

Executive Summary

This Strategy provides a plan for the sustainable use of water resources for the next 50 years in the 74 towns of the GWMWater region. The Urban Water Supply Demand Strategy (UWSDS) forms part of an overall strategy for managing water demand and supply in the region which will be considered in the development of a Sustainable Water Strategy for western Victoria. Other planning processes are in place for management of the region's overall water resource as administered by GWMWater, including the Wimmera Mallee Pipeline Project (WMPP) Business Case, and a range of groundwater management plans.

It is estimated that an extra, approximately 1,980 megalitres (ML) of water will be needed for urban use in the GWMWater region by 2055 due to climate change and urban expansion in regional centres.

Decreasing population, based on "Victoria in Future" forecasts (DSE 2005), in most of our urban areas means that our projected demands do not exceed supply, even with median climate change in these towns. GWMWater has a responsibility and commitment however to reduce per capita water consumption. This strategy has set water conservation targets in recognition of that commitment.

These targets will be a challenge to the region. Decreasing population, but a strengthening industrial future invigorated by mineral sand mining and intensive agricultural development reliant on water quality and quantity improvements brought about by the WMPP will drive the demand for increased water usage.

Current supply and demand figures are based on the security of the system for the period from 1903 to 2000. Water conservation targets have been determined based on modelling of future supply as a result of reductions in catchment yield and increases in weather sensitive demand due to median climate change. Modelling of low flows, representative of the last ten years of drought, demonstrate that the current channel supply system would be unable to sustainably supply consumptive and environmental demands without significant reconfiguration of the existing system.

The WMPP provides for this reconfiguration and is the major strategic water supply augmentation for the region. The WMPP will provide 96% security of supply for urban and rural customers. The WMPP will also provide great flexibility in meeting projected urban needs throughout much of the region. Modelling of the effect of the median climate change and low flows scenario on the WMPP will need to be considered in the next UWSDS period. Some urban supply systems outside of the WMPP area require local solutions that are currently being developed. The timeframe for requiring these additional measures, other than the WMPP, is beyond the next Water Plan period.

The strategies for each water supply system underpin the principles, objectives and actions outlined in the Government's 2004 White Paper, *Our Water Our Future*. A number of water conservation actions have been identified for the next 7 years accompanied by longer term strategies for the next 50 years. The major water conservation action for the next 5 years is the Wimmera Mallee Pipeline Project.

Strategies at a Local Level

Northern Mallee Pipeline Area

GWMWater has a high security bulk entitlement of 3,485 ML/annum from the River Murray for the Northern Mallee Pipeline (NMP). Current average annual urban demand in the NMP system is 900 ML/annum. Population forecasts for the NMP area indicate that the population is declining at approximately 0.5% per annum. Overall urban consumption, without conservation targets, is expected to fall by approximately 60 ML/annum by 2055 under a median climate change scenario. Approximately 390 ML/annum is anticipated to be saved through the achievement of water conservation targets.

Towns supplied direct off headworks

The current average annual urban demand from this system is 3,037 ML/annum. Population trends indicate growth in Ararat of approximately 0.5% per annum. Halls Gap has undergone large population growth in the last 10 years. This is expected to slow significantly however as land available for development is rapidly diminishing. The populations of Stawell and Great Western have remained constant over the last 20 years and are expected to continue this way. Pomonal, with less than 150 people, is not expected to see significant population change. The expected population growth, and correspondingly water demand growth, is 0.25% per annum. Overall urban consumption, without conservation targets, is expected to increase by approximately 710 ML/annum by 2055 under a median climate change scenario. The achievement of water conservation targets is expected to result in an average saving of 360 litres/person/day .

Horsham supply

The current average annual urban demand from this system is 3,010 ML. Horsham is experiencing population growth of approximately 1% per annum. Population growth and weather sensitive demand brought about by median climate change are expected to increase demand by 2,310 ML by 2055 without conservation targets. The achievement of water conservation targets is expected to result in an average saving of 240 litres/person/day and ensures that demand will not exceed supply by 2055.

Towns supplied by channel

The Wimmera-Mallee Domestic and Stock open channel system currently supplies water to storages at 34 towns across the channel system area. The current average annual urban demand from this system is 4,260 ML. Population within these rural towns is declining at approximately 1.1% per annum. By 2055 weather sensitive demand increases are likely to be less than demand reduction as a result of population decreases. Overall urban demand is expected to fall by approximately 1,330ML by 2055 under a median climate change scenario and without conservation targets. A further 170 ML/annum is anticipated to be saved through the achievement of water conservation targets.

Groundwater supply towns in the western Wimmera-Mallee

GWMWater supplies 12 towns from the Murray Group Limestone Aquifer in the west of the region. Urban demand within this zone is less than 2.5% of the total water utilised from this resource. In general, urban allocations are comfortably in excess of the current demand. The current average annual urban demand from this system is 1,190 ML. Population within towns in the groundwater area is decreasing at approximately 0.2% per annum except for Nhill, which has had a small population increase. Per capita consumption increases may be experienced in Nhill and Edenhope with water quality improvements. Weather sensitive demand increases are not sufficient to offset population decreases.

Overall urban demand is expected to fall by approximately 17 ML by 2055 under a median climate change scenario, without conservation targets. A further 330 ML/annum is expected to be saved through the achievement of water conservation targets.

Supply areas in the southern section of the GWMWater region

GWMWater supplies a number of towns in the south of the region from either surface water harvested into independent storages, the East Grampians Pipeline, or local groundwater supply. As rural population decline is approximately 1.5% per annum, demand in these towns is not expected to increase and is likely to decrease. A Bulk Entitlement for these towns is currently being developed. Current average annual demand in southern towns is 240 ML. Modelled weather sensitive demand increases are not sufficient to offset population decreases. Overall urban demand in the southern towns is expected to fall by approximately 120 ML by 2055, without conservation targets. A further 150 ML/annum is expected to be saved through the achievement of water conservation targets.

Actions

System	Year That Forecast Demand Exceeds Supply (Median Climate change scenario)	Year That Forecast Demand Exceeds Supply (Low inflows)	Actions to be taken over next 7 years
All			Establish urban entitlements Covering of town storages Residential reduction measures System loss and pressure reduction Industrial use reduction and efficiency increase Recycled water for high value uses
Northern Mallee Pipeline towns	NA	Demand does not exceed supply	
Wimmera Mallee Stock and Domestic Supply (WMSDS) - Headworks	2030	2008, however WMPP will have sufficiently replaced channels to extend this date.	Wimmera Mallee Pipeline
WMSDS - Horsham	2030	2008, as above	Wimmera Mallee Pipeline
WMSDS - channel	NA	2008, as above	Wimmera Mallee Pipeline
Groundwater (Western Wimmera)	NA	Demand does not exceed supply	Connect Edenhope to secure groundwater supply Connect Nhill to Wimmera Mallee Pipeline
Southern section towns	NA	2008	Secure supply to southern towns





URBAN WATER SUPPLY DEMAND STRATEGY

30 March 2007

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1 Summary

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The GWMWater region covers an area of some 62,000 square kilometres, (ie. approximately 25% of Victoria) and serves an urban population of approximately 52,000. The area extends from Streatham in the south, Quambatook to the east, Ouyen to the north and Serviceton in the west.

This Strategy contains actions to improve river health and address water shortfalls that may arise in coming years due to climate change, population change and the possibility that low inflows to storages experienced over the last 10 years may continue.

It is estimated that an extra, approximately 1,980 megalitres (ML) of water will be needed for urban use in the GWMWater region by 2055 due to climate change and urban expansion in regional centres.

Our creeks and rivers are stressed and require significant volumes of water to meet environmental flow needs. The Wimmera Mallee Pipeline Project (WMPP) will return, on average, 83,000ML/annum of water to our waterways. As the Strategy is reviewed over the next 50 years, opportunities to assess the impact of climate change on the region's river systems and to return additional water, where appropriate, will be explored.

Decreasing population, based on "Victoria in Future" forecasts (DSE 2005), in most of our urban areas means that our projected demands do not exceed supply, even with median climate change in these towns. However, GWMWater has a responsibility and commitment to reduce per capita water consumption. This strategy has set water conservation targets in recognition of that commitment. These targets will be a challenge to the region. Decreasing population, but a strengthening industrial future invigorated by mineral sand mining and intensive agricultural development reliant on water quality and quantity improvements brought about by the WMPP will drive the demand for increased water usage.

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Modelling of low flows, representative of the last ten years of drought, demonstrate that the current channel supply system would be unable to sustainably supply consumptive and environmental demands without significant reconfiguration of the existing system.

The WMPP provides for this reconfiguration and is the major strategic water supply augmentation for the region. The WMPP will provide 96% security of supply for urban and rural customers and will also provide great flexibility in meeting projected urban needs throughout much of the region. Modelling of the effect of the median climate change and low flows scenario on the WMPP will need to be considered in the next UWSDS period. Some urban supply systems outside of the WMPP area require local solutions that are currently being developed. The timeframe for requiring these additional measures, other than the WMPP, is beyond the next Water Plan period.

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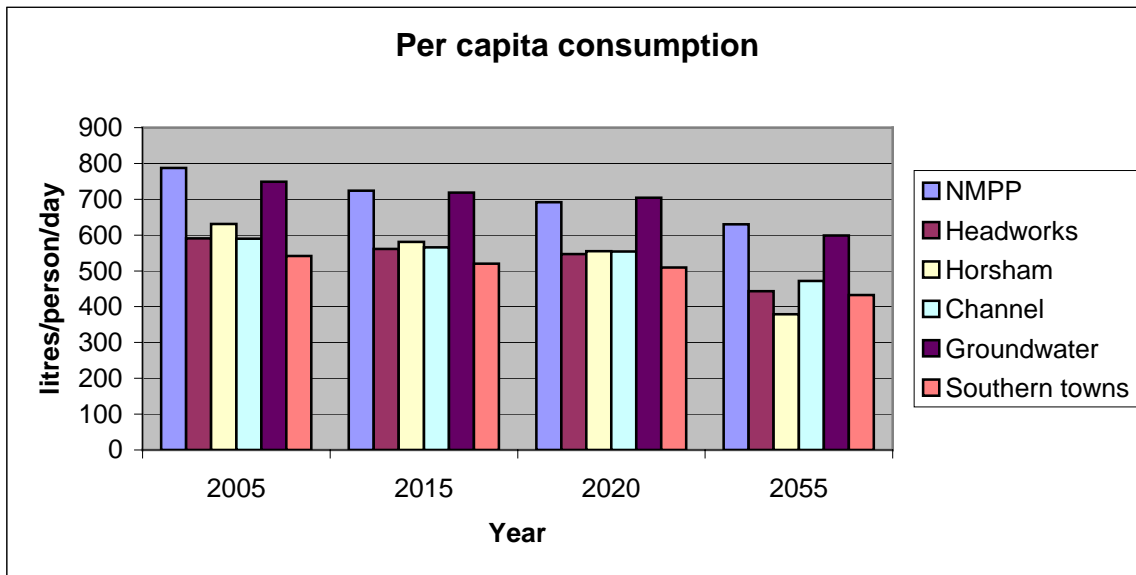
The Strategy has identified:

1. The demand in Horsham and the Headworks town will exceed supply in approximately 2030 under a median climate change scenario.
2. The demand in all other supply zones will not exceed supply, under a median climate change scenario, during the life of the Strategy.
3. The effect of climate change on the supply to the southern region towns is not accurately known. Currently supply meets demand. Further work is required to quantify the available supply.

Overall demand within towns is expected to increase by approximately 1976ML. The breakdown of demand changes, by 2055, is as follows:

Northern Mallee Pipeline supply:	- 60ML
Headworks supply towns:	+ 1,200ML
Horsham:	+ 2,306ML
Channel supply towns:	- 1,334ML
Groundwater supply towns:	- 17ML
Southern towns:	- 119ML

Water conservation targets of 8% and 5%, by 2015, have been adopted for Horsham and Headworks towns respectively. A 4% reduction by 2015 has been chosen for all other supply zones.



A number of water conservation actions have been identified for the next 7 years accompanied by longer term strategies for the next 50 years. The major water conservation action for the next 5 years is the Wimmera Mallee Pipeline. Other specific actions include:

- Covering of town storages;
- Establishing urban entitlements;
- Promoting residential and commercial reduction measures such as dual flush toilets, low flow vales etc.;
- System loss and pressure reduction;
- Industrial use reduction and efficiency increase;
- Use of recycled water for high value uses; and
- Determining long term water supply arrangements for Nhill and Edenhope, and determining available supply for southern towns.

