliance .....	52
5.2 Colour.....	54
5.2.1 Results .....	54
5.2.2 Actions Undertaken in Relation to Non-Compliance .....	54
5.3 Hardness.....	56
5.3.1 Results .....	56
5.3.2 Actions Undertaken in Relation to Non-Compliance .....	56
5.4 Electrical Conductivity .....	58
5.4.1 Results .....	58
5.4.2 Actions Undertaken in Relation to Non-Compliance .....	58
5.5 Iron .....	61
5.5.1 Results .....	61
5.5.2 Actions Undertaken in Relation to Non-Compliance .....	61
6.0 Analysis of Results .....	63
7.0 Emergency / Incident Management.....	65
7.1 Emergencies .....	65
8.0 Complaints .....	66
8.1 Complaints and Responses .....	66
8.2 Analysis of Issues .....	66
9.0 Undertakings under Section 30 of the Act.....	69
9.1 Turbidity .....	69
9.2 Trihalomethanes .....	70
9.3 Drinking Water Regulatory Audit Undertaking .....	71
10.0 Regulated Water .....	74

10.1 Complaints and Responses .....	74
11.0 Glossary of Terms.....	75
12.0 References.....	78
13.0 Appendix.....	79

## Tables and Figures

Figure 1- GWMWater’s Operational Area .....	5
Figure 2- Wimmera Mallee Pipeline Supply System.....	6
Figure 3: Electrical Conductivity improvements using the Wimmera Mallee Pipeline .....	14
Table 1.1- Water Source for Drinking Water Supplies .....	7
Table 1.2- Water Source for Regulated Water Supplies.....	9
Table 2. 1- Water Treatment Processes and Chemicals .....	11
Table 3. 1- Water Quality Reporting Standards.....	18
Table 3. 2- Results for <i>E. coli</i> in Drinking Water .....	21
Table 3. 3- Non-compliance Response for <i>E. coli</i> .....	22
Table 3. 4- Results for Chloroacetic Acid .....	25
Table 3. 5- Results for Dichloroacetic Acid .....	26
Table 3. 6- Results for Trichloroacetic Acid .....	27
Table 3. 7 - Results for Total Trihalomethanes .....	28
Table 3. 8 - Trihalomethane Failures in Fully Treated Supplies.....	29
Table 3. 9 - Trihalomethane Failures in Disinfection Only Supplies .....	29
Table 3. 10- Non-Compliance Response for Trihalomethanes in Fully Treated Supplies.....	30
Table 3. 11 - Results for Aluminium.....	34
Table 3. 12- Turbidity Results for Drinking Water Towns .....	36
Table 3. 13 - Turbidity Failures in Disinfection Only Supplies using the 95% Upper Confidence Limit theory.....	37
Table 3. 14 - Fluoride Results in Drinking Water Supplies.....	39
Table 4. 1 - Results for Chlorite .....	43
Table 4. 2 - Chlorite Failures in both Fully Treated and Disinfection Only Supplies .	43
Table 4. 3 – Arsenic Results for Drinking Water.....	45
Table 4. 4- Copper Results for Drinking Water.....	47

---

Table 4. 5- Lead Results for Drinking Water .....	49
Table 4. 6- Manganese Results for Drinking Water.....	51
Table 5. 1- pH Results for Drinking Water.....	53
Table 5. 2- True Colour Results for Drinking Water.....	55
Table 5. 3- Hardness Results for Drinking Water.....	57
Table 5. 4- Electrical Conductivity (EC) Results for Drinking Water.....	60
Table 5. 5- Iron Results for Drinking Water.....	62
Table 6. 1- Comparison of <i>E. coli</i> Results from 2005/06 to 2008/09 .....	63
Table 6. 2- Comparison of Turbidity Results from 2006/07 to 2008/09.....	64
Table 8. 1- Water Quality Complaints 2008/09.....	66
Table 8. 2- Water Quality Complaints for Drinking Water Towns .....	67
Table 8. 3- Water Quality Complaints for Regulated Supplies.....	68
Table 9. 1- Status of GWMWater Undertakings during 2008/09.....	72

## 1.0 Introduction

Grampians Wimmera-Mallee Water Corporation (trading as GWMWater) is a government-owned corporation, created by an order of the Victorian Government under the Water Act 1989. On 1 July 2004, GWMWater assumed the responsibilities of the predecessor organisations Grampians Water and Wimmera-Mallee Water.

### *Vision*

“Sustainable water solutions for regional growth and vibrant communities.”

### *Mission*

“Provide innovative and affordable services through partnerships with customers and the broader community.”

GWMWater provides a water supply to a population of around 52,000 urban customers living in 74 water supplies throughout the region. Domestic and stock water supplies are provided to 7,000 rural customers living throughout the region. The region covers an area in excess of 60,000 km<sup>2</sup> with a population density of less than 1 person/km<sup>2</sup>.

GWMWater employs 220 people throughout its operational region, with the corporate office being located in Horsham.

## 1.1 Safe Drinking Water Act 2003

### *1.1.1 Background*

The *Safe Drinking Water Act 2003* (the Act) is the legislative framework for assuring drinking water quality in Victoria.

The Act is based on:

- Adoption of ‘catchment to tap’ risk management obligations.
- Standards at the customer tap for key water quality criteria.
- Information disclosure obligations for water suppliers.
- Adoption of systemic community consultation processes.

This approach is consistent with regulatory best practice for the management of complex and inter-dependent risks.

### *1.1.2 Purpose and Outline*

The Act:

- Requires water suppliers and water storage managers to prepare and implement plans to manage risks in relation to drinking water and some types of non-potable water.
- Provides for the auditing of those plans by approved auditors.
- Requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations.

- Requires water suppliers to disclose to the public information concerning the quality of drinking water.
- Provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors.
- Requires the reporting of known or suspected contamination of drinking water to the Secretary at the Department of Human Services (DHS).

### *1.1.3 Definitions*

The Act provides the following definitions for water quality classification:

#### ***Drinking Water***

Water that is intended for human consumption or for purposes connected with human consumption, such as the preparation of food or the making of ice for consumption or for the preservation of unpackaged food, whether or not the water is used for other purposes.

#### ***Regulated Water***

Water that is not drinking water that may be supplied to the public in circumstances in which it may be mistaken as being drinking water.

### *1.1.4 Safe Drinking Water Regulations 2005*

The Safe Drinking Water Regulations 2005 (the Regulations) commenced operation on 19 July 2005.

The objective of the Regulations is to give effect to key aspects of the Act. In particular the Regulations:

- Specifies the major elements to be incorporated in risk management plans.
- Specifies standards for the quality of drinking water supplied to customers of water suppliers.
- Specifies criteria for accreditation of analysts and for approval of auditors.
- Specifies information disclosure requirements in relation to annual reports for drinking water quality.

## **1.2 Australian Drinking Water Guidelines 2004**

The Australian Drinking Water Guidelines 2004 (ADWG) provide a framework for management of drinking water supplies that is designed to assure safety at point of use. The ADWG have been developed after consideration of the best available scientific evidence.

The ADWG provide an authoritative reference of what comprises safe, good quality water, how it can be achieved and how it can be assured. The ADWG are concerned with both health and aesthetic quality.

The ADWG are not mandatory standards however, they are consistent with the Safe Drinking Water Act 2003 and provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia. These determinations need to consider the diverse array of regional or local factors, and take into account economic, political and cultural issues, including customer expectations and willingness and ability to pay.

The ADWG are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

### 1.3 Characterisation of the System

The GWMWater operational area is shown in Figure 1, overleaf. Key components of the water supply system include:

- Headworks system, comprising the area in and around the Grampians Ranges and the Wimmera River. The main reservoirs are Bellfield, Rocklands, and Wartook. Total catchment area is 290,000 hectares. Total reservoir capacity is 749,000 megalitres.
- GWMWater is also in the construction stage of the Wimmera Mallee Pipeline (WMP) which will replace the 14,000 kilometres of earthen channels with approximately 9,900 kilometres of pipeline (Figure 2). The pipeline will save 103,000 megalitres of water per annum, as well as providing improvements in raw water quality to the towns within the region.
- As of 30 June 7,500kms of Wimmera Mallee Pipeline was supplying raw water to 16 towns within the region. It is anticipated that by March 2010 the Wimmera Mallee Pipeline will be completed.
- Northern Mallee Pipeline (NMP) system consisting of 3,200 kilometres of pipeline serving 815,000 hectares. The NMP system draws its water from the Murray River.
- A total of 1,230 kilometres of reticulation pipeline servicing the 74 urban water supplies.
- As at 30 June 2009, the water supplies to 34 towns are classified as drinking water. Underbool was declared a drinking water supply on 17 September 2008.
- Of these 34 towns 19 receive fully treated water. The treated water is supplied by 13 water treatment plants owned and operated by GWMWater, and a further 4 plants operated under a BOOT agreement. These plants are located at Halls Gap, Ararat, Great Western and Stawell and are operated by AquaTower.
- The remaining 15 urban water supplies that are classified as drinking water are serviced with disinfection systems only.

#### 1.3.1 Source of water

GWMWater sources water from a range of surface water catchments, rivers and groundwater aquifers across the region. Table 1.1 on page 7 and Table 1.2 on page 9 provide a summary of the source waters by water supply for both drinking water and regulated water.



Figure 1- GWMWater's Operational Area



Figure 2- Wimmera Mallee Pipeline Supply System

**Table 1.1- Water Source for Drinking Water Supplies**

Water Supply	Source Water	Storage	Treatment Plant	Population
Ararat	Surface water (Lake Fyans, Mt Cole Reservoir, Langi Ghiran Reservoir)	Copes Hill, earthen storage of 9 ML capacity Olivers Gully, earthen storage of 341 ML capacity	Ararat WTP	7,200
Beulah	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Beulah chlorinator	230
Birchip	Surface water (Wimmera-Mallee channel system <sup>†</sup> )	3 x earthen storages totalling 368 ML	Birchip WTP	800
Brim	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Brim chloraminator	100
Charlton	Surface water (Wimmera-Mallee channel system <sup>†</sup> )	3 x earthen storages totalling 696 ML capacity	Charlton WTP	1,100
Dimboola	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	Dimboola WTP	1,560
Donald	Surface water (Wimmera-Mallee channel system <sup>†</sup> )	7 x earthen storages totalling 1,131 ML capacity	Donald chlorinator	1,380
Edenhope	Groundwater (bores)	Nil	Edenhope WTP	780
Great Western	Surface water (Lake Fyans)	Verrings Basin, earthen storage of 2 ML capacity	Great Western WTP	150
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Dairy Creek, earthen storage of 58 ML capacity	Halls Gap WTP	260
Haven <sup>#</sup>	Bore & Surface water (Laharum Bores & Lake Wartook)	1 x earthen storage of 170 ML capacity	Mt Zero WTP	-
Hopetoun	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	Hopetoun WTP	670
Horsham	Bore & Surface water (Laharum Bores & Lake Wartook)	1 x earthen storage of 170 ML capacity	Mt Zero WTP	13,290
Jung	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Jung chlorinator	90
Lake Bolac	Surface water (Mt William Creek, Stony Creek, Masons Creek) & Groundwater (bores)	2 x earthen storages totalling 30 ML capacity at Willaura Mt. Pleasant, earthen storage of 77 ML capacity	Willaura WTP	240
Lalbert	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 67 ML capacity	Lalbert chlorinator	100
Manangatang	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 206 ML capacity	Manangatang chlorinator	310
Minyip	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Minyip chlorinator	480

**Table 1.1- Water Source for Drinking Water Supplies**

Murtoa	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	Murtoa WTP	840
Nullawil	Surface water (Murray River via Northern Mallee Pipeline)	2 x lined steel tanks	Nullawil chlorinator	100
Ouyen	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 313 ML capacity	Ouyen WTP	1,250
Pomonal	Surface water (Lake Bellfield, Dairy Creek Reservoir)	1 x concrete tank	Halls Gap WTP	150
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	2 x earthen storages totalling 265 ML capacity	Quambatook chlorinator	280
Rainbow	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	Rainbow WTP	560
Rupanyup	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Rupanyup chlorinator	410
Sea Lake	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 248 ML capacity	Sea Lake chlorinator	690
St Arnaud	Surface water (Wimmera-Mallee channel system <sup>†</sup> )	Volcano, earthen storage of 720 ML capacity St. Arnaud, earthen storage of 1,000 ML capacity	St Arnaud WTP	2,640
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	Big Hill Tower, comprising a concrete tank of 163 kL and steel tank of 500 kL capacity 3 x earthen storages totalling 505 ML capacity	Stawell WTP	6,270
Ultima	Surface water (Murray River via Northern Mallee Pipeline)	1 x earthen storage of 100 ML capacity	Ultima chlorinator	190
Underbool	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	Underbool WTP	233
Walpeup	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 44 ML capacity	Walpeup chlorinator	150
Warracknabeal	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	Warracknabeal WTP	2,490
Willaura	Surface water (Mt William Creek, Stony Creek, Mason's Creek) & Groundwater (bores)	2 x earthen storages totalling 30 ML capacity Mt. Pleasant, earthen storage of 77 ML capacity	Willaura WTP	300
Woomelang	Lake Bellfield Surface water (WMPP)	2 x lined steel tanks	Woomelang chlorinator	220
Wycheproof	Surface water (Wimmera-Mallee channel system <sup>†</sup> )	2 x earthen storages totalling 412 ML capacity	Wycheproof chlorinator	730

# Population figures for Haven are not available. The Horsham population figures incorporate Haven.

† The Wimmera Mallee channel and Wimmera Mallee Pipeline system draws water from Lake Bellfield, Taylors Lake and other headworks storages within the Grampians.

**Table 1.2- Water Source for Regulated Water Supplies**

Water Supply	Water Source(s)	Raw Water Storage	Population
Antwerp	Surface water (Wimmera-Mallee channel system†)	1 x earthen storage of 32 ML capacity	30
Apsley	Groundwater (bores)	Elevated steel tank of 136 kL capacity	190
Berriwillock	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 107.8 ML capacity Elevated concrete tank of 306 kL capacity	150
Buangor	Surface water (McLeods Creek)	1 x earthen storage of 30 ML capacity	50
Chillingollah	Surface water (Murray River) via Northern Mallee Pipeline	1 x earthen storage of 16 ML capacity Concrete tank of 230 kL capacity	20
Chinkapook	Surface water (Murray River) via Northern Mallee Pipeline	Concrete tank of 230 kL capacity	20
Clear Lake	Surface water (Wimmera-Mallee channel system†)	Service Basin (earthen, open) Tank (concrete, squat on ground, open, 20kL)	20
Cowangie	Groundwater (bores)	Elevated fibreglass tank of 23 kL capacity	30
Culgoa	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 92 ML capacity Elevated concrete tower of 135 kL capacity	150
Dooen	Lake Bellfield Surface water (WMPP)	2 x poly tanks	20
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage of 34 ML capacity	230
Glenorchy	Surface water (Wimmera-Mallee channel system†)	Elevated concrete tower of 140 kL capacity 2 x earthen storages totalling 30 ML capacity	100
Goroke	Groundwater (bores)	2 x elevated steel tanks totalling 175 kL capacity	270
Harrow	Groundwater (bores) & surface water (Glenelg River)	1 x earthen storage of 4 ML capacity Elevated steel tank of 36 kL capacity	150
Jeparit	Lake Bellfield Surface water (WMPP)	2 x lined earthen storages	400
Kaniva	Groundwater (bores)	Elevated concrete tank of 70 kL capacity	740
Kiata	Groundwater (bores)	2 x concrete tanks totalling 100 kL capacity	20
Lascelles	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 22 ML capacity	50
Lillimur	Groundwater (bores)	Elevated steel tank of 23 kL capacity	30
Marnoo	Surface water (Wimmera-Mallee channel system†)	1 x earthen storage of 75 ML capacity	120
Miram	Groundwater (bores)	Elevated steel tank of 23 kL capacity	20

**Table 1.2- Water Source for Regulated Water Supplies**

Moyston	Surface water (Mt William, Stony and Masons Creeks) & groundwater (bores)	1 x earthen storage of 21 ML capacity	150
Murrayville	Groundwater (bores)	Elevated Storage	240
Nandaly	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank of 220 kL capacity	90
Natimuk	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 152 ML capacity	480
Nhill	Groundwater (bores)	Reservoir (concrete, roofed, 2.25ML, below ground) Elevated storage/tower (concrete, roofed, 455kL)	1,890
Noradjuha	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 12 ML capacity	20
Patchewollock	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages totalling 64 ML capacity Concrete tower of 410 kL capacity	80
Pimpinio	Surface water (Wimmera-Mallee channel system†)	2 x lined earthen storages	70
Serviceton	Groundwater (bores)	Elevated steel tank of 25 kL capacity	50
Speed	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank of 200 kL capacity	50
Streatham	Groundwater (bores)	1 x earthen storage of 12 ML capacity	100
Tarranyurk	Surface water (Wimmera-Mallee channel system†)	1 x earthen storage of 14 ML capacity	20
Tempy	Surface water (Murray River via Northern Mallee Pipeline)	Steel tank of 250 kL capacity Concrete tank of 230 kL capacity	50
Waitchie	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank of 230 kL capacity	10
Watchem	Surface water (Wimmera-Mallee channel system†)	1 x earthen storage of 98 ML capacity	180
Westmere	Groundwater (bores)	1 x earthen storage of 12 ML capacity (Streatham storage)	20
Wickliffe	Surface water (Mt William, Stony and Masons Creeks) & groundwater (bores)	1 x earthen storage of 21 ML capacity	120
Yaapeet	Surface water (Wimmera-Mallee channel system†)	2 x earthen storages totalling 59 ML capacity Concrete tank of 273 kL capacity	30

† The Wimmera Mallee channel and Wimmera Mallee Pipeline systems draw water from Lake Bellfield, Taylors Lake and other headworks storages within the Grampians.

