Water Performance Information

on 32 Major Western Australian Towns

1999 / 2003

Western Australia

Economic Regulation Authority

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CHAIRMAN
ECONOMIC REGULATION AUTHORITY

The data in this report was collected by the Office of Water Regulation which was closed on the 1 January 2004. Coinciding with the close of the Office, the Economic Regulation Authority was established and took over performance monitoring responsibilities of water providers. As such, the Economic Regulation Authority has published this report as part of its performance monitoring functions under section 4 (d) of the *Water Services Licensing Act 1995*.

This report details and compares water delivery and performance data provided by the Water Corporation of Western Australia and the Bunbury and Busselton Water Boards as required under their operating licence to supply water in accordance with Part 3 of the *Water Services Licensing Act 1995*.

The overall aim of this report is to provide key stakeholders and others with a greater understanding of the water services in Western Australia. It includes benchmarked data provided by the licensees where water service delivery is being measured on a continuous basis and explains how performance compares and varies over time.

This report is of interest to those who are concerned about the performance of the water industry. It is particularly relevant to water providers and the Minister for the Environment. Information on the current state of affairs in water services will be valuable to these water providers and regulators.

In particular, it is of interest to the Economic Regulation Authority because it will have an expanded role in performance monitoring and it will conduct a price review of the water industry. In the future, performance monitoring and reporting shall be broadened to include comparisons of financial performance, as well as ongoing comparisons of service quality. The scope of the exercise will also be extended to include regional Water Authorities along with the Water Corporation, Bunbury and Busselton Water Boards. Therefore, the format and indicators used in this report may not apply to performance monitoring reports published by the Economic Regulation Authority in the future.

In appreciation for their efforts, the Water Corporation of Western Australia and the Busselton and Bunbury Water Boards are acknowledged for supplying the data required for this analysis.

Lyndon Rowe

Lyndon Rowe
CHAIRMAN

Contents

The Office of Water Regulation (OWR) has evaluated 1999-2000, 2000-2001, 2001-2002 and 2002-2003 water data supplied by the Water Corporation of Western Australia and the Busselton and Bunbury Water Boards. The data relates to 32 major Western Australian towns consisting of 94% of all properties connected to water services.

The data supplied includes information on water services incorporating customer base, water consumption, supply, quality and treatment.

This report describes all water services and where possible, notes any variance between the reporting periods, for both the entire sample and individual towns. It also describes the maximum and minimum values and the highest and lowest percentage variations where appropriate.

Although water supply services have expanded over the reporting period to meet the needs of an increasing population, the volume of water consumed has significantly reduced. This reduction can be attributed to the introduction of water restrictions in designated towns over the last two years. For example, Perth residents have consumed 18% less water per property since the introduction of water restrictions. In contrast, some towns that were not put on water restrictions have consumed more water. It is therefore evident that water restrictions have a notable effect on the volume of water consumed. Interestingly however, some towns that were not put on water restrictions still managed to consume less water over the same period. This suggests that other factors may also contribute to the volume of water consumed.

In total, there was a 16% decline in water consumption between 1999-2001 and 2001-2003, which coincided with the introduction of water restrictions. This saved around 73,611 ML of water over a two-year period.

The average resident consumed around 15% less water between 1999-2001 and 2001-2003. In 2002-2003, this saved around 51 litres of water per person per day (or five buckets of water). Interestingly, Perth residents saved 59 litres per person (18% saving) while regional residents saved 15 litres per person (4% saving).

The majority of water is extracted from groundwater. In 2002-2003, for example, 65% of all water was extracted from groundwater; 76% for regional towns and 61% for Perth. The volume extracted from groundwater has increased over the reporting periods: 55% in 1999-2001 to 65% in 2001-2003. Reduced dam storage brought on by the worst two years on record for dam inflow (2001-2003) has resulted in the need to make greater use of groundwater sources. Subsequently, the standard of water treatment processes has notably increased during the reporting periods because higher volumes of water are extracted from groundwater.

There has also been a marked reduction in the volume of non revenue water in the 2001-2003 period compared to the 1999-2001 (down 34%). Due to water restrictions, Perth was the major contributor to this downturn as it reduced the volume of non revenue

water by over half in 2001-2002 (or down 41% over two years). Most regional towns reduced the volume of non revenue water over a two-year period (down 13%).

In general, the infrastructure for water supply services has expanded. Supply mains have increased around 5% in length during the reporting period; 3% in Perth and 8% in regional towns. The Integrated Water Supply Scheme servicing Perth and other regional towns has steadily increased the number of dams. The number of bores has increased 5% in both metropolitan and regional areas over the last four years. The number of service reservoirs has increased 11%; 6% in Perth and 15% in regional towns. Finally, the number of pump stations has increased 14%; 12% in Perth and 16% in regional towns.

Between 1999-2001 and 2001-2003, the number of leaks and bursts per 100km of water mains has remained stable in Perth (up 5%) but has notably reduced in regional towns (down 23%).

Water quality complaints have remained constant between 2000-2001 and 2002-2003 for both metropolitan and regional areas. However, a number of regional towns experienced notable variations to the number of water quality complaints over the reporting period. In 2001-2002, for example, Bridgetown, Collie and Denmark reported notable increases in water quality complaints. These increases were in the categories of dirty water, taste and odour. The rises in these particular categories are primarily the result of a changeover to new alternative water sources required in response to drought management.

Between 1999-2001 and 2001-2003, the number of confirmed service interruptions greater than one hour has notably increased in Perth (up 61%) but has reduced in regional towns (down 7%). Some of the increases in the number of confirmed service interruptions related to improved reporting procedures rather than actual numbers of interruptions. For example, the system for reporting service interruptions was upgraded in 2001-2002. As a result, the increased number of properties affected by interruptions decreased the average duration of those interruptions because shorter interruptions were captured with the new system.

Perth consumed 72% of all water in 2002-2003. A comparison between Perth and the ‘average’ Western Australian (WA) town identifies the difference in scale of water service delivery. Perth services a population 127 times greater, with 124 times additional connected properties and consumes 81 times more water than the average WA town. It has 11,829 kilometres of water mains compared to 157 kilometres in the average WA town, 321 times more water quality complaints and 270 times more service interruptions. However, compared to regional towns Perth is ‘on average’ no better or worse at providing a water service to the general population, based on the current performance indicators.

Prior to 1 January 2004, the Office of Water Regulation (OWR) licensed the Water Corporation of Western Australia (the Corporation) and the Busselton and Bunbury Water Boards to provide water services in Perth and over 200 Western Australian towns. A condition of these licences is that the licensee must submit prescribed performance data relating to the services provided to the OWR on an annual basis.

This report compares and evaluates the data submitted by the Corporation, Bunbury and Busselton Water Boards on water services to thirty two (32) major WA towns over four successive years, 1999/2000-2002/2003. Major towns are defined as those towns where water connection numbers exceed 1000. These towns represent around 94% of all water supply services in Western Australia.

The towns are:

Albany	Kalgoorlie / Boulder
Australind / Eaton	Karratha
Bridgetown	Katanning
Broome	Kununurra
Bunbury	Mandurah
Busselton	Manjimup
Carnarvon	Margaret River / Gnarabup
Collie	Merredin
Denmark	Narrogin
Derby	Newman
Dongara Denison	Northam
Dunsborough / Yallingup	Perth
Esperance	Pinjarra
Geraldton	Port Hedland
Harvey / Wokalup	South Hedland
Jurien	York

Report Objectives

The ***objectives*** of the report are to:

- Summarise the data provided by the Corporation, Bunbury and Busselton Water Boards
- Highlight comparative performance outcomes for the different towns served
- Examine service performance variations over a four-year period
- Benchmark, where possible, Western Australian water service delivery.

What is Benchmarking?

A ***benchmark*** is a measurement or standard that serves as a point of reference by which performance is measured. Benchmarking is a structured approach for identifying the best practices from industry and government, and comparing and adapting them to the organisation's operations. Such an approach is aimed at identifying more efficient and effective processes for achieving intended results, and suggesting ambitious goals for program output, product/service quality, and process improvement.

There are two types of benchmarking: metric and process. Metric benchmarking provides information to identify areas where there is an apparent performance gap. It does not usually, unless a complex data collection exercise is undertaken, provide an understanding of explanatory factors. Explanatory factors (e.g. physical characteristics, geography, weather, population and custom) are the key to understanding apparent performance gaps, and may add to or diminish that gap, generating a net performance gap.

Process benchmarking uses metric benchmarking outputs to bridge the apparent performance gap so best performance is achieved. Best performance may not be best performance as determined by metric benchmarking but rather the best achievable within particular circumstances and constraints. Thus, a smaller organisation may achieve optimal operational cost efficiencies but may not replicate a larger organisation's economies of scale.

Why Benchmark?

The two principal applications of benchmarking are:

1. Those benchmarking studies undertaken by the water utility (for internal and business improvements)

2. Those benchmarking studies undertaken on the water utilities or industry (for external regulatory, stakeholder, owner and customer purposes).

Internal benchmarking is benchmarking for the company, by the company. In other words, its purpose is to improve the business performance by comparing against other like companies, processes or systems.

Benchmarking has a proven history of allowing companies to look externally to their business and see:

- What are the options for business improvement?
- Where can the management most effectively expend their energies?
- What can be improved now and what can be improved later?

Most organisations want to improve and internal benchmarking is one tool to facilitate this.

Although the process may be similar, external benchmarking has a slightly different need to internal benchmarking. External benchmarking has long been used as a tool of the government owner and regulator to determine the efficiency of a business. It enables regulators to track internal performance of utilities over time and to compare this performance against other similar utilities. Comparative reporting is probably the simplest form of benchmarking. Utility benchmarking by regulators may consist of econometric and quantitative methods and is generally metric benchmarking.

Benchmarking the Water Sector: A Regulator's Perspective

Regulators use benchmarking to evaluate the performance of water providers and encourage them to gain efficiencies and improve their performances. Because water providers have a monopoly over information about their services, regulators benchmark the industry to promote information sharing and transparent reporting systems.

Benchmarking makes the regulatory process more credible by providing a relatively objective ranking of water provider performances. This stimulates competition in the water sector where little or no competition exists. Performance is not only compared between water providers but also over time. Hence, benchmarking induces the water providers to compete with their own past performances and the performance of other providers.

Regulators also benchmark water providers to inform the public about how their local water services compare with others in similar circumstances. Consumers generally support these comparisons because it gives them information about the performance of their water service that they are paying for in their annual bills.

Benchmarking is a very valuable part of the regulator's toolkit because:

- Regulators want efficient and effective outcomes for consumers
- Regulators do not want to run the day-to-day functions of the business
- Benchmarking can provide targets for regulators to set for future performance
- A benchmark target that does not provide the justification behind it will not be well received by the regulated business. Businesses will not be able to confirm their ability to achieve the proposed efficiency improvements.

A benchmarking study that is supported by a technical review of the information and process involved can meet the objectives of identifying and validating the opportunities. This will satisfy the regulator in providing defensible outcomes while providing the regulated utility with a clear indication of how efficiencies can be achieved.

The Office of Water Regulation has not provided any financial comparisons in this report as the *Water Services Licensing Act 1995* does not provide powers to the regulator to collect and publish financial information on the Corporation or Water Boards. The report therefore is limited to non-financial performance comparisons and these comparisons do not indicate relative efficiency. However, it is anticipated that the Economic Regulation Authority (ERA) will be granted powers to collect and publish financial performance information of all utilities.