2 Background

Grampians Wimmera Mallee Water Authority, trading as GWMWater, was formed from an amalgamation of the former Grampians Region Water Authority (Grampians Water) and Wimmera Mallee Water (WMW) on 1 July 2004.

The amalgamation was the consequence of a policy initiative identified in the Victorian Government White Paper 'Securing Our Water Future Together – Our Water, Our Future.' The White Paper acknowledged the extent that the two authorities covered similar geographical areas and that there was common infrastructure servicing most of the customer base.

It also commented, "Creating a single, larger authority will ensure that the proposed Wimmera Mallee Pipeline Project has the best opportunity to succeed. A new authority will have a greater capacity to plan for and deliver a project of the size and complexity of the proposed Wimmera Mallee Pipeline and will have a greater capacity to respond to demands for improved services and improved environmental outcomes into the future."

Creating a single authority will also enable an integrated approach to the provision of urban and rural services and promote a more cohesive approach to regional water resource management.'

Prior to this time, both Grampians Water and WMW had operated independently in the region for a period of ten years.

Grampians Water

Grampians Water was formed in February 1995 bringing together 18 former water trusts and water boards. Grampians Water was further expanded on 1 July 1995 when it assumed responsibility from Wimmera Mallee Water for urban water and wastewater supplies to a further 37 Wimmera Mallee towns. The number of towns serviced was formally increased to 74 in May 1997, when responsibility was assumed for the townships of Buangor, Westmere, Clear Lake, Noradjuha, Tarranyurk and Kiata.

Wimmera Mallee Water (WMW)

WMW was formed from the disaggregation of the former Rural Water Corporation in June 1994. WMW was a specialist rural water supply authority providing water services to the region's farming community and bulk supplies to urban centres and rural water intensive industries. WMW services covered some 6.2 million hectares or about 25% of Victoria.

The water supply system is one of the oldest in Victoria, with parts of it more than 100 years old. Much of its infrastructure is nearing the end of its useful life.

WMW pioneered the piping of channel systems with the Northern Mallee Pipeline Project commencing in 1992. With State and Federal Government support, funding was secured to complete the first project of its type in Australia saving 50,000 ML/year. The piping of the Patchewollock and the Cannie Ridge areas was the first part of the Wimmera Mallee Pipeline Project (WMPP) resulting in further water savings of 11,000 ML/year.

2.1 History of Water Supply

The history of the settlement of the Wimmera Mallee is very largely linked with the provision of adequate water supplies. It is quite obvious that without an assured supply the existing development would not have been possible.

In 1878, the Shires of Dunmunkle and St Arnaud constructed a timber weir in the Wimmera River, near Glenorchy, turning water into the Dunmunkle and Swedes Creeks. The Shire of Wimmera constructed a similar structure near Longerenong, to facilitate diversion of water into Yarriambiack Creek. Both these structures were severely damaged by floodwaters on several occasions and eventually abandoned.

The dry years following 1882 led to the construction of Lake Wartook Reservoir in 1887 by the Wimmera United Waterworks Trust. The natural watercourses of the Wimmera River, Yarriambiack and Dunmunkle Creeks and the Richardson River - were used as the main distribution channels.

Settlement of the Northern Wimmera and Southern Mallee continued over the next few years, leading to further demands for water and many kilometres of new channels were constructed. In the dry period culminating in the 1902 drought the water supply scheme partially failed, and this led to the construction of Lake Lonsdale in 1903.

The State Rivers and Water Supply Commission took over control of the scheme in 1906 and was the responsible Authority until July 1984. Government restructuring then led to the formation of successor bodies the Rural Water Commission and later the Rural Water Corporation which existed until June 1994. Wimmera Mallee Water was the region's rural and bulk water authority until the creation of GWMWater in 2004.

After the 1914 drought, reservoirs were constructed at Lake Fyans and Taylors Lake, and, in 1919 (also a dry year) Pine Lake was authorised. During the dry period 1927 to 1930, the Waranga Western Main Channel which brings water from the Goulburn and Loddon River systems to the east, was extended 208 kilometres west of the Loddon River to supply the northern part of the system. Moora Reservoir, Green and Dock Lakes were added to the system between 1934 and 1935.

After the construction of Rocklands and Toolondo Reservoirs, which were both completed in 1953, arrangements were made to supply the whole of the system from the Grampians reservoirs, thereby removing the heavy dependence on the Waranga Western Main Channel from 1962 onwards. It was not until the 1967/68 drought that it was again found necessary to open the channel to supplement supplies to the Wimmera-Mallee and it has remained an essential component of the system ever since.

The last and most recent storage to be constructed as part of the headworks was Lake Bellfield, completed in 1966.

2.2 The Current System

GWMWater serves a region with a population of approximately 52,000 over an area of some 62,000 square kilometres, (ie. approximately 25% of Victoria). The area served by GWMWater extends from Streatham and Lake Bolac in the south, Wedderburn and Quambatook to the east, Ouyen and Manangatang to the north and the South Australian border in the west.

The rainfall over the area is comparatively light, varying from an average of 890 mm over the Grampians area to as low as 310 mm in the Northern Mallee. The rainfall fluctuates widely from year to year. As a result, surface runoff is too unreliable to provide regular and sufficient water supplies for farms. The urban populations and dryland farming which the region supports, depend on a reliable water supply system for urban and domestic and stock use.

In terms of revenue, urban water supply is the major activity of GWMWater, delivering around 10 gigalitres of water to 30,000 customers in 74 towns across the region. Urban supply has a reliability of 83%.

Water supply for domestic and stock (D&S) customers is the predominant rural activity. D&S activity currently entails bulk water delivery to around 3,000 rural business enterprises through an annual channel supplied dam-fill for up to 22,000 dams over an area of some 2 million hectares and rural pipeline services to some 820,000 hectares of the Northern Mallee region. D&S supplies have a current reliability of 73%.

GWMWater also supplies 6,280 ML/annum of bulk water by agreement to some 172 rural and industrial customers across the region. This water is typically for intensive agricultural activities such as poultry farms, piggeries and commercial feedlots, and has a reliability of 73%.

Irrigation supply of 19,000 ML to approximately 3,000 hectares around Horsham and Murtoa is another significant activity for the rural part of the business and has a reliability of 71%.

GWMWater owns and operates a number of headworks and bulk water supply assets.

GWMWater operates four pump stations on the Murray River at Swan Hill, Piangil, Nyah and Liparoo that supply bulk water to urban storages and rural customers through the Northern Mallee Pipeline. GWMWater also operates a number of groundwater bores that supply thirteen towns in the south east, south west and west of the supply area.

A significant undertaking over the next five years will be the construction of the Wimmera Mallee Pipeline Project (WMPP). The WMPP will convert 16,500 km of open channel to 8,500 km of pipeline infrastructure. The WMPP will return to the environment an average of 83,000 ML/annum of water presently lost through GWMWater's extensive open channel network and create a further 20,000 ML of water for new developments. Lower system yields due to climate change are likely to affect available volumes.

The communities of the Wimmera and Southern Mallee expect the Wimmera Mallee Pipeline to improve quality of life through a more secure and abundant supply, making more water available for residential use and industry growth.



2.3 Population trends

Projections made by the Department of Sustainability and Environment (DSE) in *'Victoria in Future'* are the source of population forecasts used in the development of this strategy. Of the municipalities within the GWMWater region, only three, Horsham, Ararat and Northern Grampians exhibit a small annual growth in the major centres. The four western and north central municipalities; West Wimmera, Hindmarsh, Yarriambiack and Buloke are in a state of population decline. The three most northern municipalities: Mildura Rural City, Swan Hill Rural City and Loddon Shire Councils all have stable or growing populations in their major centres. However, in the small towns that fall within the GWMWater service area, populations are forecast to decline. Based on current projections, it is considered likely that this trend will continue.

A common thread of all municipalities, irrespective of whether they are in decline or stabilising, is the increase in older age groups and the decline of younger age groups.

This was reinforced in a more recent study titled *'Ageing in the Bush – A perspective from Victoria'* that showed the current trends projecting an increase in the number of persons aged 60 and over, and a decline in people aged 20 and under.

Population Projections are presented in Appendix A.

3 Current Water Supplies

3.1 Sources of Water

GWMWater obtains water from a number of sources in order to meet the needs of its customers.

1. The extensive system of headworks in the Grampians area. There are 12 main reservoirs used to harvest and store water for supply throughout the main supply system of the region. Those reservoirs are also used to supply environmental and compensation flows to the Glenelg and Wimmera Rivers.
2. The Murray River is the source of water for the Northern Mallee Pipeline system used for the supply to farms and towns in the northern area;
3. The Waranga Western Main Channel supplements urban and rural supplies in the east of the Wimmera-Mallee channel system and supplies the township of Quambatook through the Normanville Pipeline scheme;
4. Groundwater from the Murray Group Limestone Aquifer supplies irrigation, urban, and domestic and stock needs in the western part of the region.
5. Private diversions from waterways. GWMWater also manages a number of regulated and unregulated diversions for irrigation and domestic and stock purposes from waterways; and
6. The Walpeup West bore area supplies a small number of D&S customers through a reticulated system sourced from bores in the north of the region.

The current water sources and their catchment conditions are described in Table 1.

Table 1. Sources of water

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Mackenzie River at Wartook Reservoir	<p>The upper Mackenzie River is in a virtually unspoiled condition. Erosion is only occurring at a natural rate and there is abundant habitat for the aquatic life in the river. The presence of artificial barriers downstream have limited the opportunities for the migration of indigenous fish species.</p> <p>The Mackenzie River is thought to have natural cease-to-flow periods during summer, however this has altered as regulated continuous flows come from Lake Wartook.</p>	29 000	Lake Wartook	29,300	Supplies water to Horsham, Mt Zero and D&S via Mt Zero Channel. Also supplies the larger domestic and stock system when releases are made for maintaining a sufficient flood reserve and during periods of significant drought.
Mt William Creek at Lake Lonsdale	<p>The streamside zones of Mount William Creek are in a good condition with a good diversity of aquatic life. However the stream has been heavily impacted by water diversions resulting in an extensively modified flow regime which in turn has led to the streams being classified as in a moderately stressed condition. The magnitude of low flows and the duration of zero flows has particularly affected the summer flow regime.</p>	52 000	Lake Lonsdale	65,480	Lake Lonsdale is drawn upon before water from other reservoirs due to higher evaporation rates. Lake Lonsdale is an on-stream reservoir on Mount William Creek.

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Wimmera River	The Wimmera River has been greatly affected by modifications to its flow regime, particularly below Huddleston's Weir. The duration of zero flows and low flow volumes have been greatly changed. Modifications to flow volumes within each month and across the entire year have also played a role in its deteriorating health. The quality of streamside zones is variable, often reflecting the management of significant crown frontage along most of its length	82 000	Taylor's Lake	33,700	Sufficient air space is maintained in Pine and Taylor's Lakes to catch Wimmera River water when it is available. Water is diverted northwards at Glenorchy and at Huddleston's Weir to be stored off-river at Pine and Taylor's Lakes. Taylor's Lake is the main balancing storage for the Wimmera-Mallee D&S channel system. Pine Lake is primarily used for irrigation supply and is the lowest major reservoir in the GWMWater system.
			Pine Lake	62,000	
			Green Lake	5,350	
			Dock Lake	4,420	
Glenelg River at Rocklands	The middle and upper Glenelg River	125,000	Rocklands Reservoir	348,310	Rocklands and Toolondo are used

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Reservoir	<p>Basin is a highly disturbed system in a moderate to poor condition. Due to flow regulation, sedimentation and extensive snag removal, 55% of the total stream length is considered to be in very poor condition with only 25% in good to excellent condition.</p> <p>More than 60% of the Glenelg River's flows are diverted to the Wimmera and Mallee. The flow of the Glenelg River downstream of Rocklands Reservoir is highly regulated. Rocklands Reservoir's primary purpose is to supply water for stock and domestic purposes in the Wimmera and southern Mallee. The reservoir also has an important flood mitigation role for towns immediately downstream.</p>		Toolondo Reservoir	92,430	to supply Taylors and Pine Lakes.. They are also used to supply demands further north using the Rocklands-Lubeck Channel. Water from Rocklands Reservoir is released in preference to releases from Toolondo Reservoir which has lower evaporation. Toolondo is an off-river storage and, apart from a very small local catchment, can only be filled by releases from Rocklands.
			Moora Moora Reservoir	6,300	Moora Moora Reservoir is a small reservoir, primarily used to supply the Brimpaen and Laharum areas.