## 2.0 Quality Management System

### 2.1 Water Treatment

GWMWater owns and operates 13 water treatment plants.

Processes utilised at these plants are shown in Table 2.1.

AquaTower operates four water treatment plants under a 25-year Build Own Operate Transfer (BOOT) Scheme. Three of these plants (Halls Gap, Stawell and Ararat) use the dissolved air flotation and filtration process, with coagulation, flocculation, disinfection and pH correction facilities. The other (Great Western) plant utilises microfiltration.

Horsham and Haven water supplies have fluoride added, pursuant to a direction from DHS under the *Health (Fluoridation) Act 1973* in November 2006. See Section 3.6 on page 34 for further information.

Underbool was declared a drinking water supply on Wednesday 17 September 2008 in the Victoria Government Gazette number S254 and has remained so since this date.

Table 2.1 below provides a summary of the water treatment processes for each drinking water supply.

**Table 2.1- Water Treatment Processes and Chemicals**

Water Supply	Treatment Processes	Chemicals used in Treatment
Ararat <sup>^</sup>	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, potassium permanganate, powdered activated carbon, aluminium sulphate, chlorine
Beulah	Disinfection	Chlorine
Birchip	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, Polyaluminium chloride, chlorine
Brim	Disinfection	Chlorine, ammonia
Charlton	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, Polyaluminium chloride, chlorine
Dimboola	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sodium hydroxide, aluminium sulphate, chlorine
Donald	Disinfection	Chlorine
Edenhope	Coagulation, flocculation, dissolved air flotation, filtration, desalination, disinfection	Aluminium sulphate, sodium hypochlorite
Great Western <sup>^</sup>	Microfiltration, disinfection, pH correction	Sulphuric acid, poly-aluminium chloride, sodium hydroxide, chlorine
Halls Gap <sup>^</sup>	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate, chlorine

**Table 2.1 - Water Treatment Processes and Chemicals**

Haven	Receives water from Horsham	-
Hopetoun	Coagulation, flocculation, dissolved air flotation, filtration, desalination, disinfection, pH correction	Soda ash, aluminium sulphate, chlorine
Horsham	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, aluminium sulphate, chlorine, carbon dioxide, fluorosilic acid
Jung	Disinfection	Chlorine
Lake Bolac	Receives water from Willaura	-
Lalbert	Disinfection	Chlorine
Manangatang	Disinfection	Chlorine
Minyip	Disinfection	Chlorine
Murtoa	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sodium hydroxide, aluminium sulphate, chlorine
Nullawil	Disinfection	Chlorine
Ouyen	Microfiltration, disinfection	Chlorine
Pomonal	Receives water from Halls Gap	-
Quambatook	Disinfection	Chlorine
Rainbow	Coagulation, flocculation, dissolved air flotation, filtration, desalination, disinfection, pH correction	Sulphuric acid, poly-aluminium chloride, soda ash, chlorine
Rupanyup	Disinfection	Chlorine
Sea Lake	Disinfection	Chlorine
St Arnaud	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Aluminium sulphate, sodium hydroxide, chlorine
Stawell^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Carbon dioxide, sodium hypochlorite, lime, aluminium sulphate, chlorine
Ultima	Disinfection	Chlorine
Underbool~	Coagulation, flocculation, sand filters, pH correction	Sulphuric acid, Aluminium sulphate, chlorine
Walpeup	Disinfection	Chlorine
Warracknabeal	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Powdered activated carbon, lime, aluminium sulphate, chlorine
Willaura	Coagulation, flocculation, microfiltration, disinfection, pH correction	Chlorine dioxide, soda ash, calcite, aluminium sulphate, Hydrochloric acid, sodium hypochlorite
Woomelang	Disinfection	Chlorine
Wycheproof	Disinfection	Chlorine

^ Operated by AquaTower under a BOOT Contract

~ Underbool was declared a drinking water supply on 17 September 2008

## 2.2 Issues

### 2.2.1 Bulk Water Distribution System

The majority of bulk water delivered to towns serviced by GWMWater was via a network of earthen channels. These earthen channels are now being replaced by the Wimmera Mallee Pipeline. In both cases the majority of the raw water originates from the headworks in the Grampians National Park.

Raw water quality issues arise from the channel fed water because this method of delivery results in raw water which is high in turbidity due to erosion and disturbance of storages, as well as producing elevated pH and salinity levels due to soil types across the region. It is not unusual for the water to become loaded with organic materials from the catchment during the channel runs.

These problems are exacerbated due to the ongoing drought conditions and the lack of available water to conduct channel runs to these towns. Many of the towns have not had their storages filled for nearly two years. This had led to a deterioration in the raw water quality found at many of the towns.

GWMWater is in the construction stage of the Wimmera Mallee Pipeline which will have significant water quality benefits to the entire region, this has already been seen at towns which have been connected to the pipeline. Supplying water through the pipeline has led to much lower Electrical Conductivity (EC) levels and a large drop in Disinfection By-Product (DBP) concentrations.

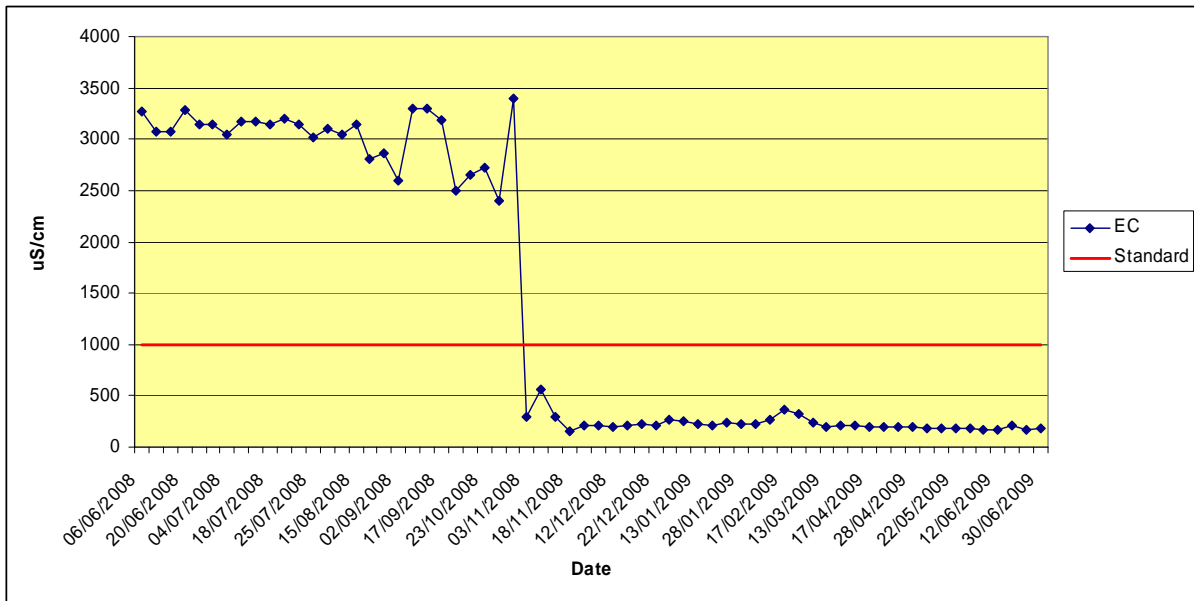
### 2.2.2 Cyanobacteria and Algal Toxins

Many reservoirs and town storages within GWMWater region are susceptible to seasonal algal blooms that require additional treatment. Powdered activated carbon dosing has been implemented at Ararat and Warracknabeal, and biologically activated carbon filters are installed at Edenhope.

### 2.2.3 Electrical Conductivity

Electrical Conductivity is a continuing issue for GWMWater at towns which have not yet been connected to the Wimmera Mallee Pipeline. High levels of salinity occur in many GWMWater water supplies which have been channel fed. This problem is also exacerbated due to the long running drought which is magnifying salinity levels in many of GWMWater's channel fed storages due to evaporation and lack of fresh water inflows. Many groundwater supplies also suffer from high salinity and resultant electrical conductivity levels.

Figure 3 on page 14 clearly illustrates the benefits that the Wimmera Mallee Pipeline can provide, in this case Electrical Conductivity (EC) measured in  $\mu\text{S}/\text{cm}$ . The sharp drop experienced in November 2008 indicates the time which the change in raw water was made, from the old earthen storage to the Wimmera Mallee Pipeline. Similar trends have been seen in other channel fed towns which now receive their raw water from the Wimmera Mallee Pipeline.



**Figure 3: Electrical Conductivity improvements using the Wimmera Mallee Pipeline**

GWMWater currently operates one reverse osmosis membrane desalination plant supplying drinking water to Edenhope. Electrical Conductivity levels in excess of the ADWG values prompted installation of the plant.

#### 2.2.4 Disinfection By-Products

GWMWater supplies disinfected-only water to 15 towns. These water supplies have no coagulation, flocculation or filtration or pH correction facilities. The supply to each of these towns has been classified as a drinking water supply, as it met the 1984 World Health Organization microbiological standards for drinking water quality.

Without coagulation or flocculation facilities, there is limited control over dissolved organic carbon at the point of disinfection. Similarly, due to the lack of control of turbidity and pH in towns with disinfection-only facilities, the effectiveness of the disinfection step is sometimes limited, requiring higher disinfection dose rates.

GWMWater has also found that due to the ongoing drought and subsequent water shortages the quality of the raw water has deteriorated to an extent whereby some of the fully treated supplies do not comply with the standard.

GWMWater has found that towns which have had, or still have, ongoing disinfection by-product problems have all been channel fed supplies, with the exception of Willaura and Lake Bolac. These towns receive their raw water from surface and ground water sources, the water is subsequently treated at Willaura where it is then distributed to both towns. Willaura Water Treatment Plant uses chlorine dioxide as a disinfectant, chlorite is produced as a disinfectant by-product. Due to the ongoing non-compliance with the chlorite standard of 0.3mg/L, the disinfectant was changed to chloramination in June 2009. This change in disinfectant will enable the supplies at the two towns to comply with all water quality parameters.

Towns which are now receiving their water from the Wimmera Mallee Pipeline have shown large decreases in disinfection by-product concentrations. The decreases experienced at these towns have allowed for them to now comply with the relevant standards.

Details of the disinfection by-products can be found on section 3.2 on page 23.

#### 2.2.5 Chlorinator Failures

GWMWater experienced one chlorinator outage for the reporting period which occurred at Woomelang on 4 August, 2008. The outage was due to staff failing to return power to the chlorinator after inspecting electrical works at the chlorinator facility. The outage caused an alarm to be sent to the local operator who fixed the problem within an hour of its occurrence. The chlorine residual was checked throughout the system and was found to be within normal operating range. Microbiological samples were taken as a precaution, all results were negative for pathogens. DHS was notified of the incident.

#### 2.2.6 Regulated Water Supplies

GWMWater supplies regulated water to 40 towns, as listed in Table 1.2 on page 9.

These water supplies are harvested from a range of sources including surface water and groundwater. The water is not put through any form of treatment and consequently is not fit for drinking or food preparation.

Customers in towns with a regulated water supply are advised of the water quality through:

- notices on their invoices;
- regular newsletters; and
- delivery of 'Living with an Untreated Water Supply' pamphlet.

Customers seeking water quality data for the regulated water supplies can obtain this information by phoning 1300 659 961 or by visiting [www.gmwwater.org.au](http://www.gmwwater.org.au).

A community consultation model has been developed to facilitate the planning for water quality improvements in towns with a non-potable water supply. The model features the establishment of a Community Reference Group in each town where improvements are to be considered. The Community Reference Group represents the views of the local community and ultimately makes a recommendation to GWMWater regarding the future water quality in the town on behalf of the local community.

### **2.3 Water Storage Manager**

GWMWater has legislative requirements pursuant to the Safe Drinking Water Act, 2003 regarding their obligations as a Water Storage Manager. This situation arises when a Water Corporation supplies water to another Water Corporation, who in turn then uses it as the basis for the supply to a water locality. GWMWater assumes this role for two other Water Corporations that are described below. GWMWater has executed a memorandum of understanding with Wannon Water and is seeking a memorandum of understanding with Coliban Water.

GWMWater in partnership with DSE have developed a monitoring program designed to assess the water quality in the GWMWater managed reservoirs. Monthly monitoring is undertaken for a suite of predetermined parameters with all analysis being conducted by a NATA accredited laboratory. These results are made available to the other water authorities as needed, as is access to all monitoring data conducted by GWMWater in its role of Water Supply Manager.

GWMWater has developed a Risk Management framework for the headworks storages under their control. This identifies risks and mitigation measures designed to minimise those risks. This framework forms the basis for the establishment of the individual RMP associated with a particular water supply. This information has been provided to both Coliban and Wannon Water Corporations.

GWMWater operational staff meet with personnel from Coliban and Wannon Water on a twice yearly basis to discuss the progress or implementation of the memorandum of understanding for supply water. Issues pertaining to GWMWater's function as a water storage manager are discussed in this open forum that also allows for the assimilation of information between the Corporations.

### *2.3.1 Coliban Water*

GWMWater provides raw water to Coliban Water who subsequently treats the water and supplies it to the localities of Wedderburn, Korong Vale and Wychetella. This water is sourced from Lake Bellfield, Taylors Lake and other headwork's storages within the Grampians and is delivered via the earthen Wimmera Mallee channel system, soon to be the Wimmera Mallee Pipeline.

### *2.3.2 Wannon Water*

GWMWater provides raw water to Wannon Water who subsequently treats the water and supplies it to the localities of Balmoral and Glenthompson. The water for the latter is sourced from Mt William Creek and is delivered to Wannon Water through the Glenthompson Pipeline. The water for Balmoral is supplied directly from Rocklands Reservoir.

### 3.0 Water Quality Performance Standards

Individual monitoring results that do not comply with the performance standard are highlighted thus.

Table 3.1 below details the water quality reporting standards specified by the Regulations.

**Table 3. 1- Water Quality Reporting Standards**

Parameter		Benchmark Standard
Microbiological organisms	<i>Escherichia coli</i>	At least 98% of all samples of drinking water collected in any 12 months period to contain no <i>E. coli</i> per 100mL
Chlorine-based chemicals	Chloroacetic acid	Must not exceed 0.15 mg/L
	Dichloroacetic acid	Must not exceed 0.1 mg/L
	Trichloroacetic acid	Must not exceed 0.1 mg/L
	Total Trihalomethanes	Must not exceed 0.25 mg/L
Chemicals derived from disinfection or treatment with ozone	Bromate <sup>^</sup>	Must not exceed 0.02 mg/L
	Formaldehyde <sup>^</sup>	Must not exceed 0.5 mg/L
Aluminium-based chemicals	Aluminium	Must not exceed 0.2 mg/L
Other parameters	Turbidity	95% upper confidence limit of mean of drinking water samples collected in the preceding 12 months must be ≤ 5.0 NTU.

<sup>^</sup> GWMWater does not use ozone as a disinfectant and hence does not test for these parameters

### 3.1 *Escherichia coli* (*E. coli*)

The health impacts and epidemiology of thermotolerant coliforms and specifically *E. coli* are described in detail in the ADWG fact sheet, FS3.

*E. coli* is used as a specific indicator of faecal contamination and hence the safety of water for drinking. *E. coli* should not be detected in a sample of drinking water. If detected, immediate action is taken.

As required by the Regulations, at least 98% of all samples of drinking water collected in any 12 months period must contain no *E. coli*. In practical terms this means that two or more individual failing samples must be recorded for this standard to fail for the year.

#### 3.1.1 Results

Microbiological sampling and analysis for *E. coli* was undertaken on a weekly basis for drinking water supplies, in accordance with the Regulations. As per the ADWG the population sizes of Horsham, Ararat and Stawell dictate the requirement to take two samples each week from within the reticulation system. Hence there is a requirement to report against 104 samples for these three towns over the reporting year.

The Willaura drinking water supply recorded a positive *E. coli* result which was received by GWMWater on 12 November 2008, with a subsequent resample taken on 13 November returning a negative *E. coli* result. Further compliance sampling conducted on 17 November returned a further positive result with the resample taken on 19 November confirming the presence of a contaminate in the Willaura system. The result from the 19 November sample was received by GWMWater on 21 November. GWMWater enacted its Emergency Management Plan, with Boil Water Notices being delivered to all Willaura customers on 21 November. These notices were rescinded on 27 November.

No cases of illness were reported and the Lake Bolac supply was not affected.

Both Horsham and Quambatook recorded positive *E. coli* results on 3 March and 9 April 2009 respectively. In both cases there was a good chlorine residual in the sample and there were no faults with the chlorinators. When re-sampling was conducted both returned a negative result with the origin of the contaminate declared unknown.