The choice of performance indicators and their definitions is also a limiting factor. There may be better comparisons to make between water providers and water services. For example, it would be valuable to compare Perth metropolitan water supply scheme against other metropolitan water supply schemes. Also, comparisons between towns may not be as useful as comparisons between water supply schemes of similar size. In addition, changes made to definitions and/or to units of measure between the reporting periods have impaired comparability between the data sets. It is anticipated that the ERA will negotiate more relevant comparisons in the future.

It is acknowledged that this report does not represent a true metric benchmarking study. In benchmarking, for example, it is preferred to use inferential statistics. Inferential statistics consist of techniques that allow the benchmarker to study samples and then make generalisations about the populations from which they were selected. It also allows them to predict future data values from existing data. Inferential statistics are useful because they provide the benchmarker with a statistical method to set population parameters.

To use inferential statistics however, the data must meet certain assumptions such as linear relationships or normal distributions or sample size requirements. The current data set does not meet these requirements so the data analysis is limited to descriptive statistics. Descriptive statistics are statistical procedures used to summarise, organise and simplify data. The problem with descriptive statistics is that the benchmarker cannot determine whether trends are reliable, constant or random.

Data reliability is relevant because random errors affect the findings of a benchmark study. Reliability is a score given to measure to represent how accurate a measure is. Validity is a score given to a measure to represent how well it measures the thing it is supposed to measure. In other words, a reliable measure measures something accurately, while a valid measure is measuring what it is supposed to measure accurately. Both reliability and validity may be assessed mathematically. In addition, data quality can be improved by incorporating testing mechanisms such as internal and external audits. However, the current data sets have not been checked for reliability or validity and are not audited. Hence, data accuracy is currently unknown.

We anticipate that future reports prepared by the ERA will address the above issues and meet the criteria of a true metric benchmarking study.

1.1 Properties/Population Serviced

Table 1 shows the number of connected properties and table 2 summarises the population serviced. Figure 1 illustrates the increase in the number of properties, figure 2 indicates the population serviced for the reporting periods and figure 3 provides the percentage of connected properties in metropolitan Perth compared to regional towns in 2002-2003.

Table 1
Number of connected properties

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*683,709*	*706,807 (3.38%)*	*726,961 (2.85%)*	*776,105 (6.76%)*
Total all towns less Perth	*132,514*	*140,542 (6.06%)*	*145,774 (3.72%)*	*155,273 (6.52%)*
Average all towns	*22,055*	*22,088 (0.15%)*	*22,718 (2.85%)*	*24,253 (6.76%)*
Average all towns less Perth	*4,417*	*4,534 (2.64%)*	*4,702 (3.72%)*	*5,009 (6.52%)*
Maximum number	*551,195 Perth*	*566,265 (2.73%)*	*581,187 (2.64%)*	*620,832 (6.82%)*
Minimum number	*1,172 Bridgetown*	*860 Jurien*	*892 (3.72%)*	*1,179 (32.17%)*
Largest increase		*Mandurah (23.03%)*	*Albany (16.83%)*	*Jurien (32.17%)*
Largest decrease		*Pinjarra (-1.04)*	*Carnarvon (-0.36%)*	*Manjimup (-0.31%)*

Note. The numbers of connected properties are estimated for Busselton and 1999-2000 data. 1999-2000 data for Jurien was unavailable

The number of connected properties has steadily risen during the reporting period. Albany, Bunbury, Geraldton, Kalgoorlie / Boulder, Mandurah and Perth have over 10,000 connected properties. Margaret River / Gnarabup has grown 53% since 1999; followed by Mandurah (41%); and Broome (37%). Towns that have grown less than 1% include Collie and Manjimup.

Table 2
Number of people serviced

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*1,598,085*	*1,708,794 (6.93%)*	*1,745,898 (2.17%)*	*1,773,427 (1.58%)*
Total all towns less Perth	*323,985*	*332,986 (2.78%)*	*343,160 (3.06%)*	*347,749 (1.34%)*
Average all towns	*51,551*	*53,400 (3.59%)*	*54,559 (2.17%)*	*55,420 (1.58%)*
Average all towns less Perth	*10,800*	*10,741 (-0.54%)*	*11,070 (3.06%)*	*11,218 (1.34%)*
Maximum population	*1,274,100 Perth*	*1,375,808 Perth*	*1,402,738 Perth*	*1,425,678 Perth*
Minimum population	*2,873 Bridgetown*	*1,964 Jurien*	*2,032 Jurien*	*2,046 Jurien*
Largest increase		*Mandurah (19.16%)*	*Albany (16.53%)*	*Margaret River / Gnarabup (7.12%)*
Largest decrease		*Denmark (-21.29%)*	*Carnarvon (-2.25%)*	*Manjimup (-1.35%)*

Note. 1999-2000 data for Jurien was unavailable.

Population growth is calculated from Australian Bureau of Statistics estimates, as follows.

Town population = average household size x number of residential households

Mandurah showed the largest growth (27%); followed by Albany (17%) and Busselton (13%). Strong negative growth occurred in Dongara Denison (-18%); York (-17%); Denmark (-16%); and Merredin (-15%). Perth grew at a faster rate (12%) than regional Western Australia (7%).

Figure 1

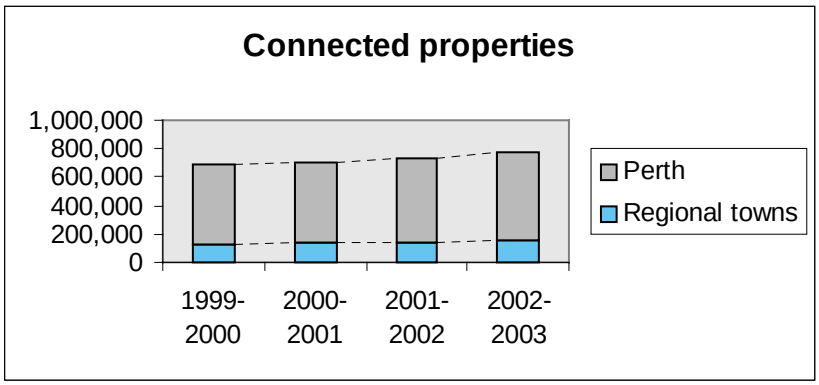


Figure 1 indicates that increase in the number of connected properties is the result of increases in the metropolitan area.

Figure 2

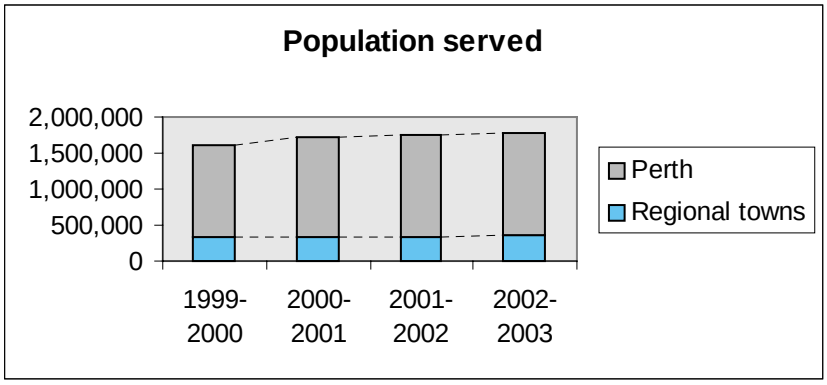


Figure 2 also indicates that an increase to population served is largely the result of increases in the metropolitan area.

Figure 3

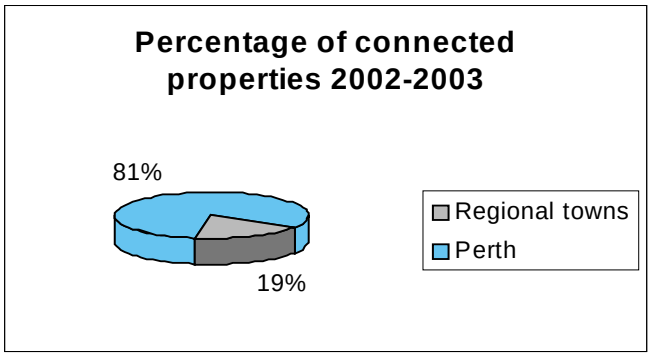


Figure 3 shows that Perth has by far the largest percentage of connected properties, which explains why increases in connected property numbers are the result of increases in metropolitan areas.

1.2 Supply/Consumption

The average water consumption per person per day for both residential and non-residential properties in all towns has reduced from 488 litres to 401 litres since 1999.

Table 3 shows the total annual water consumption, table 4 summarises the average annual consumption per connected property and table 5 and table 6 breaks down the average annual consumption per connected property into residential and non-residential categories, respectively.

Table 3
Total annual water consumption (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*284,618*	*303,222 (6.54%)*	*274,361 (-9.52%)*	*259,316 (-5.48%)*
Total all towns less Perth	*65,920*	*77,328 (17.31%)*	*71,536 (-7.49%)*	*71,863 (0.46%)*
Average all towns	*9,181*	*9,476 (3.21%)*	*8,574 (-9.52%)*	*8,104 (-5.48%)*
Average all towns less Perth	*2,197*	*2,494 (13.52%)*	*2,308 (-7.49%)*	*2,318 (0.46%)*
Maximum consumption	*218,698 Perth*	*225,894 (3.29%)*	*202,825 (-10.21%)*	*187,453 (-7.58%)*
Minimum consumption	*320 Bridgetown*	*287 Jurien*	*266 (-7.22%)*	*281 (5.67%)*
Largest increase		*Mandurah (44.50%)*	*Kununurra (12.32%)*	*Dongara Denison (16.72%)*
Largest decrease		*Kununurra (-1.61%)*	*Bridgetown (-31.99%)*	*Busselton (-15.33%)*

Note. 1999-2000 data for Jurien was unavailable.

Western Australians are consuming less water even as their population increases. Most significantly Perth residents have consumed 18% less water per property since water restrictions (see definitions; appendix 2) have been put in place. Similarly, Harvey / Wokalup (down 6%), Kalgoorlie / Boulder (down 4%), Mandurah (down 28%), Manjimup (down 11%), Merredin (down 15%), Northam (down 12%), Pinjarra (down 20%) and York (down 6%) have consumed less water. These towns are a part of the integrated water supply scheme, which were put on water restrictions in September 2001. These water restrictions have been remarkably successful in reducing the amount of water consumed. Bridgetown (down 25%), which is not part of the integrated water supply scheme, was also put on water restrictions and it consumed less water. Karratha (up 6%), Kununurra (up 6%), Newman (up 6%), Port Hedland (up 14%) and South Hedland (up 1%) were not put on water restrictions and they consumed more water. Hence, it is evident that water restrictions have a notable effect on the volume of water consumed.

Interestingly however, Albany (down 11%), Australind / Eaton (down 11%), Bunbury (down 10%), Busselton (down 7%), Carnarvon (down 3%), Collie (down 14%), Denmark (down 6%), Derby (down 3%), Dongara Denison (down 15%), Dunsborough / Yallingup (down 6%), Esperance (down 7%), Geraldton (down

14%), Katanning (down 7%), Margaret River / Gnarabup (down 9%) and Narrogin (down 7%) were not put on water restrictions but still managed to conserve water over the same period. This suggests that other factors also contribute to the volume of water consumed.