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Fyans Creek	<p>Fyans Creek's physical form is very good. Water in Fyans Creek is of high quality with relatively low levels of turbidity and salinity.</p> <p>Fyans Creek is spring-fed and therefore naturally flows throughout the year. Lake Bellfield diverts a large proportion of Fyans Creek's flow.</p>	35 000	Lake Bellfield	78,550	<p>Bellfield is mainly used for drought reserve because of its low evaporation. Bellfield is the last storage available (after Lake Lonsdale and Lake Fyans are emptied) which can supply the Main Central and Charlton Channels. Lake Bellfield is an on-stream reservoir on Fyans Creek. A small volume of water can be diverted from the upper reaches of the Wannon River (Glenelg tributary) into Lake Bellfield. Bellfield will be the primary source of supply for WMPP due to its high water quality.</p>
			Lake Fyans	18,460	<p>Lake Fyans is part of the headworks system, however its storage capacity is relatively small and its primary use is to supplement urban supplies to the townships of Stawell and Ararat. Fyans is an off-stream storage supplied with water diverted from Fyans Creek.</p>
Avon/Richardson River at Donald	<p>The Avon-Richardson catchment extends from the Pyrenees foothills to Lake Buloke. The catchment has relatively little river regulation to modify or prevent flood flows and is connected to the Wimmera-Mallee channel system. The impacts of</p>	30,000 estimated	Lake Batyo Catyo	2,250	<p>Avon-The Richardson River's' water flow can be diverted to Lake Batyo-Catyo, when water is available, to reduce reliance on transfers from the Grampians storages.</p>

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
	the gold rush, land clearance, farming practices and the water supply system is largely demonstrated by the condition of the waterways. 46% of the streams in the catchment are in moderate condition, and 54% are regarded as poor.				
Avoca River diversion to Waranga Western Main Channel	The Avoca catchment extends about 340 kilometres from the Great Dividing Range near Amphitheatre, to the Avoca Marshes and into the River Murray during associated flood events. Therefore, the Avoca River has some influence on the health of the River Murray, including salinity and flows. 76% of the streams in the catchment are in moderate condition, and 24% are regarded as poor.	0 to 1,000; Average 500			Avoca River water is diverted to Waranga Western Main Channel during high flow periods.
Goulburn-Murray Water via Waranga Western Main Channel		14,000 (average)			Water supply via Waranga Western Main Channel is covered by the Goulburn Bulk Entitlement Order. Yield is 2 yearly average, with 26,000 ML and 2,000 ML available in alternating years.

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Murray River Pumping Stations		3500			Pumping Stations located at Swan Hill, Piangil and Liparoo supply rural customers in the Northern Mallee as well as the towns of Chillingollah, Chinkapook, Manangatang, Nandaly, Sea Lake, Speed, Tempy, Ultima, Underbool, Waitchie and Walpeup. Lalbert and Patchewollock are also supplied from the Preliminary stages of the WMPP.
Groundwater bores – Urban supplies.					Apsley, Cowangie, Groke, Harrow, Kaniva, Kiata, Lillimur, Miram, Nhill, Serviceton, Streatham and Westmere supplied by Bore (Untreated); Murrayville is supplied by Bore (Disinfected).
Surface and pipeline supplies – South eastern areas					There are 3 completely independent systems that make up the East Grampians Pipeline (EGP) supply. The Elmhurst system, The Buangor System and The Willaura system Buangor, Elmhurst, Lake Bolac, Moyston, Wickliffe and Willaura supplied via the East Grampians Pipeline (EGP). (Source is harvests from local streams and ground water)

Catchment Source	Catchment Condition	Mean Annual Flow (ML)	Storage name	Full capacity (ML)	Description
Total capacity:				770,420	

3.2 Water Quality

Thirty-three of the 73 towns serviced by GWMWater rely on a bulk supply from the Grampians headworks. The water is delivered by an open earth channel network that generally only provides for one bulk delivery of water per year. Eight of the 33 towns receive a fully treated water supply, whilst a further 11 towns are supplied with water that is chlorinated (no filtration). Fourteen small towns receive untreated water supplies.

Other urban centres receive their water from a combination of surface water diversions and groundwater extractions. The larger towns invariably receive a fully treated water supply or have the water supply disinfected to meet microbiological water quality standards.

The majority of D&S customers also receive water supplies from the Grampians Headworks delivered by an open channel network. Of the water supplied to D&S customers, only supplies from the Northern Mallee pipeline system receive any form of treatment and this is coarse filtration at the point of extraction from the River Murray.

Towns Supplied Fully Treated Water

Ararat	Halls Gap / Bellfield	Pomonal
Birchip	Haven (Horsham)	Rainbow
Charlton	Hopetoun	St. Arnaud
Dimboola	Horsham	Stawell
Edenhope	Murtoa	Warracknabeal
Great Western	Ouyen	

Towns Supplied Partially Treated (disinfected) Water

Beulah	Minyip	Ultima
Brim	Murrayville	Walpeup
Donald	Nullawil	Warracknabeal
Jung	Quambatook	Watchem
Lalbert	Rupanyup	Woomelang
Manangatang	Sea Lake	Wycheproof

Towns supplied Untreated Water

Antwerp	Jeparit	Pimpinio
Apsley	Kaniva	Serviceton
Berriwillcock	Kiata	Speed
Buangor	Lake Bolac	Streatham

Chillingollah	Lascelles	Tarranyurk
Chinkapook	Lillimur	Tempy
Clear Lake	Marnoo	Underbool
Cowangie	Miram	Waitchie
Culgoa	Moyston	Westmere
Dooen	Nandaly	Wickliffe
Elmhurst	Natimuk	Willaura
Glenorchy	Nhill	Yaapeet
Goroke	Noradjuha	
Harrow	Patchewollock	

3.3 Safe Drinking Water Act 2003

The *Safe Drinking Water Act* (SDWA) 2003 contains a comprehensive state-wide regulatory framework for managing drinking water supplies. The regulatory framework advocates a risk-based approach, with standards for nine parameters to be implemented through statutory regulations. GWMWater is defined as a supplier of drinking water to the public in terms of the SDWA 2003. A comprehensive program of analysis and sampling of water supplies underpins the SDWA.

As the SDWA distinguishes between ‘drinking’ water and ‘regulated’ water, many towns supplied by GWMWater may now require additional water treatment if they are to be classified as suitable for drinking purposes, including existing supplies that are presently disinfected.

GWMWater has adopted a risk-based approach to the provision of drinking water and seeks to have individual towns appropriately declared in accordance with the regulatory framework of the SDWA.

Comprehensive risk assessments of the water supply system using the Hazard and Critical Control Point (HACCP) framework are being undertaken to ensure that the water quality risks of providing drinking water is clearly understood.

3.4 Bulk Water and Bulk Entitlements

The Bulk Entitlement (BE) process has been completed for the Wimmera and Glenelg River systems with five BE conversion orders being defined for the system.

These are:

- GWMWater (rural system, including compensation flows to the Glenelg River and water supplied to recreational lakes across the service area);
- GWMWater (urban system);
- Wannon Water (for supply to Balmoral);
- Coliban Water (for supply to Wedderburn); and
- Flora and Fauna (for environmental releases).

In addition, GWMWater holds entitlement from the River Murray and the Goulburn River systems for water supplied to the northern region through the Northern Mallee Pipeline and the Waranga Western Main Channel respectively.

GWMWater, as the manager of the headworks, is defined in the Wimmera-Glenelg BEs as the Storage Operator and has responsibility for managing the process of calculating the available water and announcing allocations. GWMWater also operates the channel system that delivers water to urban storages and to rural customers.

Bulk Entitlements are still to be finalised for the five smaller urban centres of Buangor, Elmhurst, Lake Bolac, Moyston, Wickliffe and Willaura. In addition, major revisions to existing BEs will be required to reflect changes in entitlements and operating regime as the WMPP is rolled out. Wannon Water has indicated its desire for finalisation of the Willaura system BEs for its supply to Glenthompson which is sourced from this system.

3.5 Groundwater

GWMWater has the delegated responsibility for managing groundwater extractions throughout the region. In areas of significant groundwater utilisation, Water Supply Protection Areas (WSPA) have been declared to assist the formal management of groundwater in these areas.

In addition, the sharing of the groundwater resource in the vicinity of the Victoria – South Australia border is managed through the Border Groundwaters Agreement.

WSPAs have been declared for Murrayville, Neuarpuir, Kaniva, Telopea Downs and Apsley. Plans have been approved for Murrayville and Neuarpuir. A draft plan has been completed for Telopea Downs, and a plan is currently under development for the Apsley area.

The WSPAs are managed to a five year time horizon. A review must be conducted at the end of each plan period and the plan amended to allow for new and improved knowledge of the available resource to ensure that the level of extraction is sustainable. The first of these reviews are now largely complete for the Murrayville and Neuarpuir areas.

GWMWater uses groundwater to provide water supply to 11 towns within these areas.

3.6 Waste Water Treatment and Recycled Water Use

Wastewater services are provided to 24 of the 74 towns serviced. Most of the wastewater facilities have an integrated agricultural disposal application. This practice is being increasingly supplemented and/or replaced by third party re-use applications with wastewater being supplied on commercial terms to off-site re-users.

Around 3,900 ML per annum of urban wastewater is currently collected and treated at 25 wastewater treatment facilities each year. See Appendix 2 Reclamation of Wastewater from Sewered Towns

GWMWater continues to work with Councils and the EPA in assessing the viability of sewerage works for other unsewered towns within the region. Great Western, Lake Bolac and Rupanyup have been identified as new towns for provision of sewerage services.

For more than 30 years GWMWater has been supplying reclaimed water for community benefit and regional development, with 30 third party customers currently supplied with reclaimed water.

Reclaimed water is treated to a secondary standard at all wastewater treatment plants, with the level of service for reclaimed water customers based on supplying Class C effluent quality under the environmental management guidelines that apply.

Nearly 100% of wastewater generated within the region is reused (98.7% in 2005-06), with noteworthy schemes in operation at Horsham, Ararat and Warracknabeal. Opportunities for beneficial reuse also exist at Birchip, Charlton, Dimboola, Murtoa, Nhill, Sea Lake, St Arnaud, Stawell and Willaura. Reclaimed water is currently fully allocated at Ararat, Edenhope, Horsham and Warracknabeal. It is recognised, however, that scope exists to improve the value achieved from reclaimed water within the region.

Wastewater quality at Donald currently prevents its beneficial reuse. Significant infrastructure investment at wastewater treatment plants could improve the quality of reclaimed water for reuse.

4 Estimation of the Effect of Climate Change on Urban Supply and Demand

4.1 Median Climate Change

DSE have supplied a scenario calculator for estimating the effect of an approximate 30% decline in mean annual flows for the rivers and streams that supply the GWMWater system.

The Wimmera and Avon river systems show a median decrease in mean annual flow of 38% to the year 2055. The Glenelg River shows a median decrease in mean annual flow of 36% for the same period. The Wimmera figure has been adopted as applying for the Wimmera-Mallee stock and domestic supply system including the headwater towns. For groundwater and southern region towns similar reductions for groundwater recharge and stream flows have been applied.

Future demand profiles have been modelled based on “Victoria in Future” population projections and our knowledge of population change. From our experience with the Northern Mallee Pipeline it is likely that household demand will increase with piping, particularly in towns where water is currently untreated. This is due to an increase in water quality as a result of piping.

4.2 Low Inflows Scenario

Modelling of future inflows based on the last 10 years of inflow was undertaken to examine the effect of stepped climate change. The reduction in annual inflows is estimated to be approximately 70%. Modelling of these low flows to the current channel supplied system demonstrated that it would be unable to sustainably supply consumptive and environmental demands without significant reconfiguration of the existing system.

A key part of this reconfiguration is the WMPP. The WMPP is the major strategic water supply augmentation for the region. The WMPP will provide 96% security of supply for urban and rural customers as well as greater flexibility in meeting projected urban needs throughout much of the region. Modelling of the effect of the median climate change and low flows scenario on the WMPP will need to be considered in the next UWSDS period. GWMWater has commenced further modelling of the system based on the WMPP being in place.