On 02 February GWMWater advised DHS by Section 22 notification of the presence of *E. coli* in a water sample. The sample was later found to have been taken from an unregistered sampling point which was not connected directly to the town's reticulation system. After consultation with DHS it was decided that this sample was not representative of the water being supplied to customers and the notification was rescinded. GWMWater has moved the registered sample point to another location which is more clearly identified.

Underbool was declared a drinking water supply on Wednesday 17 September 2008 in the Victoria Government Gazette number S254, and therefore, has only 40 results recorded.

Apart from Willaura, the standard for *E. coli* was satisfied in all drinking water supplies in 2008/09.

Refer to Table 3.2 on page 21 for the 2008/09 monitoring results for *E. coli* in drinking water supplies.

### *3.1.2 Actions Undertaken in Relation to Non-Compliance*

Refer to Table 3.3 on Page 22 for a discussion on the actions undertaken in relation to non-compliance for *E. coli*.

All incidents where *E. coli* are detected in drinking water are reported to DHS as required by Section 22 of the Act. GWMWater's Emergency Management Plan outlines the procedure to be followed when there is a suspected drinking water contamination incident. Boil water notices are delivered when required and after consultation with DHS. The format and wording of the notices follows a standard template that has been agreed with DHS.

The contamination of the Willaura supply was due to a small structural fault in the Clear Water Storage, this fault allowed birds to enter the storage and contaminate the supply. GWMWater undertook an extensive cleaning regime inside the storage to remove any physical contaminants, super chlorination was utilised to break down any remaining microbiological contaminants.

#### **Missing Samples**

There were no missing samples for the 2008/09 sampling period.

#### **Chlorinator Failures**

There was one chlorinator failure at Woomelang on 4<sup>th</sup> August 2008.

#### **Regulated Water Supplies**

The monitoring program for *E. coli* was reviewed for the regulated water supplies and it was decided to cease sampling and testing. The water is generally sourced from open reservoirs, the water is marketed as being unfit for human consumption and the presence of *E. coli* is expected. Confirming the quantum of the *E. coli* present doesn't generate any management action.

**Table 3.2- Results for E. coli in Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	No. Non Complying Samples	Max Results (orgs/100mL)	% Samples with no E. coli	Complying?
Ararat *	Twice weekly	104	0	0	100%	Yes
Beulah	Weekly	52	0	0	100%	Yes
Birchip	Weekly	52	0	0	100%	Yes
Brim	Weekly	52	0	0	100%	Yes
Charlton	Weekly	52	0	0	100%	Yes
Dimboola	Weekly	52	0	0	100%	Yes
Donald	Weekly	52	0	0	100%	Yes
Edenhope	Weekly	52	0	0	100%	Yes
Great Western	Weekly	52	0	0	100%	Yes
Halls Gap	Weekly	52	0	0	100%	Yes
Haven	Weekly	52	0	0	100%	Yes
Hopetoun	Weekly	52	0	0	100%	Yes
Horsham *	Twice weekly	104	1	2	99%	Yes
Jung	Weekly	52	0	0	100%	Yes
Lake Bolac	Weekly	52	0	0	100%	Yes
Lalbert	Weekly	52	0	0	100%	Yes
Manangatang	Weekly	52	0	0	100%	Yes
Minyip	Weekly	52	0	0	100%	Yes
Murtoa	Weekly	52	0	0	100%	Yes
Nullawil	Weekly	52	0	0	100%	Yes
Ouyen	Weekly	52	0	0	100%	Yes
Pomonal	Weekly	52	0	0	100%	Yes
Quambatook	Weekly	52	1	2	98%	Yes
Rainbow	Weekly	52	0	0	100%	Yes
Rupanyup	Weekly	52	0	0	100%	Yes
Sea Lake	Weekly	52	0	0	100%	Yes
St Arnaud	Weekly	52	0	0	100%	Yes
Stawell *	Twice weekly	104	0	0	100%	Yes
Ultima	Weekly	52	0	0	100%	Yes
Underbool ~	Weekly	40	0	0	100%	Yes
Walpeup	Weekly	52	0	0	100%	Yes
Warracknabeal	Weekly	52	0	0	100%	Yes
Willaura	Weekly	52	5	10	91%	No
Woomelang	Weekly	52	0	0	100%	Yes
Wycheproof	Weekly	52	0	0	100%	Yes

† **Performance Standard:** At least 98% of all samples of drinking water collected in any 12 months period to contain no E. coli per 100mL. Results are expressed in org/100mL.

\* Due to the population size of these town two E. coli samples are taken every week

~ Underbool was declared a drinking water supply on 17 September 2008

**Table 3.3- Non-compliance Response for *E. coli***

Date of incident	Water Supply	<i>E. coli</i> (org/100mL)	Reported Illness	Cause of Problem	Corrective Actions taken	Reported to DHS?
10 November to the 27 November 08	Willaura	6	No	A structural fault in the Clear Water Storage (CWS) allowed birds to gain entry to the storage which was the cause of the contamination.	The CWS was extensively cleaned and super chlorinated.  Boil Water notices were issued to Willaura residents on 21 November 08.  Multiple re-samples confirmed the end of the incident.  Boil Water notices were rescinded on 27 November 08	Yes
13 March 09	Horsham	2	No	The cause of the contamination was unknown, there was a good chlorine concentration (0.17mg/L) in the sample and there were no mains work being carried out in the area.	Reticulation system was flushed as a pre-caution.  Re-sample test confirmed no <i>E. coli</i>	Yes
07 April 09	Quambatook	2	No	The cause of the contamination was unknown, there was a good chlorine concentration (0.21mg/L) in the sample and there were no mains work being carried out in the area.	Reticulation system was flushed as a pre-caution.  Re-sample test confirmed no <i>E. coli</i>	Yes

### 3.2 Chlorine-based Chemicals

Chloroacetic acids are produced in drinking water as by-products of the reaction between chlorine and naturally occurring humic and fulvic acids. The ADWG fact sheet FS69 provides a detailed account of the health impacts and other considerations relating to chloroacetic acids.

Based on health considerations and as laid down in the Regulations, the concentrations of chloroacetic acids in drinking water should not exceed the following values:

- chloroacetic acid 0.15 mg/L
- dichloroacetic acid 0.1 mg/L
- trichloroacetic acid 0.1 mg/L

Trihalomethanes (THM) are present in drinking water principally as the result of disinfection using chlorination or, to a much lesser extent, chloramination.

Based on health considerations, the concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L.

GWMWater manages one water supply that is disinfected with chlorine dioxide gas (Section 4.1 on Page 38). Disinfection with chlorine dioxide gas does not produce haloacetic acids or trihalomethanes and hence there is no legislative requirement to monitor for them. It should be noted that this supply did comply with the relevant haloacetic acids and trihalomethane standards.

#### 3.2.1 Results

Disinfection by-product sampling and analysis for 2008/09 was undertaken on a minimum of a monthly basis for all drinking water supplies.

GWMWater satisfied the standards for chloroacetic acid, dichloroacetic acid and trichloroacetic acid in all drinking water supplies in 2008/09.

The Willaura/Lake Bolac supply utilises chlorine dioxide as the disinfectant. Hence no monitoring against trihalomethanes was undertaken during 2008/09.

The following towns did not satisfy the drinking water standards for trihalomethanes during 2008/09:

- Disinfected-only supplies to Beulah, Donald, Jung, Minyip, Rupanyup, Quambatook, Woomelang and Wycheproof.
- Fully-treated supplies to Charlton, Hopetoun, Murtoa, Rainbow and Warracknabeal.

Refer to Table 3.4 on page 25 through to Table 3.7 beginning on page 28 for disinfection by-product results.

### *3.2.2 Actions Undertaken in Relation to Non-Compliance*

GWMWater has no means to control disinfection by-products in water supplies with no coagulation or filtration facilities. The dissolved organic carbon and other natural organic matter react with the chlorine used to disinfect the water and create disinfection by-products, primarily trihalomethanes. This is an ongoing problem with the disinfection-only water supplies that source their water from the Wimmera-Mallee channel system or the Northern Mallee Pipeline, as indicated in Table 3.9 on page 29.

Several fully-treated water supplies also failed to satisfy the trihalomethane performance standard. These non-compliances with the standard can be attributed to the ongoing drought and lack of available water. Increases in dissolved organic carbon and salinity levels in town storages due to evaporation and lack of fresh channel fills have conspired to create conditions which allow for large concentrations of trihalomethanes to be produced. This problem will not abate until the Wimmera Mallee Pipeline is completed and connected to the towns.

All water supplies were fully compliant with the chloroacetic acid, dichloroacetic acid and trichloroacetic acid performance standards.

Refer to Table 3.8 and 3.9 on page 29 for a summary of actions undertaken in relation to non-compliance for total trihalomethanes.

#### **Missing Samples**

The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two trihalomethane and haloacetic acids samples per month from within the reticulation system. Hence there is a requirement to report against 24 monthly samples for these three towns.

There was one missing haloacetic acid sample from Sea Lake for the month of June 2009. The June sample bottle was not received from the laboratory, GWMWater requested a spare bottle to be sent to the sampler. However, the new sample bottle didn't arrive in time for the sample to be re-taken before the end of the sampling deadline.

**Table 3. 4- Results for Chloroacetic Acid**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat	Monthly	24	0.005	<0.005	Yes
Beulah	Monthly	12	0.007	<0.005	Yes
Birchip	Monthly	12	0.005	<0.005	Yes
Brim	Monthly	12	0.005	<0.005	Yes
Charlton	Monthly	12	0.005	<0.005	Yes
Dimboola	Monthly	12	0.005	<0.005	Yes
Donald	Monthly	12	0.005	<0.005	Yes
Edenhope	Monthly	12	0.005	<0.005	Yes
Great Western	Monthly	12	0.005	<0.005	Yes
Halls Gap	Monthly	12	0.005	<0.005	Yes
Haven	Monthly	12	0.005	<0.005	Yes
Hopetoun	Monthly	12	0.005	<0.005	Yes
Horsham	Monthly	24	0.005	<0.005	Yes
Jung	Monthly	12	0.005	<0.005	Yes
Lalbert	Monthly	12	0.005	<0.005	Yes
Manangatang	Monthly	12	0.005	<0.005	Yes
Minyip	Monthly	12	0.005	<0.005	Yes
Murtoa	Monthly	12	0.005	<0.005	Yes
Nullawil	Monthly	12	0.005	<0.005	Yes
Ouyen	Monthly	12	0.005	<0.005	Yes
Pomonal	Monthly	12	0.005	<0.005	Yes
Quambatook	Monthly	12	0.007	<0.005	Yes
Rainbow	Monthly	12	0.005	<0.005	Yes
Rupanyup	Monthly	12	0.007	<0.005	Yes
Sea Lake	Monthly	11	0.005	<0.005	Yes
St Arnaud	Monthly	12	0.005	<0.005	Yes
Stawell	Monthly	24	0.005	<0.005	Yes
Ultima	Monthly	12	0.005	<0.005	Yes
Underbool ~	Monthly	9	0.005	<0.005	Yes
Walpeup	Monthly	12	0.005	<0.005	Yes
Warracknabeal	Monthly	12	0.005	<0.005	Yes
Woomelang	Monthly	12	0.006	<0.005	Yes
Wycheproof	Monthly	12	0.005	<0.005	Yes

† **Performance Standard:** *Chloroacetic acid must not exceed 0.15 mg/L*

Note: Water supplies treated with chlorine dioxide (Willaura and Lake Bolac) are not tested for trihalomethanes.

~ *Underbool was declared a drinking water supply on 17 September 2008*

\*\*\* *Sea Lake missed the June 2009 Chloroacetic acid sample*

**Table 3.5- Results for Dichloroacetic Acid**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat	Monthly	24	0.020	0.005	Yes
Beulah	Monthly	12	0.055	0.005	Yes
Birchip	Monthly	12	0.017	0.008	Yes
Brim	Monthly	12	0.018	0.005	Yes
Charlton	Monthly	12	0.025	0.007	Yes
Dimboola	Monthly	12	0.021	0.005	Yes
Donald	Monthly	12	0.007	0.005	Yes
Edenhope	Monthly	12	0.005	0.005	Yes
Great Western	Monthly	12	0.081	0.005	Yes
Halls Gap	Monthly	12	0.022	0.012	Yes
Haven	Monthly	12	0.022	0.005	Yes
Hopetoun	Monthly	12	0.022	0.005	Yes
Horsham	Monthly	24	0.022	0.005	Yes
Jung	Monthly	12	0.042	0.005	Yes
Lalbert	Monthly	12	0.022	0.005	Yes
Manangatang	Monthly	12	0.023	0.015	Yes
Minyip	Monthly	12	0.025	0.005	Yes
Murtoa	Monthly	12	0.018	0.005	Yes
Nullawil	Monthly	12	0.032	0.005	Yes
Ouyen	Monthly	12	0.024	0.014	Yes
Pomonal	Monthly	12	0.032	0.005	Yes
Quambatook	Monthly	12	0.055	0.005	Yes
Rainbow	Monthly	12	0.019	0.005	Yes
Rupanyup	Monthly	12	0.088	0.005	Yes
Sea Lake	Monthly	11	0.030	0.014	Yes
St Arnaud	Monthly	12	0.025	0.007	Yes
Stawell	Monthly	24	0.024	0.005	Yes
Ultima	Monthly	12	0.026	0.010	Yes
Underbool ~	Monthly	9	0.011	0.005	Yes
Walpeup	Monthly	12	0.025	0.013	Yes
Warracknabeal	Monthly	12	0.021	0.005	Yes
Woomelang	Monthly	12	0.068	0.010	Yes
Wycheproof	Monthly	12	0.022	0.005	Yes

† **Performance Standard:** *Dichloroacetic acid must not exceed 0.1 mg/L*

Note: Water supplies treated with chlorine dioxide (Willaura and Lake Bolac) are not tested for trihalomethanes.

~ Underbool was declared a drinking water supply on 17 September 2008

**Table 3. 6- Results for Trichloroacetic Acid**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat	Monthly	24	0.020	0.006	Yes
Beulah	Monthly	12	0.099	0.005	Yes
Birchip	Monthly	12	0.012	0.005	Yes
Brim	Monthly	12	0.031	0.005	Yes
Charlton	Monthly	12	0.028	0.008	Yes
Dimboola	Monthly	12	0.019	0.005	Yes
Donald	Monthly	12	0.006	0.005	Yes
Edenhope	Monthly	12	0.005	0.005	Yes
Great Western	Monthly	12	0.090	0.018	Yes
Halls Gap	Monthly	12	0.023	0.012	Yes
Haven	Monthly	12	0.014	0.005	Yes
Hopetoun	Monthly	12	0.020	0.013	Yes
Horsham	Monthly	24	0.021	0.005	Yes
Jung	Monthly	12	0.073	0.005	Yes
Lalbert	Monthly	12	0.022	0.009	Yes
Manangatang	Monthly	12	0.028	0.016	Yes
Minyip	Monthly	12	0.046	0.005	Yes
Murtoa	Monthly	12	0.026	0.005	Yes
Nullawil	Monthly	12	0.034	0.005	Yes
Ouyen	Monthly	12	0.027	0.013	Yes
Pomonal	Monthly	12	0.030	0.005	Yes
Quambatook	Monthly	12	0.059	0.022	Yes
Rainbow	Monthly	12	0.013	0.005	Yes
Rupanyup	Monthly	12	0.150	0.005	Yes
Sea Lake	Monthly	11	0.036	0.020	Yes
St Arnaud	Monthly	12	0.015	0.005	Yes
Stawell	Monthly	24	0.026	0.005	Yes
Ultima	Monthly	12	0.025	0.013	Yes
Underbool	Monthly	9	0.008	0.008	Yes
Walpeup	Monthly	12	0.025	0.010	Yes
Warracknabeal	Monthly	12	0.017	0.005	Yes
Woomelang	Monthly	12	0.079	0.007	Yes
Wycheproof	Monthly	12	0.016	0.005	Yes

† **Performance Standard:** *Trichloroacetic acid must not exceed 0.1 mg/L*

Note: Water supplies treated with chlorine dioxide (Willaura and Lake Bolac) are not tested for trihalomethanes.