Table 4
Average annual consumption per connected property (kL)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Average all towns	*416*	*429 (3.06%)*	*377 (-12.03%)*	*334 (-11.47%)*
Average all towns less Perth	*497*	*550 (10.61%)*	*491 (-10.81%)*	*463 (-5.69%)*
Maximum consumption	*1,914 South Hedland*	*2,162 Port Hedland*	*2,343 Port Hedland*	*2,065 Port Hedland*
Minimum consumption	*240 Denmark*	*245 Denmark*	*218 Bridgetown*	*217 Denmark*
Largest increase		*York (34.70%)*	*Kununurra (11.92%)*	*Dongara Denison (11.40%)*
Largest decrease		*Busselton (-4.40%)*	*Bridgetown (-34.89%)*	*Jurien (-20.05%)*

Note. 1999-2000 data for Jurien was unavailable.

Average consumption per connected property standardises the volume of water consumed between different sized towns. In 2002-2003, for example, Perth was the seventh smallest consumer of water per connected property (302 ML) whereas Port and South Hedland consumed up to five times more water than other regional towns.

Water consumption peaked in 2000-2001 with the majority of towns (all except Busselton and Kununurra) consuming above Perth's rate; which was up 1% per connected property. In that year, Port Hedland consumed the most water per connected property (up 29%) while York increased its consumption the most (up 35%).

There was a 16% decline of water consumption per property with the introduction of water restrictions between 1999-2001 and 2001-2003. This saved around 73,611 ML of water over a two-year period.

Table 5 *Average annual residential consumption per connected property (kL)*				
Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Average all towns	*334*	*338 (1.26%)*	*299 (-11.56%)*	*275 (-7.86%)*
Average all towns less Perth	*352*	*383 (8.76%)*	*344 (-10.10%)*	*340 (-1.27%)*
Maximum consumption	*621 Port Hedland*	*631 Derby*	*657 Port Hedland*	*636 Port Hedland*
Minimum consumption	*214 Denmark*	*217 Denmark*	*207 Bridgetown*	*196 Denmark*
Largest increase		*York (35.26%)*	*Kununurra (14.28%)*	*Katanning (11.13%)*
Largest decrease		*Kununurra (-5.36%)*	*Bridgetown (-33.96%)*	*Harvey / Wokalup (-13.40%)*

Note. 1999-2000 data for Jurien was unavailable.

The average resident consumed around 15% less water between 1999-2001 and 2001-2003. In 2002-2003, this saved around 51 litres of water per person per day (or five buckets of water). Interestingly, Perth residents saved 59 litres per person (18% saving) while regional residents saved 15 litres per person (4% saving). There were exceptions however; Port Hedland residents consumed around 9% more water (an additional 65 litres per person) and South Hedland residents consumed around 7% more water between 1999-2001 and 2001-2003.

In 2002-2003, the average residential property consumed around 754 litres per day. Perth residential properties consumed 712 litres per day while the typical residential property outside of Perth consumed 931 litres per day. Denmark residents were the most efficient users of water. They consumed only 536 litres of water per residential property per day (29% less than the daily average) or 202 litres per person per day. Port Hedland residential properties consumed around 2.3 times more water than the average residential property while South Hedland consumed around 1.9 times more water.

On average, Western Australian residents consumed around 291 litres of water per day; Perth residents consumed 276 litres per day while regional residents consumed 353 litres per day. Port Hedland residents consumed the most with 657 litres per day; followed by Kununurra residents (631 litres per day), Derby residents (606 litres per day), Broome residents (599 litres per day), Karratha residents (596 litres per day), and South Hedland residents (542 litres per day).

Table 6 *Average annual non-residential consumption per connected property (kL)*				
Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Average all towns	*1,303*	*1,556 (19.42%)*	*1,333 (-14.33%)*	*773 (-42.03%)*
Average all towns less Perth	*1,528*	*1,876 (22.79%)*	*1,667 (-11.16%)*	*1,155 (-30.75%)*
Maximum consumption	*17,570 South Hedland*	*14,243 South Hedland*	*14,238 South Hedland*	*8,188 South Hedland*
Minimum consumption	*331 Bridgetown*	*394 Denmark*	*268 Bridgetown*	*230 Mandurah*
Largest increase		*Mandurah (72.83%)*	*Busselton (30.50%)*	*Bridgetown (11.14%)*
Largest decrease		*Busselton (-21.36%)*	*Mandurah (-54.86%)*	*Jurien (-63.56%)*

Note. 1999-2000 data for Jurien was unavailable.

The trend was to reduce the amount of water consumed by non-residential properties over the four-year period. For example, there was a notable reduction in non-residential water consumption in the 2001-2003 period compared to 1999-2001 (down 31%); Mandurah (down 58%), Geraldton (down 39%), Broome (down 37%), Perth (down 35%) and South Hedland (down 35%). On average, regional towns reduced consumption by 18%. Exceptions to this rule included Bunbury (up 37%) and Katanning (up 1%).

In 2002-2003, the average non-residential property consumed around 2,117 litres per day. Perth non-residential properties consumed 1,758 litres per day while the typical non-residential property outside of Perth consumed 3,163 litres per day. Mandurah non-residential users were the most efficient consuming 629 litres of water per non-residential property per day (70% less than the daily average).

Figure 4 graphs the ratio of residential to non-residential in property numbers and water consumed.

Figure 4

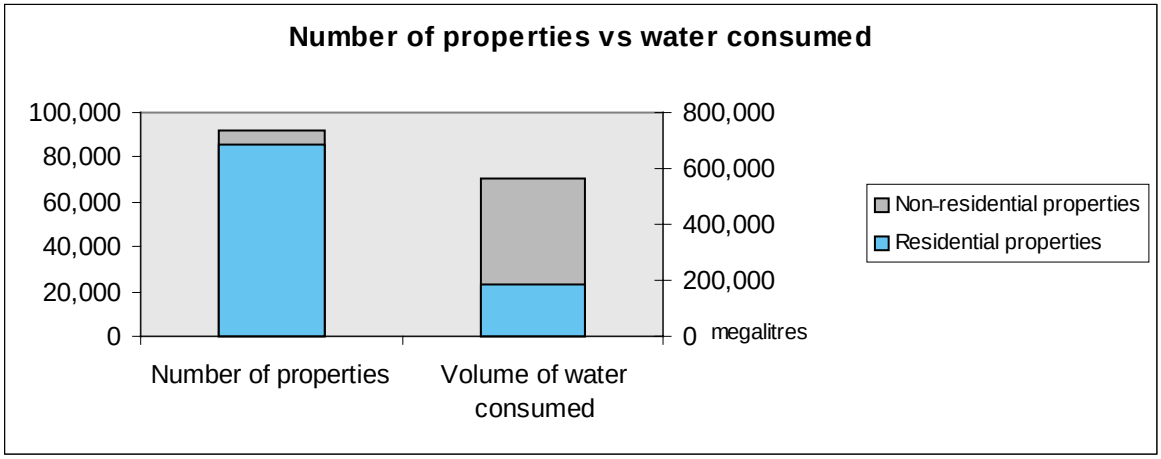


Figure 4 shows that non-residential properties consume a much larger proportion of water compared to residential properties. This is largely due to businesses using water as one of its main products such as beer and soft drink manufactures.

In 2002-2003, residential properties accounted for 88% of all properties and consumed 73% of the water. Australind / Eaton had the highest proportion of residential consumption (93%) while South Hedland had the least (22%).

The total volume of water extracted from all sources was 332,570 ML in 1999-2000, 356,475 ML in 2000-2001 (up 7%), 320,222 ML (down 10%) in 2001-2002 and 295,558 ML (down 8%) in 2002-2003. The most significant decrease was in Mandurah (down 91%) in 2000-2001; 9,115ML to 794 ML. This difference can be attributed to a significant reduction in water from impounding reservoirs due to differences in reporting procedures. In 2000-2001, Dongara Denison increased the total volume extracted from all sources from 460 ML to 733 ML (up 59%); which was the largest proportional increase.

Table 7 summarises the water extracted by impounding reservoirs, table 8 describes the water extracted by groundwater and figure 5 illustrates the changes of water extracted from impounding reservoirs and groundwater during the reporting periods.

Table 7
Water extracted by impounding reservoir (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*148,562*	*159,228 (7.18%)*	*111,435 (-30.02%)*	*102,446 (-8.07%)*
Total all towns less Perth	*27,196*	*19,516 (-28.24%)*	*17,195 (-11.89%)*	*15,827 (-7.96%)*
Average all towns	*4,643*	*4,976 (7.18%)*	*3,482 (-30.02%)*	*3,201 (-8.07%)*
Average all towns less Perth	*877*	*630 (-28.24%)*	*555 (-11.89%)*	*511 (-7.96%)*
Perth	*121,366*	*139,712 (15.12%)*	*94,240 (-32.55%)*	*86,619 (-8.09%)*
Largest increase		*Margaret River / Gnarabup* (49.71%)*	*Katanning (13.36%)*	*Bridgetown (31.56%)*
Largest decrease		*Pinjarra** Mandurah** (-100.00%)*	*Karratha*** (-100.00%)*	*Harvey / Wokalup** (-100.00%)*

Note. 1999-2000 data for Jurien was unavailable. * Reduced local dam storage required water supply to be supplemented from the river system. ** The reductions are due to the towns being connected to IWSS and the water supply is now categorised under bulk supply (treated). *** Water from impounding reservoirs was not used due to turbidity problems associated with the Harding dam supply.

There has been a decrease in the volume of water extracted from impounding reservoirs. This decrease is due to towns joining the Integrated Water Supply Scheme (IWSS; see definitions) or significant reductions in Perth. Katanning and Narrogin were the only towns to show notable increases in the volume of water extracted from impounding reservoirs.

In 2003, Collie, Denmark, Kalgoorlie / Boulder, Katanning, Manjimup, Merredin, Narrogin, Northam and York sourced all their water from impounding reservoirs.

Table 8
Water extracted by groundwater (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*183,057*	*196,157 (7.16%)*	*207,633 (5.85%)*	*191,452 (-7.79%)*
Total all towns less Perth	*49,647*	*55,371 (11.53%)*	*53,661 (-3.09%)*	*54,178 (0.96%)*
Average all towns	*5,905*	*6,130 (3.81%)*	*6,489 (5.85%)*	*5,983 (-7.79%)*
Average all towns less Perth	*1,655*	*1,786 (7.93%)*	*1,731 (-3.09%)*	*1,748 (0.96%)*
Perth	*133,410*	*140,786 (5.53%)*	*153,972 (9.37%)*	*137,274 (-10.84%)*
Largest increase		*Karratha (87.87%)*	*Kununurra (32.79%)*	*South Hedland (20.06%)*
Largest decrease		*Australind (-11.56%)*	*Geraldton (-18.00%)*	*Derby (-18.24%)*

Note. 1999-2000 data for Jurien was unavailable.

The majority of water is extracted from groundwater. In 2002-2003, for example, 65% of all water was extracted from groundwater; 76% for regional towns and 61% for Perth. The volume extracted from groundwater has increased over the reporting periods: 55% in 1999-2001 to 65% in 2001-2003. Reduced dam storage due to drought resulted in the need to make greater use of groundwater sources.