As part of this process a stakeholder group is currently examining the future operating scenarios for reservoirs, which are not required for consumptive supply. This continued modelling and determination of future operation of these reservoirs is a significant implementation action of the water supply demand strategy in association with WMPP.

5 The GWMWater Supply Strategy for the next 50 years

For the purposes of this strategy the GWMWater area has been grouped into six supply systems based on entitlements under the Wimmera and Glenelg River Bulk Entitlement and geographically distinct systems.

1. Towns supplied from Northern Mallee Pipeline (NMP),
2. Towns supplied direct from the Wimmera Mallee Domestic and Stock Water Supply system (Grampians) Headworks
3. Horsham
4. Towns supplied from the Wimmera Mallee Domestic and Stock Water Supply channel system, excluding Horsham
5. Towns supplied by groundwater to the west and south-west of the Wimmera River
6. Southern region towns

5.1 Northern Mallee Pipeline Area

The area of the GWMWater supply region already piped, was formerly supplied by open earthen channels with 50,000 megalitres per year (ML/yr) of water from the Grampians headworks some 300 kms to the south. Of the water saved approximately 35,000 ML/annum is now available as an environmental entitlement for the Wimmera and Glenelg Rivers.

GWMWater has a high security bulk entitlement of 3485 ML/annum from the River Murray for the NMP. When GWMWater's BE was established it foreshadowed an "indicative volume" of 592 ML as a BE volume for towns in the eastern part of the NMP area. However, the creation of the merged GWMWater has overridden any priority for separate urban and rural BEs in the NMP area.

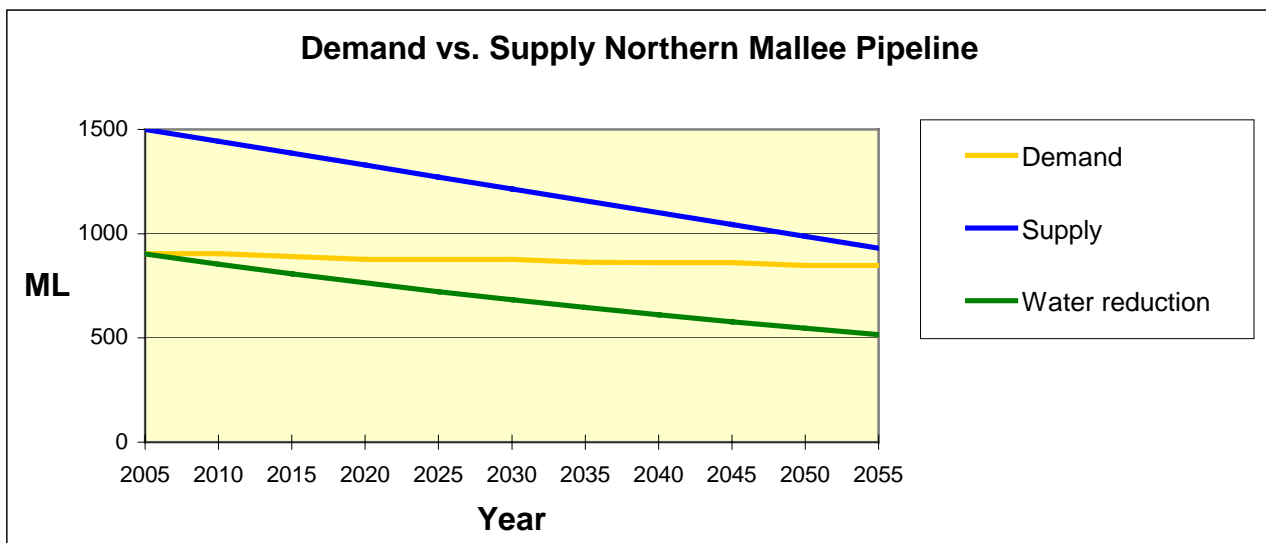


Current average annual urban demand in the NMP system is approximately 900 ML/annum. Population forecasts for the NMP area indicate that the population is declining at approximately 0.5% per annum, and with the consolidation of farms across the area will decline further. (See Appendix A *Victoria in Future*)

There is potential for a number of mineral sands mines to be located in the area, which would require the use of non saline water to undertake a level of processing. The mining companies would be responsible for purchasing this water by established water trading methods. However there may be an increase in the population of Ouyen and Manangatang as the labour requirements of the mines are established. Current indications are that the demand for water from the population increase would be met from the existing allocation.

For the purposes of this strategy, Quambatook will be considered in discussion of NMP towns. Quambatook is supplied from the Normanville Pipeline System operated by Goulburn-Murray Water, but it is adjacent to the Cannie Ridge area of NMP. A volume of 106 ML/annum of GWMWater’s Northern Mallee entitlement from the Murray River has recently been converted to a volume of 100 ML/annum urban security entitlement (99% reliability) on the Goulburn River system for Quambatook.

Overall urban use is expected to fall by approximately 60ML/annum under a median climate change scenario.



	Current	Median climate change scenario (2055)
Target reliability	99%	99%
Demand (ML)	904	847
Supply (ML)	3,485*	2,161*

* - includes rural demand

Water Conservation Targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	787	724	692	630
Residential consumption (Litres/person/day)	503	463	443	402

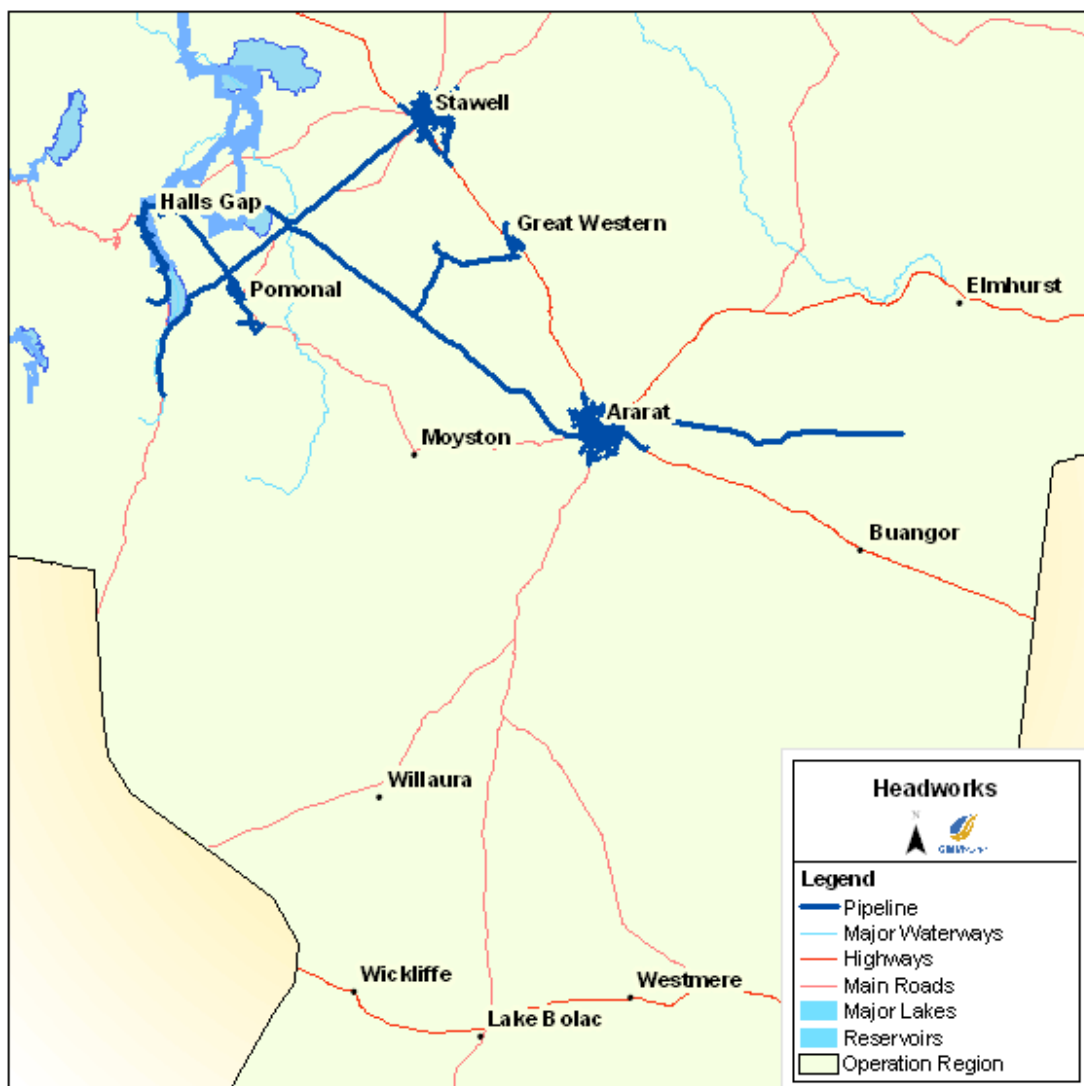
5.2 Towns supplied from the Wimmera Mallee Stock and Domestic Water Supply System

GWMWater supplies 40 townships via the Wimmera Mallee Domestic and Stock Water Supply System. The Wimmera-Glenelg Bulk Entitlement identifies three separate entitlements for the towns within the Wimmera Mallee Domestic and Stock Water Supply System, being:

1. Supplied direct off Headworks 4,094 ML
2. Horsham supply 4,810 ML
3. Supplied by channel (excl. Horsham) 4,717 ML

5.2.1 Towns supplied direct off Headworks

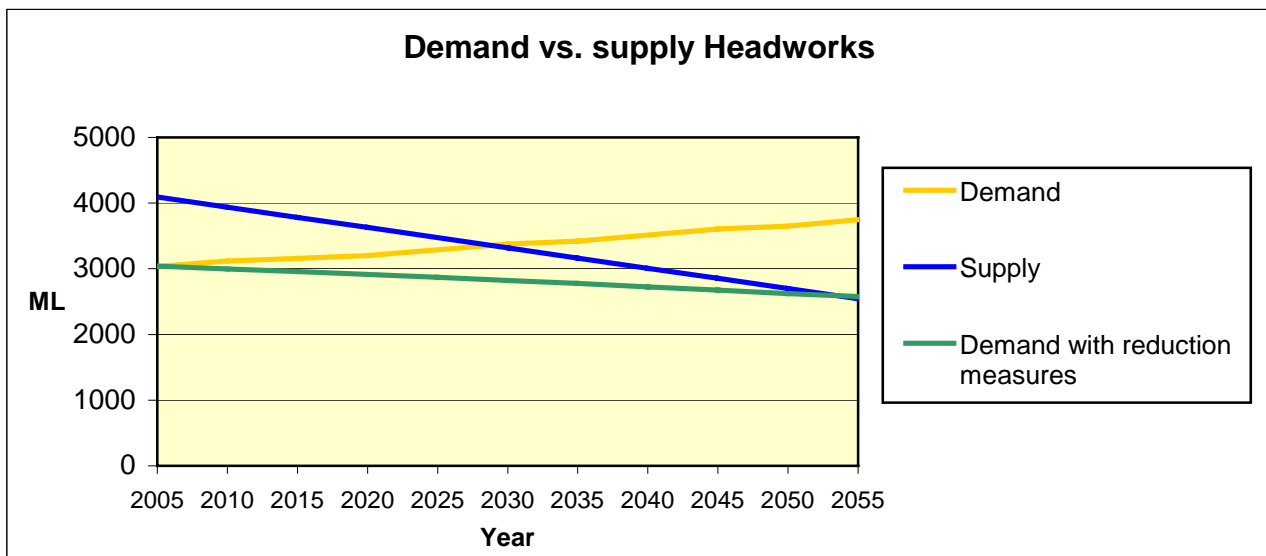
The townships of Ararat, Great Western, Halls Gap, Pomonal, and Stawell are supplied directly from Lake Bellfield, Lake Fyans and/or Mt Cole Reservoir. Stawell is primarily supplied from a separate diversion from Fyans Creek upstream of Lake Bellfield.



The current average annual urban demand from this system is 3037 ML. Population trends indicate growth in Ararat of approximately 0.5% per annum. Halls Gap has undergone large population growth in the last 10 years. However this is expected to slow significantly as the stock of land available for development is rapidly diminishing.