~ *Underbool was declared a drinking water supply on 17 September 2008*

**Table 3.7 – Results for Total Trihalomethanes**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat	Monthly	24	0.140	0.061	Yes
Beulah*	Monthly	24	0.560	0.100	No
Birchip	Monthly	12	0.250	0.051	Yes
Brim	Monthly	12	0.130	0.018	Yes
Charlton	Monthly	12	0.260	0.150	No
Dimboola	Monthly	12	0.180	0.051	Yes
Donald*	Monthly	24	0.530	0.250	No
Edenhope	Monthly	12	0.044	0.001	Yes
Great Western	Monthly	12	0.250	0.077	Yes
Halls Gap	Monthly	12	0.120	0.055	Yes
Haven	Monthly	12	0.200	0.098	Yes
Hopetoun	Monthly	12	0.300	0.011	No
Horsham	Monthly	24	0.230	0.100	Yes
Jung*	Monthly	24	0.750	0.077	No
Lalbert	Monthly	12	0.130	0.027	Yes
Manangatang	Monthly	12	0.140	0.001	Yes
Minyip*	Monthly	24	0.660	0.013	No
Murtoa*	Monthly	24	0.520	0.053	No
Nullawil*	Monthly	24	0.100	0.050	Yes
Ouyen	Monthly	12	0.110	0.027	Yes
Pomonal	Monthly	12	0.097	0.063	Yes
Quambatook	Monthly	12	0.430	0.180	No
Rainbow	Monthly	12	0.360	0.022	No
Rupanyup*	Monthly	24	0.500	0.016	No
Sea Lake	Monthly	12	0.120	0.068	Yes
St Arnaud	Monthly	12	0.220	0.073	Yes
Stawell	Monthly	24	0.100	0.020	Yes
Ultima	Monthly	12	0.097	0.031	Yes
Underbool ~	Monthly	9	0.075	0.040	Yes
Walpeup	Monthly	12	0.140	0.080	Yes
Warracknabeal*	Monthly	22	0.510	0.031	No
Woomelang*	Monthly	24	0.760	0.099	No
Wycheproof*	Monthly	24	0.440	0.140	No

† **Performance Standard:** *Total trihalomethanes must not exceed 0.250 mg/L.*

\* These towns were sampled at a higher frequency due to undertaking obligations at the towns, due to these obligations the samples are classified as compliance samples, and therefore, have been reported as such.

Note: Water supplies treated with chlorine dioxide (Willaura and Lake Bolac) are not tested for trihalomethanes.

~ *Underbool was declared a drinking water supply on 17 September 2008*

**Table 3.8 - Trihalomethane Failures in Fully Treated Supplies**

	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09
Charlton	✓	✓	✓	✓	x	✓	✓	✓	✓	x	✓	✓
Hopetoun	✓	✓	✓	✓	✓	✓	✓	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP
Murtoa	x	x	x	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP
Rainbow	x	✓	✓	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP
Warracknabeal	x	x	x	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP

**Table 3.9 - Trihalomethane Failures in Disinfection Only Supplies**

Water Supply	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09
Beulah	x	✓	✓	x	x	x	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP
Donald	x	x	x	x	x	x	x	x	x	x	x	x
Jung	x	x	x	x	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP	✓ WMP
Minyip	x	x	x	x	x	x	x	x	x	x	✓ WMP	✓ WMP
Quambatook	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓
Rupanyup	x	x	x	x	x	x	x	x	x	x	x	✓ WMP
Woomelang	x	x	x	x	x	x	x	x	x	✓ WMP	✓ WMP	✓ WMP
Wycheproof	✓	x	x	x	x	x	x	x	x	x	✓	✓

x Represents results more than 0.25mg/L

✓ Represents results less than 0.25mg/L

✓ WMP Represents results less than 0.25mg/L after the Wimmera Mallee Pipeline was connected to the town

**Table 3. 10- Non-Compliance Response for Trihalomethanes in Fully Treated Supplies**

Water Supply	Cause of Problem	Corrective Action Undertaken
Charlton	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	Changed to 2 <sup>nd</sup> town storage which had a lower dissolved organic carbon level.
Hopetoun	The Trihalomethane exceedance in the supply was a single result which occurred due to storage draw down prior to the connection of the Wimmera Mallee Pipeline.	This result was an anomaly and other than being re-sampled no further action was taken.
Murtoa	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce Trihalomethane concentration in the supply. A cross connection to the WMPP was completed during November 2008 and since then there has been no exceedances of the standard since this date. The final connection was made during June 2009, therefore, meeting all undertaking conditions.
Rainbow	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during October 2008; there have been no exceedances of the standard since this date.
Warracknabeal	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during October 2008; there have been no exceedances of the standard since this date.

**Table 3.11- Non-Compliance Response for Trihalomethanes in Disinfection Only Supplies**

Beulah	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during January 2009, there has been no exceedances of the standard since this date.
Donald	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection is scheduled to be completed by October 2009.
Jung	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during October 2008, there has been no exceedances of the standard since this date.
Minyip	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS which set out actions to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during May 2009, there has been no exceedances of the standard since this date.
Rupanyup	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS which set out actions to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. A cross connection was completed during May 2009.
Woomelang	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS which set out actions to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection was completed during May 2009, there has been no exceedances of the standard since this date.
Wycheproof	The township was being supplied channel fed water which is high in Electrical Conductivity and Dissolved Organic Carbon.	GWMWater entered into an Undertaking with DHS which set out actions to reduce the Trihalomethane concentration in the supply, with the ultimate aim of connecting the town to the Wimmera Mallee Pipeline. This connection is scheduled to be completed by October 2009.

### **3.3 Ozone-based Chemicals**

Bromate may be formed during ozonation. Bromate is a strong oxidant and may react with organic matter in water, forming bromide as a by-product.

Based on health considerations, ADWG recommends that the concentration of bromate in drinking water not exceed 0.02 mg/L.

Formaldehyde may be present in drinking water through ozonation of naturally occurring humic material, contamination by accidental spills, or deposition from the atmosphere.

Based on health considerations, ADWG recommends the concentration of formaldehyde in drinking water not exceed 0.5 mg/L.

#### *3.3.1 Results*

GWMWater does not use ozone-based chemicals in any of its supply systems. Consequently, sampling and analysis was not undertaken for either bromate or formaldehyde. These chemicals are not considered a risk in drinking water supplied by GWMWater and subsequently not tested.

### 3.4 Aluminium

Aluminium sulphate (alum) is a general-purpose coagulant that is used in water treatment to remove turbidity, natural organic matter (including colour), micro-organisms and many inorganic chemicals. Removal of natural organic matter reduces the formation of disinfection by-products, because it removes the organic precursors of the by-products.

Based on aesthetic problems caused by post-flocculation, the concentration of acid-soluble aluminium in drinking water should not exceed 0.2 mg/L.

#### 3.4.1 Results

Aluminium sampling and analysis was undertaken on a monthly basis during 2008/2009, for those water supplies utilising aluminium-based coagulants. Refer to Table 3.11 on Page 34 for the 2008/09 monitoring results. The level of aluminium in the drinking water towns that do not utilise aluminium-based coagulants was well below 0.2 mg/L.

#### Missing Samples

The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two trihalomethane and haloacetic acids samples per month from within the reticulation system. Hence there is a requirement to report against 24 monthly samples for these three towns.

There were no missing samples for the 2008/09 sampling period.

#### 3.4.2 Actions Undertaken in Relation to Non-Compliance

There were two non-complying samples taken during the 2008/09 period which came from Murtoa and Underbool. The cause of the exceedance at Murtoa was due to changes in the pH of the raw water leading up the connection of the Wimmera Mallee Pipeline. This was an isolated incident which was rectified immediately by flushing the effected water from the reticulation system.

The elevated result at Underbool was due to a fault with a dosing pump. The operator noticed that the pump was faulty changed the operation to a standby pump. Some water with elevated aluminium did make its way into the reticulations system. As a result the system was extensively flushed and a re-sample returned a result under the limit.

**Table 3. 11 - Results for Aluminium**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat	Monthly	24	0.06	0.03	Yes
Birchip	Monthly	12	0.02	0.01	Yes
Charlton	Monthly	12	0.13	0.01	Yes
Dimboola	Monthly	12	0.19	0.01	Yes
Great Western	Monthly	12	0.07	0.03	Yes
Halls Gap *	Monthly	12	0.05	0.02	Yes
Haven	Monthly	12	0.06	0.03	Yes
Hopetoun*	Monthly	12	0.08	0.01	Yes
Horsham	Monthly	24	0.07	0.01	Yes
Lake Bolac	Monthly	12	0.09	0.01	Yes
Murtoa	Monthly	12	0.62	0.01	No
Ouyen	Monthly	12	0.02	0.01	Yes
Pomonal	Monthly	12	0.15	0.02	Yes
Rainbow	Monthly	12	0.17	0.01	Yes
St Arnaud	Monthly	12	0.18	0.01	Yes
Stawell	Monthly	24	0.19	0.02	Yes
Underbool ~	Monthly	9	0.27	0.01	No
Warracknabeal	Monthly	12	0.16	0.03	Yes
Willaura	Monthly	12	0.09	0.01	Yes

† **Performance Standard:** Aluminium must not exceed 0.20 mg/L

~ Underbool was declared a drinking water supply on 17 September 2008

### 3.5 Turbidity

Turbidity is caused by the presence in the water of very fine suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. High turbidity can result in a water sample having a 'muddy' or 'milky' appearance.

Turbidity is a measurement of the light scattering property of water, and the degree of scattering is dependent on the amount, size and composition of the suspended matter.

The ADWG fact sheet FS30 contains a detailed account of turbidity and its implications for water supply.

Based on health and aesthetic considerations, ADWG recommends that turbidity not exceed 5 Nephelometric Turbidity Units (NTU). The Regulations require that the 95% upper confidence limit (UCL) of the mean of samples of drinking water collected in any 12-month period must be less than or equal to 5.0 NTU.

#### 3.5.1 Results

Turbidity sampling and analysis for 2008/09 was undertaken on a weekly basis for all drinking water supplies.

Refer to Table 3.12 on Page 36 for the 2008/09 monitoring results for turbidity in drinking water supplies.

#### Missing Samples

The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two turbidity samples per week from within the reticulation system. Hence there is a requirement to report against 104 weekly samples for these towns.

There were no missing samples for the 2008/09 sampling period.

#### 3.5.2 Actions Undertaken in Relation to Non-Compliance

GWMWater has limited control over turbidity in water supplies with no coagulation and filtration facilities. It is expected that these water supplies will fail the turbidity performance standard from time to time.

Drinking water supplies that were non-compliant with the turbidity standard during 2008/09 were: Brim, Jung, Lalbert, Manangatang, Nullawil, Ultima and Woomelang. In order to address the turbidity issues the following towns have Undertakings pursuant to section 30 of the Act: Jung, Lalbert, Manangatang, Minyip, Rupanyup, Ultima and Woomelang. Towns which did not have Undertakings placed on them, such as Brim and Nullawill were deemed to be short term elevated turbidity events which did not necessitate an Undertaking. In both cases DHS was notified under the terms of a Section 18 Notification.

The actions which will be undertaken at the towns to address the turbidity issues is to connect the towns to the Wimmera Mallee Pipeline and build new town storages, this will deliver raw water which is much lower in turbidity.

Table 3.13 on Page 37 for a summary of actions undertaken in relation to non-compliance for turbidity in filtered supplies.

**Table 3. 12- Turbidity Results for Drinking Water Towns**

Sampling Locality	Sampling Frequency	No of Samples	Result (NTU)		95% UCL of Mean	Complying (Yes/No)
			Max	Min		
Ararat	Twice weekly	104	5.3	0.1	0.4	Yes
Beulah	Weekly	52	24.0	0.4	3.0	Yes
Birchip	Weekly	52	2.8	0.1	0.6	Yes
Brim	Weekly	52	25.0	0.4	6.4	No
Charlton	Weekly	52	1.3	0.1	0.4	Yes
Dimboola	Weekly	52	1.0	0.1	0.3	Yes
Donald	Weekly	52	3.4	0.3	1.5	Yes
Edenhope	Weekly	52	11.0	0.1	1.3	Yes
Great Western	Weekly	52	1.6	0.1	0.3	Yes
Halls Gap	Weekly	52	2.6	0.1	0.4	Yes
Haven	Weekly	52	4.3	0.1	0.7	Yes
Hopetoun	Weekly	52	2.9	0.1	0.7	Yes
Horsham	Twice weekly	104	2.3	0.1	0.5	Yes
Jung	Weekly	52	14.0	2.4	3.9	No
Lake Bolac	Weekly	52	1.7	0.1	0.4	Yes
Lalbert	Weekly	52	14.0	2.4	6.5	No
Manangatang	Weekly	52	40.0	7.4	22.6	No
Minyip	Weekly	52	31.0	0.4	3.2	Yes
Murtoa	Weekly	52	17.0	0.1	1.6	Yes
Nullawil	Weekly	52	23.0	2.1	6.5	No
Ouyen	Weekly	52	2.0	0.1	0.5	Yes
Pomonal	Weekly	52	1.5	0.1	0.5	Yes
Quambatook	Weekly	52	21.0	0.1	4.0	Yes
Rainbow	Weekly	52	3.0	0.1	0.8	Yes
Rupanyup	Weekly	52	14.0	1.2	4.7	Yes
Sea Lake	Weekly	52	6.8	0.2	3.8	Yes
St Arnaud	Weekly	52	4.0	0.1	0.7	Yes
Stawell	Twice weekly	104	2.7	0.1	0.3	Yes
Ultima	Weekly	52	53.0	14.0	31.1	No
Underbool ~	Weekly	42	12.0	0.2	2.2	Yes
Walpeup	Weekly	52	6.7	0.2	2.8	Yes
Warracknabeal	Weekly	52	2.7	0.1	0.5	Yes
Willaura	Weekly	52	10.0	0.1	0.9	Yes
Woomelang	Weekly	52	14.0	0.5	5.4	No
Wycheproof	Weekly	52	7.8	0.7	3.1	Yes

† **Performance Standard:** 95% upper confidence limit of mean of drinking water samples collected in the preceding 12 months must be  $\leq 5.0$  Nephelometric Turbidity Units.

~ Underbool was declared a drinking water supply on 17 September 2008

**Table 3.13 - Turbidity Failures in Disinfection Only Supplies using the 95% Upper Confidence Limit theory**

Sampling Locality	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09
Beulah	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brim	✓	x	x	x	x	x	x	✓	✓	✓	✓	✓
Jung	x	✓	✓	✓	x	✓	x	✓	✓	✓	✓	✓
Lalbert	x	x	x	x	✓	✓	x	✓	✓	x	✓	✓
Manangatang	x	x	x	x	x	x	x	x	x	x	x	x
Nullawil	x	✓	✓	✓	✓	✓	x	x	x	x	✓	✓
Quambatook	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sea Lake	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ultima	x	x	x	x	x	x	x	x	x	x	x	x
Woomelang	x	x	x	x	✓	x	x	✓	x	✓	✓	✓
Wycheproof	x	✓	✓	✓	x	✓	✓	✓	✓	✓	x	✓

x Represents results more than 5 NTU at a 95% UCL

✓ Represents results less than 5 NTU at a 95% UCL

### 3.6 Fluoride

Fluoride occurs naturally in seawater, soil and air. Groundwater may also have quite high concentrations (1-10 mg/L) depending on the mineralogy of the strata that the water is drawn from.

Fluoride is sometimes added to water supplies to help protect teeth against dental cavities. GWMWater has only one fluoridated water supply. In November 2006, the Horsham and Haven water supply became fluoridated.

A detailed description of fluoride and its implications in a water supply can be found by reference to ADWG fact sheet FS51.

DHS specify that, based on health considerations, the concentration of fluoride in fluoridated drinking water supplies should not exceed 1.5 mg/L and have an annual average of less than 1.0 mg/L.

For non-fluoridated drinking water supplies, the concentration of fluoride should not exceed 1.5 mg/L.

#### *3.6.1 Results*

Fluoride sampling and analysis is generally undertaken on at least an annual basis for all non-fluoridated drinking water supplies and weekly for all fluoridated drinking water supplies.

All water supplies were tested on an annual basis apart from the Horsham and Haven supplies which have fluoride added to them, in this case the two supplies were tested on a weekly basis.

Refer to Table 3.14 on page 39 for the 2008/09 monitoring results for fluoride.

All water supplies complied with the ADWG health guideline values for fluoride and the requirements of the *Health (Fluoridation) Act 1973*.

#### *3.6.2 Actions Undertaken in Relation to Non-Compliance*

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for fluoride (1.5 mg/L), no corrective action has needed to be taken.

**Table 3.14 - Fluoride Results in Drinking Water Supplies**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Annually	1	0.05	0.05	0.05	Yes
Beulah	Annually	1	0.05	0.05	0.05	Yes
Birchip	Annually	1	0.24	0.24	0.24	Yes
Brim	Annually	1	0.05	0.05	0.05	Yes
Charlton	Annually	1	0.27	0.27	0.27	Yes
Dimboola	Annually	1	0.05	0.05	0.05	Yes
Donald	Annually	1	0.23	0.23	0.23	Yes
Edenhope	Annually	1	0.05	0.05	0.05	Yes
Great Western	Annually	1	0.07	0.07	0.07	Yes
Halls Gap	Annually	1	0.05	0.05	0.05	Yes
Haven <sup>^</sup>	Weekly	52	0.99	0.06	0.74	Yes
Hopetoun	Annually	1	0.05	0.05	0.05	Yes
Horsham <sup>^</sup>	Weekly	104	1.00	0.05	0.74	Yes
Jung	Annually	1	0.05	0.05	0.05	Yes
Lalbert	Annually	1	0.31	0.31	0.31	Yes
Lake Bolac	Annually	1	0.05	0.05	0.05	Yes
Manangatang	Annually	1	0.19	0.19	0.19	Yes
Minyip	Annually	1	0.05	0.05	0.05	Yes
Murtoa	Annually	1	0.05	0.05	0.05	Yes
Nullawil	Annually	1	0.08	0.08	0.08	Yes
Ouyen	Annually	1	0.12	0.12	0.12	Yes
Pomonal	Annually	1	0.05	0.05	0.05	Yes
Quambatook	Annually	1	0.24	0.24	0.24	Yes
Rainbow	Annually	1	0.05	0.05	0.05	Yes
Rupanyup	Annually	1	0.11	0.11	0.11	Yes
Sea Lake	Annually	1	0.13	0.13	0.13	Yes
St Arnaud	Annually	1	0.06	0.06	0.06	Yes
Stawell	Annually	1	0.05	0.05	0.05	Yes
Ultima	Annually	1	0.10	0.10	0.10	Yes
Underbool	Annually	1	0.25	0.25	0.25	Yes
Walpeup	Annually	1	0.18	0.18	0.18	Yes
Warracknabeal	Annually	1	0.05	0.05	0.05	Yes
Willaura	Annually	1	0.05	0.05	0.05	Yes
Woomelang	Annually	1	0.05	0.05	0.05	Yes
Wycheproof	Annually	1	0.27	0.27	0.27	Yes

† **Performance Standard:** Fluoride concentration shall not exceed 1.5 mg/L for non-fluoridated supplies. For fluoridated supplies, compliance requires all individual samples to be below 1.5 mg/L and the annual average must not exceed 1 mg/L.

