PRICEWATERHOUSECOOPERS

Essential Services Commission

Urban and Rural Water Price Review 2008: Assessment of Demand Forecasts

Final Report

March 2008

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1 Introduction

PricewaterhouseCoopers (PwC) has been engaged by the Essential Services Commission of Victoria (ESCV) to undertake a review and assessment of the demand forecasts prepared by the Victorian urban and rural water businesses.

The businesses have prepared these forecasts for inclusion in their water plans that set out the revenue and expenditure they propose to undertake over the years 2008-09 to 2012-13. The ESCV is currently undertaking a water price review that will assess the reasonableness of the proposals set out in the businesses' water plans.

The outcome of PwC's review of the businesses' demand forecasts will be an input into the ESCV's consideration of the businesses' water plans.

1.1 Objective of this review

PwC has been asked by the ESCV to provide advice on whether the demand forecasts proposed by the urban and rural businesses:

- have been developed using appropriate forecasting methodologies or approaches, given the materiality of the forecasts for the businesses' revenue and resulting prices
- reflect reasonable assumptions about the key drivers of demand, including the impact of supply restrictions
- use the best available information, including historical data that can support trends in demand, and
- take account of current demand and economic conditions.

In providing this advice, PwC is expected to have regard to:

- any guidance issued by the ESCV with respect to how it will assess the businesses' proposed demand forecasts;
- the information set out in the businesses' Water Plans (and accompanying templates) and any explanations that the businesses provide with respect to the basis used to derive the forecasts including any assumptions used;
- comparisons amongst the businesses of their forecasting methodologies and assumptions and resulting forecasts;
- relevant Victorian Government policies related to the water industry that impact on demand management, pricing, water conservation, metering and recycled water;
- any readily available data and information that PwC has available to assess demand forecasts; and
- PwC's own experience in preparing and assessing the veracity of forecasts of demand for rural and urban water services in Victoria and other Australian states.

If PwC does not believe that the businesses' proposed demand forecasts reflect these requirements, it is required to provide the ESCV with an alternative forecast. PwC has also

been asked to identify any implications of adopting an alternative demand forecast for the relevant businesses' operating or capital expenditure requirements and/or prices.

1.2 Limitations

This report has been prepared consistent with the terms and conditions agreed to between PwC and the ESCV for the provision of services.

It has been prepared by PwC for the ESCV for the sole purposes of providing an indication of whether forecasts of demand for services prepared by the water businesses are reasonable. While PwC understands that the ESCV will make this report publicly available it is not intended to be relied upon by any person other than the ESCV, nor is it to be used for any purpose other than that articulated above.

Accordingly, PwC accepts no responsibility in any way whatsoever for the use of this report by any other persons or for any other purpose.

This report has been prepared using information provided to the ESCV and PwC by the businesses in their Water Plans and information templates. We have also relied on the responses that we have received from the businesses in response to information requests that we have had.

Importantly, PwC has not undertaken any independent verification of the reliability, accuracy or completeness of this information. Therefore, it should not be construed that PwC has carried out any form of audit or other verification of the adequacy, completeness, mathematical accuracy, or reasonableness of the information provided by the businesses and upon which this report is based.

1.3 Structure of this report

The remainder of this report is structured as follows:

- Chapter 2 assesses the key assumptions used by the businesses in developing their demand forecasts
- Appendix A provides our assessment of each of the urban water businesses' demand forecasts, and
- Appendix B provides our assessment of each of the rural water businesses' demand forecasts.

Two of the businesses — GWMWater and Lower Murray Water — provide both rural and urban water services. The urban and rural components of these businesses have been dealt with separately in appendices A and B.

2 Assessment of the key assumptions

In this chapter, we set out the framework that we have used to assess the key assumptions that most businesses have applied to develop their demand forecasts and provide our view on what the value of these assumptions might be over the next regulatory period. Our views on these assumptions are then used to assess each business's forecasts and the methodology and assumptions in developing their forecasts in appendices A and B.

2.1 Urban water businesses

In developing their demand forecasts for the 2008-2013 price review, each of the urban water businesses has made assumptions in regard to:

- future growth in customer numbers;
- the impact of climate change and the likely level of water inflows into their systems over the period;
- the likely level of water consumption restrictions that will apply; and
- the impact of water conservation measures, including the effect of increased prices on water consumption.

While there is a degree of commonality between the businesses, each has assumed a different combination of these scenarios when developing their forecasts. For example, some have factored in a price elasticity impact while others have not. Some businesses have assumed extremely low water inflow conditions will continue while others have assumed that the level of water inflows will improve as the present drought conditions give way to more normal rainfalls.

In this section, we set out our approach to assessing the assumptions used by the urban water businesses and set out some high level findings from our review. An analysis of each urban water business's assumptions is set out in appendix A of this report.

2.1.1 Approach to assessing the assumptions used

To assess the assumptions used by the businesses, we have used the following principles as our starting point:

1. Consumer behaviour and water consumption patterns should not vary significantly between the businesses. The profile of consumption by a resident in Horsham should not vary to any large degree from a consumer in Bright.
2. Consumers across the state will behave in a similar way when confronted with increased water prices. That is, price elasticity should be fairly consistent across Victoria.
3. Weather patterns should be fairly consistent across the businesses given the size of the territory of Victoria. It is unlikely that climate change will affect one business more severely than another neighbouring business or that an easing of drought conditions occurs only in one business's supply area and not others.

4. Water conservation measures will have similar impacts upon consumer consumption patterns regardless of where the consumer is located.

Despite these principles, we recognise that there may be local conditions, demographic patterns or other reasons that may make it reasonable for a business to use different assumptions from other businesses to develop its forecasts. To test whether this is the case, we have engaged with the business concerned to understand why its assumptions differ from the other businesses. We have also requested that the business concerned provide information or analysis that supports the assumptions they have used.

The other consideration that has framed our assessment has been the evidence available from third party or independent sources. Where possible, we have sought to identify independent third party views on:

- likely rainfall patterns over the next regulatory period and the effect of climate change upon water inflows;
- price elasticity impacts and the effectiveness of the various non-price water conservation measures proposed by the businesses; and
- future population trends and changes in demographics.

Where available, we have tested the assumptions used by the businesses against the information and evidence available from these sources.