The populations of Stawell and Great Western have remained constant over the last 20 years and are expected to continue this way. Pomonal, with less than 150 people, is not expected to see significant population change. The expected population growth, and correspondingly demand growth, has been determined at 0.25% per annum.

Population growth and weather sensitive demand brought about by median climate change are expected to increase demand by approximately 1,200 ML.



	Current	Median climate change scenario (2055)
Target reliability	83%	96%
Demand (ML)	3,037	3,748
Supply (ML)	4,094	2,544

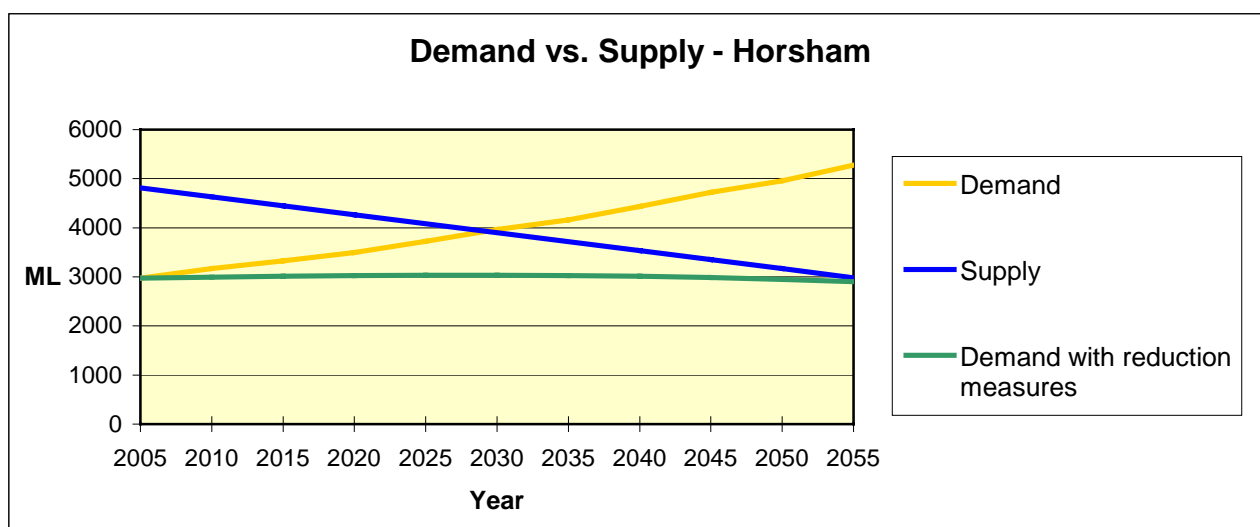
Water Conservation Targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	591	561	547	443
Residential consumption (Litres/person/day)	313	297	290	235

5.2.2 Horsham supply

Horsham is supplied from Lake Wartook via the Mt Zero Channel and Mt Zero treatment plant. The current average annual urban demand from this system is approximately 3,012 ML. As the regional centre of the Wimmera, Horsham is experiencing population growth of approximately 1% per annum.

Population growth and weather sensitive demand brought about by median climate change are expected to increase demand by up to 2,300ML/annum.



Target Reliability

	Current	Median climate change scenario (2055)
Target reliability	83%	96%
Demand (ML)	2,973	5,279
Supply (ML)	4,810	2,982

Water Conservation targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	631	581	555	379
Residential consumption (Litres/person/day)	379	349	333	227

5.2.3 Towns supplied by channel

The Wimmera-Mallee Domestic and Stock channel system currently supplies water to storages at 34 towns across the channel system area. Typically these towns are supplied once per year. Replacement of channels with pipes through the WMPP has recently commenced. The current average annual urban demand from this system is almost 4,270 ML. Water restrictions in these towns have been required since 1999.

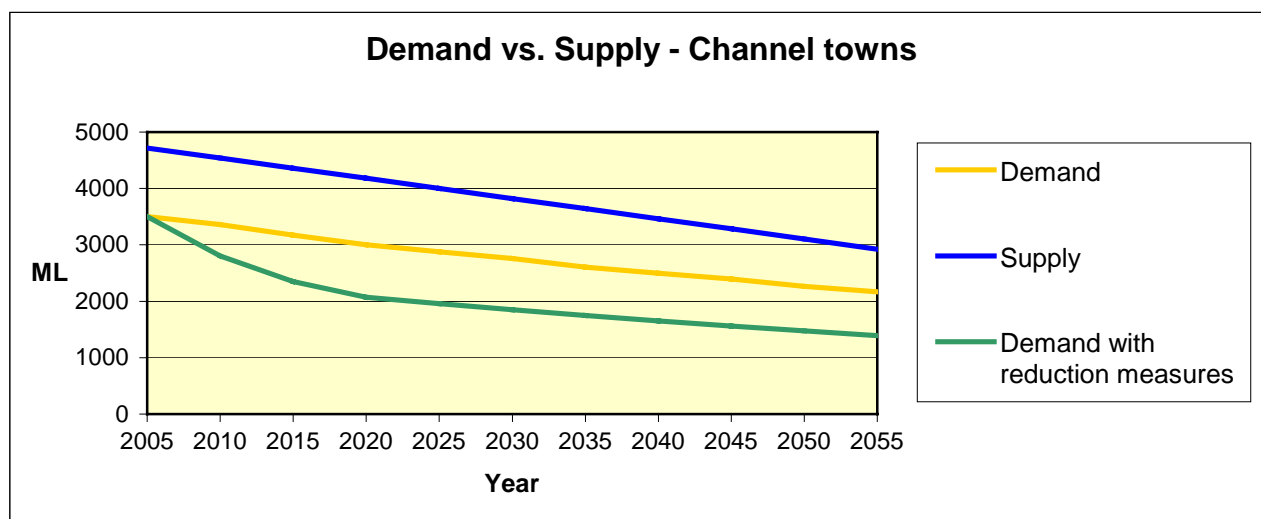


In some years in the past some towns have needed restrictions as the volume in storage at these towns is barely sufficient to last through the summer period. Further, a very low level in one or more town storages has triggered an early start to the channel system to replenish these town storages before the normal planned supply.

In other cases town storages have required a rerun of part of the channel system to provide a top-up late in the channel season to reduce the period the town would be reliant on the storage until the next channel run. These local supply shortfalls will cease to be a problem when the channel system is piped.

Population within these rural towns is declining as per the trend of the surrounding broadacre agricultural areas. Decline is occurring at approximately 1.1% per annum.

Weather sensitive demand increases are not sufficient to offset population decreases. Overall urban demand is expected to fall by approximately 1330ML/annum under a median climate change scenario.



Target Reliability

	Current	Median climate change scenario (2055)
Target reliability	83%	96%
Demand (ML)	3,503	2,169
Supply (ML)	4,717	2,923

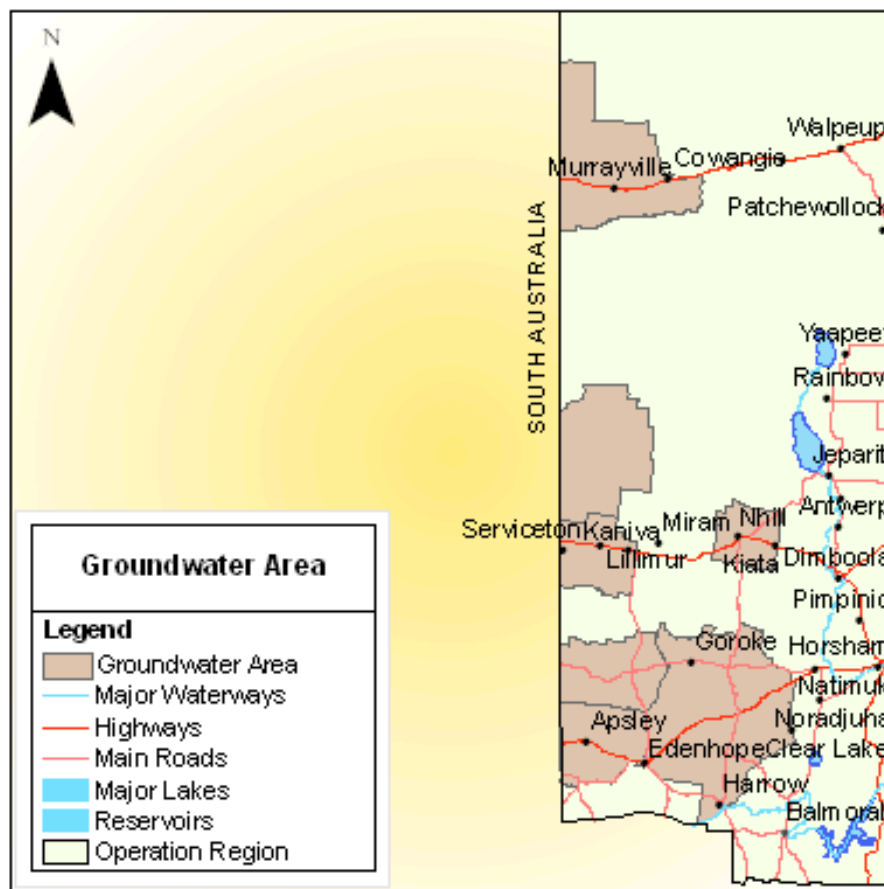
Water Conservation targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	590	566	554	472
Residential consumption (Litres/person/day)	398	390	382	318

5.3 The Groundwater Supply Areas in the western Wimmera-Mallee

GWMWater operates or manages a number of groundwater supplied systems. These systems include:

- Urban supplies to 12 towns - including Nhill, Kaniva, and Murrayville
- The Walpeup West D&S system;
- Irrigation areas - including Murrayville, Telopea Downs, and Neuarcurr



These systems are supplied from the Murray Group Limestone Aquifer that extends in the west from near Harrow on the Glenelg River, northwards following an alignment approximating the Wimmera River to the northern limit of the GWMWater area, and the area west of this to beyond the South Australian border.

Table 2. Urban allocation in groundwater supplied towns

Area Name	PAV (ML)	Town	Allocation	Demand (ML)
Apsley WSPA	New PAV currently being determined	Apsley	40	42
		Edenhope	150	191
Nhill GMA	998	Nhill	1,000	463
Gymbowen GMA	10,330*	Goroke	86	62

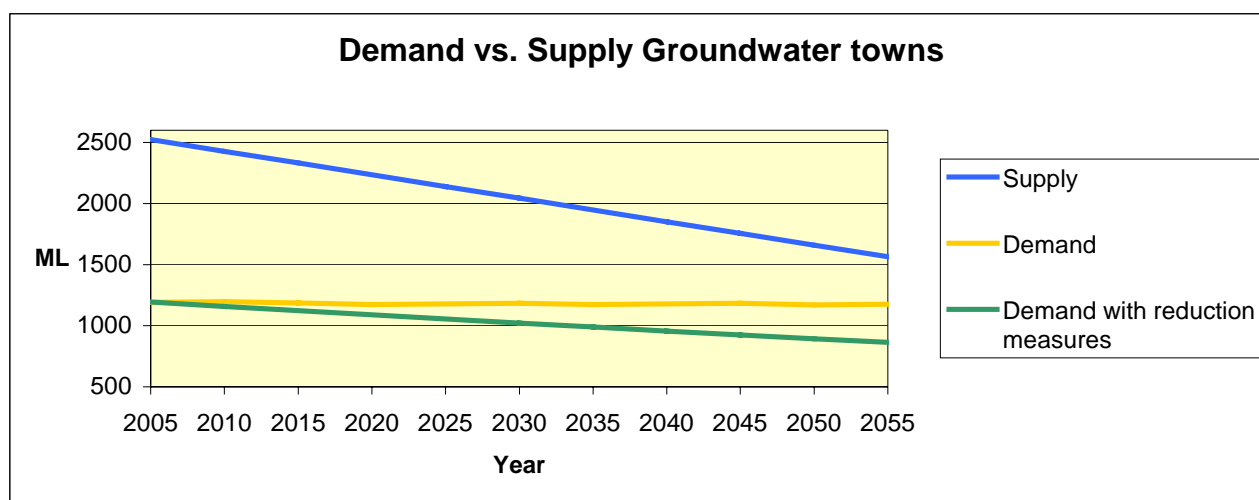
		Harrow	29	36
Kaniva WSPA	6,950	Kaniva	600	217
		Lillimur	32	9
		Miram	7	2
		Serviceton	25	31
Neuarpuurr WSPA	10,307			
Murrayville WSPA	10,883	Cowangie	40	4
		Murrayville	475	128
Teloepa Downs WSPA	13,435			
Other		Kiata	40	7
TOTAL			2524	1192

* - PAV not gazetted yet.