<sup>^</sup> Fluoridated water supplies managed by GWMWater.

### 3.7 Other Algae, Pathogen, Chemical or Substances

Regulation 10 (b) requires the water supplier to ensure that the drinking water supplied to the customer does not contain any chemical, toxin, pathogen or other substance that may pose a risk to human health.

#### 3.7.1 Results and Actions Taken in Relation to Non Compliance

Blue-green algae (BGA) sampling is generally undertaken on a weekly basis by GWMWater for all of the open raw water storages associated with a water supply. Most monitoring is done in-house with samples from known problem storages being sent to the laboratory. Samples tested in house which return high counts of potentially toxic blue-green algae are also sent to a laboratory in Melbourne for verification. Periodic check samples are also sent to the laboratory for quality assurance of in-house counting technique.

GWMWater has obligation to notify DHS as per the requirements set out in the Blue-Green Algae Circular 2008/09 for the presences of toxic blue-green algae species using either/or the number of cells/mL or the biovolume (mm<sup>3</sup>/L) of toxic blue-green algae species present. GWMWater will notify DHS by the arrangements set out in Section 22 of the *Safe Drinking Water Act 2003*.

GWMWater did not experience any toxic BGA blooms in any of the major headworks storages or any of the town storages for the reporting period.

A large BGA bloom was experienced on the Murray River from approximately March 2009 to mid May 2009. GWMWater was in contact with Lower Murray Water and Goulburn Murray Water as well as the New South Wales Department of Water and Energy throughout the duration of the bloom.

GWMWater decided to isolate all towns on the Northern Mallee Pipeline, which draws its water from the Murray River, as a precaution to stop toxins and or algal cells contaminating the town storages. This was done in accordance with GWMWater's Local BGA Response Plan. Customers drawing water from the Northern Mallee Pipeline were also informed of the bloom and given guidance on how to manage their water supplies while the bloom was in progress. GWMWater also undertook to sample all town storages twice weekly to ascertain if a localised bloom was likely in any of the storages. Algal toxicity samples were also taken and analysed by the Australian Water Quality Centre, there was found to be undetectable levels of algal toxins in the raw water.

The Northern Mallee Pipeline resumed full capacity operating capacity on 9 April 2009.

## 4.0 Chemicals of Concern

Individual monitoring results that do not comply with the performance standard are highlighted thus.

### 4.1 Chlorine Dioxide-based Chemicals

Chlorine dioxide is used as a disinfectant in the Willaura and Lake Bolac water supplies. Chlorine dioxide dissociates into chlorite and, to a lesser extent, chlorate when added to water.

In all cases, chlorine dioxide is generated on site using hydrochloric acid and sodium chlorite.

Based on health considerations, the concentrations of chlorine dioxide and its by-products should not exceed:

- Chlorine dioxide - 1 mg/L
- Chlorite - 0.3 mg/L

#### 4.1.1 Results

Disinfection by-product sampling and analysis for 2008/2009 was undertaken on a fortnightly basis at Willaura and Lake Bolac which are the only towns using chlorine dioxide as a disinfectant. Fortnightly sampling was undertaken due to the ongoing non-compliance with the chlorite guideline value of 0.3mg/L.

Refer to Table 4.1 on Page 43 for the 2008/09 chlorite monitoring results.

### Missing Samples

There were no missing samples from either of the towns using chlorine dioxide as a disinfectant.

#### 4.1.2 Actions Undertaken in Relation to Non-Compliance

GWMWater has made numerous operational changes at the Willaura treatment plant to try to lower the chlorite concentration in the towns' supplies. This included changing the type of coagulant, the coagulant dose rates, filtering processes and delivery water. All these changes did not lower chlorite levels to acceptable standards and remained around the 1.0mg/L level.

GWMWater also contracted the services of the Australian Water Quality Centre to undertake extensive testing of the raw water to ascertain if chlorine dioxide was a feasible type of disinfectant for the supply. The testing indicated that chlorine dioxide could not be used if the system was to deliver water which met the ADWG guideline value.

It was recommended that GWMWater use chloramination as the primary disinfectant. After conducting information sessions at both Willaura and Lake Bolac it was decided that the customers were happy to change disinfectant. GWMWater has since built and commissioned a chloramination disinfectant plant at Willaura, the date of commissioning was 16 June 2009. GWMWater envisages that the change in

disinfection will allow the supplies to fully comply with all water quality standards and guideline values.

**Table 4.1 - Results for Chlorite**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Lake Bolac	Monthly	24	2.6	1.4	No
Willaura	Monthly	24	2.3	0.2	No

† Performance Standard: *Total chlorite must not exceed 0.30 mg/L*

**Table 4.2 - Chlorite Failures in both Fully Treated and Disinfection Only Supplies**

Sampling Locality	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09
Lake Bolac	x	x	x	x	x	x	x	x	x	x	x	x
Willaura	x	x	x	x	x	x	x	x	x	x	x	x

x Represents results more than 0.30mg/L

✓ Represents results less than 0.30mg/L

## **4.2 Arsenic**

Arsenic is a naturally occurring element that can be introduced into water through the dissolution of minerals or other means. For a detailed description of the health and toxicological effects of arsenic, refer to the ADWG fact sheet FS38.

ADWG recommends that on the basis on health considerations, the concentration of arsenic in drinking water should not exceed 0.007 mg/L.

### *4.2.1 Results*

Arsenic sampling and analysis is generally undertaken on an annual basis for both drinking water supplies.

Refer to Table 4.3 on Page 45 for the 2008/09 monitoring results for arsenic in drinking water supplies.

## **Missing Samples**

There were no missing samples for the 2008/09 reporting period.

### *4.2.2 Actions Undertaken in Relation to Non-Compliance*

There were no non-compliances with the performance standard for the 2008/09 reporting period.

**Table 4.3 – Arsenic Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Result (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Beulah	Annually	1	0.001	Yes
Birchip	Annually	1	0.003	Yes
Brim	Annually	1	0.001	Yes
Charlton	Annually	1	0.002	Yes
Dimboola	Annually	1	0.002	Yes
Donald	Annually	1	0.003	Yes
Edenhope	Annually	1	0.001	Yes
Great Western	Annually	1	0.001	Yes
Halls Gap	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Jung	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.002	Yes
Lalbert	Annually	1	0.001	Yes
Manangatang	Annually	1	0.005	Yes
Minyip	Annually	1	0.006	Yes
Murtoa	Annually	1	0.001	Yes
Nullawil	Annually	1	0.001	Yes
Ouyen	Annually	1	0.001	Yes
Pomonal	Annually	1	0.001	Yes
Quambatook	Annually	1	0.003	Yes
Rainbow	Annually	1	0.001	Yes
Rupanyup	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.001	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.001	Yes
Underbool~	Annually	1	0.001	Yes
Walpeup	Annually	1	0.001	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.001	Yes
Woomelang	Annually	1	0.004	Yes
Wycheproof	Annually	1	0.002	Yes

† **Performance Standard:** Arsenic must not exceed 0.007 mg/L

~ Underbool was declared a drinking water supply on 17 September 2008

### 4.3 Copper

Copper is commonly used in domestic water supply pipes and fittings. Copper concentrations can rise substantially when water with a low pH and hardness remains in stagnant contact with copper plumbing.

A detailed description of copper and its implications in a water supply can be found by reference to ADWG fact sheet FS49.

The taste threshold for copper is in the range 1-5 mg/L, depending on the water purity. ADWG suggest that based on health considerations, the concentration of copper in drinking water should not exceed 2 mg/L, while for aesthetic considerations, the concentration of copper in drinking water should not exceed 1 mg/L.

#### 4.3.1 Results

Copper sampling and analysis is generally undertaken on an annual basis for all drinking water supplies.

Refer to Table 4.4 on page 47 for the 2008/09 monitoring results for copper.

All water supplies complied with both the ADWG aesthetic and health values for copper.

#### Missing Samples

The water supplies of Lake Bolac and Willaura were not sampled during the 2008/09 reporting period. This was due to a scheduling issue which arose after a scheduling problem. However, based on historic data there has never been a copper exceedance at these towns, and therefore, there was no re-sample taken. The computer problem has since been rectified and it is not envisaged that this problem will occur again.

#### 4.3.1 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for copper (2 mg/L), no corrective action has needed to be taken.

The samples taken for analysis were taken from the reticulation. Copper levels may be higher at customer's internal taps, as a consequence of utilising copper plumbing. If a customer is experiencing copper staining or discolouration of their water, please contact the GWMWater Customer Service Centre on 1300 659 961.

**Table 4. 4- Copper Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.003	Yes
Beulah	Annually	1	0.003	Yes
Birchip	Annually	1	0.025	Yes
Brim	Annually	1	0.020	Yes
Charlton	Annually	1	0.022	Yes
Dimboola	Annually	1	0.002	Yes
Donald	Annually	1	0.018	Yes
Edenhope	Annually	1	0.001	Yes
Great Western	Annually	1	0.006	Yes
Halls Gap	Annually	1	0.005	Yes
Haven	Annually	1	0.007	Yes
Hopetoun	Annually	1	0.002	Yes
Horsham	Annually	1	0.005	Yes
Jung	Annually	1	0.003	Yes
Lake Bolac	Annually	0	-	-
Lalbert	Annually	1	0.038	Yes
Manangatang	Annually	1	0.004	Yes
Minyip	Annually	1	0.020	Yes
Murtoa	Annually	1	0.004	Yes
Nullawil	Annually	1	0.025	Yes
Ouyen	Annually	1	0.004	Yes
Pomonal	Annually	1	0.320	Yes
Quambatook	Annually	1	0.001	Yes
Rainbow	Annually	1	0.009	Yes
Rupanyup	Annually	1	0.004	Yes
Sea Lake	Annually	1	0.001	Yes
St Arnaud	Annually	1	0.004	Yes
Stawell	Annually	1	0.016	Yes
Ultima	Annually	1	0.008	Yes
Underbool~	Annually	1	0.004	Yes
Walpeup	Annually	1	0.003	Yes
Warracknabeal	Annually	1	0.002	Yes
Willaura	Annually	0	-	-
Woomelang	Annually	1	0.004	Yes
Wycheproof	Annually	1	0.002	Yes

† **Performance Standard:** Copper must not exceed 2.0 mg/L.

~ Underbool was declared a drinking water supply on 17 September 2008

#### **4.4 Lead**

Lead can be present in drinking water as a result of dissolution from natural sources, or from household plumbing systems containing lead. These may include lead in pipes, or in solder used to seal joints.

A detailed description of lead and its implications in a water supply can be found by reference to ADWG fact sheet FS55.

In humans, lead is a cumulative poison that can severely affect the central nervous system. ADWG suggest that based on health considerations, the concentration of lead in drinking water should not exceed 0.01 mg/L.

##### *4.4.1 Results*

Lead sampling and analysis is generally undertaken on an annual basis for all drinking water supplies.

Refer to Table 4.5 on page 49 for the 2008/09 monitoring results for lead.

All water supplies complied with the ADWG health values for lead.

##### **Missing Samples**

There were no missing samples for the 2008/09 reporting period.

##### *4.4.2 Actions Undertaken in Relation to Non-Compliance*

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for lead (0.01 mg/L), no corrective action has needed to be taken.

**Table 4. 5- Lead Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Beulah	Annually	1	0.002	Yes
Birchip	Annually	1	0.003	Yes
Brim	Annually	1	0.003	Yes
Charlton	Annually	1	0.001	Yes
Dimboola	Annually	1	0.001	Yes
Donald	Annually	1	0.001	Yes
Edenhope	Annually	1	0.002	Yes
Great Western	Annually	1	0.001	Yes
Halls Gap	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Jung	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.001	Yes
Lalbert	Annually	1	0.001	Yes
Manangatang	Annually	1	0.001	Yes
Minyip	Annually	1	0.001	Yes
Murtoa	Annually	1	0.001	Yes
Nullawil	Annually	1	0.001	Yes
Ouyen	Annually	1	0.001	Yes
Pomonal	Annually	1	0.001	Yes
Quambatook	Annually	1	0.001	Yes
Rainbow	Annually	1	0.001	Yes
Rupanyup	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.001	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.001	Yes
Underbool~	Annually	1	0.001	Yes
Walpeup	Annually	1	0.001	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.001	Yes
Woomelang	Annually	1	0.001	Yes
Wycheproof	Annually	1	0.001	Yes

† **Performance Standard:** Lead must not exceed 0.01 mg/L.

~ Underbool was declared a drinking water supply on 17 September 2008

## 4.5 Manganese

At concentrations exceeding 0.1 mg/L, manganese imparts an undesirable taste to water and stains plumbing fixtures and laundry. Even at concentrations of 0.02 mg/L, manganese will form a coating on pipes, which can slough off as black ooze. Some nuisance micro-organisms can concentrate manganese and give rise to taste, odour and turbidity problems in distribution systems.

A detailed description of manganese and its implications in a water supply can be found by reference to ADWG fact sheet FS56.

ADWG suggest that, based on aesthetic considerations, the concentration of manganese in drinking water should not exceed 0.1 mg/L. Manganese would not be a health consideration unless the concentration exceeded 0.5 mg/L.

### 4.5.1 Results

Manganese sampling and analysis is generally undertaken on an annual basis for all drinking water supplies.

Refer to Table 4.6 on page 51 for the 2008/09 monitoring results for manganese.

All water supplies complied with both the ADWG aesthetic and health values for manganese.

### Missing Samples

There were no missing samples for the 2008/09 reporting period.

### 4.5.2 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for manganese, no corrective action has been taken.

**Table 4. 6- Manganese Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.010	Yes
Beulah	Annually	1	0.004	Yes
Birchip	Annually	1	0.002	Yes
Brim	Annually	1	0.004	Yes
Charlton	Annually	1	0.001	Yes
Dimboola	Annually	1	0.001	Yes
Donald	Annually	1	0.041	Yes
Edenhope	Annually	1	0.001	Yes
Great Western	Annually	1	0.001	Yes
Halls Gap	Annually	1	0.014	Yes
Haven	Annually	1	0.032	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.013	Yes
Jung	Annually	1	0.008	Yes
Lake Bolac	Annually	1	0.015	Yes
Lalbert	Annually	1	0.005	Yes
Manangatang	Annually	1	0.012	Yes
Minyip	Annually	1	0.016	Yes
Murtoa	Annually	1	0.012	Yes
Nullawil	Annually	1	0.001	Yes
Ouyen	Annually	1	0.001	Yes
Pomonal	Annually	1	0.011	Yes
Quambatook	Annually	1	0.034	Yes
Rainbow	Annually	1	0.003	Yes
Rupanyup	Annually	1	0.011	Yes
Sea Lake	Annually	1	0.006	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.002	Yes
Ultima	Annually	1	0.007	Yes
Underbool~	Annually	1	0.014	Yes
Walpeup	Annually	1	0.020	Yes
Warracknabeal	Annually	1	0.005	Yes
Willaura	Annually	1	0.012	Yes
Woomelang	Annually	1	0.003	Yes
Wycheproof	Annually	1	0.012	Yes

† **Performance Standard:** *Manganese should not exceed 0.5 mg/L.*

~ *Underbool was declared a drinking water supply on 17 September 2008*

## 5.0 Non-Standard Aesthetic Parameters

Individual monitoring results that exceed the aesthetic guideline value set out in ADWG are highlighted **thus**.

### 5.1 Hydrogen Ion Concentration, pH

The parameter pH is a measure of the hydrogen ion concentration of water. It is measured on a logarithmic scale from 0 to 14. A pH of 7 is neutral, while a pH greater than 7 is alkaline, and a pH less than 7 is acidic.

One of the major objectives in controlling pH is to minimise corrosion and encrustation in pipework. If the water is too alkaline (above pH 8.5), rapid deposition and build-up of calcium carbonate can result which may eventually block the pipe. When pH is below 6.5 or above 11, the water may corrode plumbing.

ADWG fact sheet FS25 suggests that, based on the need to reduce corrosion and encrustation in pipework, drinking water should have a mean value between pH 6.5 and pH 8.5.

#### 5.1.1 Results

Sampling and laboratory analysis for pH during 2008/09 was undertaken on a weekly basis for all drinking water towns. The water samplers use a TPS WP81 hand-held meter to undertake in-house analysis.