Again, we recognise that there may be reasons why the conditions being experienced by a particular business may warrant the use of an assumption that deviates from the views of these third party sources. We have engaged with the business concerned to understand why the assumption they have used varies and requested that further information or evidence be provided in support of their approach.

In late January PwC provided the ESCV with a draft report of its assessment. In this draft report, we had adjusted the businesses' forecasts where the information provided had not supported the assumptions they had used or where information had not been forthcoming from the business. In most cases, we adjusted the forecasts to bring them into line with the assumptions used by the other businesses and/or the evidence available from third party sources. In doing so, we gave consideration to local conditions and modified the final assumption used to develop a revised set of forecasts.

We stressed that the forecasts set out in that report were a draft view on the businesses' forecasts and that there remained issues or questions on the forecasts that we wished to resolve before providing our final view on the forecasts. Further communications with the businesses occurred prior to the final report to ensure that we fully understood the businesses' forecasts and we had all the information we needed to formulate a final view on the businesses' demand forecasts.

The majority of businesses provided submitted responses to the draft report. These responses and further communications with businesses form the basis for any further amendments we have made to the forecast demands in this final report.

In some instances the businesses were able to provide further information supporting their original water plan forecasts and we have adjusted our final forecasts accordingly.

Some businesses took the opportunity to materially revise their water plan forecasts.

- GWMWater revised its forecasts to reflect better information regarding the Grampians Wimmer Mallee Pipeline.
- North East Water revised its forecast consumption in response to our draft report
- Westernport Water revised its full demand schedule after discovery of an error in its base year.

Our analysis in this final report is based on the latest demand revisions submitted by the businesses.

2.1.2 Assessment of the urban water businesses' key assumptions

As noted above, the urban water businesses have referred to four key assumptions underlying their demand forecasts — population growth and demographic changes; climate change and likely water inflows; restriction levels applying to water consumption; and price and non-price water conservation measures.

In most cases, it has been extremely difficult to understand the detailed methodology that the businesses have used to develop their demand forecasts. In a number of cases, the impression provided is that the businesses have simply used their 'best guess' at future demand. While more robust methodologies would be preferable, we have some sympathy with this approach given the current severity of the drought in some districts and the large uncertainties over future rainfall patterns.

The Victorian water sector appears at the centre of a confluence of events and uncertainties that make predicting water demand difficult. Much of the State is suffering severe drought conditions and it remains very uncertain whether these conditions will continue or whether normal rainfall patterns will return. Even if normal rainfall levels return, there are water conservation and demand management programs being implemented that may modify future demand patterns from those seen in the past. One of the largest uncertainties confronting this review has been how customer behaviour responds to the lifting of water restrictions and how fast this response will be.

Despite these uncertainties, we have had to formulate a view on the outlook for water supplies and the likely customer response to the lifting of restrictions and implementation of water conservation measures in order to assess the assumptions that the businesses have made. In formulating this view, we have given consideration to the views and analysis provided by the businesses as well as the views and information of third party sources, such as the CSIRO and Bureau of Meteorology.

However, the uncertainties concerning the future have led us to err on the side of caution where we have been confronted with conflicting analysis and information. We believe that this approach is necessary to ensure that we do not recommend a set of forecasts that are overly optimistic and thus which could affect the future revenues that these businesses earn.

In the sections that follow, we set out our views on the likely trend in population and demographic changes, water inflows and resulting restriction levels and the effectiveness of water conservation measures. These views are used to assess the assumptions that have been used by the business when evaluating their forecasts. A business-by-business assessment is provided in appendices A and B of this report.

Population growth and demographic changes

Most businesses have forecast an average per annum growth rate of between 1% and 1.5% for customer connections. The exceptions are:

- Western Water which is forecasting much higher growth due to expected strong population growth as a result of the Melbourne 2030 strategy; and
- GWMWater which is forecasting much lower customer connection growth due to declining fertility rates and its ageing population.

To develop their forecasts, most of the businesses have relied on the Victorian Government's *Victoria in Future* report (VIF 2004). As the population groupings contained in the VIF do not often translate directly to the water businesses' supply areas, the businesses have adjusted the forecasts in the VIF using local council and/or historical information to develop a population forecast for their water supply area.

We agree with the businesses' use of the VIF forecasts as the starting point for developing a set of customer number forecasts.

As a result, the issue that we have focussed on in this review is the methodology that the businesses have used to:

- translate the VIF forecasts into population forecasts for their supply area;
- adjust the population forecasts into a customer number forecast;
- forecast water supply connections for non-residential customers; and
- forecast the number of customers connecting to the wastewater and trade waste system.

Few of the businesses explained in their water plan the detailed methodology that they have used to translate the VIF forecasts into population forecasts for their water supply area. While some noted that they have used local council or historical information to adjust the forecasts, there was no detail on how this additional information had been used or what adjustments were actually made.

Where we have had reservations regarding the forecast growth rate in customer connections we have discussed the methodology used to derive the forecasts with the business.

Most of the businesses have forecast that the growth in residential customer connections will be above the expected population growth rate forecast by VIF. The higher growth rate aims to take account of ageing populations in many of the urban communities that these businesses serve. In their view, an ageing population will result in more single occupancy residences and thus a greater number of connections than suggested by population forecasts.

We believe that increasing the growth in connections above the population growth rate is appropriate as the information presented in VIF indicates that single occupancy residences will increase in number over coming years. The VIF report projects two key expectations about Victoria's population:

1. As the population ages and as increasing numbers of people do not have children, Victoria will see strong increases in lone person or couple without children households.

2. One of the key impacts of population growth that will be visible in the future will be the rapid growth of households compared to total population growth. In almost all areas of the state, household growth will outpace population growth due to declining average household size.[1]

In most instances, we have found no issues with the way that the businesses have made this adjustment to their expected forecasts and thus we believe that most of the residential connection forecasts presented by the businesses are reasonable.

However, we note that there was at least one instance in which the ViF forecasts for last few years under-forecast actual connections growth for one business. For this business, we did not believe that the ViF forecasts were an appropriate basis for assessing the customer connection forecasts of the business concerned.

The businesses have used a variety of methods to forecast non-residential connections. Some have applied the same growth rate that they have used to forecast residential connections because both types of customers have grown at similar rates in the past. Similar relationships have been used to forecast wastewater demand and trade waste demand. For example, one business applied the same forecast growth rate to non-residential customers as it did to residential customers as both types of customer connections have historically grown at similar rates.

