



**STATISTICAL PROFILE AND
PERFORMANCE BENCHMARKING
OF WATER SUPPLY SERVICES
IN 32 MAJOR WESTERN AUSTRALIAN
TOWNS
1999/2000**

June 2001

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FOREWORD

More than two years ago my Office set about defining and securing the essential information that would enable the evaluation and reporting of the Western Australian water industry's performance and that of its major service providers.

The undertaking was a crucial element of an integrated response to Sections 5 (b), (c), (d) and (g) of the Water Services Coordination Act 1995 that outline the functions of the Coordinator of Water Services in relation to; advising the Minister on policy issues, monitoring and evaluating the performance of licence-holders and, publishing related reports.

This report on water services is the first publicly released document resulting from the endeavour and the first in a planned annual series of reports on the water and wastewater industries in Western Australia. The series is characterised by the application of metric benchmarking techniques to facilitate performance evaluation and the promotion of 'competition by comparison' through open, transparent reporting.

At a time when the Office has initiated a public consultation process to review service standards for

water supply, sewerage and drainage licenses, it is expected that this report will also help to inform discussion, debate and decision on several of the standards and associated issues under review.

Coincidentally, the Government has recently commenced implementing the Machinery of Government (MOG) Taskforce recommendations. I believe the report on water services will contribute to an understanding of the actions and regulatory mechanisms that will be required to give effect to relevant MOG recommendations. More importantly, to the extent of the available financial benchmarking data, the report helps delineate the regulatory landscape in which the anticipated economic regulation model will be positioned.

I trust that the report will be of interest to the broader community as well as valuable to those more directly involved in the water industry and concerned with its performance and future. The Office of Water Regulation welcomes feedback on the report's structure and content.

Dr Brian Martin
Coordinator of Water Services





PART 5(A) of the Water Service Coordination Act 1995 sets out the functions of the Coordinator of Water Services in respect of the licensing of Western Australian water service providers in accordance with Part 3 of the Act. The Office of Water Regulation (OWR) supports the Coordinator in this undertaking by reporting on licensee performance and compliance with operating licence requirements.

This report is a product of the OWR's analysis and evaluation of 1999-2000 data submitted by the Water Corporation of Western Australia and the Bunbury and Busselton Water Boards as required under their respective licences. The report presents pertinent statistics on water supply services in thirty-two major towns served by the three licensees and benchmarks (compares) key aspects of performance.

With around 85% of the State's total population residing in the benchmarked towns, the report's statistical and performance information is a reasonable barometer of water supply services in WA more generally, albeit to the extent that the nature and completeness of the data can reveal.

Some shortcomings in data quality have moderated what and how we have been able to report. Other reporting limitations have resulted from definitional differences between providers and/or emerging concerns about the appropriateness of existing definitions. Where an appreciation of these factors would help inform the reader's understanding of the data, the report explains their relevance.

STATISTICAL PROFILE

Physical

In the 32 benchmarked towns during the 1999/2000 year 736,785 properties supplying the potable water needs of at least 1.6 million Western Australians were served by the three licensees. Between them, these towns consumed nearly 285,000 megalitres (ML) of water with residential consumption accounting for about 209,000 ML in 620,000 properties.

Perth's annual water consumption averaged 372 kilolitres (kl) per served property (332kl residential and 618kl non-residential). Respectively, Bunbury and Busselton water consumption averages were 396kl (329kl residential, 642kl non-residential) and 459kl (318kl residential, 1120kl non-residential). For all towns and all properties (residential and non-residential) the average annual consumption was 386kl. Excluding Perth, the average annual consumption per served property was 441kl.

Residential properties represented 84% of all properties and consumed 73% of all water. Non-residential (16% of all) properties consumed 27% of all water. On average, the weekly water consumption by all towns totalled 5,475 ML. For Perth, Bunbury and Busselton the average weekly water consumption figures were, respectively; 4206 ML, 107 ML and 71 ML. During the peak water consumption week for Perth 7,224ML was consumed. In Bunbury and Busselton peak week water consumption was 201 ML and 125 ML respectively.

The total volume of water extracted from all sources to supply the benchmarked towns during the year was 332,570 ML. These sources consisted of impounding reservoirs 149,513 ML (45%) and groundwater 183,057 ML (55%). Various water treatment protocols were categorised into three broad processes; Disinfection Only 195,483 ML (59%), Disinfection and Filtration 13,798 ML (4%) and Disinfection, Filtration and Additional Treatment processes 124, 178 ML (37%).

The water extraction and delivery infrastructure included 15,937 kilometres of mains, 23 'referable' dams, 5 weirs, 428 bores, 237 service reservoirs or tanks, and 203 pump stations.

Unaccounted for water amounted to nearly 48,023 ML and this represented about 14% of water supplied and 17% of water consumed. For every served property an average volume of 65 kilolitres (kl) was unaccounted for annually, the equivalent of approximately 178 litres per property per day. In the Perth area unaccounted for water was 14% of the volume supplied (61kl per property served per annum). For Bunbury and Busselton the rates were around 20% (97kl per property) and 4% (19kl per property) respectively.

Financial

Provider Assets and Trading Revenues

The estimated Current Replacement Value (CRV) of water systems assets required to serve the benchmarked towns was almost \$4 billion. About \$2.7 billion of this was attributable to the Perth area. The CRV for Bunbury's systems assets was \$56.4 million. For Busselton the CRV was \$11.6 million.

Averaged on a per served property basis for all towns, the CRV of systems assets was \$5,323. For Perth, the average CRV of assets per property was \$4,589. The Bunbury and Busselton equivalents were \$4,025 and \$1,446 (the lowest of all towns) respectively. In Karratha, the CRV per served property was the highest of all towns at \$51,019.



EXECUTIVE SUMMARY CONTINUED

Total reported trading revenue from water operations was \$408 million which comprised; usage (ie. consumption) charges of \$170 million, access charges of \$126 million and, other revenues totalling \$112 million. Of the \$408 million, the Perth area accounted for \$283 million, while Bunbury and Busselton respectively derived \$6.6 million and \$2.4 million in revenue from their water service operations.

Usage revenue per served property averaged \$231 for all towns. The Perth, Bunbury and Busselton averages were \$202, \$190 and \$152 respectively. As a percentage of total trading revenue, the usage revenue component for the Perth area was 42%. The equivalents for Bunbury and Busselton were 41% and 51% respectively.

Access revenue per served property averaged \$172. For Perth, Bunbury and Busselton the averages were respectively, \$165, \$190 and \$145. As a percentage of total trading revenue, access revenue was 34% for Perth, 41% for Bunbury and 49% for Busselton.

Other Revenue derived from trading averaged \$116 per property served in the Perth area and \$89 for Bunbury. For all towns (excluding Busselton) the average Other Revenue derived per served property was \$154.

Note: The OWR has been unable to evaluate Water Corporation financial data relating to depreciation, some aspects of capital expenditure, treatment costs and economic real rates of return. This data was either not provided to us at all or was considered to be unsuitable for useful evaluation. As a consequence, comparative analyses against equivalent financial data for Bunbury and Busselton have not been possible. However, in the interest of transparency and completeness all financial data received from the three licensees is included in the Appendices.

Costs to Customers

The cost of the average annual bill to a customer living in the Perth area was \$324.10. In Bunbury the average bill was \$277.10 and in Busselton it was \$231.10 (the lowest).

Based on an assumed annual consumption of 415kl by all customers in all towns, the comparative cost of water services in Perth, Bunbury and Busselton respectively was \$361.40, \$315.00 and \$284.90 (the lowest for any town). For all remaining towns, bills for annual water consumption of 415kl were either; \$347.75, \$356.95 or \$358.40, depending on the applicable tariff structure for the town.

The real annual increase (over 1998-1999) in the bill for a customer consuming 415kl in 1999-2000 was 2.43% for Perth and 0.00% for Bunbury. In all remaining towns the reported increases were less than 2.40%.

PERFORMANCE PROFILE

Key Performance Indicators

The OWR has examined in some depth the key areas of provider performance that directly or indirectly have a significant impact on water services customers. Although the reader is encouraged to study interpretive commentary on these in the body of the report, our findings in respect of the indicators are decidedly positive.

In the area of **Continuity of Supply** it was found that:

The average rate of leaks and bursts per 100kms of water main for all towns was 13.5 which compares very favourably with the permitted maximum of 20 as specified in operating licences. Perth performance was 12.25, Bunbury 22.22 and Busselton 19.10.

An average of 93% of all served properties did not experience a confirmed supply interruption lasting longer than one (1) hour, an excellent result relative to the minimum target of 75% as set out in the operating licences. The figure for Perth was 93%, for Bunbury 91% and for Busselton 86%.

For all towns served by the Water Corporation, the average number of confirmed service interruptions (incidents) per 1000 properties served was 59. As yet, no minimum performance standard is defined for this indicator. The highest rate occurred in Newman (134) and the lowest in Dunsborough Yallingup (1). Excluding Perth (63), the average for all remaining Water Corporation towns was 46 per 1000 properties.

For all towns served by the Water Corporation the average number of supply interruptions exceeding 1 hour in duration per incident per 1000 served properties was 1.12. The best performer here was again Dunsborough Yallingup with a rate of zero. The least favourable performance (22.11) was in Merredin. The Perth rate was 1.05.