In 2003, Albany, Australind / Eaton, Broome, Bunbury, Busselton, Carnarvon, Derby, Dongara Denison, Dunsborough / Yallingup, Esperance, Geraldton, Jurien, Karatha, Kununurra, Mandurah, Port Hedland and South Hedland sourced their water from groundwater. Perth sourced its water from both impounding reservoirs and groundwater. Margaret River / Gnarabup used river extraction for most of its water due to drought while Harvey / Wokalup, Newman and Pinjarra sources their water from the IWSS.

Figure 5

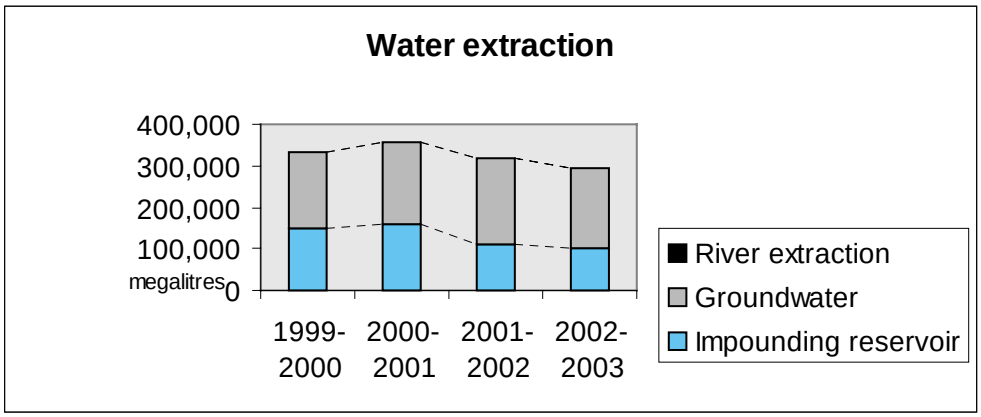


Figure 5 demonstrates that the proportion of groundwater extracted has increased compared to water extracted from impounding reservoirs. Also, the volume of water extracted from rivers is negligible.

1.3 Treatment

Table 9 and 10 show the total volume of water requiring treatment with disinfection only and the number of disinfection only treatment plants, respectively. Figure 6 illustrates these trends graphically.

Table 9
Total volume of water requiring treatment with disinfection only (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*195,483*	*198,323 (1.45%)*	*144,650 (-27.06%)*	*129,266 (-10.64%)*
Total all towns less Perth	*56,878*	*43,671 (-23.22%)*	*39,691 (-9.11%)*	*33,272 (-16.17%)*
Perth	*138,605*	*154,652 (11.58%)*	*104,959 (-32.13%)*	*95,994 (-8.54%)*
Largest increase		*Dongara Denison (59.35%)*	*Kununurra (32.79%)*	*South Hedland (20.06%)*
Largest decrease		*Albany Dunsborough / Yallingup Geraldton Karratha (-100.00%)*	*Bridgetown (-33.97%)*	*Mandurah Pinjarra (-100.00%)*

Note. 1999-2000 data for Jurien was unavailable.

There has been an overall reduction in the volume of water receiving treatment with disinfection only. This reduction coincides with increases in volume of higher order treatment processes indicating an overall increase in treatment processing over the four year period due to an increase in groundwater supply.

Table 10
Number of treatment works with disinfection only

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*51*	*47 (-7.84%)*	*50 (6.38%)*	*49 (-2.00%)*
Total all towns less Perth	*30*	*26 (-13.33%)*	*26 (0.00%)*	*27 (3.85%)*
Perth	*21*	*21 (0.00%)*	*24 (14.29%)*	*22 (-8.33%)*
Treatment works added		*Bridgetown Collie Jurien Manjimup Port Hedland*	*Perth (x3)*	*Bridgetown Busselton Margaret River / Gnarabup*
Treatment works removed		*Albany (x2) Dunsborough / Yallingup Geraldton (x2) Karratha (x2) Mandurah Pinjarra*	*Nil*	*Mandurah Manjimup Perth (x2)*

Note. 1999-2000 data for Jurien was unavailable.

In 2002-2003, Bridgetown treated 92%, Manjimup treated 85% and Perth treated 43% of water with disinfection only. Carnarvon, Collie, Dongara Denison, Jurien, Kalgoorlie / Boulder, Katanning, Kununurra, Margaret River / Gnarabup, Merredin, Narrogin, Northam, Port Hedland, South Hedland and York treated all their water with disinfection only. In total, 44% of all water was treated with disinfection only.

Table 11 and 12 show the total volume of water requiring treatment with disinfection and filtration and the number of disinfection and filtration treatment plants, respectively. Figure 6 illustrates these trends graphically.

Table 11
Total volume of water requiring treatment with disinfection and filtration (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*13,798*	*13,231 (-4.11%)*	*9,483 (-28.33%)*	*10,386 (9.53%)*
Total all towns less Perth	*11,709*	*13,231 (13.00%)*	*9,483 (-28.33%)*	*10,386 (9.53%)*
Maximum volume	*6,893 Bunbury*	*7,318 (6.17%)*	*6,483 (-11.42%)*	*6,408 (-1.15%)*
Largest increase		*Busselton (91.38%)*	*Nil*	*Bridgetown Mandurah (100%)*
Largest decrease		*Albany Bridgetown Harvey / Wokalup Perth (-100.00%)*	*Esperance (-100.00%)*	*Busselton (-3.17%)*

Note. 1999-2000 data for Jurien was unavailable.

There has been a marked reduction in water requiring treatment from disinfection and filtration due to reductions in Perth and Esperance. In contrast, there has been a notable increase in Busselton and Mandurah.

Table 12
Number of treatment works with disinfection and filtration

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*13*	*11 (-4.11%)*	*9 (-28.33%)*	*11 (9.53%)*
Total all towns less Perth	*12*	*11 (13.00%)*	*9 (-28.33%)*	*11 (9.53%)*
Maximum amount	*6 Bunbury*	*6*	*6*	*6*
Treatment works added		*Busselton (x2)*	*Nil*	*Bridgetown Mandurah*
Treatment works removed		*Albany Bridgetown Harvey / Wokalup Perth*	*Esperance (x2)*	*Nil*

Note. 1999-2000 data for Jurien was unavailable.

In 2002-2003, Bridgetown treated 8% and Busselton treated 81% of water with disinfection and filtration. Bunbury and Mandurah treated all of its water with disinfection and filtration. In total, 4% of all water was treated with disinfection and filtration.

Table 13 and 14 show the total volume of water requiring treatment with disinfection only and additional processes and the number of disinfection only and additional processes treatment plants, respectively. Figure 6 illustrates these trends graphically.

Table 13
Total volume of water requiring treatment with disinfection only and additional processes (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*0*	*21,976 (100%)*	*24,531 (11.63%)*	*40,366 (64.55%)*
Total all towns less Perth		*15,546 (100%)*	*15,367 (-1.15%)*	*17,266 (12.36%)*
Maximum volume		*10,201 Geraldton*	*9,164 Perth*	*23,100 Perth*
Largest increase		*Albany Dunsborough / Yallingup Geraldton Harvey / Wokalup Karratha Perth (100%)*	*Esperance (100%) Perth (42.52%)*	*Albany (5452.17%) Perth (152.07%)*
Largest decrease		*Nil*	*Dunsborough / Yallingup (-100%)*	*Harvey / Wokalup (-100%)*

Note. 1999-2000 data for Jurien was unavailable.

There have been significant increases in the volume of water being treated with disinfection and additional processes. This increase accounts for a drop in the volume of water treated with lower order treatment processes. This suggests that the standard of water treatment has increased over a four-year period. The most notable increase has been in Perth. Dunsborough / Yallingup introduced disinfection and additional process treatment in 2000-2001 but they have since upgraded their treatment process. Harvey / Wokalup treated water with disinfection and additional processes until it joined the IWSS in 2002-2003.

Table 14
Number of treatment works with disinfection only and additional processes

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*0*	*12 (100%)*	*12 (0.00%)*	*10 (-16.67%)*
Total all towns less Perth	*0*	*7 (100%)*	*8 (14.29%)*	*6 (-25.00%)*
Maximum amount		*5 Perth*	*4 (-20.00%)*	*3 (-25.00%)*
Treatment works added		*Albany Dunsborough / Yallingup Geraldton (x2) Harvey / Wokalup Karratha (x2) Perth (x5)*	*Esperance (x2)*	*Nil*
Treatment works removed		*Nil*	*Dunsborough / Yallingup Perth*	*Geraldton Harvey / Wokalup Perth*

Note. 1999-2000 data for Jurien was unavailable.

In 2002-2003, Perth treated 10% of water with disinfection and additional processes. Esperance, Geraldton and Karratha treated all of its water with disinfection and additional processes. In total, 14% of all water was treated with disinfection and additional processes.

Table 15 and 16 show the total volume of water requiring treatment with disinfection, filtration and additional processes and the number of disinfection, filtration and additional processes treatment plants, respectively. Figure 6 illustrates these trends graphically.

Table 15
Total volume of water requiring treatment with disinfection, filtration and additional processes (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*124,178*	*131,883 (6.20%)*	*148,029 (12.24%)*	*118,401 (-20.01%)*
Total all towns less Perth	*10,096*	*12,467 (23.48%)*	*13,940 (11.82%)*	*10,531 (-24.45%)*
Perth	*114,082*	*119,416 (4.68%)*	*134,089 (12.29%)*	*107,870 (-19.55%)*
Largest increase		*Albany (417.68%)*	*Derby (13.36%)*	*Dunsborough / Yallingup (6.15%)*
Largest decrease		*Busselton (-100.00%)*	*Denmark (-6.44%)*	*Albany (-79.71%)*

Note. 1999-2000 data for Jurien was unavailable.

The volume of water treated with disinfection, filtration and additional processes has remained stable over a four-year period. However, Perth and Albany reduced the volume of water treated with filtration in 2002-2003.

Table 16
Number of treatment works with disinfection, filtration and additional processes

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*13*	*13 (0.00%)*	*14 7.69%)*	*14 (0.00%)*
Total all towns less Perth	*7*	*7 (0.00%)*	*8 (14.29%)*	*8 (0.00%)*
Maximum amount	*6 Perth*	*6*	*6*	*6*
Treatment works added		*Albany Australind / Eaton*	*Dunsborough / Yallingup*	*Manjimup*
Treatment works removed		*Busselton (x2)*	*Nil*	*Albany*

Note. 1999-2000 data for Jurien was unavailable.

In 2002-2003, Albany treated 19%, Manjimup treated 15% and Perth treated 48% of water with disinfection, filtration and additional processes. Australind / Eaton, Broome, Denmark, Derby and Dunsborough / Yallingup treated all of its water in this way. In total, 40% of all water was treated with disinfection, filtration and additional processes.