Generally, where the growth rates in non-residential connections, wastewater connections and trade waste connections have been forecast using the historical relationships between residential, non-residential, wastewater and trade waste growth, we have tended to accept the forecasts generated as reasonable.

In only a few cases are we of the view that the customer connection forecasts provided by the businesses require adjusting. As a result, we have used the customer connection forecasts as a check of any adjustments we have made to the volume forecasts. Any adjustment to the volumes should not result in unrealistic changes in the average consumption levels that the forecasts produce.

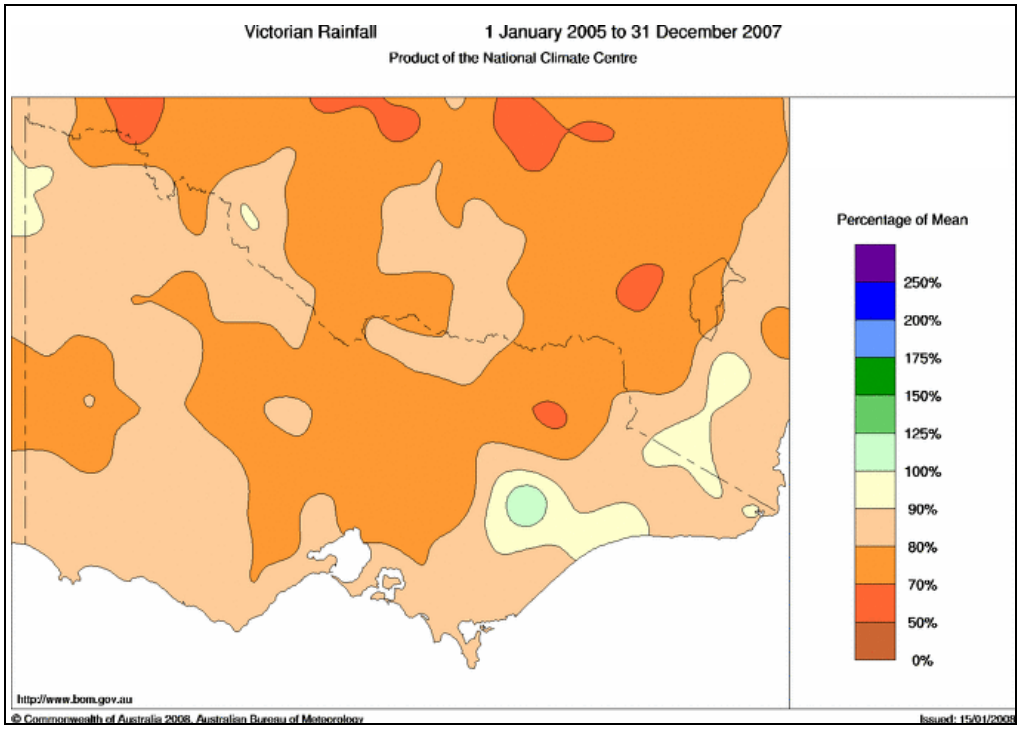
Water inflows, climate change and restriction levels

One of the key factors that the businesses have considered when developing their demand forecasts has been their expectations about the availability of water over the next regulatory period. Most areas of Victoria are currently experiencing some level of drought which has reduced the availability of water supplies and thus forced demand reductions upon customers. In some cases, dam levels are critical, severe restrictions apply and the water authority is investigating alternative sources of supply, including trucking water in from other districts.

Figure 1 shows that rainfall levels have been between 70 and 90% of mean rainfall levels over the last three years, indicating the extent of the drought in some areas.

[1] Victoria in Future 2004 Overview Report, Department of Planning and Community Development, p. 5

Figure 1: Rainfall in Victoria, January 2005 to December 2007, percentage of the mean



One of the key factors that will influence the level of water demand over the next regulatory period is whether there will be an easing of drought conditions and a return to more normal rainfall levels resulting in an increase in consumption as water becomes more readily available.

Consistent with our framework, we have sourced information from third party sources where possible to develop a view on a likely scenario for water inflows over the next regulatory period. In particular, we have sought information from these sources on expected weather patterns and likely rainfall levels and the impact of climate change on weather and rainfall levels.

There is a great deal of uncertainty over what rainfall levels will occur in the future and, in particular, how climate change will affect the pattern and quantity of rainfall. Due to this uncertainty, we believe more cautious assumptions on these matters are preferable to minimise the risk that we recommend demand forecasts that are overly optimistic. However, we are also mindful of excessively pessimistic assumptions that may lead to forecasts that are overly conservative.

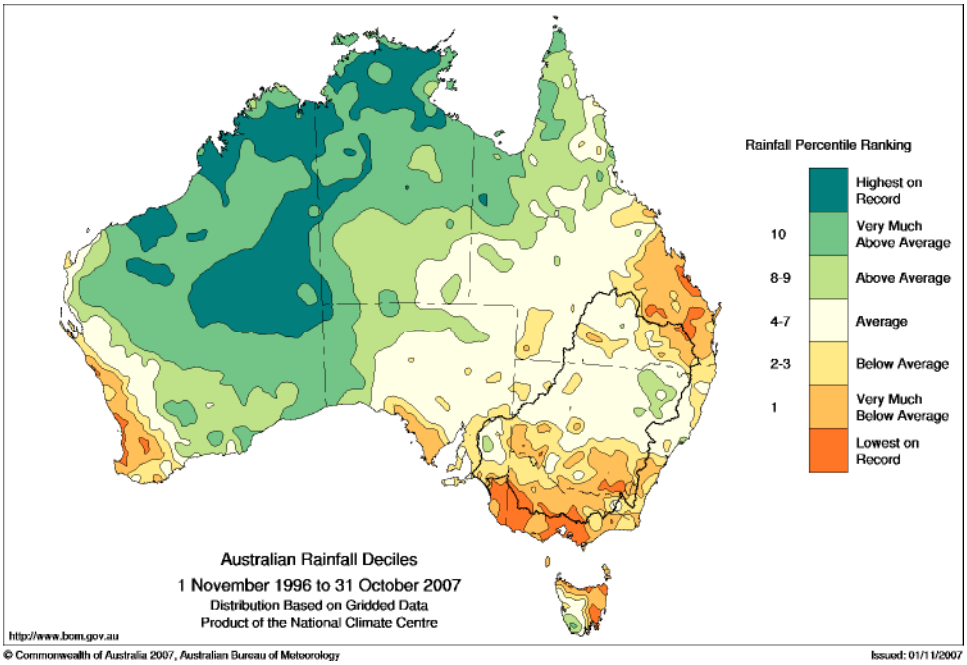
Water inflows and restriction levels

Some of the businesses have developed their forecasts assuming a low water inflow scenario. A low inflow scenario predicts future inflow levels using an average of the last 10 years of inflows.