With respect to **Water Quality** performance it was found that:

The average number of water quality complaints per 1000 properties served was 6. For Perth the complaint rate was 6.4 per 1000 properties. Bunbury and Busselton rates were 20.8 and 9.50 respectively. Excluding Perth area water quality complaints, the



EXECUTIVE SUMMARY CONTINUED

average number of complaints for all other towns was 4.6 per 1000 properties. Care is required in interpreting complaint rate data as it includes non-health related water quality complaints and because definitional differences exist between providers.

With the minor exceptions discussed in the report, microbiological water quality enjoyed by all towns was very good. Every one of the 32 benchmarked towns exceeded minimum performance standards for permissible levels of Total Coliforms in drinking water.

All 32 benchmarked towns also exceeded the minimum compliance targets for water samples to be free of Thermo-tolerant Coliforms. With the exception of Port Hedland (98%), all towns achieved 100% compliance with the standard for water samples to be free of amoebae.

Performance Benchmarking

From the performance indicators provided by the raw and derived data, four (4) were selected (two for each of water quality and supply continuity) to enable the internal and competitive benchmarking of performance by towns and providers. This decision was based on the key outcome of the OWR's Customer Survey (1999-2000) which found that 84% of residential respondents rated water quality and reliability of supply as the most

important aspects of water supply. Commercial respondents expressed similar levels of concern.

The OWR standardised performance data to formulate an (unweighted) aggregate score for each town against:

- ▲ number of water quality complaints per 1000 served properties (water quality);
- ▲ microbiological compliance (water quality);
- ▲ average duration of supply interruptions (supply continuity);
- ▲ services not experiencing drinking water supply interruptions lasting longer than 1 hour (supply continuity).

The resulting score considers the four indicators taken together and compares the relative performance of the benchmarked towns. Irrespective of definitional differences for water quality complaints, it is clear that Carnarvon outperformed all other towns.

Conversely, Harvey Wokalup was outperformed by all other towns. In summary, a high level of performance is apparent with 23 towns scoring more than 95 (out of 100), 7 towns scoring between 90 and 95, and just 2 towns scoring less than 90. Individual scores and the ranking of each town together with explanatory notes are provided in *Table 15*.



Comments and Further Information

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INTRODUCTION



OFFICE OF WATER REGULATION (OWR) licensing conditions for the Water Corporation and the Busselton and Bunbury Water Boards require that specific “benchmarking data” relating to business and operational performance are reported annually to the Coordinator of Water Services.

In satisfaction of this requirement for the 1999-2000 financial year the three licensees submitted to the Coordinator relevant data concerning:

- ▲ *Water Services – 32 major towns (Appendix 1) connected to water services supplied by the three licensees and;*
- ▲ *Wastewater Services – 19 major towns connected to wastewater services provided by the Water Corporation only.*

Significant findings from the OWR’s analysis of the *Water Services* data are the subject of this report. A second report will address wastewater services.

Benchmarking data enables the OWR to compare (or benchmark) performance in a number of areas (*Appendix 2*), including relative performance in respect of certain key indicators. In the context of this report, there are three primary means by which the Office seeks to benchmark performance:

- ▲ *Historic Longitudinal* – Benchmark the historic performance of a particular provider relative to itself across time. This means the evaluation of annual performance to assess the extent to which it has improved or declined over time – a longitudinal evaluation of performance using annual benchmarking data.
- ▲ *Internal* – Benchmark the performance of a particular provider at a disaggregated level. For that provider it would mean a comparison of its performance on a regional, town or scheme basis. For example, in the case of the Water Corporation this could mean evaluating its relative performance achievements in delivering water services to Albany as compared to Broome, Karratha, Port Headland, etc.
- ▲ *Competitive* – Benchmark the performance of one provider against another or other providers for the same indicator(s) (eg. Water Corporation compared with Busselton and Bunbury Water Boards for water mains leaks and bursts).

As this is the first report in an annual performance reporting cycle for benchmarking data, the OWR is unable to utilise historic longitudinal benchmarking techniques until data becomes available for the 2000-2001 year. Equivalent data for 1998-1999

was incomplete and this constrained our ability to compare it with 1999-2000 data in a balanced and comprehensive manner. However, there has been considerable scope for internal, and to an extent, competitive, benchmarking in respect of the reported data. The results of these approaches are reflected in the report.

Data Quality

It is stressed from the outset that the OWR has evaluated the raw data **as reported** by the providers. Whilst the Office is satisfied that the reported data appears to be generally consistent with our regulatory knowledge and understanding of the magnitude, geographical dispersion, scope and performance of the water services operated during the 1999-2000 year, the OWR is unable to attest to the veracity of that data. In part, our reluctance to do so is due to the fact that one of the three providers submitted two sets of unforeshadowed, unsolicited data amendments over as many months following its original benchmarking data submission.

Nevertheless, we expect and have assumed that all data was subject to some manner of quality check prior to its original submission, or subsequent amendment(s). Our minimum expectation is that rudimentary quality checks will have contributed to a significant level of data accuracy (freedom from material error) and, to the extent achievable, data completeness.

In regard to data completeness, we note without comment advice from the Water Corporation that ‘[the Corporation’s] financial systems are not configured to enable the extraction of treatment costs (OMA) or capital expenditure in the categories of; new works, subdivider/development and other’.

On the matter of data accuracy the opinion of the OWR is that some anomalies or inconsistencies do exist – shortcomings that are not logically attributable to definitional quandaries (discussed below). Where we believe this may have occurred and we have nonetheless evaluated and reported findings concerning such data, an appropriate qualifying/explanatory statement is provided in the text.

There have been and currently remain definitional problems for the Water Corporation in identifying, quantifying and reporting some data elements. Where these difficulties had the potential to give rise to ambiguity or uncertainty in the data or its meaning, they are explored in the text of the report.

Whatever the shortcomings of existing industry definitions (including those established and/or used by





INTRODUCTION CONTINUED

members of the Water Services Association of Australia – WSAA), where these might help inform the reader their substance (though not necessarily their complete formal definition) is outlined at **Appendix 3**.

Report Objectives

With the foregoing caveats in mind, the OWR considers that (according to the data submitted by the three providers) this report on water services for the 1999-2000 financial year is both balanced and accurate. The objectives of the report are to:

- ▲ summarise pertinent facts and figures (including financial information) on the general business and operational environments of Western Australia's three main licensed water providers;
- ▲ discuss related performance achievements of the different towns/providers against key statistical and performance indicators and;
- ▲ provide a comparative view of performance by benchmarking achievements in the crucial areas of water quality and supply continuity and rating the 32 towns relative to each other against these indicator types. (**Tables 14 and 15**)

For completeness and transparency the report includes a series of supporting Appendices detailing the raw data submitted by the three providers. Also appended are the various data elements derived by the OWR from the raw data. In all, the Appendices provide precise metrics on significant aspects of water services operations and performance in all benchmarked towns.

It is expected that some readers will wish to review the raw and derived data to develop a more detailed understanding of the profiles for different towns and to draw their own conclusions about various aspects of water services performance by the providers. We encourage this level of scrutiny and independent assessment.

The OWR also recognises that for all intents and purposes the overwhelming majority of water services in Western Australia are supplied by the three identified licensees (in fact, primarily by the Water Corporation). Consequently, we believe that the report reasonably indicates the overall condition of the WA water services industry as a whole – in regard to the themes that could be addressed given the available data.





1.1 Properties/Population Served

Properties totalling 736,785 in the benchmarked towns were provided with water services. Of these, 620,926 properties (84%) were classified as residential and 116,859 (16%) were classified as non-residential – a ratio of 5.25:1. The non-residential component refers to industrial, commercial, municipal and other supplies.

The highest number of services was provided in Perth with 504,810 residential properties (around 81% of the total for all towns) and 82,333 non-residential properties (about 70% of the total for all towns) in receipt of water services. (*Appendix 4*).

Outside the Perth area, Mandurah recorded the highest number of residential and non-residential water services of any town, 19,203 and 5,414 respectively. The smallest numbers of water services were provided in York (917 residential) and Newman (258 non-residential).

The minimum population reached by all water services in the benchmarked towns is believed to be 1,600,000. Difficulties in determining the exact size of the served population arise from the fact that ABS population statistics are currently available by shire, but not by town.

Water Corporation estimates suggest that the total population served by its water services statewide is perhaps 1,710,000 (about 788,000 properties). Estimates of the population served by water services of the Bunbury and Busselton Water Boards account for a further 47,000 persons.

Where the actual population served in a town was not known, the Water Corporation has estimated the population using ABS information. It has assumed that on average 2.173 persons consume water (reside) at each property served (both residential and non-residential). The averages applied by the Bunbury and Busselton Water Boards to estimate the populations served by their water connections are almost identical to the average utilised by the Water Corporation.

For the benchmarked towns, the population served represents around 85% of Western Australia's total population that, according to ABS statistics, was 1,873,000 as at December 1999. The balance of the population (approximately 273,000 persons) is widely dispersed in relatively small communities served either by private water providers, shire councils or the Water Corporation. In the case of those living in remote locations commercial water services may also be unavailable.

As expected, the largest (estimated) population for all towns provided with water services is Perth (1,274,100). Elsewhere, the largest town population availing of water services resides in Mandurah (53,419). The smallest population served is in Bridgetown (2,873).