Figure 6

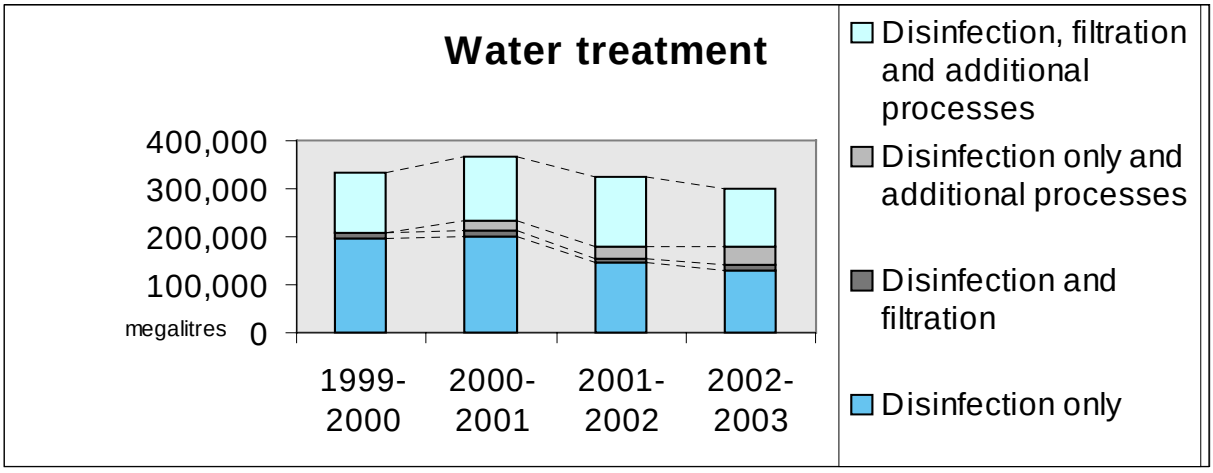


Figure 6 shows that most water is treated with either disinfection only or disinfection, filtration and additional processes.

1.4 Non Revenue Water

Non revenue water is a useful statistic because it indicates water has been wasted or irretrievably lost – although not all non revenue water is wasted or lost. It includes unbilled metered consumption, unbilled unmetered consumption, unauthorised consumption, customer metering inaccuracies, leakage on mains, leakage and overflows at storages and leakage on service connections up to a point of customer metering. It should be noted however, that the impact of non revenue water is difficult to quantify because a number of factors contribute to its recorded amount such as:

- timing differences between customer and master readings;
- water used for planned maintenance work in reservoirs and mains cleaning and any repairs requiring emptying of these reservoirs or mains;
- water leakage or losses from both reservoirs and pipelines;
- water used for firefighting;
- any illegal use of fire hydrants (eg., washing down hard sand areas)
- any riparian releases;
- water supplied to others, that is, from one water scheme to another; and
- theft from the supply system.

Hence, non revenue water should be interpreted with caution. Regardless of these interpretive difficulties, non revenue water can be compared for the reporting periods.

Table 17 summarises the volume of non revenue water and figure 7 illustrates unaccounted as a percentage of volume supplied.

Table 17
Volume of non revenue water (ML)

Data (variance)	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*48,023*	*46,045 (-4.12%)*	*24,905 (-45.91%)*	*36,662 (47.21%)*
Total all towns less Perth	*11,945*	*9,002 (-24.63%)*	*9,354 (3.91%)*	*8,800 (-5.92%)*
Average all towns	*1,549*	*1,439 (-7.11%)*	*778 (-45.91%)*	*1,146 (47.21%)*
Average all towns less Perth	*398*	*290 (-27.07%)*	*302 (3.91%)*	*284 (-5.92%)*
Maximum volume	*36,078 Perth*	*37,043 (2.67%)*	*15,551 (-58.02%)*	*27,862 (79.16%)*
Minimum volume	*-136 Dongara Denison*	*-315 Australind / Eaton*	*-3 Merredin*	*-23 Merredin*
Largest increase		*Dunsborough / Yallingup (206.71%)*	*Katanning (1661.81%)*	*Margaret River / Gnarabup (323.75%)*
Largest decrease		*Australind / Eaton (-168.10%)*	*Merredin (-103.54%)*	*York (-133.77%)*

Note. 1999-2000 data for Jurien was unavailable.

There has been a marked reduction in the volume of non revenue water in the 2001-2003 period compared to the 1999-2001 period (down 34%). However, non revenue water has been variable over the last four years so this trend may not be maintained in the future. For example, the percentage of non revenue water to volume of water supplied has varied from 14% (1999-2000) to 13% (2000-2001) to 8% (2001-2002) and to 12% (2002-2003). Similarly, non revenue water as a percentage of the volume of water consumed has varied from 17% to 15% to 9% to 14% during the reporting periods. Hence, non revenue water was proportionally low during the 2001-2002 reporting period, which was due to the introduction of water restrictions. Perth was the major contributor to this downturn because it reduced the volume of non revenue water by over half in 2001-2002 (or down 41% over two years). Most regional towns reduced the volume of non revenue water over a two-year period (down 13%).

Figure 7

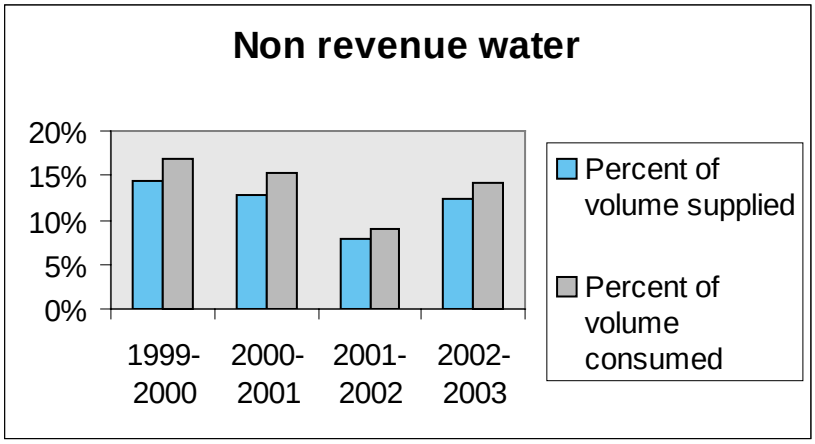


Figure 7 demonstrates that the non revenue water either as a percent of volume supplied or consumed follows the same trend and there has been a reduction over the reporting periods.

Table 18 describes volume of non revenue water per property and per kilometre of mains and figure 8 illustrates this trend graphically.

Table 18
Non revenue water per connected property (kL/property) and kilometre of water main (ML/km)

Data (variance)	Volume per connected property				Volume per kilometre of water main			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Average all towns	*77*	*70 (-8.30%)*	*37 (-47.34%)*	*54 (44.48%)*	*3.01*	*2.85 (-5.48%)*	*1.52 (-46.70%)*	*2.20 (44.65%)*
Average all towns less Perth	*90*	*64 (-28.94%)*	*64 (0.18%)*	*57 (-11.68%)*	*2.65*	*1.92 (-27.78%)*	*1.96 (2.06%)*	*1.81 (-7.51%)*
Maximum volume	*216 South Hedland*	*219 South Hedland*	*187 Kununurra*	*267 South Hedland*	*11.45 South Hedland*	*5.70 Newman*	*5.78 Newman*	*7.19 South Hedland*
Minimum volume	*-110 Dongara Denison*	*-52 Australind / Eaton*	*-2 Merredin*	*-14 Merredin*	*-3.02 Dongara Denison*	*-1.74 Australind / Eaton*	*-0.03 Merredin*	*-0.18 Merredin*
Largest increase		*Dunsborough / Yallingup (193.29%)*	*Katanning (1655.17%)*	*Merredin (587.54%)*		*Dunsborough / Yallingup (196.01%)*	*Katanning (1661.52%)*	*Merredin (621.49%)*
Largest decrease		*Margaret River / Gnarabup (-3190.51%)*	*Australind (-138.81%)*	*York (-132.50%)*		*Margaret River / Gnarabup (-2093.59%)*	*Australind (-139.81%)*	*York (-133.75%)*

Note. 1999-2000 data for Jurien was unavailable.

Non revenue water per connected property and kilometre of water main has trended downwards over the last four years. A comparison between 1999-2001 and 2001-2003 periods, for example, shows that non revenue water per connected property reduced 39% over the last two years; 45% for Perth and 21% for regional towns. Similarly, the volume of non revenue water per kilometre reduced 37% for all towns; 42% for Perth and 17% for regional towns.

In 2002-2003, the towns with the highest levels of non revenue water, above 100 kL per connected property and over 4 ML per kilometre of mains per annum, included Jurien, Port Hedland and South Hedland. Merredin and York were able to account for all of their water.

Figure 8

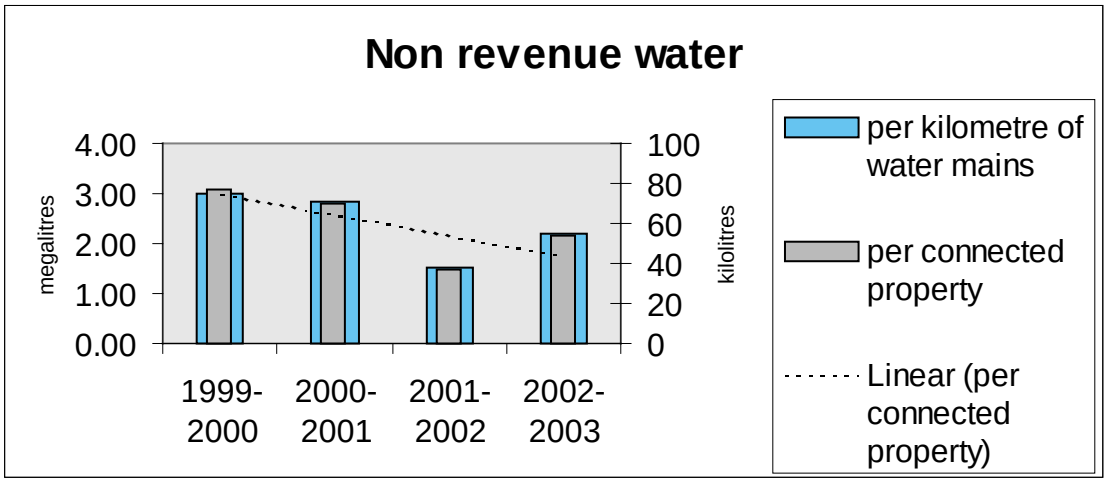


Figure 8 illustrates a downward trend in the volume of non revenue water.

1.5 Infrastructure

Table 19 shows how the length of supply mains and length of supply mains per 1000 connected properties.

Table 19
Infrastructure: Supply mains

Data (variance)	Length of supply mains				Length of supply mains per 1000 connected properties			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*15,937*	*16,166 (1.44%)*	*16,404 (1.48%)*	*16,694 (1.76%)*				
Total all towns less Perth	*4,502*	*4,698 (4.36%)*	*4,783 (1.81%)*	*4,865 (1.72%)*				
Average all towns	*514*	*505 (-1.73%)*	*513 (1.48%)*	*522 (1.76%)*	*23.31*	*22.87 (-1.88%)*	*22.57 (-1.34%)*	*21.51 (-4.68%)*
Average all towns less Perth	*150*	*152 (0.99%)*	*154 (1.81%)*	*157 (1.72%)*	*33.97*	*33.43 (-1.60%)*	*32.81 (-1.84%)*	*31.33 (-4.51%)*
Maximum	*11,435 Perth*	*11,468 (0.29%)*	*11,622 (1.34%)*	*11,829 (1.78%)*	*103.65 Carnarvon*	*88.05 Carnarvon*	*88.25 Carnarvon*	*78.59 Merredin*
Minimum	*36 Port Hedland*	*27 Jurien*	*27 (0.00%)*	*28 (3.70%)*	*18.88 South Hedland*	*20.25 Perth*	*20.00 Perth*	*19.05 Perth*
Largest increase		*South Hedland (120.00%)*	*Pinjarra (21.05%)*	*Bunbury (5.60%)*		*South Hedland (117.80%)*	*Pinjarra (19.15%)*	*Bunbury (3.90%)*
Largest decrease		*Carnarvon (-14.98%)*	*Northam South Hedland (-0.26%)*	*Kununurra (-0.78%)*		*Mandurah (-18.72%)*	*Margaret River / Gnarabup (-7.99%)*	*Jurien (-21.54%)*

Note. 1999-2000 data for Jurien was unavailable.