The majority of these businesses reside in the western districts of the state where drought conditions appear worst.

Given the extended drought period experienced in Victoria, the average inflows used by these businesses would be below long term averages and thus imply that they expect severe drought conditions to continue. Figure 2 sets out the rainfall percentile ranking for the last 11 years, confirming the extremely dry conditions that have prevailed over much of Victoria during this period.

Figure 2: Rainfall percentile ranking, Australia, 1995 to 2007



We have attempted to source information on the most likely rainfall scenario over the next 5 to10 years from the Bureau of Meteorology and other agencies. However, very little is publicly available on the likely rainfall scenario going forward. Available forecasts only extend out over the next twelve months, whereas we require forecasts for the next 6 to 7 years.

While we understand the severity of the drought conditions occurring in some areas, we have assumed that the next regulatory period will see a return to a 'medium climate change rainfall scenario'. This scenario is one of gradual climate change based on the long run average (the past 50 to 100 years) of inflows.

In our view, this scenario provides a reasonable 'middle ground' between the low inflow and high inflow scenarios available and thus provides the right balance of risks over the period. We note that many of businesses have assumed a medium rainfall scenario over the next regulatory period when developing their forecast demand.

We are of the view that the medium inflow scenario should be modified to account for the broad community acceptance of climate change. The CSIRO is predicting that climate change will lead to annual, winter and spring rainfall decreasing whereas changes to summer and autumn rainfalls are less certain. Overall, the CSIRO believe that the effect on Australian rainfall by 2030 will be as follows:

> Best estimates of annual precipitation change represent little change in the far north and decreases of 2% and 5% elsewhere. In summer and autumn decreases are

> smaller and there are slight increases in the east. Decreases of around 5% prevail in winter and spring, particularly in the south west where they reach 10%.[2]

Thus, while we have assumed a medium inflow scenario, we expect inflows to be less than the average over the last 50 to 100 years because of the declining rainfalls expected under climate change.

Assuming a medium rainfall scenario (with climate change impact) suggests that water restrictions will ease over the period and consumption will return to levels similar to pre-drought levels. How quickly customers return to consumption patterns and levels that were prevalent prior to restrictions coming into effect will influence the rate of growth in water demand over the period.

We have not been able to source information or research that examines how rapidly customers return to earlier consumption levels and patterns as water restrictions are lifted. However, several water businesses have anticipated that consumption will return to between 70% and 90% of pre-restriction levels over a two year period.

To assess the bounce back in consumption following the easing of restrictions, we have assessed each business's assumption on a case-by-case basis using a return to between 70% and 90% of pre-restriction levels over a two year period as a benchmark. In this assessment, we have given consideration to the reasons the businesses have given for the pattern they have assumed where such information has been provided.

Some of the businesses believe that many of the water conservation measures introduced in recent years, such as water efficient appliances, as well as greater public appreciation of water and the impact of restrictions on their consumption behaviour will lead to permanent declines in water consumption. Thus, even with increased water inflows and the removal of restrictions, these businesses believe that baseline water consumption will be lower than the baseline level that has occurred in the past.

Despite some businesses assuming a low inflow scenario, we have found that few of the volume forecasts that they have submitted require adjusting to reflect a medium inflow scenario. Most of these businesses will be the beneficiaries of alternative water supplies — in particular the Goldfields Pipeline — that will come on line during the period. Thus, even though these businesses have forecast low inflows, their water demand forecasts anticipate the complete removal of restrictions and strong growth in consumption levels as the supplies from these alternative sources become available.

Water conservation measures

The final factor that we have considered in reviewing the businesses' demand forecasts is the effectiveness of the water conservation measures that they intend implementing over the period. Under their Water Strategies, each business has committed to reducing mid 1990s average consumption levels by 25% by 2015.

Water conservation measures are the primary tool that the businesses' intend to use to achieve this target and thus we have examined how their assumptions regarding the effectiveness of these measures have been factored into the forecasts.

[2] CSIRO 2007 Climate Change in Australia — Technical Report, p. 67

Water conservation measures can be price-based or non-price based. In our view, price is a water conservation measure that can be used by a business to encourage more efficient use of water. The measure of price elasticity can thus be considered a measure of how effective price is as a water conservation measure.

Price-based measures (price elasticity)

Only five of the water businesses have taken into account the impact of changing prices on residential demand through assumptions about the price elasticity of demand (see table 1). Where it has been applied, it has often been unclear from the plans what elasticity figures has been used and/or how the measure used has been translated in the businesses' demand forecasts.

Most of the businesses have not incorporated elasticity impacts into their forecasts for non-residential demand. The water plans did not provide any obvious reasoning for why this was the case.

To assist the analysis, where a business has not incorporated price elasticity impacts, we have assumed that they believe price elasticity is zero and thus we have assessed their assumption to apply a zero price elasticity measure.

Table 1: Price elasticities applied by selected businesses in their water plans

Business	Thresholds	Elasticity measure
Barwon Wate	n.a.	-0.6
Lower Murray Water	0-300kL	-0.05
	300-600kL	-0.2
	>600kL	-0.3
North East Water	Indoor consumption	10% price increase will result in a 0.5% reduction in demand
	Outdoor consumption	10% price increase will result in a 1.5% reduction in demand
Western Water	0-53kL	0
	53-106kL	-0.1
	>106kL	-0.1

Consistent with our framework, our starting point for assessing the price elasticities used by the businesses has been third party views. For this purpose, we have sourced price elasticity information from the Water Supply Association of Australia (WSAA) which has published the following price elasticity figures:

- Indoor consumption — for every 10% increase in price there will be a 0.5% reduction in demand; and

- Outdoor consumption — for every 10% increase in price there will be a 1.5% reduction in demand.