1.2 Consumption

Total annual water consumption for all towns was 284,618 megalitres (ML). Of this, residential consumption accounted for 208,707 ML (73% of the total) with the balance of 75,911 ML (27%) attributed to consumption by the non-residential sector (*Figure 1*). The water consumption ratio (residential to non-residential) was 2.75:1.

For all benchmarked towns the average annual consumption per property served (residential and non-residential) was 386 kilolitres (kl). Each residential property consumed an average of 337 kl for the year – equivalent to a daily consumption of 922 litres. Non-residential properties averaged an annual consumption of 650 kl per property – a daily equivalent of 1,780 litres. It should be noted that in some cases a 'served property' may have more than one customer.

Average weekly water consumption by all towns totalled 5,475 ML. Total consumption by these towns in their peak consumption weeks of the year exceeded average weekly consumption by an estimated 77% at 9,720 ML. In providing this statistic the OWR acknowledges that peak week consumption for different towns may occur during different weeks of the year. Similarly, the Water Corporation believes it is not meaningful to total the peak week consumption data for the towns it serves.

For the Perth area, total annual water consumption was 218,698 ML (167,829 ML residential and 50,869 ML non-residential), excluding unaccounted for water which is discussed later. Perth's total water consumption accounted for almost 77% of the total consumption by all towns. Perth's residential water consumption represented 80% of the total residential consumption by all towns. In contrast, for the non-residential sector the Perth area accounted for only 67% of the total non-residential consumption by all towns. (*Appendix 5*)



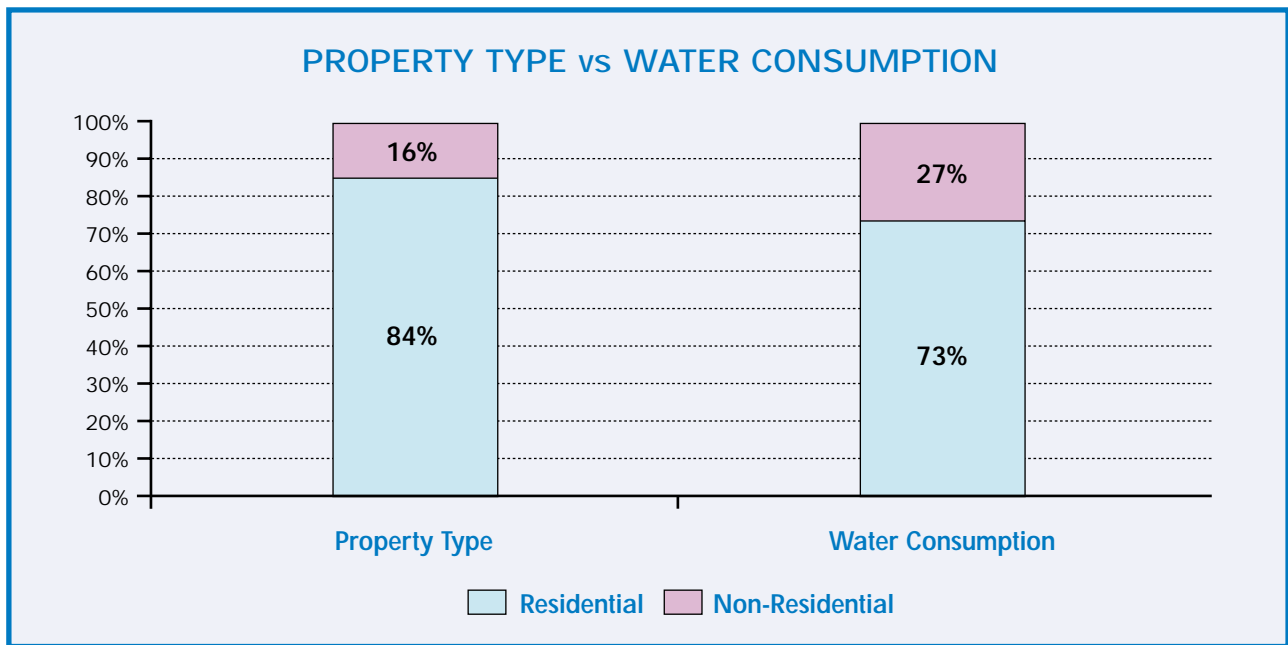


Figure 1

Outside the Perth area, total water consumption was highest in absolute terms in Kalgoorlie-Boulder (7,848 ML) and lowest in Bridgetown with 320 ML (244 ML and 76 ML respectively for the residential and non-residential sectors). Residential consumption was highest in Mandurah (5,907 ML) and non-residential consumption was highest in South Hedland (5,082 ML).

Of Eaton's total water consumption, 92% (the highest percentage rate for any town) was attributed to the residential sector, the remainder (8%) to the non-residential sector. The highest percentage rate of non-residential to total consumption occurred in South Hedland with 77% of the town's consumption being attributed to this sector.

Overall, the average water consumption per person per day for both residential and non-residential properties in all towns was around 488 litres.

Per property served, the highest rate of annual residential water consumption occurred in Port Hedland with 654kl. The lowest rate was in Denmark (216kl per annum per residential property served). For non-residential properties, the highest annual rate of consumption occurred in South Hedland (6,043kl), the lowest was recorded again in Denmark (116kl).

Table 1 summarises key statistics on water consumption in 1999-2000.

Residential – highest	Port Hedland	654 kl
Residential – lowest	Denmark	216 kl
Non-residential – highest	South Hedland	6,043 kl
Non-residential – lowest	Denmark	116 kl
	All Properties	386 kl
	All Residential Properties	337 kl
	All Non-residential Properties	650 kl
	Perth – All Properties	372 kl
	Bunbury – All Properties	396 kl
	Busseton – All Properties	459 kl

Table 1

1.3 Supply

The total volume of water extracted from all sources to supply the benchmarked towns during the year was 332,570 ML (Figure 2). These sources consisted of:

- ▲ Impounding Reservoirs – 149,513 ML (45%)
- ▲ Groundwater – 183,057 ML (55%)

Fourteen (14) towns were entirely dependent on water from groundwater extraction. Of these, Geraldton recording the highest volume at 9,528 ML and Dongara Denison the lowest volume at 460 ML. (Appendix 6)

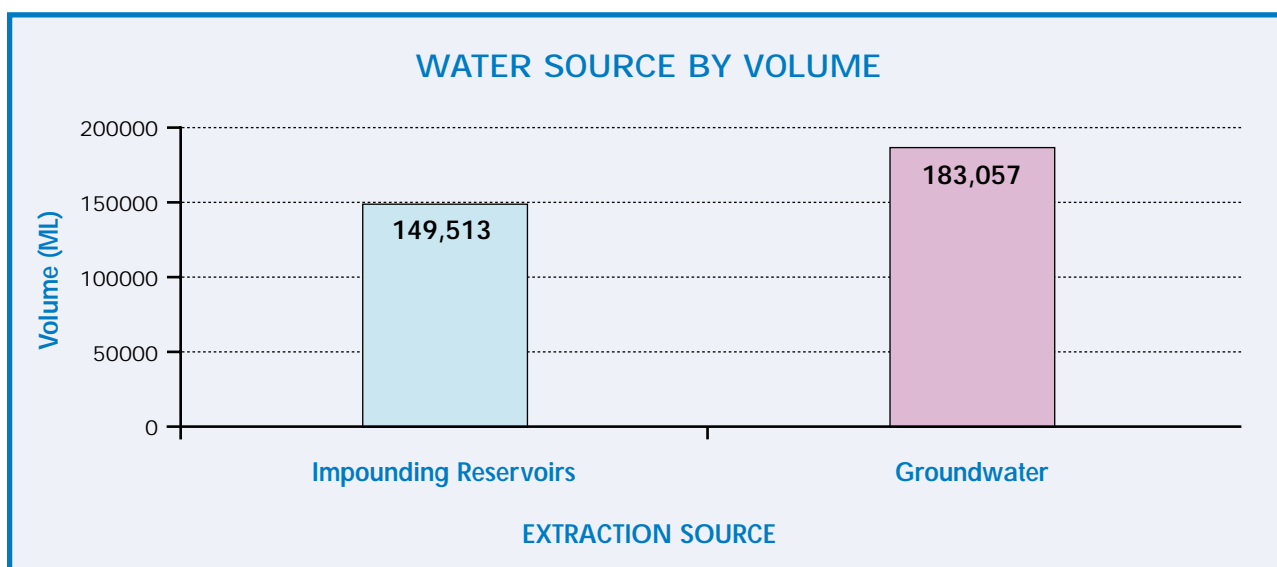


Figure 2

Twelve (12) towns were entirely dependent on impounding reservoirs for their water supplies. Of these, the smallest volume extracted was in Bridgetown (373 ML) and the highest occurred in Kalgoorlie Boulder (8,082 ML).

Albany, Perth, Mandurah and Karratha relied on water extracted from both impounding reservoirs and groundwater. Of these towns, groundwater extraction in Mandurah accounted for less than 10% of the total volume. Half of Karratha's water extraction came from groundwater (1,688 ML). The Perth area relied on groundwater for approximately 52% (133,410 ML) of its total supply while Albany extracted 3,754 ML from groundwater, about 80% of its total supply.

It should be noted that some towns served by the Water Corporation were part of larger schemes and did not have master meters to directly measure delivery volumes on a town basis. In these cases the volumes of water supplied have been estimated by the Corporation although the towns involved were not identified.