Supply mains have increased around 5% in length during the reporting period; 3% in Perth and 8% in regional towns. However, the length of supply mains has reduced in Carnarvon (down 15%), Kalgoorlie / Boulder (down 2%), Katanning (down 1%), Kununurra (down 4%), Narrogin (down 2%) and Northam (down 1%). On average, supply mains are longer for regional connected properties than those in Perth. South Hedland and Margaret River / Gnarabup have approximately doubled its length of water mains in 2000-2001. Due to increases in the number of connected properties, Mandurah reduced the length of mains per property by 25% during the four-year period. Carnavon had the largest decrease in the length of supply mains per connected property over the reporting period (down 26%).

Table 20 shows the number of dams and bores.

Table 20
Infrastructure: Dams and bores

Data (variance)	Dams				Bores			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*25*	*27 (8.00%)*	*27 (0.00%)*	*29 (7.41%)*	*428*	*425 (-0.70%)*	*435 (2.35%)*	*449 (3.22%)*
Total all towns less Perth	*15*	*14 (-6.67%)*	*14 (0.00%)*	*15 (7.14%)*	*223*	*229 (2.69%)*	*232 (1.31%)*	*233 (0.43%)*
Average all towns	*0.78*	*0.84 (8.00%)*	*0.84 (0.00%)*	*0.91 (7.41%)*	*13.38*	*13.28 (-0.70%)*	*13.59 (2.35%)*	*14.03 (3.22%)*
Average all towns less Perth	*0.48*	*0.45 (-6.67%)*	*0.45 (0.00%)*	*0.48 (7.14%)*	*7.19*	*7.39 (2.69%)*	*7.48 (1.31%)*	*7.52 (0.43%)*
Perth	*10*	*13 (30.00%)*	*13 (0.00%)*	*14 (7.69%)*	*205*	*196 (-4.39%)*	*203 (3.57%)*	*216 (6.40%)*
Largest increase		*Perth (30.00%)*	*Nil*	*Harvey / Wokalup (100%)*		*Albany (15.00%)*	*Derby (133.33%)*	*Port Hedland (12.50%)*
Largest decrease		*Pinjarra (-100%)*	*Nil*	*Nil*		*Dunsborough / Yallingup (-25.00%)*	*Kununurra (-16.67%)*	*Derby (-28.57%)*

Note. 1999-2000 data for Jurien was unavailable.

The Integrated Water Supply Scheme (IWSS; see definitions) servicing Perth has steadily increased the number of dams. Reduced dam storage brought on by the worst two years on record for dam inflow (2001-2003) has highlighted the importance of Perth's groundwater resources. The water supplied from the IWSS is not all consumed by metropolitan customers. Bulk supplies are transferred to the South West region for use by Mandurah, Pinjarra and North Dandalup.

The loss of one dam for regional areas in 2000-2001 relates to Pinjarra, which receives all of its water from the IWSS. The dam, which was an old source for Pinjarra, is no longer in use. In 2002-2003, the Stirling Dam has been added to the IWSS and it also supplies the Harvey / Wokalup scheme.

The number of bores has increased 5% in both metropolitan and regional areas over the last four years. The IWSS added 11 bores while regional areas added 10 bores. However, the overall number of bores reduced in Dunsborough / Yallingup (-3), Esperance (-1), Karratha (-1) and Kununurra (-1). In Dunsborough / Yallingup, older bores were decommissioned and replaced with larger deep bores.

Table 21 shows the number of service reservoirs and pump stations.

Table 21
Infrastructure: Service reservoirs and pump stations

Data (variance)	Service reservoirs				Pump stations			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*245*	*259 (5.71%)*	*262 (1.16%)*	*273 (4.20%)*	*202*	*219 (8.42%)*	*227 (3.65%)*	*230 (1.32%)*
Total all towns less Perth	*148*	*160 (8.11%)*	*165 (3.13%)*	*170 (3.03%)*	*116*	*125 (7.76%)*	*129 (3.20%)*	*134 (3.88%)*
Average all towns	*7.90*	*8.09 (2.41%)*	*8.19 (1.16%)*	*8.53 (4.20%)*	*6.31*	*6.84 (8.42%)*	*7.09 (3.65%)*	*7.19 (1.32%)*
Average all towns less Perth	*4.93*	*5.16 (4.62%)*	*5.32 (3.13%)*	*5.48 (3.03%)*	*3.74*	*4.03 (7.76%)*	*4.16 (3.20%)*	*4.32 (3.88%)*
Perth	*97*	*99 (2.06%)*	*97 (-2.02%)*	*103 (6.19%)*	*86*	*94 (9.30%)*	*98 (4.26%)*	*96 (-2.04%)*
Largest increase		*Port Hedland (200.00%)*	*Mandurah (44.44%)*	*Margaret River / Gnarabup (20.00%)*		*Carnarvon (300.00%)*	*Kununurra (100.00%)*	*Margaret River / Gnarabup (25.00%)*
Largest decrease		*Carnarvon (-28.57%)*	*Broome (-25.00%)*	*Jurien (-50.00%)*		*Harvey / Wokalup (-50.00%)*	*Collie (-100.00%)*	*Australind / Eaton (-14.29%)*

Note. 1999-2000 data for Jurien was unavailable.

During the reporting period, the number of service reservoirs has increased 11%; 6% in Perth and 15% in regional towns. The IWSS added six service reservoirs while regional areas added 22. However, the overall number of service reservoirs reduced in Broome (-1), Carnarvon (-2), Jurien (-1) and Manjimup (-1).

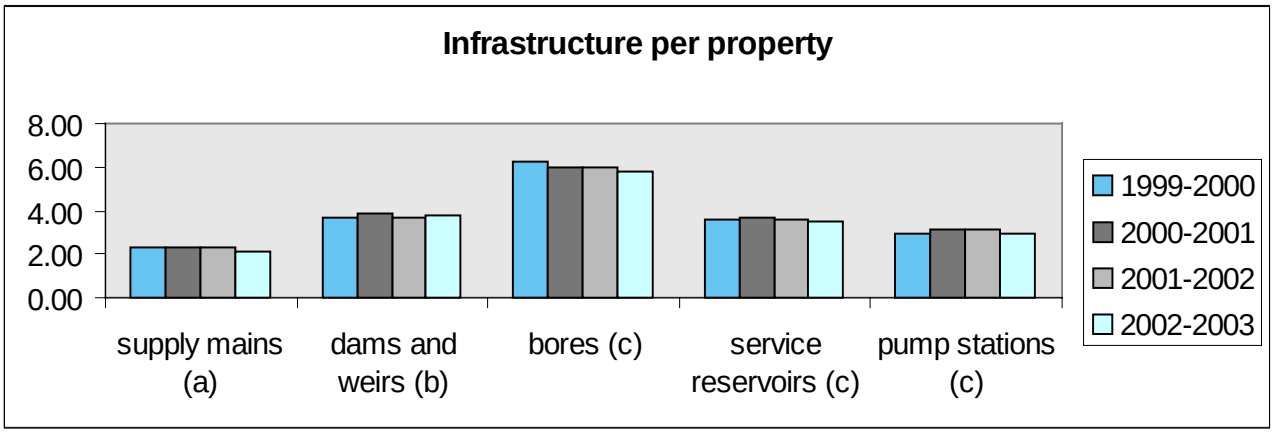
The number of pump stations has increased 14%; 12% in Perth and 16% in regional towns. The IWSS has added 10 pump stations while regional areas have added 18. However, the number of pump stations has reduced in Australind / Eaton (-1) and Harvey / Wokalup (-1).

In general, the infrastructure for water supply services has expanded. Over the four-year period, infrastructure improvements included Australind / Eaton (+14km supply mains, +2 service reservoirs), Bridgetown (+2km supply mains, +2 bores, +2 service reservoirs, +1 pump station), Broome (+10km supply mains), Bunbury (+26km supply mains), Busselton (+20km supply mains), Carnarvon (+2 pump stations), Collie (+2km supply mains, +3 service reservoirs, +1 pump station), Denmark (+3km supply mains,), Derby (+7km supply mains, +2 bores), Dongara Denison (+1km supply mains), Dunsborough / Yallingup (+16km supply mains, +3 service reservoirs, +4 pump stations), Esperance (+3km supply mains), Geraldton (+6km supply mains, +1 bore, +1 service reservoir, +6 pump stations), Harvey / Wokalup (+16km supply mains, +1 dam,), Jurien (+1km of supply mains, 3 bores, 1 service reservoir), Kalgoorlie / Boulder (+6km supply mains, +2 pump stations), Karratha (+3km supply mains), Kununurra (+1 pump station), Mandurah (36km supply mains, 4 service reservoirs, +1 pump station), Manjimup

(+7km supply mains), Margaret River / Gnarabup (+55km supply mains, +2 service reservoirs, +2 pump stations), Merredin (+11km supply mains), Perth (+394km supply mains, +4 dams, +11 bores, +6 service reservoirs, +10 pump stations), Pinjarra (+17km supply mains), Port Hedland (+25km supply mains, +2 bores, +8 service reservoirs), South Hedland (+78km supply mains) and York (+11km supply mains).

Figure 9 illustrates these trends in the infrastructure over the reporting periods graphically.

Figure 9



Note. [a] supply mains per 100 connected properties; [b] dams per 100,000 connected properties; [c] bores, service reservoirs, pump stations per 10,000 connected properties.

2.1 Key Performance Indicators

Table 22 describes the number of leaks and bursts. Due to its size, Perth has by far the largest amount of water leaks and bursts while the smallest towns had the lowest.

Table 22
Number of leaks and bursts

Data (variance)	Number of leaks and bursts				Number of leaks and bursts per 100 kilometres of water mains			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*2,148*	*2,095 (-2.47%)*	*2,133 (1.81%)*	*2,058 (-3.52%)*				
Total all towns less Perth	*747*	*652 (-12.72%)*	*631 (-3.22%)*	*493 (-21.87%)*				
Average all towns	*69*	*65 (-5.52%)*	*67 (1.81%)*	*64 (-3.52%)*	*13.48*	*12.96 (-3.85%)*	*13.00 (0.33%)*	*12.33 (-5.19%)*
Average all towns less Perth	*25*	*21 (-15.53%)*	*20 (-3.22%)*	*16 (-21.87%)*	*16.59*	*13.88 (-16.36%)*	*13.19 (-4.94%)*	*10.13 (-23.19%)*
Maximum number	*1,401 Perth*	*1,443 (3.00%)*	*1,502 (4.09%)*	*1,565 (4.19%)*	*54.46 Merredin*	*34.13 Kalgoorlie / Boulder*	*42.12 Merredin*	*24.59 Port Hedland*
Minimum number	*2 Kununurra*	*2 Manjimup*	*3 Newman South Hedland*	*1 Jurien*	*3.61 Dunsborough / Yallingup*	*2.21 Australind / Eaton*	*2.10 South Hedland*	*1.47 Karratha*
Largest increase		*Newman (150.00%)*	*Australind / Eaton (350.00%)*	*Port Hedland (200.00%)*		*Kununurra (159.80%)*	*Australind / Eaton (340.55%)*	*Port Hedland (200.81%)*
Largest decrease		*Manjimup (-85.71%)*	*Newman (-70.00%)*	*Jurien (-83.33%)*		*Manjimup (-86.80%)*	*Newman (-70.07%)*	*Merredin (-78.77%)*

Note. 1999-2000 data for Jurien was unavailable.