In analysing the businesses' demand forecasts, we have assessed the extent to which price impacts can explain any slowing in future water demand growth rates. For example, one business is proposing to introduce large price increases in the next regulatory period and, at the same time, is forecasting a slowing in demand growth compared with recent history. Applying the WSAA elasticity estimates to the anticipated price increases accounts for almost all of the slower growth and thus we have accepted their volume forecasts.

Some businesses have not assumed any price impact on demand in the future because, under the current level of restrictions, they do not believe that price will have a noticeable impact upon customer usage. Customers in these water supply areas are already subject to stage 3 or 4 restrictions while effectively ban all outdoor usage.

We also are of the view that in those areas where stage 3 or 4 restrictions currently apply, customers have already reduced their discretionary consumption to such a point that price will have little impact on usage.

This is borne out by the WSAA elasticity measures that suggest that price elasticity for indoor residential use under normal supply conditions is quite low. Under stage 3 and 4 restrictions, customers have severely curtailed or eliminated altogether their outdoor use of water. As a result, it is unlikely that residential water usage will respond noticeably to price increases.

While considering a low or zero price elasticity may be appropriate under current supply conditions and restriction, the task that we have had to consider is how restriction levels may change in the future. This in turn is dependent on the likely rainfall scenario assumed going forward and/or the coming on line of alternative water supply sources.

We believe that higher rainfall levels in the future will see an easing of restrictions and thus consumers will begin to increase their discretionary use. As a result, we expect them to respond more noticeably to price elasticity impacts, although the absolute price elasticity impacts will remain quite low.

For the draft report and this final report, we have applied a 0.07 price elasticity to the demand forecasts where we have believed this necessary. 0.07 has been derived by taking the weighted average of WSAA's price elasticity estimates with the weights based on 80% indoor use and 20% indoor use.

The elasticity adjustments made to the businesses' forecasts were based on the prices that the businesses had set out in their water plan templates. If the ESCV adjusts the businesses' prices as a result of its price review, then this may affect the price elasticity adjustment made to the businesses' forecasts.

Non-price water conservation measures

Most of the businesses propose implementing non-price water conservation measures over the next regulatory period. The measures include water efficient appliance programs, indoor retrofitting and business efficiency programs.

Most businesses also indicate that they intend to maintain permanent water saving rules. These rules limit the extent of water use for outdoor activities such as odd/even day watering programs and prohibitions on pavement watering.

In most cases, non-price water conservation programs have been introduced to achieve the business's water conservation targets set out in their Water Strategy. In these Strategies, the businesses have committed to achieving 25% reductions in water use by 2015 from mid-1990 levels.

The level of information provided by the businesses in support of the water savings that will be achieved by the proposed water conservation programs and water savings rules varies.

Some businesses have used the results achieved in metropolitan areas such as Melbourne and Sydney to quantity to anticipated benefits of these programs. In most instances, where anticipated water savings have been supported by such information, we have tended to accept the savings proposed.

Other businesses have not provided similar independent support for the savings that they anticipate they will achieve over the period. In some cases, the business has stated that certain programs will be implemented with little justification of the water volume savings they have assumed when developing their forecasts.

In the draft report we queried the assumptions used by a number of businesses and adjusted the forecasts upward to discount the effect of water conservation programs in their forecasts. Most of the affected businesses were able to provide further information in response to the draft report. This information was in most cases sufficient to provide us with confidence in the assumed benefits of the conservation programs.

2.1.3 Conclusions

We have amended several of the water businesses demand forecasts. In most cases, it is the water volume forecasts that have been altered because we believe that they are based on overly conservative assumptions, particularly in regard to the rainfall outlook. In these cases, we have adjusted the forecasts upward to reflect our assumption of a medium rainfall scenario going forward. Price elasticity impacts have also been applied in some cases.

We have also made adjustments to some of the customer number forecasts because they have also appeared overly conservative. These adjustments have had flow effects to the water volume demand forecasts and thus these have also been altered to maintain a realistic average consumption level.

2.2 Rural water businesses

There are five water businesses that provide rural water services — Lower Murray Water; Grampians Wimmera Malley Water; FMIT; Southern Rural Water; and Goulburn Murray Water. Their primary role is to supply irrigation water in line with the water entitlements that govern the allocation of this water. They also supply stock and domestic allocations and some provide drainage services to their irrigation customers.

2.2.1 Approach to assessing the forecasts

The approach we have taken to assessing the rural water businesses' forecasts has been to compare the forecasts against the available history.

Under normal rainfall scenarios, we would expect to see a fairly consistent trend of increased usage and increasing number of customers. However, we have been conscious of the extent of the drought and the extremely low dam levels prevalent in a number of the irrigation

districts. We are also aware that many river and groundwater systems have been capped preventing the water business from issuing any further licences to use these resources.

Hence, while the available history has provided a starting point for our analysis, we have given close consideration to the factors influencing supply in the businesses' supply area and what this will mean for demand over the next regulatory period.

Some of the conclusions on the assumptions that we have made in regard to the urban water businesses are also relevant to the rural water businesses. This is particularly the case regarding our view on the rainfall outlook.

Consistent with the conclusion we have come to for a medium climate change scenario going forward, we have expected the same conditions to apply to the rural water businesses and thus we expect that water demand will increase in rural areas over the regulatory period.

2.2.2 Assessment of the rural water businesses' key assumptions

The key factors that the rural businesses' have given consideration to when developing their demand forecasts include number of irrigation licences; water supply conditions and the availability of alternative water sources; water trading outcomes, and improved irrigation practices.

It should be noted that the businesses have not all assumed the same set of assumptions when developing their forecasts. As a result, we have not set out our analysis of their assumptions in this section and instead address each business individually in section 4 of this report.

As with the urban water businesses, it has often been difficult to gain a detailed understanding of the methodology the rural water businesses have used to forecast demand in their supply areas.

2.2.3 Conclusions

For the final report, we made adjustments to the demand forecasts provided by one rural water business to reflect a medium inflow scenario and adjust for incorrect use of historical data.