1.4 Treatment

The total volume of water requiring treatment was 333,459 ML (Figure 3). This need was met according to three main water treatment protocols categorised as:

- ▲ Disinfection – 195,483 ML (59%)
- ▲ Disinfection and Filtration – 13,798 ML (4%)
- ▲ Disinfection, Filtration and Additional Treatment processes – 124,178 ML (37%)

For the three treatment levels, the number of Treatment Works utilised were:

- ▲ 51 – Disinfection only
- ▲ 13 – Disinfection and filtration
- ▲ 13 – Disinfection, filtration and additional processes

It is understood that the same treatment works can be utilised for more than one treatment process and there is obviously some double or even triple counting in the above figures. The Water Corporation advises that some of their treatment processes involve disinfection and unspecified additional processes but no filtration and these cases are included in the Disinfection Only category. The Corporation has also emphasised that water treatment consists of several processes (rather than only three).

Perth and Albany were the only two towns that employed all three water treatment processes. For Perth, the Disinfection, Filtration and Additional Processes protocol was used to treat 45% of the water. About 1% of Perth's water was treated by the Disinfection and Filtration process and the remainder (54%) was subject to Disinfection Only. Less than 1% of Albany's water was subject to Disinfection and Filtration. Disinfection Only was used for 79% of Albany's water treatment and the Disinfection, Filtration and Additional Processes method was used to treat the remaining 20%.



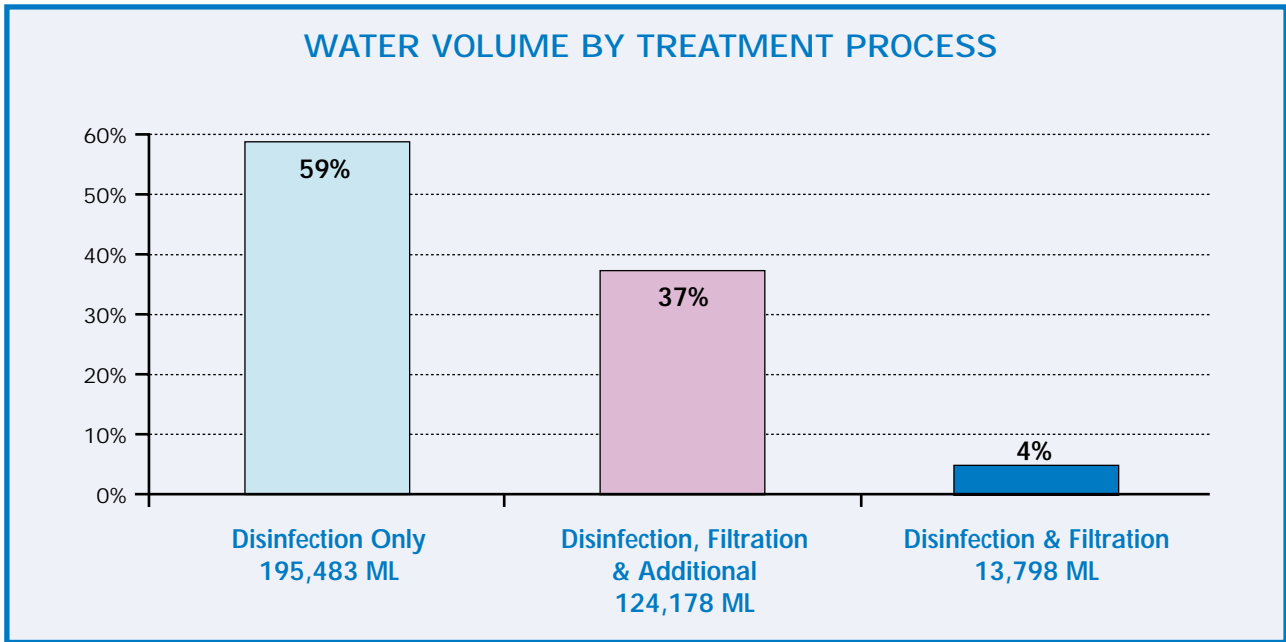


Figure 3

Bridgetown, Bunbury, Esperance and Harvey Wokalup used only the Disinfection and Filtration method for all of their water treatment. Australind (including Eaton), Broome, Denmark and Derby employed the use of the Disinfection, Filtration and Additional Processes method for 100% of their water treatment. Water treatment in nineteen (19) towns was subject to the Disinfection Only process. (Appendix 7)

1.5 Unaccounted for Water

Concept

In essence, 'unaccounted for' water is the difference between the volume supplied and metered consumption.

For the towns it serves the Water Corporation advises that data on unaccounted for water is not considered useful because of timing differences between the customer and master meter readings. The Corporation also stresses that unaccounted for water is not confined to leakages or water losses from reservoirs and pipelines. By way of clarification, the Corporation has outlined its view that unaccounted for water specifically includes:

- ▲ 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 out of fire hydrants (eg washing down of hard sand areas)
- ▲ Any riparian releases
- ▲ Water supplied to others (eg. in the case of Perth's water supply some 10,793 ML was provided to Mundaring, and to the SWR).

For those not familiar with water industry terminology this is a useful summary of unaccounted for water in most jurisdictions. However, the last point may be confusing and warrants discussion.

In the example cited, water supplied to others has been classified as unaccounted for even though it was obviously accounted for both in terms of its destination (Mundaring and the South-West Region) and volume (10,793 ML). The apparent anomaly becomes stronger if the water was supplied for a valid purpose and in response to a formal request – which seems an inescapable conclusion in this case.

Nevertheless, if the water was unaccounted for until its (seemingly metered) supply to other locations had been effected it is highly improbable that 10,793 ML of water so supplied would, in its entirety, subsequently remain physically unaccounted for at its new destination(s). It may even be that the original supply of



a known volume of water to new (known) locations involved some nominal charge, price, notional payment or cost accounting treatment, (ie. was accounted for, financially as well as physically).

Notwithstanding these comments, the water in question was not part of metered consumption by business or residential customers – at least not in Perth and not until after its ‘supply to others’. The ‘others’ in this case were the Water Corporation’s own water supply schemes. Mundaring supplies water to towns in the Goldfields and the SWR scheme supplies water to towns in the SW Region. Most of the supplied water would not have remained unaccounted for at these new locations because it will have been delivered eventually for metered consumption by residential and business customers in the towns served by the two schemes.

While this particular example of unaccounted for water may or may not represent a strong case for definitional clarity, it does serve to highlight the level of care that is sometimes necessary to correctly interpret the benchmarking data. As outlined, unaccounted for water can be legitimately and usefully applied and all of it is not wasted or irretrievably lost – but some portion of it is. There are costs associated with supplying water (extraction, treatment, transport, storage, etc) and a charges associated with using it (metered consumption). Therefore, to a water service provider unaccounted for water can mean unnecessary supply costs and foregone consumption revenues. For paying (metered) customers, unnecessary supply costs due to unaccounted for water will to some extent be directly or indirectly priced into and reflected in water service charges.

For these and other reasons (such as resource conservation) unaccounted for water is an important

statistic for both providers and consumers, although the financial impact on either would be difficult to quantify. Nevertheless, if all unaccounted for water was subject to metered consumption and charged to paying customers, the total volume of unaccounted for water (48,023 ML) in the benchmarked towns during 1999-2000 would potentially represent up to \$29 million in additional consumption revenue. The estimate is based on the simple relationship that \$170 million in usage (or consumption) revenue was derived from total metered water consumption of 284,618 ML in the benchmarked towns, which is discussed later in the Financial Profile.

Despite substantial uncertainties associated with quantifying the financial impacts of unaccounted for water, its magnitude in terms of volume relative to extraction/supply, consumption, connected properties and length of water mains can be readily quantified as discussed below. Significant differences are observed in measures of unaccounted for water from town to town.

Indicated Levels Against Consumption & Supply

In addition to the total volume of water consumed by residential and non-residential properties in all benchmarked towns, unaccounted for water (the difference between water supplied from all sources and metered consumption) amounted to 48,023 ML for the year. This volume represented around 14% of total water supplied and 17% of water consumed. The relative contribution of unaccounted for water in the context of water supplied is illustrated in (Figure 4).