Between 1999-2001 and 2001-2003, the number of leaks and bursts per 100km of water mains has remained stable in Perth (up 5%) but has notably reduced in regional towns (down 23%). In particular, the leaks and bursts have reduced in Newman (down 64%), South Hedland (down 64%), Dongara Denison (down 61%), Broome (down 58%), Busselton (down 56%), Karratha (down 56%) and Esperance (down 52%).

The number of leaks and bursts over four years per 100 kilometres of water mains shows that Mandurah, Pinjarra, Carnarvon, Australind / Eaton are the best performers (top 10%) while Merredin, Kalgoorlie / Boulder, Collie and Harvey / Wokalup are the worst performers (bottom 10%).

Table 23 describes the number of water quality complaints and number of water quality complaints per 1000 properties. In 2002-2003, Collie, Perth and Derby were the towns most likely to receive a complaint.

Table 23
Number of water quality complaints

Data (variance)	Water quality complaints				Water quality complaints per 1000 properties			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*4,427*	*12,320 (178.29%)*	*11,138 (-9.59%)*	*12,685 (13.89%)*				
Total all towns less Perth	*687*	*1,173 (70.74%)*	*1,133 (-3.41%)*	*1,120 (-1.15%)*				
Average all towns	*143*	*385 (169.60%)*	*348 (-9.59%)*	*396 (13.89%)*	*6*	*17 (169.20%)*	*15 (-12.10%)*	*16 (6.68%)*
Average all towns less Perth	*23*	*38 (65.23%)*	*37 (-3.41%)*	*36 (-1.15%)*	*5*	*8 (60.99%)*	*8 (-6.88%)*	*7 (-7.19%)*
Maximum number	*3,740 Perth*	*11,147 (198.05%)*	*10,005 (-10.24%)*	*11,565 (15.59%)*	*26 Margaret River / Gnarabup*	*63 Harvey / Wokalup*	*54 Bridgetown*	*20 Collie*
Minimum number	*0 Carnarvon Katanning Narrogin Newman*	*0 Jurien*	*0 Jurien*	*0 Merredin*	*0 Carnarvon Katanning Narrogin Newman*	*0 Jurien*	*0 Jurien Newman*	*0 Merredin Newman*
Largest increase		*Kalgoorlie / Boulder (1233.33%)*	*Denmark (500.00%)*	*Dongara Denison (200.00%)*		*Kalgoorlie / Boulder (1218.58%)*	*Denmark (478.85%)*	*Dongara Denison (186.32%)*
Largest decrease		*Margaret River / Gnarabup (-60.42%)*	*Dongara Denison (-83.33%)*	*Merredin (-100.00%)*		*Margaret River / Gnarabup (-65.90%)*	*Dongara Denison (-83.95%)*	*Merredin (-100.00%)*

Note. 1999-2000 data for Jurien was unavailable.

The data raises one main concern. Why did water quality complaints increase in 2000-2001? The majority of towns averaged over 150% more complaints in 2000-2001 compared to 1999-2000. The increase in complaints relates to data inconsistencies. For example, water quality complaint information in 1999-2000 (except Bunbury and Busselton) related to water quality faults not the total number of water quality complaints. Water quality faults (work orders) are generated following customer contact and require a work crew to attend. Water quality complaint information between 2000-2003 relates to the total number of water quality complaints received for each financial year. Hence, water quality compliant information in 1999-2000 cannot be compared with water quality compliant information in subsequent years.

2000-2003 water quality complaint information can be compared. Water quality complaints have remained stable over this period for both metropolitan and regional areas. However, a number of regional towns experienced notable variations to the number of water quality complaints over the reporting period. In

2001-2002, for example, Bridgetown, Collie and Denmark reported notable increases in water quality complaints. These increases were in the categories of dirty water, taste and odour. The rises in these particular categories are primarily the result of a changeover to new alternative water sources required in response to drought management.

The number of water quality complaints between 2000-2003 per connected property shows that Jurien, Newman, South Hedland and Port Hedland are the best performers (top 10%) while Harvey / Wokalup, Bridgetown, Australind / Eaton and Derby are the worst performers (bottom 10%). However, Harvey / Wokalup has made significant improvements to its number of water quality complaints over the last two years. Bridgetown, Australind / Eaton and Derby have also made improvements in recent times. These trends are encouraging and there has been a slight reduction in the average number of complaints per connected property in regional towns as a result. Collie however, is trending in the opposite direction and it has recorded the highest number of complaints per connected property in 2002-2003.

Table 24 describes the number of service interruptions greater than one hour and service interruptions greater than one hour per 1000 properties. Figure 10 illustrates the trends in performance graphically.

Table 24
Number of service interruptions greater than one hour

Data (variance)	Number of confirmed service interruptions greater than 1 hour				Service interruptions greater than 1 hour per 1000 properties			
	1999-2000	2000-2001	2001-2002	2002-2003	1999-2000	2000-2001	2001-2002	2002-2003
Total all towns	*49,045*	*70,233 (43.20%)*	*72,578 (3.34%)*	*103,833 (43.06%)*				
Total all towns less Perth	*10,274*	*12,550 (22.15%)*	*10,410 (-17.05%)*	*10,706 (2.84%)*				
Average all towns	*1,582*	*2,195 (38.73%)*	*2,268 (3.34%)*	*3,245 (43.06%)*	*71.73*	*99.37 (38.52%)*	*99.37 (0.47%)*	*133.79 (34.00%)*
Average all towns less Perth	*342*	*405 (18.21%)*	*336 (-17.05%)*	*345 (2.84%)*	*77.53*	*89.30 (15.18%)*	*71.36 (-20.03%)*	*68.95 (-3.45%)*
Maximum number	*38,771 Perth*	*57,683 (48.78%)*	*62,168 (7.78%)*	*93,127 (49.80%)*	*475 Harvey / Wokalup*	*702 Broome*	*309 Collie*	*1,459 Jurien*
Minimum number	*0 Dunsborough / Yallingup*	*0 Dongara Denison*	*0 Dongara Denison*	*0 Dunsborough / Yallingup Katanning*	*0 Carnarvon Dunsborough / Yallingup*	*0 Dongara Denison*	*0 Dongara Denison*	*0 Dunsborough / Yallingup Katanning*
Largest increase		*Carnarvon (10100.00%)*	*Jurien (15200.00%)*	*Geraldton (3512.50%)*		*Derby (3380.16%)*	*Jurien (14651.12%)*	*Geraldton (3324.92%)*
Largest decrease		*Dongara Denison (-100.00%)*	*York (-98.10%)*	*Dunsborough / Yallingup Katanning (-100.00%)*		*Dongara Denison (-100.00%)*	*York (-98.15%)*	*Dunsborough / Yallingup Katanning (-100.00%)*

Note. 1999-2000 data for Jurien was unavailable.

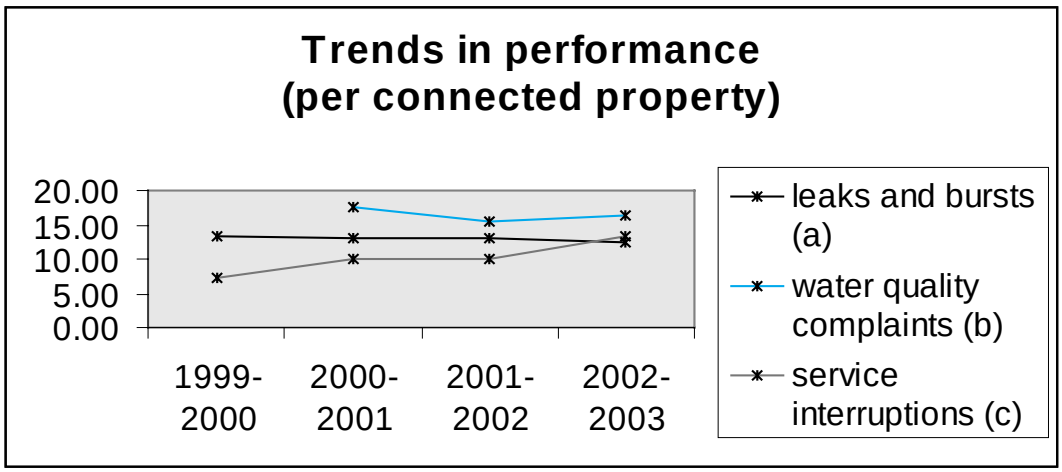
Between 1999-2001 and 2001-2003, the number of confirmed service interruptions greater than one hour has notably increased in Perth (up 61%) but has reduced in regional towns (down 7%). The most notable increases in the number of confirmed service interruptions included Port Hedland (up 394%), Kununurra (up 379%), Pinjarra (up 231%) and South Hedland (207%). The most notable decreased included York (down 98%), Busselton (down 96%), Dunsborough / Yallingup (down 94%) and Merredin (down 88%).

Some of the increases in the number of confirmed service interruptions related to improved reporting procedures rather than actual numbers of interruptions. For example, the system for reporting service interruptions was upgraded in 2001-2002. As a result, the increased number of properties affected by interruptions decreased the average duration of those interruptions because shorter interruptions were captured with the new system.

The number of service interruptions per 1000 connected properties between 1999-2003 shows that Dunsborough / Yallingup, Margaret River / Gnarabup, Dongara Denison and Mandurah are the best performers (top 10%) while Jurien, Collie,

Broome and Harvey / Wokalup are the worst performers (bottom 10%). The number of service interruptions trended upward in Jurien and Collie while it trended downwards in Broome and Harvey / Wokalup.

Figure 10



Note. [a] leaks and bursts per 100 kilometres of water mains; [b] water quality complaints per 1,000 connected properties; [c] service interruptions per 100 connected properties.

2.2 Performance Benchmarking

Perth is by far the largest town. Of the 32 towns, for example, Perth consumed 72% of all water in 2002-2003. To prevent distortion of the extent of water delivery in WA, Perth should be considered separately from the other towns. However, WA regional towns share demographic and performance characteristics on water services, which makes it valuable to provide information on the 'average' town (excluding Perth). Table 25 describes the vital statistics for Perth and the 'average' regional town.

A comparison between Perth and the 'average' WA town identifies the difference in scale of water service delivery. Perth services a population 127 times greater, with 124 times additional connected properties and consumes 81 times more water than the average WA town. It has 11,829 kilometres of water mains compared to 157 kilometres in the average WA town, 321 times more water quality complaints and 270 times more service interruptions. However, compared to regional towns Perth is 'on average' no better or worse at providing a water service to the general population, based on the current performance indicators. It should be noted however, that these performance indicators are not a complete assessment of water providers' performances.