Edenhope is a special case within this grouping. Until recently Edenhope has been supplied from Lake Wallace. Since about 2001, Lake Wallace has been empty or nearly so, and the town's supply is now reliant on some marginal bores with desalination. GWMWater is no longer able to consider Lake Wallace a secure resource, and accordingly will undertake investigations in its 2006-07 capital works program to determine an alternative, secure supply to Edenhope.

Urban demand within groundwater zones is less than 2.5% of the total water utilised. In general, urban allocations are comfortably in excess of the current demand. Population within towns in the groundwater area is decreasing at approximately 0.2% per annum except for Nhill, which has had a small population increase. Per capita consumption increases may be experienced in Nhill and Edenhope with water quality improvements.

Weather sensitive demand increases are not sufficient to offset population decreases. Overall urban demand is expected to fall, slightly, by approximately 17 ML/annum under a median climate change scenario.



Target Reliability

	Current	Median climate change scenario (2055)
Target reliability	96%	96%
Demand (ML)	1,192	1,175
Supply (ML)	2,524	1,565

Water Conservation targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	749	719	704	599
Residential consumption (Litres/person/day)	514	493	483	411

5.4 Supply areas in the southern section of the GWMWater Region

There are a number of towns in the south of the GWMWater supply region that are supplied from either:

- Surface water harvested into independent storages,
- The East Grampians Pipeline supply, or
- Local groundwater supply



Supply from independent storages

Elmhurst and Buangor have independent supply systems. Water for Elmhurst is diverted from Hickman Creek, whilst water for Buangor is harvested from McLeods Creek. Both creeks are tributaries of the Wimmera River. Elmhurst and Buangor are small towns with populations of 234 and 49 persons respectively. Population trends for these towns are not available. Rural population decline in the Rural City of Ararat, in which both towns are based, is approximately 1.5% per annum and this figure is applicable to these towns.

The average annual demands for Elmhurst and Buangor are 22 ML and 12 ML per annum respectively. Based on data available, both of these towns have historically shown responsive catchments that enable reasonable levels of water harvesting even in the most dry winter conditions. A BE for these towns is currently being determined.

East Grampians Pipeline supply

The East Grampians Pipeline supply (aka the Willaura system) is adjacent to the southeast corner of the Grampians range and is supplied by six weirs on small streams, with two each located on Stoney Creek, Mt. William Creek and Masons Creek. The supply is supplemented during the summer months by a groundwater supply comprising three bores.

The East Grampians Pipeline supply system services the townships of Willaura, Moyston, Lake Bolac and Wickliffe and provides bulk water to the Wannon Region Water Authority township of Glenthompson under a supply agreement between the two Authorities. The Moyston supply also has a groundwater allocation of 140 ML/annum. The system also supplies a number of rural connections, which draw water from the pipelines, between the various towns. Altogether the system services approximately 1,000 GWMWater connections. The average annual total demand for these towns is 189 ML/annum and services approximately 1400 persons.

The system has proven to be a very reliable due to the availability of the backup groundwater bores. Restrictions have not yet been required in response to the current drought even during the very dry 2002-03 season. However, some problems are being experienced in the early part of this 2006-07 summer.

Willaura is the largest of the towns in this system with just over 300 people. All four towns are located within rural communities in the Rural City of Ararat. As rural population decline is approximately 1.5% per annum, demand in these towns is not expected to increase and is likely to decrease. A BE for these towns is currently being determined.

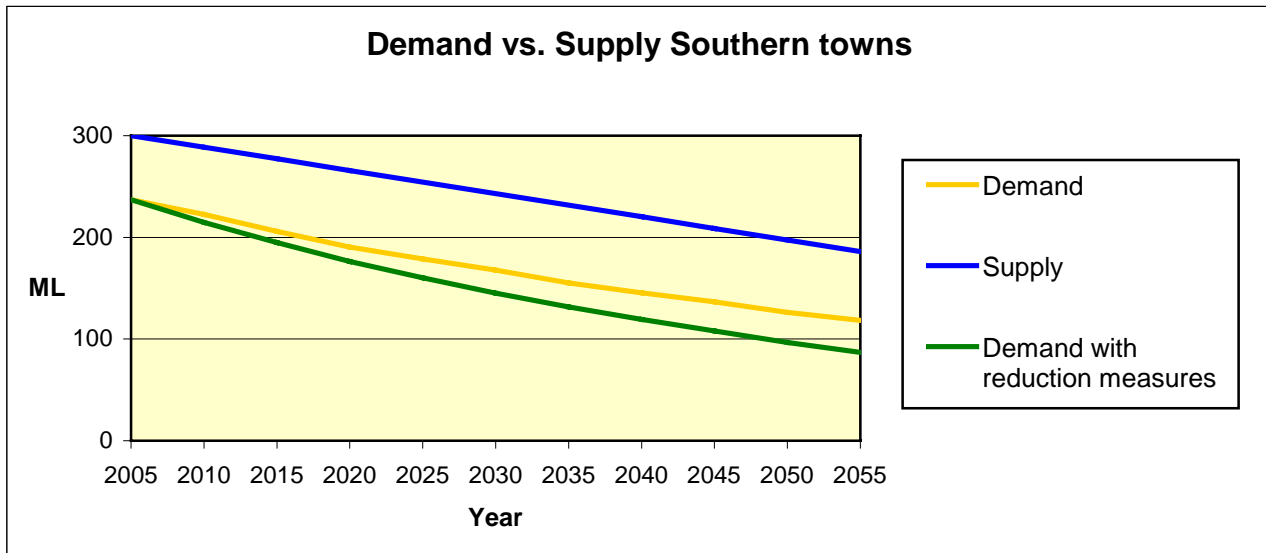
Local groundwater supply

A single bore, located to the north west of Streatham, supplies Streatham and Westmere. The average annual demand for the towns is approximately 15 ML/annum. Both towns are located within rural communities within the Rural City of Ararat. As rural population decline is approximately 1.5% per annum, demand in these towns is not expected to increase and is likely to decrease.

Existing concerns about the condition of the Streatham bore and declining yield have led to it being included on the 2006-07 GWMWater capital works program for upgrade.

Current average daily per capita use in southern towns is towns is 237 litres, reflecting the wetter climate in the south in comparison to other supply zones in the region. With no significant industry identified for urban centres in the region and a declining population base, total demand is not expected to increase

Weather sensitive demand increases are not sufficient to offset population decreases. Overall urban demand in the southern towns is expected to fall by approximately 119 ML/annum.



Target Reliability

	Current	Median climate change scenario (2055)
Target reliability	96%	96%
Demand (ML)	237	118
Supply (ML)	300	186

Water Conservation targets

	Current	2015	2020	2055
Total per capita consumption (Litres/person/day)	542	520	509	433
Residential consumption (Litres/person/day)	432	415	406	346

Based on the assumptions applied (See Appendix C), the following will occur:

1. The demand in the Horsham supply and the Headworks towns will exceed supply in approximately 2030 under a median climate change scenario.
2. Given the high security of urban supplies in the groundwater towns, it is unlikely that urban demand will exceed supply during the life of the strategy. Supplies to Edenhope, Nhill and Streatham have been identified as areas where specific actions are required. Proposals for upgrading supply for these towns are included in this strategy.
3. As urban demand in the NMP towns is only a small component of total system demand it is unlikely that urban demand will exceed supply during the life of the strategy.
4. The effect of climate change on the supply to the southern region towns is unknown. Currently supply meets demand. Further work is required to quantify the available supply.

6 Strategies to Meet Water Conservation Targets

6.1 Wimmera Mallee Pipeline Project

Construction of the WMPP has commenced. This is the major supply augmentation project for the region, servicing both rural and urban customers. Once completed an annual average volume of 83,000ML and 20,000ML will be available for the environment and regional development respectively. This 20,000ML is more than adequate to meet supply shortfalls in Horsham and Headworks towns. The experience from the NMP suggests a 20% to 25% increase in town annual average use following connection to the pipeline.

The construction of the Wimmera Mallee Pipeline, over the next 5 years, is the major project to address urban and rural water supply and demand for the life of the Strategy.

6.2 Urban entitlements

Water use is unrestricted for most commercial and industrial customers connected to town supplies. (Stage 4 water restrictions limit water use by car washes, nurseries and filling of swimming pools). New urban commercial customers can connect to the system without the need to purchase an entitlement unlike rural customers. Uncontrolled water demand in towns creates the possibility that town supplies will not be able to meet annual and peak supply demands. GWMWater is investigating the establishment of entitlements for urban supplies.

6.3 Connect Edenhope to groundwater supplies

A reliable water source is a major issue in Edenhope. The town has previously relied on supply from Lake Wallace. It is likely under climate change that supply from Lake Wallace will be limited. Currently the town relies on groundwater bores due to low inflows into Lake Wallace over the last 10 years. A scoping study has identified two areas approx 10 kms north, and 20 kms north west of Edenhope as likely long-term water sources for Edenhope. These locations are within the Apsley WSPA, for which a management plan is under development. Until the plan is complete, or the WSPA revoked, the Water Act precludes the transfer of entitlements or allocation of new entitlements. GWMWater's investigations for a new source at Edenhope will need to consider these aspects of the groundwater management framework.

6.4 Residential, recreational and commercial reduction measures

Residential, recreational and commercial measures include installation of water efficient showerheads, shorter showers, water friendly gardens, low flow taps, replacing single flush toilets with dual-flush toilets, water efficient washing machines, and replacing flush urinals with waterless urinals.

GWMWater is an active participant in educating the community on water conservation. GWMWater will continue to support Victorian, Australian and local initiatives to conserve water. In the first instance, GWMWater will support voluntary installation of the above measures. Once pipelining is complete and GWMWater has a better understanding of urban demand, GWMWater will review whether regulating these measures is required.

6.5 Water loss and system pressure reduction

Water loss from water distribution systems can be significant. Water loss can be either due to meter inaccuracies, unauthorised consumption or real losses due to leakage.

GWMWater's estimated water loss is approximately 15.4%. Water loss carries a significant price tag, both economic and environmental. A loss reduction program is presently being prepared to address this issue.

Water pressure has a substantial impact on water loss. Maximum pressures significantly affect the rates at which new breaks occur and water losses through leaks are directly related to the water pressure within the water main. Water pressure also has a substantial impact on customer water usage. Generally hose watering systems are turned on for fixed periods and most people tend to shower for a fixed time. In both cases, consumption is dependent on flow rate. Consequently, pressure management can be an effective tool to both reduce water loss in distribution systems and to minimise usage by customers. The downside is that low water pressure can affect both fire protection and water quality. Some evaporative air conditioners may also require a minimum pressure to operate effectively.

GWMWater is trialling pressure management. The impact on usage is being assessed under a variety of scenarios.

6.6 Increase efficiency of large water users and industry

GWMWater is a member of the Savewater Alliance and is currently trialling the savewater efficiency service in the region. The service is aimed at assisting industry in reducing water consumption and investigating opportunities for potable water substitution. The trial to date has shown that a number of industries have already implemented water saving measures. The scope for further savings is anticipated to be of the order of 5% -10%.

6.7 Determine sustainable supply to southern towns

The East Grampians water supply system supplies four towns, and some 60 rural customers. The water source for this system is six small weirs on three different creeks, supplemented during the summer months by three bores located in a bore field. Supplies from the system are adequate in 'normal' years however the creek supplies reduce under drought conditions. GWMWater is investigating sustainable supplies to the towns particularly under drought conditions. The long term effect of climate change on the East Grampians system and other southern towns reliant on bore water is currently being considered.

6.8 Reclaimed water for high value uses

There is scope for expanded reuse of reclaimed water within the GWMWater region. Reclaimed water is currently fully allocated at Ararat, Edenhope, Horsham and Warracknabeal however there may be opportunities for higher value use. Opportunities for beneficial reuse also exist at Birchip, Charlton, Dimboola, Murtoa, Nhill, Sea Lake, St Arnaud, Stawell and Willaura. Opportunities for potable substitution are currently being investigated.