In terms of water volume supplied (extracted, gathered or delivered) per town, Harvey Wokalup had the

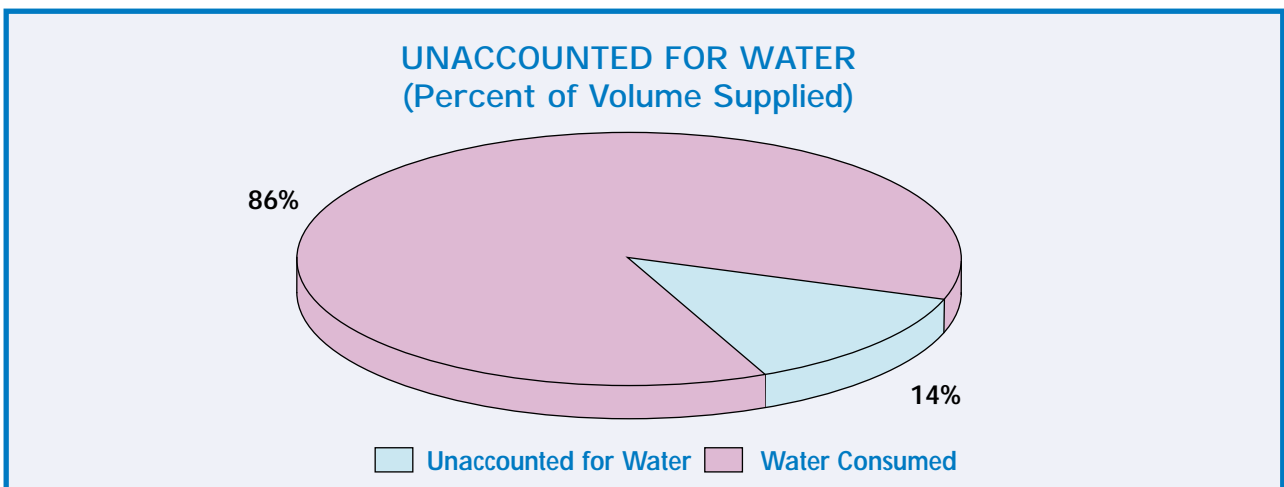


Figure 4

highest level (34%) of unaccounted for water. Excluding those towns for which the raw data shows a negative value against unaccounted for water (ie. apparent system gains rather than losses) the lowest level of unaccounted for water loss from the total volume extracted occurred in Kalgoorlie Boulder (3%).

For Bunbury and Busselton unaccounted for water represented around 20% and 4% respectively of the water volumes extracted in each. The Perth figure was 14%. (*Appendix 8*)

Harvey Wokalup had the highest level (51%) and Kalgoorlie Boulder the lowest level (3%) of unaccounted for water as percentages of their respective town water consumption volumes. For Bunbury this was 24% and for Busselton, 4%. For Perth the figure was 16.5%.

Another perspective on unaccounted for water is that for every 6.9 litres of water supplied about 1 litre is not accounted for as part of known metered consumption.

Indicated Levels for Connected Properties

The average volume of unaccounted for water per property served per year in all benchmarked towns was 65 kl, which is approximately 178 litres per property served per day, or 82 litres per person.

Excluding Perth, the average volume of unaccounted for water per property served per year in the benchmarked towns was 80 kl. For Perth, the equivalent average was 61 kl. The Bunbury and Busselton averages were 97 kl and 19 kl respectively.

Of all towns, unaccounted for water in Geraldton was the highest per served property with 185kl per annum. Kalgoorlie Boulder experienced the lowest unaccounted for water losses per connected property per annum at 18kl.

Levels per Kilometre of Water Main

To the (unquantifiable) extent that it may provide some indication of the general physical condition of water mains in the benchmarked towns, recorded volumes of unaccounted for water have been compared on the basis of mains length. In evaluating this information, the reader should be mindful of all factors that can contribute to unaccounted for water as discussed earlier.

On average, during the 1999-2000 year one (1) kilometre of water mains in the benchmarked towns corresponded with (as distinct from resulted in) slightly more than 3 ML of unaccounted for water. This is the equivalent of about 8.25 kl of unaccounted for water per day occurring for (but not necessarily leaking from)

every 1 km of mains. This average was based on the unaccounted for water data for all benchmarked towns regardless of those recording negative values.

Highest correspondence between mains length and unaccounted for water occurred in South Hedland with 11.45 ML per km mains per annum (31.37 kl per km mains per day). The lowest level was in Denmark with 0.55 ML per km mains per annum (1.51 kl per km mains per day). Figures for Bunbury and Busselton respectively were; 4.42 ML/km/pa. (12.1 kl/km/day) and, 0.84 ML/km/pa. (2.3 kl/km/day). In Perth, the amount was 3.16 ML per km main per annum (8.65 kl/km/day).

Note that the comparisons made for individual towns exclude those for which the raw data shows a negative value against unaccounted for water (ie. apparent system gains rather than losses). *Tables 2 and 3* below summarise key statistics on unaccounted for water in 1999-2000.

Unaccounted for Water as a Percentage of Total Volume Supplied		
Highest	Harvey Wokalup	34%
Lowest	Kalgoorlie Boulder	3%
	Average for all 32 Towns	14%
	Perth	14%
	Bunbury	20%
	Busselton	4%

Table 2

Unaccounted for Water (ML) per (1) Kilometre of Mains per Annum		
Highest	South Hedland	11.45ML
Lowest	Denmark	0.55ML
	Average for all 32 Towns	3ML
	Perth	3.16ML
	Bunbury	4.42ML
	Busselton	0.84ML

Table 3

1.6 Infrastructure

Supply mains for delivering water to properties in all towns were 15,937 kilometres in length for 1999-2000. In addition to the mains and the water treatment infrastructure already mentioned, supply also required the use of the following assets:

- ▲ Dams – 23
- ▲ Weirs – 5



- ▲ Bores – 428
- ▲ Service Reservoirs and Tanks – 237
- ▲ Pump stations – 203

The total number of dams reported by the Water Corporation relates to referable dams only. (Referable dams are those that meet defined technical specifications in terms of height and storage capacity or those that would be considered dangerous in the event of their failure). A number of other minor dams also exist throughout the State.

Advice from the Water Corporation indicates that there is no clear distinction between what constitutes a dam (other than a referable dam) and a weir. In regard to the number of service reservoirs and tanks, where such storage facilities exist and supply more than one town, each of these (reservoirs or tanks) may be counted for every town it serves.

A similar difficulty arises in the case of pump stations. These could also be counted more than once if they serve to pump water to more than just one town. (*Appendix 9*)





FINANCIAL PROFILE

THE WATER BUSINESS in Western Australia is a large-scale financial undertaking involving the operation, maintenance, replacement and ongoing development of an enormous infrastructure. Billions of dollars are tied up in assets and hundreds of millions of dollars are annually expended on capital works or received as revenue.

2.1 Assets

It is estimated that the *current replacement value of the system assets* involved in extracting, storing, treating, delivering and otherwise managing the supply of water to the benchmarked towns (together with other centres dependent on Water Corporation assets) is more than \$5.2 billion. The *written down replacement value* is estimated at more than \$4.6 billion dollars. About half the current replacement value of these assets is attributed to water services infrastructure for the Perth area (\$2.7 billion).

For the 32 benchmarked towns, the current and written down replacement values of systems assets are, respectively, \$3,922 million and \$3,297 million. (The written down replacement asset values for Bunbury and Busselton are excluded from the latter figure as the data was neither requested of, nor reported by, these providers).

For the customer, some idea of the cost involved in providing the supply and delivery infrastructure may be understood by considering systems assets on the basis of their value averaged per served property. With about 736,800 properties served in the benchmarked towns, the current replacement value of water systems assets averages approximately **\$5,323** per property. (*Appendix 10*)

In these terms, the lowest current replacement value for systems assets per property served occurs in Busselton (averaging \$1,446) and the highest (averaging \$51,019) occurs in Karratha. For Perth, the equivalent figure is \$4,589 and Bunbury is \$4,025. Compared with the average of \$5,323, the figures for twelve towns are less than this.

Table 4 below summarises key statistics on system asset values in 1999-2000.

Current Replacement Value of System Assets per Connected Property		
Highest	Karratha	\$51,019
Lowest	Busselton	\$1,446
	Average	\$5,323
	Perth	\$4,589
	Bunbury	\$4,025

Table 4

2.2 Trading Revenue

Total reported annual revenue from water operations (trading) for the benchmarked towns was \$408 million. For Perth, the amount was \$283 million. For Bunbury and Busselton it was \$6.6 million and \$2.4 million respectively.

According to Water Corporation advice, their figures exclude what is known as 'abnormal' revenue, investment income and receipts from the Government to cover deficits on operations. However, payments (or subsidies) by the Government to the Water Corporation in the form of Community Service Obligations (CSOs) are understood to have been included. The Bunbury and Busselton Water Boards do not receive CSO subsidies.

Total trading revenue (*Figure 5*) is the sum of the sub-totals for three (3) distinct revenue streams, and these are:

- ▲ Usage Charges – \$170 million
 - ▲ Access Charges – \$126 million
 - ▲ Other Revenue – \$112 million
- An appreciation of what the different revenue sources mean relative to one another and comparatively at a town level may be gained by considering the average access, usage and other revenue amounts that could be (either directly, or indirectly) attributed to each property served in the different benchmarked towns. (*Appendix 11*)

2.2.1 Usage (Consumption) Revenue

For all served properties in all towns the average revenue derived by providers from water usage charges during the year was \$231 per property. Comparatively, the lowest quantum of usage charge revenue per property occurred in Denmark (\$127 per property served). The highest amount was in Port Hedland (\$2,136 per property served). For Perth, the equivalent figure was \$202. In Busselton it was \$152 and in Bunbury, \$190.

In fifteen towns (mainly in the north of the State and the Goldfields) the revenue rates were higher than the \$231 average. The remaining towns (predominantly in the south-east and the south-west of the State) were less than this.

There is little or no correlation between the quantum of usage charge revenue per property in a particular town and actual annual consumption per property in the same town. Inter alia, this reflects minor differences in water service rates and charges applied in different areas of the State (discussed later).