Refer to Table 5.1 on Page 53 for the 2008/09 monitoring results for pH.

Drinking water towns that recorded individual results outside of the ADWG aesthetic values for pH were: Dimboola, Edenhope, Great Western, Halls Gap, Haven, Horsham, Jung, Manangatang, Pomonal, Quambatook, Stawell, Ultima, Walpeup, Willaura, Woomelang and Wycheproof.

#### Missing Samples

There were no missing samples for the 2008/09 reporting period.

#### 5.1.2 Actions Undertaken in Relation to Non-Compliance

All water supplies met the standard. Individual failures to meet pH guidelines are not actioned. If sustained high pH values are recorded, or individual pH readings return values well outside the guidelines, an immediate investigation would be prompted and emergency pH correction would be contemplated.

**Table 5. 1- pH Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (pH)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Weekly	104	8.4	6.6	7.4	Yes
Beulah	Weekly	52	9.4	6.7	7.5	Yes
Birchip	Weekly	52	9.8	6.6	7.7	Yes
Brim	Weekly	52	8.3	6.7	7.7	Yes
Charlton	Weekly	52	8.8	6.8	7.8	Yes
Dimboola	Weekly	52	8.8	6.2	7.8	Yes
Donald	Weekly	52	8.5	6.8	7.7	Yes
Edenhope	Weekly	52	8.5	6.0	7.5	Yes
Great Western	Weekly	52	8.4	6.4	7.5	Yes
Halls Gap	Weekly	52	8.2	6.1	7.4	Yes
Haven	Weekly	52	8.5	6.4	7.7	Yes
Hopetoun	Weekly	52	9.5	6.6	7.5	Yes
Horsham	Weekly	104	8.5	6.3	7.7	Yes
Jung	Weekly	52	8.2	6.1	7.5	Yes
Lake Bolac	Weekly	52	8.3	6.5	7.6	Yes
Lalbert	Weekly	52	8.4	7.0	7.8	Yes
Manangatang	Weekly	52	9.6	6.9	8.1	Yes
Minyip	Weekly	52	8.9	6.9	7.8	Yes
Murtoa	Weekly	52	8.7	6.5	7.4	Yes
Nullawil	Weekly	52	8.2	6.6	8.0	Yes
Ouyen	Weekly	52	8.2	7.0	8.0	Yes
Pomonal	Weekly	52	7.9	6.2	7.3	Yes
Quambatook	Weekly	52	9.5	6.2	8.0	Yes
Rainbow	Weekly	52	7.7	6.6	7.4	Yes
Rupanyup	Weekly	52	8.8	7.1	8.0	Yes
Sea Lake	Weekly	52	8.5	6.9	7.8	Yes
St Arnaud	Weekly	52	8.9	6.8	7.7	Yes
Stawell	Weekly	104	8.4	6.2	7.4	Yes
Ultima	Weekly	52	8.6	6.4	7.5	Yes
Underbool~	Weekly	42	8.6	6.6	7.7	Yes
Walpeup	Weekly	52	9.3	7.2	8.4	Yes
Warracknabeal	Weekly	52	8.8	6.6	7.7	Yes
Willaura	Weekly	52	8.6	6.1	7.5	Yes
Woomelang	Weekly	52	9.9	7.1	8.6	Yes
Wycheproof	Weekly	52	9.2	7.1	7.9	Yes

† **Guideline Value:**      *The mean of the pH samples should be between 6.5 and 8.5.*

~ Underbool was declared a drinking water supply on 17 September 2008

## 5.2 Colour

In natural waters, colour is due mainly to the presence of Dissolved Organic Matter (DOM), which originates from soil and decaying vegetation.

The dissolution of metals in pipes and fittings can also discolour drinking water. In bore water, 'red water' is a frequent problem, caused by the oxidation of iron. In addition, a black discolouration in reservoirs and distribution systems can result from the action of bacteria on dissolved manganese to produce insoluble oxides. Some of these compounds form colloidal suspensions, or are only partially dissolved, and so contribute to apparent rather than true colour.

ADWG fact sheet FS15 provides that, based on aesthetic considerations, mean true colour in drinking water should not exceed 15 Hazen Units (HU).

### *5.2.1 Results*

True colour sampling and analysis for 2008/09 was undertaken on a minimum monthly basis for all drinking water supplies.

Refer to Table 5.2 on page 55 for the 2008/09 monitoring results for true colour. The drinking water towns of: Brim, Dimboola, Jung, Lake Bolac, Manangatang, Minyip, Sea Lake, Ultima, Willaura and Woomelang recorded individual results outside of the ADWG aesthetic values for true colour during 2008/09.

### **Missing Samples**

There were no missing samples for the 2008/09 reporting period.

### *5.2.2 Actions Undertaken in Relation to Non-Compliance*

Brim, Jung, Manangatang, Minyip, Sea Lake, Ultima and Woomelang are all disinfection only supplies where there is no mechanism for removing colour, therefore, there was no action undertaken. The fully treated supplies at Dimboola, Lake Bolac and Willaura experienced single events of elevated colour in the supplies. Due to these elevated results at these towns being single events no further action was taken.

**Table 5. 2- True Colour Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (Pt/Co) *			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Monthly	24	4	2	3	Yes
Beulah	Monthly	12	15	3	7	Yes
Birchip	Monthly	12	5	2	3	Yes
Brim	Monthly	12	30	2	13	Yes
Charlton	Monthly	12	4	2	3	Yes
Dimboola	Monthly	12	18	2	4	Yes
Donald	Monthly	12	6	3	4	Yes
Edenhope	Monthly	13	3	2	3	Yes
Great Western	Monthly	12	6	2	4	Yes
Halls Gap	Monthly	12	6	2	3	Yes
Haven	Monthly	12	3	2	2	Yes
Hopetoun	Monthly	12	7	2	3	Yes
Horsham	Monthly	24	4	2	2	Yes
Jung	Weekly	12	25	2	13	Yes
Lake Bolac	Monthly	12	18	2	8	Yes
Lalbert	Monthly	12	12	2	4	Yes
Manangatang	Monthly	12	50	2	11	Yes
Minyip	Monthly	12	22	6	11	Yes
Murtoa	Monthly	12	13	4	8	Yes
Nullawil	Monthly	12	13	4	8	Yes
Ouyen	Monthly	12	14	2	4	Yes
Pomonal	Monthly	12	6	2	3	Yes
Quambatook	Monthly	12	5	2	4	Yes
Rainbow	Monthly	12	12	2	5	Yes
Rupanyup	Monthly	12	12	3	5	Yes
Sea Lake	Monthly	12	70	2	9	Yes
St Arnaud	Monthly	12	6	2	3	Yes
Stawell	Monthly	24	6	2	2	Yes
Ultima	Monthly	12	28	5	11	Yes
Underbool~	Monthly	9	4	2	3	Yes
Walpeup	Monthly	12	8	2	4	Yes
Warracknabeal	Monthly	12	14	2	4	Yes
Willaura	Monthly	12	20	2	7	Yes
Woomelang	Monthly	12	50	3	10	Yes
Wycheproof	Monthly	12	10	2	4	Yes

† **Guideline Value:** Colour should not exceed a mean of 15 Hazen Units.

~ Underbool was declared a drinking water supply on 17 September 2008

### **5.3 Hardness**

Hardness is caused primarily by the presence of calcium and magnesium ions.

ADWG fact sheet FS24 contains a full discussion on the ramifications of hardness and what constitutes hard and soft water. ADWG suggest that, to minimise build-up of scale in hot water systems, mean total hardness (as calcium carbonate) in drinking water should not exceed 200 mg/L.

High total hardness may be a problem for supplies reliant on groundwater. Surface waters can generally be expected to have acceptable values.

#### *5.3.1 Results*

Hardness sampling and analysis for 2008/09 was undertaken on a quarterly basis for all drinking water supplies. Refer to Table 5.3 on page 57 for the 2008/09 monitoring results for hardness in drinking water supplies.

Drinking water towns with results for hardness above the ADWG values were: Donald, Minyip and Warracknabeal.

#### **Missing Samples**

There were no missing samples for the 2008/09 reporting period.

#### *5.3.2 Actions Undertaken in Relation to Non-Compliance*

There was no action undertaken with relation to hardness in these supplies. The towns which failed for the parameter are all towns which have recently been connected, or will be connected in the near future to the Wimmera Mallee Pipeline. The water which will be delivered through the pipeline will be much softer than the channel fed water.

**Table 5. 3- Hardness Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Quarterly	8	59	33	48	Yes
Beulah	Quarterly	4	200	37	98	Yes
Birchip	Quarterly	4	150	100	128	Yes
Brim	Quarterly	4	460	42	150	Yes
Charlton	Quarterly	4	120	96	109	Yes
Dimboola	Quarterly	4	140	41	73	Yes
Donald	Quarterly	4	360	320	348	No
Edenhope	Quarterly	4	170	11	94	Yes
Great Western	Quarterly	4	53	37	47	Yes
Halls Gap	Quarterly	4	45	30	37	Yes
Haven	Quarterly	4	53	50	52	Yes
Hopetoun	Quarterly	4	140	55	89	Yes
Horsham	Quarterly	8	65	47	62	Yes
Jung	Quarterly	4	280	36	145	Yes
Lake Bolac	Quarterly	4	32	27	30	Yes
Lalbert	Quarterly	4	110	81	95	Yes
Manangatang	Quarterly	4	71	56	64	Yes
Minyip	Quarterly	4	350	34	249	No
Murtoa	Quarterly	4	370	44	113	Yes
Nullawil	Quarterly	4	34	23	26	Yes
Ouyen	Quarterly	4	61	42	52	Yes
Pomonal	Quarterly	4	47	32	39	Yes
Quambatook	Quarterly	4	100	61	87	Yes
Rainbow	Quarterly	4	270	38	100	Yes
Rupanyup	Quarterly	4	230	170	188	Yes
Sea Lake	Quarterly	4	81	58	68	Yes
St Arnaud	Quarterly	4	68	62	66	Yes
Stawell	Quarterly	8	38	28	34	Yes
Ultima	Quarterly	4	43	30	36	Yes
Underbool~	Quarterly	3	110	56	90	Yes
Walpeup	Quarterly	4	81	63	72	Yes
Warracknabeal	Quarterly	4	470	52	254	No
Willaura	Quarterly	4	23	21	23	Yes
Woomelang	Quarterly	4	150	48	156	Yes
Wycheproof	Quarterly	4	170	140	162	Yes

† **Guideline Value:** Hardness should not exceed a mean of 200 mg/L CaCO<sub>3</sub>.

~ Underbool was declared a drinking water supply on 17 September 2008

## 5.4 Electrical Conductivity

Electrical Conductivity (EC) is caused by inorganic salts and small amounts of organic matter that are dissolved in water. Electrical conductivity comprises sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate (and nitrite) and phosphate.

High EC values may be associated with excessive scaling in pipes, fittings and household appliances.

ADWG fact sheet FS28 provides that, based on taste, mean electrical conductivity in drinking water should not exceed 1000  $\mu\text{S}/\text{cm}$ . The fact sheet describes guideline values for Total Dissolved Solids (TDS) and approximates that the electrical conductivity standard is at approximately twice that of the total dissolved solids. As it is easier and more cost effective to monitor electrical conductivity than total dissolved solids, the analysis for compliance is based on electrical conductivity.

### 5.4.1 Results

Sampling and field analysis for electrical conductivity during 2008/09 was undertaken on a weekly basis for all drinking water supplies other than Ararat, Stawell and Horsham where twice weekly samples were taken. All analysis was undertaken using a TPS WP81 hand-held meter.

Refer to Table 5.4 on page 56 for the 2008/09 monitoring results for electrical conductivity in drinking water supplies.

During 2008/09, 13 out of 35 drinking water supplies recorded electrical conductivity levels above 1000  $\mu\text{S}/\text{cm}$ .

### Missing Samples

There were no missing samples during the 2008/09 reporting period.

### 5.4.2 Actions Undertaken in Relation to Non-Compliance

The water that is delivered via the Wimmera-Mallee channel system tends to become more saline the further a field it travels. The water at Hopetoun, for example, is generally more saline than the water at Doon (refer to Figure 1 on page 5).

The high levels of electrical conductivity recorded at the 12 towns can be attributed to various reasons, such as:

- The source water at the headworks in storages such as Taylors Lake being high in electrical conductivity
- The water flows through open earthen channels as it is delivered to the towns where it increases in concentration the further it travels from the headworks
- The long running drought which has magnified the electrical conductivity concentrations in the town storages due to evaporation
- A lack of water in the headworks to supply fresher water to the storages through further channel runs.

Towns which had a mean Electrical Conductivity of more than  $1000\mu\text{S}/\text{cm}$  were Beulah, Brim, Donald, Minyip, Rupanyup and Warracknabeal. With the exception of Donald all these towns have been connected to the Wimmera Mallee Pipeline and have seen massive drops in their Electrical Conductivity concentrations. However, these drops did not occur early enough for the mean Electrical Conductivity concentration to drop below  $1000\mu\text{S}/\text{cm}$ . Donald is expected to be connected to the Wimmera Mallee Pipeline in late 2009.

A desalination plant is installed in Edenhope to provide water with an acceptable electrical conductivity.

**Table 5. 4– Electrical Conductivity (EC) Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (uS/cm)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Weekly	104	285	155	205	Yes
Beulah	Weekly	52	2338	146	1143	No
Birchip	Weekly	52	974	340	666	Yes
Brim	Weekly	52	3500	155	1572	No
Charlton	Weekly	52	775	190	580	Yes
Dimboola	Weekly	52	820	160	308	Yes
Donald	Weekly	52	2060	1840	2223	No
Edenhope	Weekly	52	1282	80	409	Yes
Great Western	Weekly	52	335	180	247	Yes
Halls Gap	Weekly	52	220	120	159	Yes
Haven	Weekly	52	370	255	303	Yes
Hopetoun	Weekly	52	1403	141	625	Yes
Horsham	Weekly	104	383	245	302	Yes
Jung	Weekly	52	2130	145	847	Yes
Lake Bolac	Weekly	52	285	120	161	Yes
Lalbert	Weekly	52	862	261	322	Yes
Manangatang	Weekly	52	257	164	200	Yes
Minyip	Weekly	52	2500	150	1701	No
Murtoa	Weekly	52	2870	185	793	Yes
Nullawil	Weekly	52	971	78	156	Yes
Ouyen	Weekly	52	230	122	164	Yes
Pomonal	Weekly	52	361	130	174	Yes
Quambatook	Weekly	52	561	311	387	Yes
Rainbow	Weekly	52	1850	153	732	Yes
Rupanyup	Weekly	52	1660	185	1097	No
Sea Lake	Weekly	52	553	189	232	Yes
St Arnaud	Weekly	52	545	131	409	Yes
Stawell	Weekly	104	390	125	151	Yes
Ultima	Weekly	52	195	105	135	Yes
Underbool~	Weekly	41	417	200	350	Yes
Walpeup	Weekly	52	316	207	254	Yes
Warracknabeal	Weekly	52	3400	170	1607	No
Willaura	Weekly	52	987	115	162	Yes
Woomelang	Weekly	52	1100	181	678	Yes
Wycheproof	Weekly	52	1247	167	936	Yes

† **Guideline Value:** Electrical Conductivity (EC) should not exceed a mean of 1000 uS/cm.

~ Underbool was declared a drinking water supply on 17 September 2008

## 5.5 Iron

At concentrations exceeding 0.3 mg/L, iron imparts an undesirable taste to water and stains plumbing fixtures and laundry. Some nuisance micro-organisms can concentrate iron and give rise to taste, odour and turbidity problems in distribution systems.

A detailed description of iron and its implications in a water supply can be found by reference to ADWG fact sheet FS58.

ADWG suggest that, based on aesthetic considerations, the concentration of iron in drinking water should not exceed 0.3 mg/L.

### *5.5.1 Results*

Iron sampling and analysis is generally undertaken on a quarterly basis for all drinking water supplies.

Refer to Table 5.5 on page 62 for the 2008/09 monitoring results for Iron.

The supplies at the disinfection only towns of Brim, Lalbert, Jung, Manangatang, Minyip, Nullawil, Sea Lake and Ultima all had results that failed, either on a once off basis or across the entire reporting period.

### *5.5.2 Actions Undertaken in Relation to Non-Compliance*

As the ADWG Standard for Iron is an aesthetic guideline, no specific corrective action has been performed. Customers are encouraged to call the GWMWater Customer Service Centre on 1300 659 961 should they be concerned with taste and odour issues.