A URBAN WATER BUSINESSES

Central Highlands Water (CHW)

CHW's forecasts for the 2007-08 to 2012-13 period are as follows:

- Residential and non-residential water demand is predicted to increase by an average of 10.0% and 11.8% per annum, respectively. Growth is driven by predicted increases in customer connections and the assumption that restrictions will gradually ease over the regulatory period, with these effects moderated to some extent by CHW's water conservation/demand management strategy (focused primarily on the Ballarat system).
- However, the very high growth rate in water demand reflects very low levels of water consumption in 2007-08 due to Stage 4+ restrictions. Over 2005-06 to 2007-08, residential and non-residential demand declined by an average of 15.6% and 11.2% per annum, respectively. Recalculating the growth rate to include 2005-06 consumption levels produces average annual residential and non-residential demand forecast growth rates to 2012-13 of 1.9% and 4.7%, respectively.
- CHW's water demand forecasts are based on a 'stepped' climate change scenario (a sudden shift or downward step in rainfall conditions due to climate change).[3] Under this scenario, inflows to the Ballarat catchments were predicted to be 10,790 ML per annum, based on average inflows recorded over the 1997 to 2004 years.[4]
- CHW's predicts that restrictions will gradually be eased over the regulatory period due to supply augmentation measures (such as the Goldfields Pipeline). Its Water Plan assumes that once restrictions are lifted consumption returns to the historical levels applicable at each restriction stage. However, CHW expressed its belief that the current behaviour of its customers in implementing many of their own water saving measures suggests that it is 'unlikely' that this assumption will be realised.[5]
- CHW assumes that its water conservation/demand management program will achieve a 25% reduction in 1990's average usage by 2013 for the Ballarat system (which equates to usage of 187 kL per connection, per annum). For other systems, they are aiming to achieve a 10% reduction by 2055, or 0.2% per annum. Overall, across all CHW's systems, this translates to an average usage of 193 kL per residential connection, per annum, by 2013.

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[3] CHW WSDS, pp 18-19.

[4] In correspondence to PwC and the ESC, CHW has recently reported that its expectations about restrictions have changed since its Water Plan was submitted. Due to low inflows in 2007, it now expects the lifting of restrictions in the Ballarat system to be pushed back by 6 to 12 months for each change (or to have to purchase additional temporary water to make up the shortfall). CHW's Water Plan forecast was based on average inflows to the Ballarat system from 1997 to 2004, however, actual inflows since 2004 now suggest that "there is a very high likelihood that this level of inflow will not be achieved on a regular basis" – which will result in either higher levels of restrictions or the need to purchase temporary water. (According to CHW, the average yield over 2005 to 2007 has been 3,333 ML per annum, which is around 7,400 ML per annum less than the assumptions in the Water Plan.)

[5] CHW response to ESC/PwC, 18 December 2007.

- According to CHW, it has been unable to quantify the impacts on demand in response to the introduction of a rising block tariff and predicted price increases. It also noted that research has shown that water demand is relatively price inelastic, and that due to the high level of water restrictions predicted for its major systems of Ballarat, Maryborough and Daylesford during much of the regulatory period, demand is forecast to be at consumption levels that include little discretionary usage. Consequently, CHW has made no specific allowance for price effects in its demand forecasts – although it does state that "it is assumed that the elasticity of demand will assist in achieving the demand management savings assumed."[6]

- Residential water connections (an average of 1.2% per annum) are forecast to grow at a slightly greater rate than non-residential water customers (1.0%). CHW's customer growth forecasts are based on VIF population predictions, "with adjustments for local information". Population growth forecasts have then been converted to connection growth forecasts, so that connection growth rates marginally exceed population growth rates (in line with changing demographic trends such as smaller households).

- Residential wastewater connections are also anticipated to growth at a faster rate than non-residential connections: 1.3% for residential customers and 1.1% for non-residential connections.

- CHW forecasts non-residential wastewater (sewerage) demand to increase by an average annual rate of 1% (which equates to a growth rate of zero on a per connection basis). This implies that the ratio of non-residential wastewater consumption to water consumption would decline from historic levels, from around 13% to 10% over 2004-05 to 2007-08, to 8% by 2013.

Customer connections

In our Draft report we noted our concern that CHW's forecasts of residential connections (1.2% per annum over 2007-08 to 2012-13) is low compared to the VIF *household* growth rate estimates for the Central Highlands (an average of 1.6% per annum). We also note that CHW's residential connections grew by an annual average rate of 1.9% per annum over the three years from 2005/6 to 2007/8; and, for the Ballarat system, by an average of 2.0% per annum from 2000 to 2005.

In response our concerns, CHW acknowledged that growth in connection in recent times have been strong, and greater than *VIF population* forecasts. It appears that CHW has adjusted VIF *population* growth rates up to account for recent higher historical growth rates in *connections*. For instance, its demand model for the Ballarat system notes VIF population growth rates for 2000 to 2009 and for 2010-2019 of 1.25% per annum and 0.99% per annum respectively, but actually applies growth rates of 1.60% per annum and 1.32% per annum over these periods in recognition of high growth rates in recent years. CHW's model for the Ballarat system states that the:

> *Trend in connection growth in designed to follow trends shown in VIF forecasts, except for the short-term. Analysis of recent trends indicates stronger than expected short term growth. Housing affordability and fast train service are important factors.*

CHW's Water Supply Demand Strategy states that:

[6] CHW response to ESC/PwC, 18 December 2007.

Since 2000, the Ballarat and district water supply system has experienced strong water connection growth at a rate of 1.88% per annum on the back of substantial employment growth in service industries, expansion of core manufacturing industries, growth in agricultural industries, and external population growth pressures.

The pattern of growth is expected to continue into the future, with numerous regional projects and strategies generating ongoing opportunities for growth, including

- *the regional growth corridor strategy;*
- *Deer Park freeway bypass project;*
- *fast train project;*
- *upgrades to the local transport network;*
- *residential development strategies;*
- *business and industry initiatives; and*
- *education and research opportunities.*[7]

Given this strong expected growth in both population and development in general for the region, we have adjusted CHW's forecast residential water and wastewater connections up to reflect VIF's household growth projection for the Central Highlands (an average of 1.6% per annum over 2007-08 to 2012-13).

Due to the forecasts of strong growth for the region as a whole, we have also adjusted CHW's forecast non-residential water and wastewater connections up by the same rate. As mentioned above, CHW's has forecast residential connections to grow at a slightly higher rate than non-residential connections.

However, we note that non-residential connections grew at a slightly higher average annual rate than residential connections over the three years from 2005/6 to 2007/8 (2.0% for non-residential connections, compared to 1.9% for residential connections)[8]. We see no reason why non-residential connection growth would not match residential connection growth over the regulatory period.