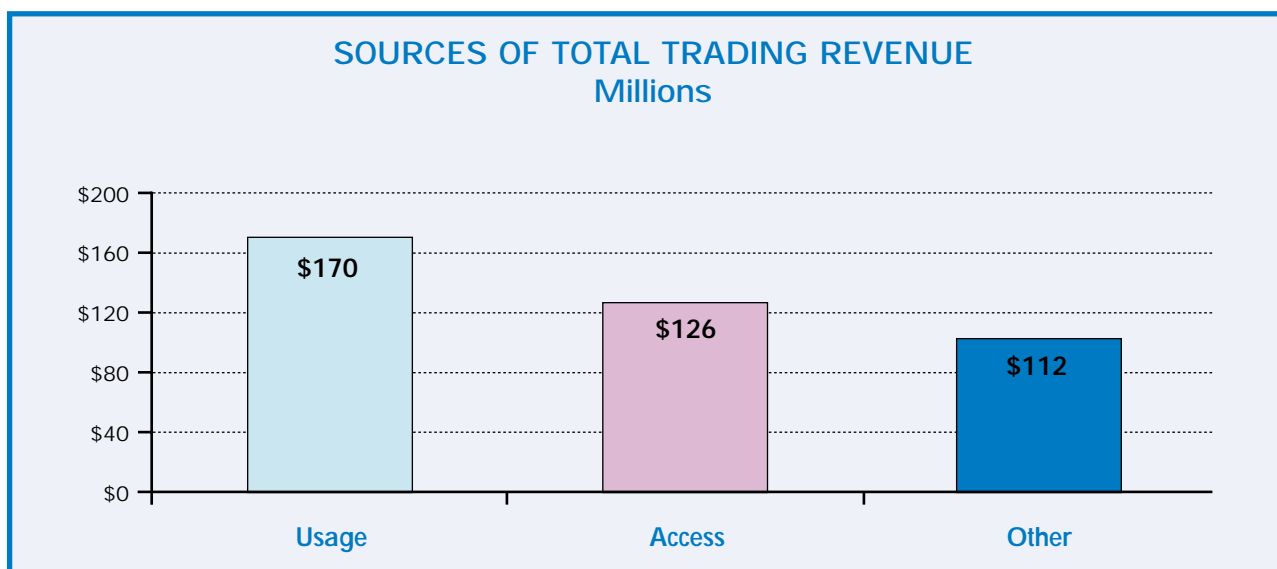


Figure 5

As a percentage contribution to total water services revenue for each town, usage revenue was lowest in Bridgetown and Denmark (both 20%). The highest proportion of usage revenue to total revenue was obtained in Harvey Wokalup (62%). For Perth it was 42%. In Bunbury usage revenue contributed 41% of total revenue. For Busselton, the contribution was 51%. In seven (7) towns, usage revenue accounted for more than 50% of total revenue (Busselton, Dongara Denison, Newman, Geraldton, Kalgoorlie Boulder, South Hedland, and Harvey Wokalup).

Table 5 below summarises key statistics on Usage Revenue for 1999-2000.

Usage (Volumetric Consumption) Revenue per Connected Property		
Highest	Port Hedland	\$2,136
Lowest	Denmark	\$127
	Average for all 32 Towns	\$231
	Perth	\$202
	Bunbury	\$190
	Busselton	\$152

Table 5

2.2.2 Access Revenue

The average access charge revenue per served property derived from water service operations in all towns was \$172 (per property per annum). In other

words, for every property served in every benchmarked town water service providers derived an average of \$172 from the access component of water services charges.

The lowest per property access charge revenue source was Katanning where each property served 'contributed' an average of just \$112 per annum. At the other end of the scale, Eaton contributed access charge revenues averaging \$352 per property per annum. For Perth the amount was \$165. In Busselton, it was \$145 and for Bunbury, \$190 per year.

Access charge revenue per property in ten towns was less than the (\$172) average for all towns. There was no obvious pattern to the figures for towns on the basis of their geographical locations.

Combining the revenue attributable to access with that of usage, the total average annual revenue derived by providers from these sources on the basis of each property served was approximately \$402 per property. The averages for Perth, Bunbury and Busselton were; \$367, \$380 and \$297 respectively.

In terms of its percentage contribution to the total water services revenue for each town, Access revenue in Port Hedland was the lowest (4%). For Perth it was 34%, Bunbury was 41% and Busselton 49% (the highest).

In exactly half of the benchmarked towns Access Revenue as a percent of total revenue for each town was less than 25%. For the remaining half, Access Revenue ranged upwards from 25% to 49% of total revenue.





Table 6 below summarises key statistics on Access Revenue for 1999-2000.

Access Revenue per Connected Property		
Highest	Eaton	\$352
Lowest	Katanning	\$112
	Average for all 32 Towns	\$172
	Perth	\$165
	Bunbury	\$190
	Busselton	\$145

Table 6

2.2.3 Other Revenue

As mentioned earlier, data for Total Trading Revenue includes CSO payments but these payments are not included in either the Access or Usage (two of the three) components for Total Trading Revenue. By definition therefore, the figures for Other Revenue reported by the Water Corporation should also include CSO 'payments'.

However, the specific CSO figures for each town cannot be determined from the data and the following comments on Other Revenue should not be interpreted as directly or solely referring to CSO data either at the aggregate or the town level.

Other Revenue is a significant component of the total revenue from water operations. As a percentage of this total for the Water Corporation's benchmarked towns, Other Revenue represents some 27%. By comparison, Access and Usage revenues represent 31% and 42% respectively.

As a percentage of total revenue, other revenue is highest for Karratha with 69.5%. The lowest percentage occurs in the case of Dongara Denison (10.8%). For two towns the rate is approximately the same as the average for all towns, ie. 27% (Kalgoorlie Boulder and Northam).

Ten towns had rates below the average (Australind, Broome, Eaton, Geraldton, Harvey Wokalup, Mandurah, Newman, Perth, Pinjarra and South Hedland).

In the sixteen towns not otherwise mentioned, the percentage of Other Revenue to Total Revenue was above the 27% average for all towns. The rate in half of these sixteen towns was more than 50% (Katanning, Bridgetown, Port Hedland, Kununurra, Denmark, Narrogin, York, Margaret River Gnarabup). Effectively, it means that for these towns (and Karratha) the revenue

derived from Access and Usage Charges combined was less than that which was derived solely from Other Revenue.

Per property served, Other Revenue was greatest for Port Hedland (\$3,552) and least for Dongara Denison (\$50). For Perth it was \$116 and in Bunbury \$89. Overall, the average revenue derived per property from Other Revenue sources for all properties served in the benchmarked towns was \$152 (excluding Busselton which reported no Other Revenue).

Table 7 below summarises key statistics on Other Revenue for 1999-2000.

Other Revenue – Averaged on the Basis of Connection Numbers		
Highest	Port Hedland	\$3,552
Lowest	Dongara Denison	\$50
	Average for all 32 Towns	\$152
	Perth	\$116
	Bunbury	\$89
	Busselton	\$0

Table 7

2.3 Costs to Customers

2.3.1 Average Bill

The cost of the average annual bill for residential customers (as distinct from residential properties served) generally varies from town to town. These variations are mainly a function of the different consumption levels in each town and, to a lesser extent the rates and charges (tariff structures) applicable for various towns.

The average residential water bill ranges from \$231.10 for customers of the Busselton Water Board to \$581.00 in the case of Port Hedland customers. For Perth, the average bill for residential customers was \$324.10. For Bunbury the amount was \$277.00. In both Esperance and Merredin residential customers had average bills of \$286.45 per annum. In York and Narrogin the average was \$292.45, in Dunsborough Yallingup and Kalgoorlie Boulder the average was \$306.30 and, in both Derby and Kununurra the average bill was \$476.30 per annum.

Because the average cost of a residential water bill is largely determined by consumption volume (which differs from town to town) it is not a reliable indicator of comparative residential water costs as a function of geographical location.





Table 8 below summarises key statistics on Average Residential Water Bills in 1999-2000.

Average Residential Water Bills		
Highest	Port Hedland	\$581
Lowest	Busselton	\$231
	Perth	\$324
	Bunbury	\$277

Table 8

2.3.2 Comparative Cost

A better (though not definitive) understanding of the relative cost of residential water in different areas of the State can be gained by standardising annual residential consumption to 415kl for all towns and then calculating what the bill would be. (*Appendix 12*)

This method eliminates consumption variability and enables identification of those towns in which similar rates and charges, both for access and usage, are applied. Accordingly, the three providers have reported for each town what the bill would be for each residential customer consuming an average of 415kl of water annually. Note that in only 10 of the towns did average annual residential water consumption actually exceed 415 kl.

Had they consumed 415 kl of water, the annual bill for residential customers in Busselton would be the lowest of all towns at \$284.90. Bunbury follows with a bill of \$315.00. For the remaining towns, all of which are provided for by the Water Corporation, only four (4) different billing amounts are applicable and this also demonstrates which towns share common rates and charges.

For Perth, the standardised bill for 415 kl of water was \$361.40. Outside the Perth area, the remaining three billing amounts were:

- ▲ \$347.75 – Broome, Carnarvon, Derby, Dongara Denison, Karratha, Kununurra, Newman, Port Hedland, South Hedland.
- ▲ \$356.95 – Albany, Australind, Collie, Dunsborough Yallingup, Eaton, Esperance, Geraldton, Harvey Wokalup, Mandurah, Margaret River Gnarabup, Northam, Pinjarra.
- ▲ \$358.40 – Bridgetown, Denmark, Kalgoorlie Boulder, Katanning, Manjimup, Merredin, Narrogin, York.