**Table 5. 5–Iron Results for Drinking Water**

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L) *		Complying (Yes/No)
			Max	Min	
Ararat	Quarterly	8	0.27	0.02	Yes
Beulah	Quarterly	4	0.34	0.14	Yes
Birchip	Quarterly	4	0.04	0.02	Yes
Brim	Quarterly	4	0.40	0.30	No
Charlton	Quarterly	4	0.30	0.02	Yes
Dimboola	Quarterly	4	0.20	0.02	Yes
Donald	Quarterly	4	0.08	0.03	Yes
Edenhope	Quarterly	4	0.04	0.02	Yes
Great Western	Quarterly	4	0.06	0.02	Yes
Halls Gap	Quarterly	4	0.12	0.02	Yes
Haven	Quarterly	4	0.04	0.02	Yes
Hopetoun	Quarterly	4	0.11	0.02	Yes
Horsham	Quarterly	8	0.08	0.02	Yes
Jung	Quarterly	4	0.67	0.20	No
Lake Bolac	Quarterly	4	0.02	0.02	Yes
Lalbert	Quarterly	4	0.52	0.11	No
Manangatang	Quarterly	4	2.00	0.49	No
Minyip	Quarterly	4	0.55	0.03	No
Murtoa	Quarterly	4	0.13	0.02	Yes
Nullawil	Quarterly	4	0.77	0.33	No
Ouyen	Quarterly	4	0.02	0.02	Yes
Pomonal	Quarterly	4	0.10	0.04	Yes
Quambatook	Quarterly	4	0.25	0.10	Yes
Rainbow	Quarterly	4	0.09	0.04	Yes
Rupanyup	Quarterly	4	0.32	0.08	Yes
Sea Lake	Quarterly	4	0.30	0.16	Yes
St Arnaud	Quarterly	4	0.03	0.02	Yes
Stawell	Quarterly	8	0.05	0.02	Yes
Ultima	Quarterly	4	1.90	0.45	No
Underbool	Quarterly	3	0.06	0.02	Yes
Walpeup	Quarterly	4	0.19	0.08	Yes
Warracknabeal	Quarterly	4	0.19	0.02	Yes
Willaura	Quarterly	4	0.03	0.02	Yes
Woomelang	Quarterly	4	0.38	0.15	No
Wycheproof	Quarterly	4	0.16	0.02	Yes

† **Guideline Value:** Iron should not exceed 0.3 mg/L.

~ Underbool was declared a drinking water supply on 17 September 2008

## 6.0 Analysis of Results

Table 6.1 below and Table 6.2 on Page 64 provide a comparison between 2008/09 *E. coli* and turbidity data and results from previous periods, for drinking water supplies.

**Table 6.1- Comparison of *E. coli* Results from 2005/06 to 2008/09**

Water Supply	2005/06		2006/07		2007/08		2008/09	
	No. samples	% with no <i>E. coli</i>	No. samples	% with no <i>E. coli</i>	No. samples	% with no <i>E. coli</i>	No. samples	% with no <i>E. coli</i>
Ararat	100	100%	115	100%	104	100%	104	100%
Beulah	49	100%	52	100%	52	100%	52	100%
Birchip	48	100%	53	100%	52	100%	52	100%
Brim	49	98%	51	100%	52	100%	52	100%
Charlton	49	100%	52	100%	52	100%	52	100%
Dimboola	49	100%	52	100%	52	100%	52	100%
Donald	49	100%	52	100%	52	100%	52	100%
Edenhope	50	96%	52	100%	52	100%	52	100%
Great Western	49	100%	52	100%	52	100%	52	100%
Halls Gap	108	100%	52	100%	52	100%	52	100%
Haven#	-	-	52	100%	52	98%	52	98%
Hopetoun	49	100%	52	100%	52	100%	52	100%
Horsham	84	100%	102	100%	104	100%	104	98%
Jung	49	96%	52	98%	54	98%	52	100%
Lake Bolac*	-	-	19	100%	52	100%	52	100%
Lalbert	48	98%	52	100%	52	100%	52	100%
Manangatang	48	100%	52	100%	52	100%	52	100%
Minyip	49	98%	52	100%	52	98%	52	98%
Murrayville^	49	100%	48	100%	-	-	-	-
Murtoa	49	100%	52	100%	52	100%	52	100%
Nullawil	48	100%	52	100%	52	100%	52	100%
Ouyen	49	100%	52	100%	52	100%	52	100%
Pomonal	55	100%	52	100%	52	100%	52	100%
Quambatook	48	98%	52	98%	52	100%	52	100%
Rainbow	48	100%	52	100%	52	100%	52	100%
Rupanyup	49	100%	52	98%	52	100%	52	100%
Sea Lake	49	96%	52	100%	52	100%	52	100%
St Arnaud	50	100%	52	100%	52	98%	52	100%
Stawell	99	100%	104	100%	104	100%	104	100%
Ultima	48	100%	52	98%	52	100%	52	100%
Underbool	-	-	-	-	-	-	41	100%
Walpeup	49	100%	52	100%	52	98%	52	100%
Warracknabeal	50	100%	52	100%	52	100%	52	100%
Watchem‡	49	96%	52	98%	41	100%	-	-
Willaura*	-	-	19	100%	52	98%	52	92%
Woomelang	48	98%	52	100%	52	100%	52	100%
Wycheproof	47	100%	52	100%	52	100%	52	100%

^ Murrayville water supply declared as regulated on 28 May 2007.

\* Lake Bolac and Willaura received a drinking water supply from 8 March 2007.

# Haven was part of Horsham prior to 2006/07

‡ Watchem water supply was declared as regulated on 14 March 2008

~ Underbool was declared a drinking water supply on 17 September 2008

Table 6.2- Comparison of Turbidity Results from 2006/07 to 2008/09

Water Supply	2006/07		2007/08		2008/09	
	No. samples	95% UCL of mean (NTU)	No. samples	95% UCL of mean (NTU)	No. samples	95% UCL of mean (NTU)
Ararat	117	0.5	104	0.7	104	0.5
Beulah	52	4.6	52	5.6	52	3.0
Birchip	53	0.5	52	2.8	52	0.6
Brim	52	5.9	52	4.6	52	6.4
Charlton	52	0.4	52	1.2	52	0.4
Dimboola	52	0.5	52	0.8	52	0.3
Donald	52	1.0	52	1.5	52	1.5
Edenhope	52	0.5	52	0.6	52	1.4
Great Western	52	0.3	52	0.4	52	0.3
Halls Gap	52	0.5	52	0.6	52	0.4
Haven#	52	0.5	52	0.6	52	0.7
Hopetoun	52	0.5	52	0.9	52	0.7
Horsham	102	0.5	104	0.5	104	0.5
Jung	52	5.1	52	5.2	52	3.8
Lake Bolac*	19	0.7	52	0.5	52	0.4
Lalbert	52	28.2	52	10.6	52	6.5
Manangatang	52	23	52	17.7	52	22.6
Minyip	52	5.2	52	2.2	52	3.3
Murrayville^	51	0.6	52	0.8	-	-
Murtoa	52	0.6	52	2.1	52	1.7
Nullawil	52	8.1	52	9.6	52	6.6
Ouyen	52	0.4	52	1.0	52	0.5
Pomonal	52	0.5	52	0.6	52	0.5
Quambatook	52	5.3	52	6.5	52	4.0
Rainbow	52	2.6	52	1.5	52	0.8
Rupanyup	52	12.8	52	2.4	52	4.7
Sea Lake	52	7.1	52	13.8	52	3.9
St Arnaud	52	0.4	52	0.4	52	0.7
Stawell	104	0.4	104	0.4	104	0.4
Ultima	52	27.8	52	42.8	52	32.0
Underbool	-	-	-	-	41	2.2
Walpeup	52	3.1	52	3.1	52	2.8
Warracknabeal	52	0.6	52	1.0	52	0.5
Watchem‡	52	2.9	41	1.6	-	-
Willaura*	19	0.8	52	0.5	52	0.9
Woomelang	52	20.1	52	13.0	52	5.4
Wycheproof	52	3.9	52	6.3	52	3.1

^ Murrayville water supply declared regulated on 28 May 2007.

\* Lake Bolac and Willaura water supplies became drinking water on 8 March 2007.

# Haven was part of Horsham prior to 2006/07

‡ Watchem water supply was declared as regulated on 14 March 2008

~ Underbool was declared a drinking water supply on 17 September 2008

Turbidity generally deteriorated from 2006/07. This is due largely to the critically low water levels in both the Grampians fed systems as well as those which take their water from the Murray River. The construction of the Wimmera Mallee Pipeline has realised large improvements to the turbidity of the water delivered to the towns which has led to improvements in the water quality.

## 7.0 Emergency / Incident Management

### 7.1 Emergencies

GWMWater reviewed its Emergency Management Plan during 2008/09. The Emergency Management Plan includes specific procedures for the management of water quality incidents.

Water quality incidents are notifiable to DHS under section 22 of the Act. The Emergency Management Plan reflects this requirement.

Responses to incidents are presented in the following tables:

- Woomelang chlorinator failure on page 19
- Table 3.2 *E. coli* on page 21
- Table 3.8 Total Trihalomethanes on page 29
- Table 3.12 Turbidity on page 36
- Table 4.2 Chlorite on page 43

## 8.0 Complaints

### 8.1 Complaints and Responses

GWMWater's *Customer Complaints and Disputes Policy* recognises the customer's rights, including the right to complain.

GWMWater systematically records all complaints in a complaint register. Trends in water quality complaints are able to be tracked and monitored and appropriate action taken.

When a water quality complaint is received, the complaint is logged and a service request is raised for the incident to be investigated.

Table 8.1 below summarises the complaints received during 2008/09, for both drinking water and regulated water supplies.

Table 8.2 on page 67 and Table 8.3 on page 68 provide a detailed breakdown of the total number of complaints received from customers supplied with drinking and regulated water, respectively.

**Table 8.1- Water Quality Complaints 2008/09**

Type of Complaint	No. of Complaints		Complaints per 100 Customers†	
	Drinking	Regulated	Drinking	Regulated
Discoloured	27	27	0.061	0.511
Taste / odour	14	8	0.032	0.152
Blue water	0	0	-	-
Air in water	0	0	-	-
Suspected illness	0	0	-	-
Other	17	0	0.038	-
<b>Total</b>	<b>58</b>	<b>35</b>	<b>0.131</b>	<b>0.661</b>

† ESC defines a customer as a property which, is connected to the water business' water system; and receives a fixed and/or usage account.

### 8.2 Analysis of Issues

The total number of complaints received is very low. The total number of complaints received during the 2008/09 period was less than in the preceding 12 months. A higher number of complaints come from customers of non-potable water supplies.

The number of water quality complaints in any category is well below the threshold for triggering a strategic response to the issue. Individual complaints are dealt with on their merits. The Wimmera Mallee Pipeline is likely to provide a solution to many of the discoloured and odour complaints received from customers in towns with a regulated water supply.

An incident in the Horsham supply which occurred on 11 December caused a number of complaints to be registered. The complaints arose due to dirty water being allowed into the system after large scale mains work has been carried out. GWMWater acted quickly to rectify the problem and notified DHS under Section 22 of the *Act*.

**Table 8. 2- Water Quality Complaints for Drinking Water Towns**

Water Supply	Pop'n served	ESC Customers^	Number of Complaints						Total
			Colour	Taste <sup>†</sup>	Blue	Air	Illness <sup>‡</sup>	Other	
Ararat	7,000	3,754	3	-	-	-	-	1	4
Beulah	230	179	-	-	-	-	-	-	0
Birchip	800	450	-	-	-	-	-	-	0
Brim	100	58	1	-	-	-	-	-	1
Charlton	1,100	676	-	-	-	-	-	-	0
Dimboola	1,560	869	-	-	-	-	-	-	0
Donald	1,380	846	1	-	-	-	-	-	1
Edenhope	780	538	-	-	-	-	-	-	0
Great Western	150	124	-	-	-	-	-	-	0
Halls Gap	260	456	3	1	-	-	-	-	4
Hopetoun	670	391	-	1	-	-	-	-	1
Horsham#	13,290	7,464	15	7	-	-	-	8	30
Jung	90	43	1	2	-	-	-	-	3
Lake Bolac	240	164	-	-	-	-	-	-	0
Lalbert	100	61	-	-	-	-	-	-	0
Manangatang	310	166	-	-	-	-	-	-	0
Minyip	480	278	-	-	-	-	-	-	0
Murtoa	840	490	-	-	-	-	-	2	2
Nullawil	100	43	-	-	-	-	-	-	0
Ouyen	1,250	668	-	-	-	-	-	-	0
Pomonal	150	110	-	-	-	-	-	-	0
Quambatook	280	168	-	-	-	-	-	1	1
Rainbow	560	373	-	-	-	-	-	-	0
Rupanyup	410	251	-	-	-	-	-	-	0
Sea Lake	690	419	1	-	-	-	-	-	1
St Arnaud	2,640	1,370	-	-	-	-	-	1	1
Stawell	6,270	3,187	2	3	-	-	-	2	7
Ultima	190	95	-	-	-	-	-	-	0
Walpeup	150	76	-	-	-	-	-	-	0
Warracknabeal	2,490	1,438	-	-	-	-	-	2	2
Watchem	180	86	-	-	-	-	-	-	-
Willaura	300	245	-	-	-	-	-	-	0
Woomelang	220	145	-	-	-	-	-	-	0
Wycheproof	730	438	-	-	-	-	-	-	-
<b>Total</b>	<b>45,990</b>	<b>26,119</b>	<b>27</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>58</b>

**Table 8. 3- Water Quality Complaints for Regulated Supplies**

Water Supply	Pop'n served	ESC Customers <sup>^</sup>	No. Complaints						Total
			Colour	Taste <sup>†</sup>	Blue	Air	Illness <sup>‡</sup>	Other	
Antwerp	30	12	5	1	-	-	-	-	6
Apsley	190	116	-	-	-	-	-	-	0
Berriwillock	150	90	-	-	-	-	-	-	0
Buangor	50	37	-	4	-	-	-	-	4
Chillingollah	20	9	-	-	-	-	-	-	0
Chinkapook	20	16	-	-	-	-	-	-	0
Clear Lake	20	4	-	-	-	-	-	-	0
Cowangie	30	13	-	-	-	-	-	-	0
Culgoa	150	77	-	1	-	-	-	-	1
Dooen	20	17	-	1	-	-	-	-	1
Elmhurst	230	111	-	-	-	-	-	-	0
Glenorchy	100	62	-	1	-	-	-	-	1
Goroke	270	173	-	-	-	-	-	-	0
Harrow	150	90	-	-	-	-	-	-	0
Jeparit	400	312	1	-	-	-	-	-	1
Kaniva	740	496	1	-	-	-	-	-	1
Kiata	20	20	-	-	-	-	-	-	0
Lascelles	50	28	-	-	-	-	-	-	0
Lillimur	30	16	1	-	-	-	-	-	1
Marnoo	120	70	-	-	-	-	-	-	0
Miram	20	13	-	-	-	-	-	-	0
Moyston	150	88	-	-	-	-	-	-	0
Murrayville*	240	183	-	-	-	-	-	-	0
Nandaly	90	33	-	-	-	-	-	-	0
Natimuk	480	260	5	4	-	-	-	-	9
Nhill	1,890	1,147	11	-	-	-	-	-	11
Noradjuha	20	7	-	-	-	-	-	-	0
Patchewollock	80	52	-	-	-	-	-	-	0
Pimpinio	70	37	1	-	-	-	-	-	1
Serviceton	50	34	-	-	-	-	-	-	0
Speed	50	38	2	-	-	-	-	-	2
Streatham	100	48	-	-	-	-	-	-	0
Tarranyurk	20	8	-	-	-	-	-	-	0
Tempy	50	33	-	-	-	-	-	-	0
Underbool	230	135	-	-	-	-	-	-	0
Waitchie	10	5	-	-	-	-	-	-	0
Westmere	20	17	-	-	-	-	-	-	0
Wickliffe	120	42	-	-	-	-	-	-	0
Yaapeet	30	36	-	-	-	-	-	-	0
<b>Total</b>	<b>6,510</b>	<b>3,985</b>	<b>27</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>

## 9.0 Undertakings under Section 30 of the Act

GWMWater has entered into 14 undertakings, pursuant to Section 30 of the Safe Drinking Water Act. These undertakings relate to the Beulah, Donald, Jung, Lalbert, Manangatang, Minyip, Murtoa, Nullawil, Rainbow, Rupanyup, Ultima, Warracknabeal, Woomelang and Wycheproof. A summary of these undertakings is provided in Table 9.1 on Page 71.

The undertakings fall into three broad categories:

- Water supplies that fail the turbidity standard
- Water supplies that fail the trihalomethane standard
- Water supplies that fail both turbidity and trihalomethane standards.

### 9.1 Turbidity

Water supplies that fail the turbidity standards are dispersed throughout GWMWater operating region, however the cause of the turbidity problems varies over the region. Refer to Figure 1 on page 5 for the locations of these towns.

The water provided to towns such as Manangatang, Lalbert and Ultima is sourced from the Murray River. The Northern Mallee Pipeline delivers water to unlined earthen storages, from where it is reticulated to the towns. The water that is delivered into the storages is generally of acceptable turbidity (2-5 NTU), although relatively soft. While it would be expected that the turbidity of the water would gradually improve whilst in storage, through natural settling, the reverse is true.

The town storages are clay lined and generally performed satisfactorily whilst the water was supplied from the Grampians headworks. However, the water from the Murray River is much softer than the water from the Grampians system and tends to react with the dispersive clay lining to create turbidity.

The solution to the dispersive clay problem at three of the undertaking towns, Lalbert, Manangatang and Ultima, is to eliminate the storage altogether and move to tank storage. GWMWater will not meet the current undertaking deadline of 30 June 2009 for the completion of the tanks at these three towns. The reasons for not meeting this deadline are twofold; firstly GWMWater changed the specification of the new storages from lined earthen storages to tank storage. This change in specification required GWMWater to re-engineer the project which increased the project delivery time. Secondly, there were construction issues with the liners of the tanks which further extended the time which it took to finalise their construction. The current tender arrangements with the contractor clearly state that practical completion of the tanks will be before 30 September 2009. GWMWater has informed DHS of the new deadline arrangements. GWMWater is also happy to state, that as a post script to this annual report the construction of the tanks and the new supply arrangements are complete.