Water demand

CHW has predicted average residential and non-residential water consumptions per connection will increase by 7.5% and 4.9% per annum over the 2008-09 to 2012-13 regulatory period, respectively. This increased growth is primarily due to the Goldfields Pipeline coming on line in 2008, which will augment water supplies in CHW area.

We note that CHW has used a 'stepped' climate change scenario in predicting water inflows and future restriction levels. However, we have not adjusted CHW's forecasts to align it with our view of a medium water inflow scenario because they incorporate an increase in future water supplies from alternative water sources rather than increasing rainfall levels.

Table A.1 below lists the forecast restriction regime for the Ballarat system, which accounts for approximately 80% of total CHW supply, and the residential and non-residential per connection water demands for the CHW water system as a whole. Our Draft Report queried why CHW believes high level water restrictions will remain in place until 2011, when the Goldfields Pipeline is scheduled to commence operation in 2008. In response, CHW

[7] CHW, 2007, *Water Supply Demand Strategy – Ballarat and District Regional Water Supply Strategic Plan 2006 to 2055*, p 16.

[8] Sourced from ESC performance data.

referred to its mean storage level forecast (Appendix D of its Water Plan), which determines its forecast restriction level regime (and which includes all supply augmentations, including the Pipeline). CHW also notes that the Pipeline will improve security significantly, but will not alleviate all supply side risk for Ballarat – as allocations from the Goulburn system (where the Pipeline will source its water) over the past two years have been 29% and 53%.[9]

Table A.1: CHW - restriction regime and demand per connection

Service	2006	2007	2008	2009	2010	2011	2012	2013
Restriction level (for Ballarat)	2	4	4+	4	4/3	3/2	1	1
Residential demand per connection (kL)	184	147	127	144	152	169	190	193
Non-Residential demand per connection (kL)	829	876	631	865	895	959	1,032	1,046

CHW's water conservation/demand management strategy is outlined in its Water Supply Demand Strategy (WSDS). This strategy is primarily comprised of several indoor retrofit programs and a 'major consumers' strategy. Our Draft Report noted that a significant feature of this program is also an 'unaccounted water strategy' (saving 415 ML/year across the Ballarat and district water supply system), which would be targeted at augmenting supply rather than reducing demand. In response to our Draft Report, CHW have advised the forecast water savings from this strategy have not been incorporated into its demand model.[10]

CHW does not factor in the effect of specific aspects of its water conservation and demand management program into its forecasts. Rather, its forecasts appear to be dominated by the effects of its restriction regime. In correspondence, CHW indicated that it is confident that its water conservation targets will be achieved because its current regime of restrictions and demand management measures are realising savings of 15% greater than Stage 4 restrictions.[11]

In any case, we believe that CHW's forecasts are reasonable. They predict a strong rebound in consumption towards the end of the regulatory period, following a sustained period of high level restrictions.

However, while we have accepted CHW's per connection demand estimates, we have adjusted total volumes up in line with our adjustments to CHW's connection forecasts.

[9] CHW response to ESC/PwC, 11 March 2008.

[10] Ibid.

[11] CHW response to ESC/PwC, 18 December 2007.

Wastewater demand

In our Draft Report we noted that CHW has assumed that per connection wastewater demand for non-residential customers remains unchanged over the period, despite significant growth in water consumption.

In response, CHW has pointed out that actual per connection non-residential wastewater volumes over 2005 to 2007 remain constant, despite increasing levels water restrictions (and declining level of per connection water consumption). It notes that this shows that non-residential wastewater volumes include minimal discretionary usage "*and consequently will not alter significantly with the changing levels of restrictions and water consumption*." [12]

We have accepted CHW's per connection non-residential wastewater volumes. However, we have adjusted total volumes up in line with our aforementioned adjustments to wastewater connections.

Revised forecasts

Our view on CHW's demand forecasts is that they are reasonable on a per connection basis. However, based on recent historical growth and VIF forecasts, we believe that CHW has underestimated its forecast residential and non-residential connection numbers. We have adjusted connection and total volume forecasts accordingly.

CHW's forecasts and our amendments to these forecasts are set out in the following table:

[12] CHW response to ESC/PwC, 11 March 2008.

				2008-09	2009-10	2010-11	2011-12	2012-13
Water	Residential	Tariff 1	Cust	5,793	5,805	5,818	5,831	5,843
			Revised	**5,797**	**5,839**	**5,882**	**5,924**	**5,964**
		Tariff 2	Cust	46,490	47,073	47,664	48,260	48,867
			Revised	**46,519**	**47,349**	**48,185**	**49,029**	**49,880**
		Tariff 3	Cust	1,433	1,437	1,441	1,445	1,450
			Revised	**1,434**	**1,445**	**1,457**	**1,468**	**1,480**
		Tariff 4	Cust	137	138	138	138	138
			Revised	**137**	**139**	**140**	**140**	**141**
		Tariff 1 (0 to 150kL)	kL	541,408	541,001	641,827	715,157	812,576
			Revised	**541,743**	**544,168**	**648,844**	**726,560**	**829,419**
		Tariff 1 (150 to 300kL)	kL	232,570	232,395	275,706	307,207	349,054
			Revised	**232,714**	**233,755**	**278,720**	**312,105**	**356,289**
		Tariff 1 (Over 300kL)	kL	168,543	168,416	199,803	222,632	252,958
			Revised	**168,647**	**169,402**	**201,988**	**226,182**	**258,201**
		Tariff 2 (0 to 150kL)	kL	4,322,284	4,653,026	5,214,781	5,968,214	6,050,868
			Revised	**4,324,962**	**4,680,263**	**5,271,797**	**6,063,373**	**6,176,293**
		Tariff 2 (150 to 300kL)	Cust	1,587,242	1,708,698	1,914,988	2,191,666	2,222,018
			Revised	**1,588,226**	**1,718,700**	**1,935,926**	**2,226,611**	**2,268,077**
		Tariff 2 (Over 300kL)	kL	596,200	641,821	719,307	823,233	834,634
			Revised	**596,569**	**645,578**	**727,172**	**836,359**	**851,935**
		Tariff 3 (0 to 150kL)	kL	157,169	165,378	165,560	165,743	165,927
			Revised	**157,266**	**166,346**	**167,370**	**168,386**	**169,366**
		Tariff 3 (150 to 300kL)	kL	74,940	78,854	78,940	79,028	79,115
			Revised	**74,986**	**79,316**	**79,803**	**80,288**	**80,755**
		Tariff 3 (Over 300kL)	kL	59,777	62,899	62,968	63,038	63,108
			Revised	**59,814**	**63,267**	**63,656**	**64,043**	**64,416**
		Tariff 4 (0 to 150kL)	kL	12,197	12,183	12,168	12,154	12,139
			Revised	**12,205**	**12,254**	**12,301**	**12,348**	**12,391**
		Tariff 4 (150 to 300kL)	kL	4,338	4,333	4,328	4,323	4,318
			Revised	**4,341**	**4,358**	**4,375**	**4,392**	**4,408**
		Tariff 4 (Over 300kL)	kL	2,918	2,915	2,911	2,908	2,904
			Revised	**2,920**	**2,932**	**2,943**	**2,954**	**2,964**
	Non-Residential / **Concessional**	Tariff 1	Cust	691	691	692	693	693
			Revised	**689**	**694**	**699**	**704**	**708**
		Tariff 1 - Major Cust	Cust	6	6	6	6	6
			Revised	**6**	**6**	**6**	**6**	**6**
		Tariff 2	Cust	4,253	4,305	4,357	4,410	4,463
			Revised	**4,242**	**4,321**	**4,399**	**4,480**	**4,561**