Table 9 below summarises key statistics on Residential Water Bills for 415 kl consumption volume in 1999-2000.

Cost of Annual Residential Bill Based on Consumption of 415kl		
Highest	Perth	\$361.40
Lowest	Busselton	\$284.90
	Bunbury	\$315.00

Table 9

2.3.3 Annual Bill Increase

On the basis of all residential customers consuming 415kl of water annually, the real percentage increase in the resulting bill for 1999-2000 over that of 1998-1999 has been reported for the benchmarked towns.

Note that this data excludes Busselton which reported the increase as \$10.25 rather than as a percentage. It is unclear whether this figure is intended to represent the actual increase or the real increase – which takes into account changes in the Consumer Price Index.

Bunbury reported that there was no real increase (0.00%) for residential customers. For Perth, the real increase was 2.43%. In the case of Carnarvon, Collie, Denmark and Derby the real increase was 0.02%. Seven towns recorded an increase of 2.00%, Broome, Dongara Denison, Karratha, Kununurra, Newman, Port Hedland and South Hedland. The remaining eighteen towns all recorded increases of 2.39%.

In view of the comparative cost groupings discussed above, the reported annual bill percentage increases may indicate movement by some towns between tariff structures.

2.4 Other Financial Data

Apart from the financial data already discussed, other financial data relating to the benchmarked towns was also requested by the OWR. (*Appendices 15 and 16*)

As explained in the Introduction, in respect of some requested financial data elements nothing at all could be provided by the Water Corporation. Other financial data elements were in fact provided by the Corporation but we believe it may cause unwarranted confusion or be misleading if we were to report our related findings since they are more inconclusive than explanatory.

The above remarks refer particularly to five (5) fundamental financial data elements. In the opinion of the OWR the status of these data elements is as follows:





FINANCIAL PROFILE CONTINUED

- ▲ **Depreciation** – this data was provided but because depreciation methods used by the different providers were unclear it was considered that comparative analyses would not have been reasonable.
- ▲ **Capital Expenditure (including new works, subdivider development and other)** – other than at an aggregate level, the data required by the OWR was not reported by the Corporation.
- ▲ **Treatment costs** – no data provided by the Corporation.
- ▲ **Operating Costs** – data was provided but there appeared to be some inconsistency with operating cost data previously reported to the OWR (unrelated to the benchmarking data) and this requires clarification prior to analysis.
- ▲ **Economic Real Rates of Return** – remarks as for Operating Costs.





FROM THE REPORTED benchmarking data key aspects of performance in the pivotal areas of supply continuity and water quality were evaluated.

3.1 Key Performance Indicators

3.1.1 Continuity of Supply – (Appendix 13)

▲ Number of Leaks and Bursts per 100 kms of water Main

The average for 1999-2000 was 13.5 (significantly below the permitted maximum of 20). Within the permitted range (ie. not more than 20 leaks and bursts per 100 km mains) the best level of compliance was obtained for Dunsborough Yallingup at 3.6 per 100 kms and the lowest compliant level was in York (19.3).

Thirteen towns performed better than average with less than 13.5 leaks/bursts per 100 kms main. Conversely, nineteen towns performed worse than average.

Nine towns (Bridgetown, Bunbury, Collie, Dongara Denison, Esperance, Harvey Wokalup, Kalgoorlie Boulder, Merredin and Port Hedland) failed to meet the performance standard, exceeding the permitted maximum number of leaks and bursts per 100 kms mains. Of these towns, the worst result was in Merredin (54.5) and the 'best' result was in Bunbury (22.2). For Perth, the figure was 12.25.

Table 10 below summarises key statistics on leaks and bursts per 100 km mains during 1999-2000.

Number of Leaks and Bursts per 100 km Water Main		
Best Performance	Dunsborough Yallingup	3.6
Worst Performance	Merredin	54.5
	Average for all 32 Towns	13.5
	Perth	12.2
	Bunbury	22.2
	Busselton	19.1
	Permitted Maximum	20.0

Table 10

▲ Percentage of Properties Not Experiencing a Confirmed Supply Interruption of Longer Than One (1) Hour

The average for 1999-2000 was 93% (comparing well with the minimum mandatory performance target of 75%).

Only two towns (Bridgetown 61% and Harvey Wokalup 59%) failed to meet the 75% mandatory target. Eighteen towns performed above the 93% average for all towns. Three towns (Carnarvon, Pinjarra and Dunsborough Yallingup) achieved 100%, ie. no connected services in these towns were reported to have experienced drinking water supply interruptions greater than 1 hour.

Table 11 below summarises the key statistics on properties not experiencing supply interruptions during 1999-2000.

Percent Properties Without Confirmed Supply Interruptions > 1 Hour		
Worst Performance	Harvey Wokalup	59%
Best Performance	Carnarvon, Pinjarra, Dunsborough-Yallingup	100%
	Average for all 32 Towns	93%
	Perth	93%
	Bunbury	91%
	Busselton	86%
	Minimum Mandatory Requirement	75%

Table 11

▲ Number of Incidents (Confirmed Service Interruptions) Per 1000 Properties Served

This is an alternative indicator of water service continuity. The average for all the benchmarked towns was 59 interruptions per 1000 properties served (excluding Bunbury and Busselton which did not and were not required to report on an incident basis). The difference between this and the previous indicator is that an incident can effect more than one property or service and may not necessarily result in a supply failure to a connected property for a duration longer than 1 hour.

The highest number of incidents was recorded for Newman with 134 per 1000 properties served. Dunsborough Yallingup was the lowest with 1 incident per 1000 properties. Twelve towns recorded incidents higher than the average of 59. With Perth performance factored out, the average number of incidents for all remaining towns served by the Water Corporation was 46 per 1000 properties served.

The performance relationship between this and the previous indicator can best be understood by combining the two into a single expression, namely;

▲ Number of Supply Interruptions Exceeding 1 Hour Per Incident Per 1000 Properties Served



On average, the number was 1.12 (including the Perth figures) for 1999-2000. The best performance here was again in Dunsborough Yallingup where there was 1 service interruption incident per 1000 properties but it did not result in any service disruptions to properties that exceeded 1 hour in duration.

Merredin was at the other end of the scale with an average of 22.11 supply interruptions exceeding 1 hour in duration per 1000 properties for each incident reported. Explaining this another way, Merredin had 5 service interruption incidents per 1000 properties served and these incidents resulted in an average of 113 confirmed service interruptions lasting longer than 1 hour (for every 1000 properties served).

On average, for all 30 towns served by the Water Corporation there were 59 service interruption incidents per 1000 properties and these interruptions resulted in 67 service interruptions that lasted longer than 1 hour (for every 1000 properties). Excluding the numbers for Perth, for the remaining 29 Water Corporation towns (on average) 46 incidents per 1000 properties occurred and these incidents resulted in 69 interruptions of greater than 1 hour's duration for every 1000 properties.

Table 12 below summarises the key statistics on supply interruptions exceeding 1 hour duration per Incident per 1000 properties served in 1999-2000 (for Water Corporation towns only).

Number of Supply Interruptions > 1 hour per <u>Incident</u> per 1000 Properties		
Highest	Merredin	22.11
Lowest	Dunsborough Yallingup	0.00
	Average for 30 Towns	1.12
	Perth	1.05

Table 12

3.1.2 Water Quality – (Appendix 14)

▲ Number of Water Quality Complaints Per 1000 Properties Served

The average number of water quality complaints per 1000 properties served in 1999-2000 was 6 and the total number of complaints actually reported for all

towns was 4,427. No water quality complaint data was reported for Carnarvon, Katanning, Narrogin and Newman and the OWR has interpreted this to mean there were no such complaints for these towns.

The highest rates of complaint occurred in Bunbury and Margaret River Gnarabup with respectively, 20.8 and 20.0 complaints per 1000 properties served. In addition to these towns, four others (Australind, Busselton, Eaton and Perth) had complaint rates higher than the 6 per 1000 properties average for all towns.

However, it should be noted that, for any town, water quality complaints do not necessarily mean that it is the water service provider who has done (or failed to do) something that gives rise to a water quality complaint. For example, it is understood that amongst the three licensees the Water Corporation may count a customer water quality communication as a complaint only if it can be attributed to the Corporation's assets. Neither the Bunbury nor the Busselton Water Board appears to make this distinction, highlighting a possible definitional difference between providers.

Furthermore, earth works by third parties can result in pipe damage that effect non-health related characteristics (aesthetic quality) of water, such as turbidity, taste, odour, etc. Therefore, care needs to be exercised in interpreting water quality complaints as conclusive evidence that a particular provider has compromised critical aspects of water quality (such as health aspects) or that the complaint rates in a given year are indicative of a systemic or serious problem.

Ignoring definitional differences and without distinguishing health and non-health related water quality complaints, the lowest complaint rate was in Northam (0.3 complaints per 1000 properties served). Nine other towns (Dongara Denison, Esperence, Kalgoorlie Boulder, Karratha, Kununurra, Pinjarra, Port Hedland and South Hedland) also had complaint rates of less than 1 per 1000 properties served.

A further thirteen towns had complaint rates less than the average rate of 6 for all towns. For Perth, the average rate of water quality complaints was 6.4 per 1000 properties served. Excluding the Perth complaint data, the average complaint rate on water quality for all other benchmarked towns was 4.6 per 1000 properties served.



Table 13 below summarises the key statistics on water quality complaints during 1999-2000.