The other towns which fail the turbidity standard, such as Jung, Minyip, Nullawil, Rupanyup and Woomelang have all been connected to the Wimmera Mallee Pipeline and have seen large decreases in the turbidity in the supplies. The Minyip

undertaking deadline of 31 March 2009 was not met due to construction problems with the tank lining. GWMWater had previously met all interim measures which formed part of the undertaking obligations, such as aerating the Treated Water Storage, air scouring the towns reticulation system and holding a town meeting. The finalisation of all undertaking obligations, namely the completion of the new tanks and changes in supply arrangements were made on 23 April 2009.

Rupanyup has been connected to the Wimmera Mallee Pipeline through a temporary connection which will stay in place until the new tanks are complete. While Rupanyup did not meet the undertaking deadline the supply has complied with all water quality standards since the temporary connection was made.

## 9.2 Trihalomethanes

Water supplies that fail the trihalomethane standard are predominantly located in the Wimmera-Mallee channel area. Refer to figure 1 on page 5 for the location of this area. The water supplies to 11 towns, Beulah, Donald, Jung, Minyip, Murtoa, Nullawil, Rainbow, Rupanyup, Warracknabeal, Woomelang and Wycheproof are affected by this issue.

The water supplies to these towns are sourced from headworks in the Grampians. The water is delivered to the unlined town storages via open channels through farmland. The water that is delivered into storage is highly turbid, very high in salt (EC) and always carries a significant organic load.

The townships of Beulah, Jung, Minyip, Murtoa, Nullawil, Rainbow, Warracknabeal and Woomelang have all been connected to the Wimmera Mallee Pipeline through new raw water storages, therefore, satisfying all undertaking obligations. However, the Beulah supply was not connected before the scheduled end date of the undertaking. This was because of problems encountered with the construction of the new tank storage, DHS was notified that the deadline was not met. Prior to the connection of the new supply arrangements GWMWater had met all mitigating actions which formed part of the undertaking obligations, such as aerating the Treated Water Storage, air scouring the reticulation system and holding a town meeting. GWMWater made the final town connection on 31 January 2009 and since the connection there have been large decreases in the concentration of trihalomethanes in the treated water.

Rupanyup has been connected to the Wimmera Mallee Pipeline through a temporary connection which will stay in place until the new tanks are complete. While Rupanyup did not meet the undertaking deadline the supply has complied with all water quality standards since the temporary connection was made. Refer to Table 3.9 on page 29 for trihalomethane results.

The undertaking obligations for the construction of a new raw water storage at Murtoa was not met by the undertaking deadline. GWMWater had previously met all mitigating actions such as air scouring the reticulation system, vacuum cleaning the Clear Water Storage and elevated tank as well as holding a town meeting. While the new storage was not complete by the undertaking deadline GWMWater had made a cross connection from the Wimmera Mallee Pipeline and has supplied water,

which as of 23 October 2008, met all water quality standards. The new lined earthen storage was completed on 18 May 2009.

The townships of Donald and Wycheproof are nearing completion, in both cases the new town storages have been completed and are awaiting connection to the Wimmera Mallee Pipeline. GWMWater is confident that this connection will be made before the scheduled end date of the undertakings which is 31 October 2009.

### **9.3 Drinking Water Regulatory Audit Undertaking**

As part of GWMWater commitment under section 11 of the *Act* an audit of GWMWater's Risk Management Plans was conducted during the 2007/08 reporting period. GWMWater received seven major non-compliances and twenty one minor non-compliances. As a result of these non-compliances GWMWater entered into an undertaking with DHS which set out measures for GWMWater to remedy the issues found during the audit. GWMWater worked toward meeting all obligations under the terms of the Undertaking, and received correspondence from the Department on 2 September 2009 stating the Department was satisfied that GWMWater had met its undertaking obligations.

**Table 9.1- Status of GWMWater Undertakings during 2008/09**

Water Supply	Date Accepted	End Date	Interim Risk Management Actions	Status	Proposed actions	Status
Beulah	2/01/2008	31/10/2008	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Install aeration device in TWS	Complete
Donald	10/06/2008	31/10/2009	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Near completion
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Air scour reticulation system	Complete
Jung	10/06/2008	30/11/2008	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Air scour reticulation system	Complete
					Vacuum clean TWS	Complete
Lalbert *	26/02/2007	30/06/2009	Consult local council/community	Complete	Build new town storage	Under construction
			Place undertaking details on GWM web site	Complete		
Manangatang *	26/02/2007	30/06/2009	Consult local council/community	Complete	Build new town storage	Under construction
			Place undertaking details on GWM web site	Complete		
Minyip	2/01/2008	31/03/2009	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Install aeration device in TWS	Complete
Murtoa	18/03/2008	31/10/2008	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Install aeration device in CWS	Complete
			Fortnightly THM monitoring	Complete	Vacuum clean CWS and elevated tank	Complete
					Air scour reticulation system	Complete
Nullawil	2/01/2008	31/03/2008	Consult local council/community	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Place undertaking details on GWM web site	Complete	Build new town storage	Complete
Rainbow	18/03/2008	31/10/2008	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Vacuum clean CWS	Complete
Rupanyup	1/02/2008	31/03/2009	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Under construction
			Place undertaking details on GWM web site	Complete	Install aeration device in TWS	Complete

Undertakings which have been fully completed are highlighted thus.

\* Indicates towns which were not complete during the annual report time frame but have been completed at the time of writing

**Table 9.1- Status of GWMWater Undertakings during 2008/09**

Water Supply	Date Accepted	End Date	Interim Risk Management Actions	Status	Proposed actions	Status
Ultima *	26/02/2007	30/06/2009	Consult local council/community	Complete	Build new town storage	Under construction
					Electro fish the town storage	Complete
Warracknabeal	18/03/2008	31/10/2008	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Install aeration device in CWS	Complete
					Vacuum clean CWS and elevated tank	Complete
		Fortnightly THM monitoring	Complete	Air scour reticulation system	Complete	
Woomelang	10/06/2008	31/10/2009	Consult local council/community	Complete	Connect to Wimmera Mallee Pipeline Project	Complete
			Place undertaking details on GWM web site	Complete	Build new town storage	Complete
					Air scour reticulation system	Complete
Wycheproof	10/06/2008	31/10/2009	Fortnightly THM monitoring	Complete	Connect to Wimmera Mallee Pipeline Project	Near completion
			Consult local council/community	Complete	Build new town storage	Complete
			Place undertaking details on GWM web site	Complete	Air scour reticulation system	Complete
					Vacuum clean TWS	Complete

TWS = Treated Water Storage

Undertakings which have been fully completed are highlighted thus.

\* Indicates towns which were not complete during the annual report time frame but have been completed at the time of writing

## 10.0 Regulated Water

Regulated water is water that is not intended for drinking but which could reasonably be mistaken as drinking water. This will be the case when the water is delivered to households through a piped reticulation system, for example.

Section 6 of the Safe Drinking Water Act, 2003 allows the Minister for Health to declare certain water as regulated.

GWMWater must manage risks in relation to water that is not intended for drinking, as part of its normal business practices. GWMWater is required to:

- Prepare a Risk Management Plan for the regulated water;
- Ensure the Risk Management Plan contains the matters specified in regulation 6 of the Safe Drinking Water Regulations;
- Have the Plan audited by an approved auditor;
- Take all reasonable steps to minimise the likelihood of the water being mistaken as drinking water;
- Include a summary of the management activities for regulated water supply in the Annual Report

GWMWater had a total of 40 towns supplied with water classified as 'regulated water' under Section 6 of the Act during the 2008/09 reporting period. The regulated water supplies are listed in Table 1.2 on Page 9. The Minister of Health also declared all rural water pipelines, other than the Wimmera Mallee Pipeline as regulated supplies in the Victorian Government Gazette No. s 36 on Monday 23 February 2009. A copy of notice can be found in the Appendix.

The remaining 40 towns were serviced by a non-potable water supply, which was declared as regulated on 29 June 2007. A Risk Management Plan has been prepared for each of the 40 water supplies.

### 10.1 Complaints and Responses

GWMWater acknowledges that the largest number of customer complaints arise from regulated supplies, the complaints usually relate to colour and odour. The construction of the Wimmera Mallee Pipeline will significantly increase the quality of the water delivered to customers in regulated towns and GWMWater anticipates a corresponding drop in complaints from these supplies.

## 11.0 Glossary of Terms

Terms and abbreviations used in this Report have been collated into a Glossary to provide clarity.

- ADWG, 2004: The Australian Drinking Water Guidelines provide a framework for the management of drinking water supplies designed to ensure safety at the point of use.
- Alum: Aluminium sulphate as used as a coagulant in the water treatment process.
- Anabaena: A species of Blue Green Algae.
- BOOT: Build Own Operate and Transfer. A form of commercial contract associated with the provision of treated water at privately-owned water treatment plants.
- Bore: Conduit for extracting groundwater from an aquifer to the surface for use in a town water supply.
- Carcinogen: A chemical or other agent that is linked to high incidences of cancer.
- Chlorination: Process of adding chlorine gas to water as a disinfectant.
- Chlorite: Disinfection by-product formed from the reaction of chlorine dioxide gas with natural organic matter.
- Coagulation: The clumping together of solids so they can more easily be settled out or filtered out of water. A chemical called aluminium sulphate (alum) is generally used to aid coagulation in water treatment
- Concentration: A measure of how much of a given substance there is mixed with another substance (in this case water), usually expressed as a weight to volume, e.g. milligrams per litre (mg/L).
- CWS: Clear Water Storage.
- Cylindrospermum: A species of Blue Green Algae.
- DHS: Department of Human Services, Victoria.
- Disinfection by-products: Reaction of natural organic material with the disinfectant medium producing by products via reaction. Chlorine disinfection produces Trihalomethanes, whilst chlorine dioxide disinfection produces chlorite.
- Disinfection-only Water Supplies: Water supplies that have disinfection as their only form of treatment.
- Dissolution: A form of chemical weathering in which water molecules, sometimes in combination with acid or another compound in the environment, attract and remove oppositely charged ions or ion groups from a mineral or rock.
- Distribution System: The system of pipes delivering water from the Water Treatment Plant to the Reticulation System.
- DOC: Dissolved Organic Carbon – directly proportional to the amount of disinfection by product produced during disinfection.
- DOM: Dissolved Organic Matter – this term can be interrelated with the amount of ‘colour’ in the water
- Drinking Water: Legislatively defined as water intended for human consumption or associated with purposes for human consumption. Also known as a

	potable supply.
DSE:	Department of Sustainability and Environment, Victoria
EC:	Electrical Conductivity as measured in micro Siemens per centimetre ( $\mu\text{S}/\text{cm}$ ).
Entry Point:	The point at which the water supply enters the reticulation system.
ESC:	Essential Services Commission
Flocculation:	The water-treatment process after coagulation that uses gentle stirring to cause suspended particles to form larger, aggregated masses (floc). The aggregates are removed from the water by a separation process (eg, sedimentation, flotation, or filtration)
Fluoridation:	The act of adding fluoride to a water supply in accordance with the <i>Health (Fluoridation) Act, 1973</i> .
Fully-treated Water Supplies:	Water supplies that have coagulation and filtration processes in addition to disinfection.
GWMWater:	Grampians Wimmera Mallee Water Corporation (trading as GWMWater)
HAA:	Haloacetic Acids formed as a by-product of disinfection with chlorine. HAAs take the form of chloroacetic acid, dichloroacetic acid and trichloroacetic acid.
Hand-held Meter:	A device used to determine chemical characteristics of water in the field without the need to collect a sample and send to the laboratory for analysis.
Hardness:	Caused by the presence of calcium and magnesium ions in water and can contribute to scale build up in pipes and appliances.
HU:	Scientific units for True Colour measurements – Hazen Units.
Jar Testing:	A bench top test designed to optimise chemical dose rates based on known quality of raw water.
kL:	Kilolitre (1,000 L).
L:	Litre
mg/L:	Scientific units for the concentration of a parameter given as milligrams per litre. Also known as parts per million (ppm).
ML:	Mega litre (1,000,000 L).
NATA:	National Accredited Testing Authority
NMP:	Northern Mallee Pipeline drawing its water from the Murray River.
Notifications:	Pursuant to Sections 18 and 22 of the <i>Safe Drinking Water Act, 2003</i> .
NTU:	Scientific units for turbidity measurements – Nephelometric Turbidity Units.
Orgs/100mL:	Organisms per 100 mL. A measure of the number of <i>E. coli</i> .
pH:	The measure of the concentration of hydrogen ions in a sample related to a logarithmic scale between 1 (acidic) and 14 (basic).
Regulated Water:	Water not intended for human consumption, but that could easily be mistaken as such. Also known as a non-potable supply. This term is defined in the <i>Safe Drinking Water Act 2003</i> .

Reticulation System:	The system of pipes delivering water to the customers tap from the entry point to the system.
RMP:	Risk Management Plan pursuant to the <i>Safe Drinking Water Act 2003</i> .
<i>Safe Drinking Water Act, 2003:</i>	Legislative framework for assuring drinking water quality in Victoria
Safe Drinking Water Regulations, 2005:	Regulations made subsequent to the Safe Drinking Water Act that give effect to key aspects of the Act.
Sampling:	The process of collecting a representative amount of water from a reticulation system to analyse and compare against the ADWG Standards and subsequently report to DHS.
SCADA	Supervisory Control and Data Acquisition. A computer interface to acquire data remotely through a telemetered communications exchange network.
THMs:	Trihalomethanes – disinfection by-product using chlorine as a disinfectant. Take the form of trichloromethane, bromodichloromethane, dibromochloromethane and tribromomethane.
TWS:	Treated Water Storage (applicable to disinfection only supplies)
UCL:	Upper Confidence Limit. A statistical method of evaluating a sample set.
Undertakings:	Legally binding commitment made pursuant to Section 30 of the <i>Safe Drinking Water Act, 2003</i> .
UV:	Ultra-Violet light. UV reacts with organic material in water to form high fractions of DOC.
Wimmera Mallee Pipeline Project:	Wimmera Mallee Pipeline Project.
WTP:	Water Treatment Plant.

## 12.0 References

1. *Australian Drinking Water Guidelines 2004*, National Health and Medical Research Council, Canberra, 2004
2. **Blue-Green Algae Circular 2008/09**, Department of Sustainability and Environment
3. *Safe Drinking Water Act 2003* (Act No. 46/2003), 11 June 2003, Parliament of Victoria.
4. **Safe Drinking Water Regulations 2005** (S/R No. 88/2005), 19 July 2005, Parliament of Victoria.

## 13.0 Appendix

### Safe Drinking Water Act 2003

#### NOTICE OF DECLARATION UNDER SECTION 6 REGULATED WATER

I, Daniel Andrews, Minister for Health, under section 6 of the **Safe Drinking Water Act 2003** (the Act) **declare** the water supplied by Grampians Wimmera Mallee Water from the sources and by the methods identified below, which is not drinking water, to be regulated water for the purposes of the Act:

- the Northern Mallee Pipeline network, being the network extending from offtakes at the Murray River at Liparoo Pump Station, Piangil Pump Station and Nyah Pump Station (note: this excludes drinking water supplied from this network at Underbool, Walpeup, Ouyen, Manangatang, Sea Lake and Ultima);
- the St Arnaud pipeline, being the pipeline extending from Volcano reservoir in a generally south-east direction to St Arnaud reservoir;
- the Mount Cole pipeline, being the pipeline extending from Mount Cole reservoir in a generally western direction to Copes Hill reservoir near Ararat;
- the Ararat - Lake Fyans pipeline, being the pipeline extending from Lake Fyans in a generally south-eastern direction to Copes Hill Reservoir near Ararat, including the branch pipeline extending in a generally north-eastern direction to Panrock Creek reservoir and Verrings Basin near Great Western;
- the Stawell supply main, being the supply main extending from Lake Bellfield in a generally north-eastern direction to Stawell No. 4 reservoir;
- the Moyston pipeline, being the pipeline extending from Willaura headworks basin in a generally eastern direction to Moyston;
- the Willaura pipeline, being the pipeline extending from Willaura headworks basin and the branch pipeline from weirs at Masons Creek, in a generally south-eastern direction to Willaura reservoir;
- the Wickliffe pipeline, being the pipeline extending from Willaura reservoir in a generally southern direction to Wickliffe;
- the Willaura - Lake Bolac pipeline, being the pipeline extending from the Willaura water treatment plant in a generally south-eastern direction to the junction of Mortlake - Ararat Road and Montgomery Street in Lake Bolac (note: this excludes drinking water supplied from this pipeline to the town of Lake Bolac);

- the Mount Zero pipeline, being the pipeline extending from the Mount Zero water treatment plant in a generally north-western direction to the Morson Road Pump Station and reservoir near Horsham (note: this excludes drinking water supplied from this pipeline to Horsham and Haven).

This declaration will take effect from the date this notice is published in the Victoria Government Gazette.