Table 25
Vital statistics for the 'average' town less Perth (and Perth)

Data – Average town (Perth)	1999-2000	2000-2001	2001-2002	2002-2003
Population served	*10,800 (1,274,100)*	*10,741 (1,375,808)*	*11,070 (1,402,738)*	*11,218 (1,425,678)*
Number of connected properties	*4,417 (551,195)*	*4,534 (566,265)*	*4,702 (581,187)*	*5,009 (620,832)*
Number of residential connected properties	*3,746 (509,327)*	*4,026 (529,157)*	*4,181 (542,118)*	*4,253 (552,573)*
Number of non-residential connected properties	*671 (41,868)*	*508 (37,108)*	*521 (39,069)*	*756 (68,259)*
Total annual water consumption – megalitres	*2,197 (218,698)*	*2,494 (225,894)*	*2,308 (202,825)*	*2,318 (187,453)*
Residential water consumption – megalitres	*1,363 (167,829)*	*1,541 (173,195)*	*1,439 (156,138)*	*1,445 (143,652)*
Non-residential water consumption – megalitres	*835 (50,869)*	*953 (52,700)*	*868 (46,687)*	*873 (43,801)*
Average weekly consumption – megalitres	*42 (4,206)*	*48 (4,344)*	*44 (3,900)*	*45 (3,605)*
Peak week consumption – megalitres	*89 (7,224)*	*86 (7,708)*	*79 (6,004)*	*80 (5,836)*
Volume of water consumed per head of population – kilolitres/person	*203 (172)*	*232 (164)*	*208 (145)*	*207 (131)*
Average annual consumption per residential property – kilolitres/property	*352 (330)*	*383 (327)*	*344 (288)*	*340 (260)*
Average annual consumption per non-residential property – kilolitres/property	*1,528 (1,215)*	*1,876 (1,420)*	*1,667 (1,195)*	*1,155 (642)*
Daily consumption per residential property – litres/property	*964 (903)*	*1,049 (897)*	*943 (789)*	*931 (712)*
Daily consumption per non-residential property – litres/property	*4,187 (3,329)*	*5,141 (3,891)*	*4,568 (3,274)*	*3,163 (1,758)*
Total volume of water extracted – megalitres	*2,593 (254,776)*	*2,451 (280,498)*	*2,323 (248,212)*	*2,312 (223,893)*
Water extracted from impounding reservoirs – megalitres	*877 (121,366)*	*630 (139,712)*	*555 (94,240)*	*511 (86,619)*

Table 25 continued
Vital statistics for the 'average' town less Perth (and Perth)

Data – average town (Perth)	1999-2000	2000-2001	2001-2002	2002-2003
Water extracted from groundwater – megalitres	*1,655 (133,410)*	*1,786 (140,786)*	*1,731 (153,972)*	*1,748 (137,274)*
Non revenue water – megalitres	*398 (36,078)*	*290 (37,043)*	*302 (15,551)*	*284 (27,862)*
Non revenue water per connected property – kilolitres/property	*90 (65)*	*64 (65)*	*64 (27)*	*57 (45)*
Ratio of residential to non-residential properties	*7.09 (12.17)*	*7.92 (14.26)*	*8.03 (13.88)*	*5.62 (8.10)*
Ratio of residential to non-residential consumption	*1.63 (3.30)*	*1.62 (3.29)*	*1.66 (3.34)*	*1.66 (3.28)*
Non revenue water as percent of volume supplied	*15% (14%)*	*12% (13%)*	*13% (6%)*	*12% (12%)*
Non revenue water as percent of volume consumed	*18% (16%)*	*12% (16%)*	*13% (8%)*	*12% (15%)*
Disinfection only water treatment – megalitres	*1,835 (138,605)*	*1,409 (154,652)*	*1,280 (104,959)*	*1,073 (95,994)*
Disinfection and filtration water treatment – megalitres	*378 (2,089)*	*427 (0)*	*306 (0)*	*335 (0)*
Disinfection only and additional processes – megalitres	*0 (0)*	*501 (6,430)*	*496 (9,164)*	*557 (23,100)*
Disinfection, filtration and additional water treatment – megalitres	*326 (114,082)*	*402 (119,416)*	*450 (134,089)*	*340 (107,870)*
Length of water mains – kilometres	*150 (11,435)*	*152 (11,468)*	*154 (11,622)*	*157 (11,829)*
Number of water quality complaints	*23 (3,740)*	*38 (11,147)*	*37 (10,005)*	*36 (11,565)*
Number of water quality complaints per 1000 properties	*5 (7)*	*8 (20)*	*8 (17)*	*7 (19)*
Number of confirmed service interruptions > 1 hour	*342 (38,771)*	*405 (57,683)*	*336 (62,168)*	*345 (93,127)*
Service interruptions > 1 hour per 1000 properties	*78 (70)*	*89 (102)*	*71 (107)*	*69 (150)*
Percentage of services not experiencing supply interruptions > 1 hour	*92% (93%)*	*91% (90%)*	*93% (89%)*	*93% (85%)*
Number of water main leaks and bursts	*25 (1,401)*	*21 (1,443)*	*20 (1,502)*	*16 (1,565)*
Number of bores	*7 (205)*	*7 (196)*	*7 (203)*	*8 (216)*
Number of service reservoirs	*5 (97)*	*5 (99)*	*5 (97)*	*5 (103)*
Number of pump stations	*4 (86)*	*4 (94)*	*4 (98)*	*4 (96)*

Table 26 *Data criteria*
Customer base
Number of people serviced
Number of connected properties
Number of residential connected properties
Number of non-residential connected properties
Ratio of residential to non-residential connected properties
Water consumption
Total annual water consumption
Total annual residential water consumption
Total annual non-residential water consumption
Average weekly consumption
Peak week consumption
Volume of water consumed per head of population
Average annual consumption per connected property
Average annual consumption per residential connected property
Average annual consumption per non-residential property
Daily consumption per residential property
Daily consumption per non-residential property
Ratio of residential to non-residential consumption
Water supply
Total volume of water extracted
Water extracted from impounding reservoirs
Water extracted from rivers
Water extracted from groundwater
Non revenue water (delivered less metered consumption)
Non revenue water per connected property
Non revenue water per 100 kilometres of water mains
Non revenue water as a percent of volume supplied
Non revenue water as percent of volume consumed
Water treatment
Disinfection only – number of works
Disinfection only – volume supplied
Disinfection and filtration – number of works
Disinfection and filtration – volume supplied
Disinfection only and additional processes – number of works
Disinfection only and additional processes – volume supplied
Disinfection, filtration and additional processes – number of works
Disinfection, filtration and additional processes – volume supplied

Table 26 continued *Data criteria*
Assets
Length of supply mains
Number of dams
Number of bores
Number of service reservoirs
Number of pump stations
Performance
Number of leaks and bursts
Number of leaks and bursts per 100 kilometres of water mains
Number of water quality complaints
Number of water quality complaints per 1000 connected properties
Number of confirmed service interruptions greater than one hour
Number of confirmed service interruptions greater than one hour per 1000 connected properties

Table 27
Industry Definitions

Complaint (Standards Australia defined)

Any expression of dissatisfaction with a product or service, offered or provided.

Connected properties (Water Services Association of Australia; WSAA defined)

A water property is:

- Connected to the licensee's water system;
- The subject of billing for water supply (fixed and/or consumption); and
- The owner and tenant are not separately counted as water properties.

This includes:

- A connected non-rateable property; and
- A connected but non-metered property.

It does not include:

- A body corporate; or
- A rated but unconnected property.

Integrated water supply scheme (Corporation defined)

The Integrated Water Supply Scheme (IWSS) serves communities from Harvey to Perth as well as the agricultural areas of the north eastern and eastern wheat belt, and the Goldfields region as far as Norseman. Water for this scheme is supplied from a number of surface (dams) and groundwater (bores) sources which are connected by a system of trunk mains to achieve comprehensive integration.

Interruption (WSAA defined)

An interruption commences when the utility is aware that "water is no longer available at the customer's first cold water tap and ceases when 'normal' service is restored" i.e. the last valve has been opened. A water supply interruption is any event causing a total loss of water supply due to any cause.

Example: If a customer notifies they are without water, the duration commences at the time of notification. If the utility is responding to a notification of a broken main, unless this notification also indicates a loss of supply, the duration commences once the shut off valve is closed (if repairs are not being done under pressure).

An unplanned interruption is when the customer has not received at least 24 hours notification of the interruption, or when the duration of the interruption exceeds that which was originally notified. This should include all un-notified interruptions caused by third parties.

Table 27 continued *Industry Definitions*
Non revenue water (IWS defined)
The difference between the annual volumes of system input and billed authorised consumption. Non revenue water includes not only the real losses and apparent losses, but also the unbilled authorised consumption.
Water mains (WSAA defined)
The total length of mains delivering potable water to customers. This includes all trunk and reticulation mains, expressed in kilometres. It does not include all lengths associated with mains to meter connections, or source works such as bore fields not associated with the water supply.
Water population (WSAA defined)
Metropolitan population receiving a water service from the utility based on census data obtained from the Australian Bureau of Statistics.
Water pumping stations (WSAA defined)
Total number of water pumping stations used to deliver potable water to the customer within the metropolitan area.
Water quality complaints (WSAA defined)
Total number of complaints received by the utility that relate to the water quality. With respect to water quality, this is any complaint regarding discolouration, taste, odour, stained washing, illness etc. It does not include complaints relating to service interruption, adequacy, restriction, pressure etc.
Water restrictions (Corporation defined)
The existing restrictions are classified as Stage 4 and include the following conditions: • Swimming pools are to be filled only to the minimum extent necessary for proper functioning. • Buildings and paths are to be sprayed only to the minimum necessary for fire fighting, cleaning for public health, and construction or repair. • Watering of lawns and gardens is only permitted on two days each week between 6pm and 9am, or by the use of a hand held hose or watering can. These conditions do not apply to market gardens or plant nurseries which do not have an alternate water supply, and any other place exempted by the Water Corporation.

Table 27 continued *Industry Definitions*
Water supplied (WSAA defined)
Environmental flows – Estimated wholesale flow allocation to the environment, upstream of the master meter in megalitres for the reporting period. *Bulk water sales* – Total external bulk water sales in megalitres for the reporting period. *Residential* – Total metered and estimated non-metered consumption by domestic properties in megalitres for the reporting period. *Commercial and industrial* – Total metered and estimated non-metered consumption by non-domestic properties in megalitres for the reporting period. *Other* – Total estimated non-metered consumption by other properties/sources. This includes but may not be limited to an estimate of water used for fire fighting, mains flushing, estimated losses due to customer meter errors, water taken by councils or contractors and any other consumption due to operations. *Total* – The water master meter volume and should equal the sum of environmental flows, bulk water sales, residential consumption, commercial and industrial consumption and other consumption.
Water treatment plants (WSAA defined)
For both ground-water and surface water, a water treatment plant is defined as an individual location that receives raw or partially treated water for treatment (excluding secondary disinfecion) and ultimate delivery to customers. *Disinfection only* – Total number of water treatment plants providing simple disinfection only treatment of potable water supply to the metropolitan area. *Full treatment* – Total number of water treatment plants providing simple disinfection only and some other physical treatment only (eg filtration and disinfection) plus single stage complex physical or chemical treatment eg super-chlorination, flocculation or biofiltration.

For additional information, view the Economic Regulation Authority website at:
www.era.wa.gov.au

Western Australia

Economic Regulation Authority

Contact the Economic Regulation Authority at:
Level 6, Governor Stirling Tower, 197 St. Georges Terrace, Perth WA 6000
GPO Box 8469 Perth Business Centre WA 6849