Case study: Stawell Water Scoping Study

Stawell is located approximately 240 kilometres north west of Melbourne. The town's population is approximately 6,000 people.

A water scoping study investigated the potential for recycled water infrastructure and reuse within Stawell and surrounds. Approximately 200 ML/year of reclaimed water is supplied to 3 existing schemes. The study identified up to a further 250 ML/year available for offsite reuse. The water is currently used for irrigating pasture and tree lots on GWMWater land. Three potential pipeline schemes were investigated.

The study recommended a low pressure Class C supply passing by Stawell's parks and gardens on its way to Stawell Gold Mines. A scaled-down option, seeking highest value, has an estimated capital cost of about \$2.5 million with annual operating costs of \$120,000 per year.

Funding options are currently being investigated.

6.9 Connect Nhill to WMP

One of the options for future supply to Nhill is to connect into the WMPP. This connection would be separate to the current pipeline project.

Case study: Water supply to Nhill

The township of Nhill is located on the Western Highway, approximately 75 kilometres north-west of Horsham, midway between Melbourne and Adelaide. The town's population is approximately 1,900 people.

Nhill is supplied from six groundwater bores located throughout the town. Each bore pumps directly into a pipe network system.

The town water supply at Nhill is untreated. The supply is salty, and is high in hardness and iron levels. In addition, arsenic levels in the supply consistently exceed the Australian Drinking Water Guideline (ADWG) limit. The supply is not disinfected, and the microbiological quality does not achieve ADWG requirements.

The current supply is unsuitable for drinking. Consequently expansion of food processing opportunities in the town is limited.

GWMWater conducted a consultation program with the Nhill community regarding improvements to the quality of the town supply. A community reference group, which was formed to assist GWMWater in determining the community's position in respect of the future water quality for the town supply, recommended that the Nhill water supply be treated to comply with ADWG.

In response to this recommendation, GWMWater undertook investigations into options for providing drinking water quality to the township Nhill.

An evaluation was undertaken of the following water supply options for Nhill.

- Maintaining the current untreated supply arrangement from the local groundwater system.
- Fully treat the local groundwater supply system at Nhill, including treatment to reduce salt.
- Increasing the capacity of the WMPP pipeline and the Dimboola Water Treatment Plant, to enable the piping of treated water from Dimboola to Nhill.
- Increase the capacity of the WMPP pipeline, connect Nhill to the new pipeline system and fully treat the piped bulk water supply at Nhill.
- The supply of treated water via the WMPP through a centralised treatment plant that forms part of the WMPP

The study confirmed the favoured option of providing a new source of supply for Nhill through the piping of water as part of an extension from the currently proposed configuration of the future WMPP.

GWMWater is also currently reviewing the operation of its Wastewater Treatment Plant (WWTP). Currently, the high salinity water from the treatment plant is used to irrigate low-valued pasture on site. Further, emergency discharges from the WWTP, are perceived to affect the adjoining Nhill Swamp which is a high value wetland. The wetland has significant economic and social value for the Nhill community and contain threatened fauna.

When the Nhill water supply becomes connected to WMPP, the salinity of both the water supply and the wastewater stream, will significantly reduce. This will provide significant opportunities for the reclaimed water to be treated to Class A standard and used for higher value uses.

The water will also be available for replacement of existing supplies such as to public facilities in towns. As part of its plans GWMWater is considering the construction of a wet weather storage that will eliminate the need for future discharge to Nhill Swamp.

GWMWater is working with a local Stakeholder Advisory Group to develop a preferred strategy for treating and ultimately reusing water from the WWTP.

6.10 Treatment and use of stormwater

GWMWater is working closely with local Government in the development of Sustainable Water Use Plans. As the managers of stormwater, local Government is developing and undertaking works programs to substitute stormwater for potable supplies. Most Councils in the region have set targets of 15% - 25% reduction in demand across council owned and managed facilities.

6.11 Swimming pool covers

Swimming pool covers have the potential to save almost 100 ML per annum throughout the GWMWater region. Industry figures indicate that 50,000 litres of water is lost from a 9 m x 4 m pool during the October – March period. GWMWater would support a move by the Victorian Government to mandate the installation and use of swimming pool covers.

6.12 Covering of town storages

As part of the WMPP, most town storages are to be reduced in size. Potential also exists for the storages to be covered. GWMWater will investigate covering of storages as part of consideration of centralised treatment of water supplies during the next Water Plan period.

6.13 Installing rainwater tanks in new homes and existing houses

GWMWater will continue to support Federal, State and local initiatives to conserve water. In the first instance, GWMWater will support voluntary installation of rainwater tanks. It is worth noting that rainwater tanks are installed on many homes in the region, particularly in towns which do not receive a drinking water supply. Once pipelining is complete and GWMWater has a better understanding of urban demand under pipelining, GWMWater will review whether regulating these measures is required.

6.14 Dual pipe systems in new residential and commercial developments

Local Government has overall responsibility for new residential development. GWMWater supports improved efficiency of water use in buildings. As part of this strategy, GWMWater will work with Local Government in their planning processes and identify growth areas that are suitable for mandating dual pipe reticulation systems using the new Clause 56 of the Victorian Planning Provisions.

6.15 Greywater reuse for toilet, laundry and garden

The Environment Protection Authority has responsibility for greywater. GWMWater is an active participant in educating the community on water conservation and will continue to support initiatives to conserve water.

6.16 Connect WMP and NMP to Waranga Channel

All system interconnection options are longer term strategies in the GWMWater region. It is technically feasible to connect the WMPP and NMP systems. Such a connection would require significant extension of trunk mains. Further, connection would need to be considered in a regional water supply context as connection for urban supply only would be extremely expensive for little gain.

6.17 Regional brackish groundwater utilisation

Groundwater east of the Wimmera River is extremely variable in quality and yield. GWMWater is currently researching and trialling desalination technology in the region. However the low yields, low recovery rates and high cost of production make desalination, currently, an unattractive option. Desalination is more likely to play a role in drought contingency, rather than in long term ongoing town supply.

6.18 Supply from Tertiary Confined Sand Aquifer

The Tertiary Confined Sand Aquifer sits, at depth, below freshwater aquifers in the west of the GWMWater region. The depth to water has, to date, made extraction economically unviable. Sustainable yields from the aquifer have been calculated but not thoroughly tested in this area, and currently no allocations have been made from this resource within western Victoria. The aquifer is more likely to play a role in drought contingency supply, rather than in long-term ongoing town supply. Given the decline in urban demand in groundwater supplied areas, the resource is unlikely to be required for urban supplies

Table 4: Water savings and costs of implementation of actions

Strategy Action	Water saving	Cost
Wimmera Mallee Pipeline	103,000 ML per annum	\$501 M
Urban entitlements	0 ML	
Connect Edenhope to groundwater	0 ML	\$100,000
Residential, recreational and commercial reduction measures	700 ML per annum	\$1,250,000
Water loss and system pressure reduction	2000 ML per annum	\$1,680,000 (savings)
Increase efficiency of large water users and industry	700ML per annum	\$200,000
Determine sustainable supply to southern towns	0 ML	\$100,000
Reclaimed water for high value uses	200ML per annum	\$2 M
Treatment and use of stormwater	500ML per annum	\$5 M
Connect Nhill to WMPP	0 ML	\$38 M
Swimming Pool Covers	60 ML per annum	\$800,000
Covering of town storages	100 ML per annum	
Installing rainwater tanks in new homes and existing houses	0 ML	
Dual pipe systems in new residential and commercial developments		
Greywater reuse	100 ML per annum	\$1.5 M
Connect WMPP and NMP to Waranga Channel	0 ML	\$50 M
Regional brackish groundwater utilisation	4,000 ML	\$12 M
Supply from Tertiary Confined Sand Aquifer	0 ML	\$1 M

7 Greenhouse Gas Emissions

Recognising the WMPP as the major water saving project in the region and impacting on this Strategy, GWMWater has undertaken an energy audit of the pipeline. The pipeline when operational will consume approximately 27 million kilowatt hours (kWh) per year. This consumption equates to approximately 40,000 tonnes of CO₂ emissions per year. In response to this significant increase in energy use, GWMWater has identified a range of energy reduction activities, including the potential construction of a mini hydro plant. The energy savings equate to approximately 4,600 tonnes of CO₂ per year. Further, energy reduction work has been undertaken including the removal of a major pump station at Taylors Lake from the design.

GWMWater, along with other water authorities, is currently conducting an energy and greenhouse review of all operations. Further savings are likely to be identified. GWMWater is also currently investigating the feasibility of alternative energy sources for the WMPP.

8 Stakeholder Consultation

Over the last 5 years, GWMWater and its predecessors have consulted extensively with its stakeholders on a range of issues including water quality, drought management, water entitlements and tariffs, and development of the Water Plan.

GWMWater has eight standing Customer Consultative Committees that provide advice to the Board on the development and ongoing review of all GWMWater's activities. Over 100 customer representatives are involved in these groups, which generally meet on a quarterly basis. An annual customer advisory group summit is held in Horsham each year.

Consultation undertaken in relation to the WMPP includes community information sessions held in 15 towns throughout the region in May 2005, followed by a further 14 sessions in November 2005. Regional 'Piping It' offices have been opened in Dimboola, Jeparit, Rainbow, Horsham and Culgoa.

These offices are open one half day per week and provide a local base for people with enquiries about the project. GWMWater has also formed a Rural Tariff Working Group, Reservoirs Review Stakeholder Working Group, Landowners Liaison Group and Pipeline Community Reference Group to provide advice on issues specific to the WMPP.

Since May 2005, regular 'Piping It' newsletters have also been circulated to approximately 33,000 customers throughout the region providing the latest information on the WMPP.

Significant media coverage continues to be received within the region on all water related issues.

Over the past five years extensive consultation programs have been conducted in Apsley, Berriwillock, Culgoa, Goroke, Harrow, Jeparit, Kaniva, Lake Bolac, Moyston, Natimuk, Nhill, Underbool and Willaura to determine these communities desire for future water quality improvements. The consultation process adopted involved the formation of a local community reference group which works with GWMWater, usually over a period of 4-6 months, to develop a recommendation regarding the towns future water quality for consideration by the Board of GWMWater.

Consultation has also been undertaken with the Ouyen, Stawell, Dimboola, Hopetoun, Nhill and Minyip communities in relation to opportunities for the beneficial use of reclaimed water.

Potential water supply options to Dadswells Bridge have also been investigated in association with the local community.

GWMWater's quarterly urban customer newsletter 'Tapping In' is circulated to 23,000 customers with their accounts, providing information on current issues.

GWMWater staff are regularly invited to be guest speakers at a range of service clubs throughout the region, covering a range of topics including water conservation, water quality and treatment processes, drought management and the WMPP.

Monthly paid 'infotorials' in each of the regions 14 major newspapers provide timely information on a range of water related topics.

GWMWater is also regularly represented at field days, agricultural shows and other major events throughout the region.

Through our comprehensive Community Engagement and Marketing Strategy the community of the GWMWater region has a detailed knowledge of supply and demand issues across the region. The community will have the opportunity for further input into supply and demand options for urban areas through the consultation processes available during development of the Water Plan 2008-2013.