				2008-09	2009-10	2010-11	2011-12	2012-13
		Tariff 2 - Major Cust	Cust	69	69	69	69	69
			Revised	**69**	**69**	**70**	**70**	**71**
		Tariff 2 - Contracts	Cust	1	1	1	1	1
			Revised	**1**	**1**	**1**	**1**	**1**
		Tariff 3	Cust	168	168	169	169	169
			Revised	**168**	**169**	**171**	**172**	**173**
		Tariff 4	Cust	42	42	42	42	42
			Revised	**42**	**42**	**42**	**43**	**43**
		Tariff 1	kL	254,035	253,781	303,846	340,552	389,009
			Revised	**253,357**	**254,730**	**306,808**	**345,923**	**397,546**
		Tariff 1 - Major Cust	kL	60,388	60,327	72,229	80,954	92,473
			Revised	**60,227**	**60,553**	**72,933**	**82,231**	**94,502**
		Tariff 2	kL	1,307,754	1,370,712	1,474,871	1,600,690	1,624,090
			Revised	**1,304,264**	**1,375,836**	**1,489,249**	**1,625,935**	**1,659,729**
		Tariff 2 - Major Cust	kL	2,091,998	2,192,711	2,359,332	2,560,602	2,598,035
			Revised	**2,086,416**	**2,200,908**	**2,382,332**	**2,600,986**	**2,655,047**
		Tariff 2 - Contracts	kL	732,743	768,019	826,379	896,877	909,988
			Revised	**730,788**	**770,890**	**834,435**	**911,022**	**929,957**
		Tariff 3	kL	72,177	74,794	74,787	74,780	74,773
			Revised	71,984	75,074	75,516	75,959	76,414
		Tariff 4	kL	5,442	5,436	5,432	5,426	5,421
			Revised	**5,427**	**5,456**	**5,485**	**5,512**	**5,540**
	Vacant Land		Cust	2,206	2,229	2,251	2,273	2,296
	Fire Service Charge		Cust	885	894	903	912	921
Sewerage	Residential	Tariff 1	Cust	40,606	41,141	41,683	42,234	42,792
			Revised	**41,263**	**41,966**	**42,673**	**43,387**	**44,105**
		Tariff 2	Cust	757	764	772	780	788
			Revised	**769**	**779**	**790**	**801**	**812**
		Tariff 3	Cust	1,035	1,046	1,056	1,067	1,077
			Revised	**1,052**	**1,067**	**1,081**	**1,096**	**1,110**
		Tariff 4	Cust	2,062	2,068	2,075	2,081	2,088
			Revised	**2,095**	**2,109**	**2,124**	**2,138**	**2,152**
	Non-Residential	Tariff 1	Cust	3,327	3,365	3,404	3,443	3,483
			Revised	**3,367**	**3,423**	**3,480**	**3,537**	**3,595**
		Tariff 2	Cust	82	83	84	85	86
			Revised	**83**	**84**	**86**	**87**	**89**
		Tariff 3	Cust	80	81	82	83	84
			Revised	**81**	**82**	**84**	**85**	**87**
		Tariff 4	Cust	194	195	196	197	198
			Revised	**196**	**198**	**200**	**202**	**204**
		Tariff 1	kL	394,589	398,535	402,520	406,545	410,611
			Revised	**399,295**	**405,402**	**411,477**	**417,644**	**423,772**
		Tariff 2	kL	4,286	4,329	4,372	4,416	4,460
			Revised	**4,337**	**4,404**	**4,469**	**4,537**	**4,603**
		Tariff 3	kL	17,307	17,480	17,655	17,831	18,010
			Revised	**17,513**	**17,781**	**18,048**	**18,318**	**18,587**

				2008-09	2009-10	2010-11	2011-12	2012-13
		Tariff 4	kL	36,658	37,025	37,395	37,769	38,147
			Revised	**37,095**	**37,663**	**38,227**	**38,800**	**39,370**
	Concessional	Tariff 1	Cust	408	413	418	422	427
			Revised	**413**	**419**	**426**	**433**	**440**
		Tariff 2	Cust	9	9	9	10	10
			Revised	**9**	**9**	**10**	**10**	**10**
		Tariff 3	Cust	21	22	22	22	22
			Revised	**22**	**22**	**22**	**23**	**23**
		Tariff 4	Cust	26	26	26	26	26
			Revised	**27**	**27**	**28**	**28**	**29**
	Vacant Land	Tariff 1	Cust	1,847	1,866	1,885	1,903	1,922
		Tariff 2	Cust	85	86	86	87	88
		Tariff 3	Cust	56	57	57	58	58
		Tariff 4	Cust	135	136	137	139	140
	New Country Towns	Tariff 1	Cust	-	400	850	850	850
	Maryborough &		kL	62,936	63,565	64,201	64,843	65,491
	Tullaroop		**Revised**	**63,687**	**64,660**	**65,630**	**66,613**	**67,590**