Appendix A. Population trends in GWMWater region

Figure 2.4.1: Average population loss – Victoria

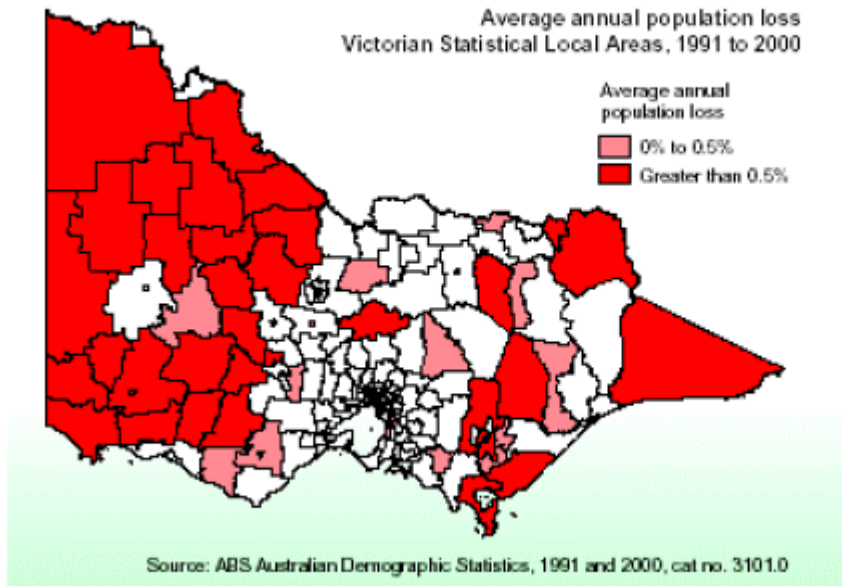
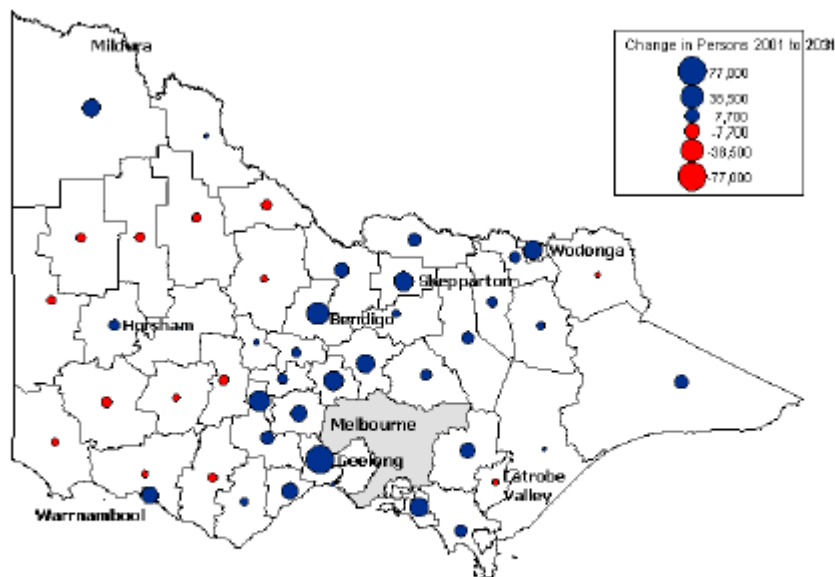
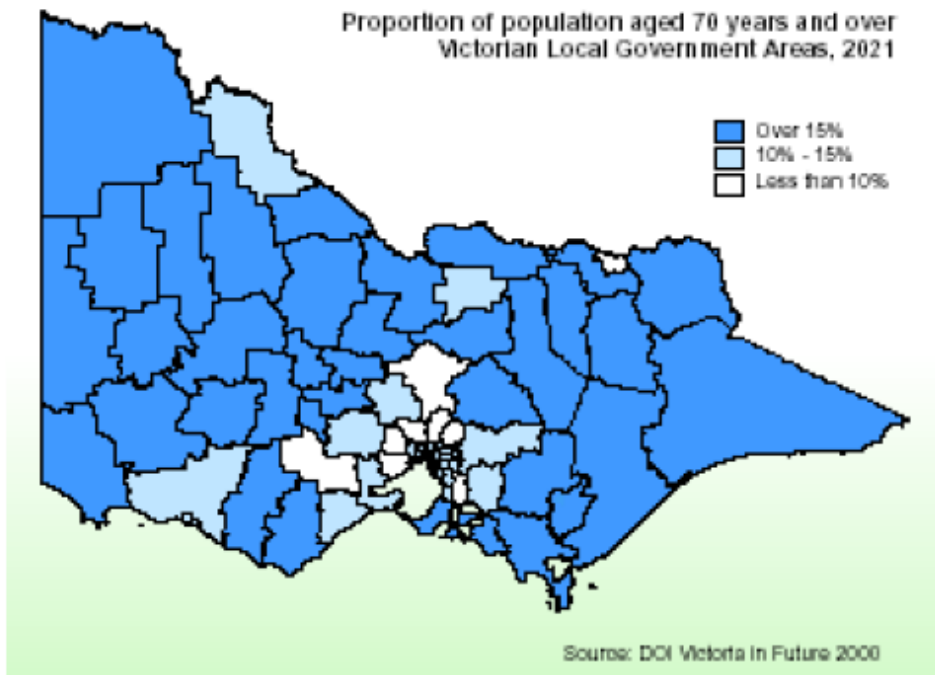


Figure 2.4.2: Projected change in persons – Victoria 2001-2031



A common thread of all municipalities, irrespective of whether they are in decline or stabilising, is the increase in older age groups and the decline of younger age groups.

Figure 2.4.3: Victoria Ageing profile 2021



Reference: Department of Infrastructure 'Towns in Time' - 1999
 Department of Infrastructure 'Victoria in Future' - 1999
 Department of Infrastructure 'Regional Matters' - 2002

Projections made by the Department of Sustainability and Environment (DSE) in 'Victoria in Future' suggest that this trend will continue. This was reinforced in a more recent study titled 'Ageing in the Bush - A perspective from Victoria' that showed the current trends projecting an increase in the number of persons aged 60 and over, and a decline in people aged 20 and under.

Appendix B. Wastewater Use in GWMWater region

TOWN	Influent	On-Site Irrigation	Off-site Irrigation	Evaporation	Discharge to waterways	Volume of Reuse
Ararat	832	427	405	0	0	832
Birchip	52	52	0	0	0	52
Charlton	37	37	0	0	0	37
Dimboola	89	89	0	0	0	89
Donald	113	113	0	0	0	113
Edenhope	188	0	188	0	0	188
Halls Gap	137	135	2	0	0	137
Horsham	1130	255	875	0	0	1130
Jeparit	42	0	0	42	0	0
Kaniva North	90	0	0	90	0	0
Kaniva South	90	0	0	90	0	0
Murtoa	88	88	0	0	0	88
Natimuk	23	0	0	23	0	0
Nhill	165	164	1	0	0	165
Rainbow	36	0	0	36	0	0
Sea Lake	55	55	0	0	0	55
Serviceton	5	0	0	5	0	0
St Arnaud	171	170	1	0	0	171
Stawell	444	279	165	0	0	444
Warracknabeal	109	0	109	0	0	109
Willaura	26	0	0	12	14	0
Wycheproof	41	41	0	0	0	41
Total	3963	1905	1746	298	14	3651

Appendix C. Determination of urban supply and demand

1. Determination of supply zones

The GWMWater area has been grouped into six supply systems based on entitlements under the Wimmera and Glenelg River Bulk Entitlement and geographically distinct systems.

1. Towns supplied from Northern Mallee Pipeline (NMP),
2. Towns supplied direct from the Wimmera Mallee Domestic and Stock Water Supply system (Grampians) Headworks
3. Horsham
4. Towns supplied from the Wimmera Mallee Domestic and Stock Water Supply channel system, excluding Horsham
5. Towns supplied by groundwater to the west and south-west of the Wimmera River
6. Southern region towns

2. Determination of demand

2.1. Base level

In order to compare demand versus supply a base level of available demand has been determined. For all supply zones, other than the Northern Mallee Pipeline the average annual consumption of each town up to the year 2000 has been adopted as this represents consumption when water restrictions were generally not in place. For Northern Mallee Pipeline supplied towns, the average annual consumption since the year 2000 has been used as this represents consumption post completion of the Northern Mallee Pipeline.

The base level demands are as follows:

Supply area	Base Demand (ML/annum)
Northern Mallee Pipeline	904
Headworks	3037
Horsham	2973
Channel	3503
Groundwater	1192
Southern towns	237

2.2. Effect of Population change and median climate change (weather sensitive demand)

Population change in supply zones

Supply area	Population change /annum
Northern Mallee Pipeline	- 0.5%
Headworks	+ 0.5%
Horsham	+ 1.0%
Channel	- 1.1%
Groundwater	- 0.2%
Southern towns	- 1.5%

Demand (ML/annum) due to population change and median climate change (weather sensitive demand)

Supply area	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055
Northern Mallee Pipeline	904	904	890	877	876	876	863	862	861	848	847
Headworks	3037	3121	3160	3200	3287	3377	3419	3512	3606	3651	3748
Horsham	2973	3168	3327	3493	3722	3965	4163	4434	4722	4958	5279
Channel zone	3503	3360	3175	3001	2877	2759	2607	2499	2395	2263	2169
Groundwater zone	1192	1198	1186	1174	1179	1185	1173	1178	1182	1171	1175
Southern towns	237	223	206	190	179	168	155	146	137	126	118

3. Determination of available supply under climate change scenario

The 38% decrease over a period of 50 years was applied to entitlement volumes to determine available supply volumes.

Available supply (ML/annum) under a median climate change scenario

Supply area	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055
Northern Mallee Pipeline	1500	1443	1386	1329	1272	1215	1158	1101	1044	987	930
Headworks	4094	3939	3784	3629	3474	3319	3164	3009	2854	2699	2544
Horsham	4810	4628	4446	4264	4082	3900	3718	3536	3354	3172	2982
Channel zone	4717	4538	4359	4180	4001	3822	3643	3464	3285	3106	2923
Groundwater zone	2524	2428	2332	2236	2140	2044	1948	1852	1756	1660	1656
Southern towns	300	289	277	266	255	243	231	220	209	197	186

Reduction targets (Litres/person/annum) in order for demand to meet supply

Supply area	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055
Northern											
Mallee	787	756	725	696	668	642	616	591	568	545	523
Pipeline											
Headworks	591	576	561	546	531	516	501	486	471	456	443
Horsham	631	606	581	555	530	505	480	454	429	404	379
Channel zone	590	500	443	413	413	413	413	413	413	413	413
Groundwater zone											
Southern towns	749	734	719	704	689	674	659	644	629	614	599
Southern towns	542	530	520	509	500	490	480	470	460	445	433

Appendix D. Overview of Wimmera Mallee Pipeline

The current channel supply system provides an inadequate level of security of supply to meet the needs and expectations of the region. Domestic and stock supply customers experience restrictions in more than one year in every five. This equates to a security of supply of only 78%. Full urban supply is provided in 83% of years, as it has a higher priority in years of drought. That still means restrictions at least one year in every ten. In comparison, recreational lakes in the region receive no supply at all, three years in every ten.

Current supply and demand figures are based on the security of the system for the period from 1903 to 2000. Modelling of low flows, representative of the last ten years of drought, demonstrate that the current channel supply system would be unable to sustainably supply consumptive and environmental demands without significant reconfiguration of the existing system.

The WMPP provides for this reconfiguration and is the major strategic water supply augmentation for the region. The WMPP will provide 96% security of supply for urban and rural customers and will also provide great flexibility in meeting projected urban needs throughout much of the region.

Modelling of the effect of the median climate change and low flows scenario on the WMPP will need to be considered in the next UWSDS period. Some urban supply systems outside of the WMPP area require local solutions that are currently being developed. The timeframe for requiring these additional measures, other than the WMPP, is beyond the next Water Plan period.

The Wimmera Mallee Pipeline Project is a \$501 million investment in regional water infrastructure. The project will result in a higher reliability, higher quality water supply to farms and towns across the region. Rather than many properties and towns relying on a single channel run each year to supply their needs, the system will deliver water 24 hours a day, 7 days a week.

The pipeline will result in an average of 83,000 ML/annum being returned to the Wimmera and Glenelg River systems. This is added to the environmental entitlement of 35,000 ML already generated by the Northern Mallee Pipeline, giving the Wimmera and Glenelg Rivers and the Wimmera terminal lakes close to an extra 120,000 ML per annum on average. An allocation of 1,000 ML of water each year to off-stream water bodies and wetlands recognises the value of the range of habitats in the region.

A further 20,000 ML/annum will be available for regional development. The new system will also make available a further 3,000 ML of water for recreational lakes in the region.

The pipeline will replace approximately 17,500 kilometres of open earthen channels with approximately 8,800 kilometres of pipe. The system will reticulate water to approximately 2 million hectares including 36 towns.

Water savings resulting from the completion of the WMP will enable more flexible operation of the 12 reservoirs that service the existing distribution system. While the primary purpose of the reservoirs is to ensure security of supply, it is recognised that they play a major role in the areas of tourism, the environment, recreation and flood mitigation.

One of the key issues facing the region is the pressure on the Wimmera and Glenelg River systems. These rivers supply and sustain wetlands of international significance, provide a social and environmental focus for many in the region, and provide water for stock, domestic and irrigation uses. The Wimmera and Glenelg Rivers are under stress, leading to the serious consequent issues of salinity, loss of habitat, protecting biodiversity and other impacts.