Number of Water Quality Complaints per 1000 Properties		
Highest Number	Bunbury	20.79
Lowest Number	Northam	0.29
	Average for all 32 Towns	6
	Perth	6.37
	Busselton	9.50
	Average Excluding Perth	4.6

Table 13

▲ **Microbiological Water Quality (Total Coliforms)** –

The performance targets established for this indicator vary from town to town and, (according to the 1987 National Health and Medical Research Council (NH&MRC) guidelines for drinking water quality), depend on the size of the ‘population supplied with water’. Town populations can readily be converted to connection numbers, and vice versa. In the case of the Water Corporation, a potentially more rigorous standard for Drinking Water Quality Management (known as SG10) is applied.

- ▲ Whether NH&MRC or SG10, the minimum number of water samples that must be tested annually for total coliforms and the permissible number of non-complying samples are dependent on town connection numbers. In turn, the permissible non-compliance rate for a town depends on the number of samples taken. As a result of these relationships the target compliance level for each town usually varies with the size of the scheme (ie. the number of connections).

The following examples based on advice from the Water Corporation clarify the practical application of the SG10 guidelines on microbiological water quality requirements in different towns.

- ▲ Albany with 11,323 properties must take a minimum of 120 samples per year and is allowed up to 9.75% total coliform and 5% thermotolerant coliform exceptions.
- ▲ Denmark with 1,964 properties must take a minimum of 36 samples per year and is allowed up to 5 total coliform and 5 thermotolerant exceptions (ie. up to 13.88% of the samples tested for total coliforms may be permitted exceptions to guideline values).
- ▲ Margaret River/Gnarabup with 2,394 properties must take a minimum of 48 samples per year and is

allowed up to 5 total coliform and 5 thermotolerant coliform exceptions (ie. up to 10.41% total coliform exceptions are allowed).

- ▲ For Water Corporation towns with more than 8,600 services (which include Albany, Geraldton, Kalgoorlie Boulder, Mandurah and Perth) the compliance requirement is 90.25% for total coliforms and 95% for thermotolerant coliforms.
- ▲ *It should be clearly understood that in the 1999-2000 year every one of the 32 benchmarked towns exceeded minimum performance standards for permissible levels of total coliforms in drinking water.*
- ▲ In just over half of the benchmarked towns 100% of all water samples tested did not record total coliforms in concentrations that would require any sample to be counted as a (permissible) non-compliant sample.

In fifteen (15) towns some of the samples tested for total coliform concentrations did not meet NH&MRC (or SG10) guideline values and such samples were counted as (permissible) non-compliant samples. On no occasion did any of these cases result in the total number of non-compliant samples exceeding the maximum permissible number (of non-compliant samples) for the year. Therefore, we iterate that the 15 towns involved still exceeded the minimum performance standards set for allowable total coliforms in drinking water.

The towns and corresponding percentages for (total coliform) complying samples are identified in Tables 14 and 15 of the next section on Performance Benchmarking.

- ▲ **Microbiological Water Quality (Thermo-tolerant Coliforms)** – As shown in the previous examples for total coliforms, exception percentages for thermotolerant coliforms can also vary by town as a consequence of different connection numbers. **All 32 benchmarked towns exceeded the minimum compliance targets for water samples to be free of thermo-tolerant coliforms.** Twenty-three towns achieved a 100% result. Nine towns achieved less than this but in all cases exceeded the target levels set under the relevant guidelines.
- ▲ **Microbiological Water Quality (Amoebae – Thermophilic Naegleria)** – With the exception of Port Hedland (98%), all towns achieved 100% compliance with the standard for water samples to be free of amoebae.



3.2 Performance Benchmarking

The challenge in benchmarking the performance of different providers or towns is to decide which of these are reasonably comparable and against what criteria. Comparisons are generally straightforward where established compliance indicators are involved since these apply common units of measure and tend to use agreed definitions that help ensure data consistency between providers.

As discussed earlier however, providers may use definitions that differ from one another (or which in practical terms are interpreted differently) and of course fundamental demographic variations between benchmarked towns may be sufficient to limit their comparability for particular data elements.

Established performance indicators correspond with only a handful of the total benchmarking data elements reported and most of the remaining elements provide no direct expression of performance of any kind. Nevertheless, this data does give rise to useful statistical facts and figures and the OWR has also used it to derive new data elements, or performance indicators – which appear in this report.

Perhaps the key undertaking has been to formulate a single benchmark value or index that reasonably indicates the relative **overall** performance of different towns (and indirectly, providers) by combining and measuring the aggregate (standardised) effect of the most instructive water service performance indicators – whether they be established or newly derived. The OWR has developed its own methodology to formulate this index. In doing so, alternative benchmarking methods used by other regulators including those of OFWAT in the United Kingdom were reviewed.

3.2.1 Selection of Indicators

In consideration of the performance indicators reflected in the raw and derived data, the OWR concluded that four (4), two relating to continuity of supply and two concerning water quality, were sufficiently robust, objective and instructive to reasonably benchmark aggregate performance, albeit with some caveats – most notably possible definitional differences for water quality complaints.

Performance benchmarking has been undertaken explicitly for the benchmarked towns (primarily an **internal benchmarking** exercise) as detailed in the tables that follow. However, a useful consequence of having done so is that the same information is clearly sufficient for the reader to compare and contrast the

aggregate and indicator-specific performance of the three providers (**competitive benchmarking**).

It should be noted that the principal reason for OWR's focus on water quality and supply continuity performance was the major finding of our 1999-2000 Customer Survey, which reported that:

“The most important water supply aspects in relation to residential respondents appeared to be ‘water quality’ (84% rating this aspect as very important) and ‘reliability of supply’ (84%)”.

The specific indicators selected for the performance benchmarking exercise were:

- ▲ **Number of Water Quality Complaints per 1000 Properties Served**
- ▲ **Microbiological Compliance – Total Coliforms**
- ▲ **Average Duration of Supply Interruptions**
- ▲ **Percentage of Services NOT Experiencing Drinking Water Supply Interruptions Longer than One (1) Hour**

That several other quality or continuity related indicators may also be relevant is acknowledged by the Office. However, the more obvious ones have been excluded for reasons that include:

- ▲ **identical performance levels** – (eg. with one exception thermophilic naegleria water quality performance was identical in all towns);
- ▲ **substantial concordance with a selected indicator** – (eg. all nine of the towns with less than 100% for thermotolerant coliforms are also included in the fifteen towns that achieved less than 100% for total coliforms – and at similar or identical performance levels;
- ▲ **incompleteness** – (eg. the Busselton & Bunbury service interruption Incidents were unreported);
- ▲ **redundancy** – (eg. number of confirmed service interruptions >1 hour per 1000 properties served would yield exactly the same result as the percent of services NOT experiencing drinking water supply interruptions >1 hour).

Table 14 on page 20 shows the actual figures reported or calculated for each benchmarked town against the four selected indicators. This table has been provided for two (2) reasons. Firstly, it enables the reader to assess town and provider performance based on the raw and derived performance data for each of the indicators. Secondly, it enables the reader to relate this data to the standardised scores and aggregate performance scores for each town in Table 15.



Table 15 shows the Table 14 figures transformed to comparative (standardised) 'scores' that have also been averaged for each town to determine an aggregate score out of 100, a performance index. This index enables performance benchmarking of the 32 towns on the basis of achievements against the selected indicators taken together.

In calculating the index, relative weightings were not assigned to the individual indicators for the reasons outlined in the section headed Interpretive Context (ie. in a quantitative sense all indicators were considered to be of equal importance).



Table 14

Reported or Calculated Performance Data for Selected Indicators of Water Quality and Supply Continuity

DATA ELEMENT	WATER QUALITY		CONTINUITY OF SUPPLY	
	Number of Water Quality Complaints per 1000 Properties Served	Microbiological Compliance Total Coliforms	Average Duration of Interruptions	% of Services <u>NOT</u> Experiencing Drinking Water Supply Interruptions > 1 Hour
Town/Unit	Number	%	Hours	%
Albany	4.15	92.00	0.69	86.65
Australind Eaton	8.75	99.00	0.42	93.41
Bridgetown	1.51	96.00	1.49	60.80
Broome	1.17	100.00	0.62	96.88
Bunbury (Water Board)	20.79	99.28	0.48	90.58
Busselton (Water Board)	9.50	100.00	0.07	85.86
Carnarvon	0.00	100.00	0.25	99.96
Collie	1.58	92.00	0.50	94.43
Denmark	3.05	98.00	1.54	76.43
Derby	1.48	100.00	1.09	99.41
Dongara Denison	0.61	100.00	0.61	98.00
Dunsborough Yallingup	5.40	98.00	0.89	100.00
Esperance	0.41	100.00	0.63	83.69
Geraldton	1.22	96.00	0.51	96.27
Harvey Wokalup	5.70	99.00	1.02	59.40
Kalgoorlie Boulder	0.70	100.00	0.49	90.51
Karratha	0.64	100.00	0.84	96.26
Katanning	0.00	100.00	2.15	98.94
Kununurra	0.69	96.00	0.34	98.54
Mandurah	2.97	96.00	1.39	98.28
Manjimup	1.25	96.00	0.93	95.28
Margaret River Gnarabup	20.05	94.00	0.64	99.12
Merredin	1.71	100.00	7.00	88.65
Narrogin	0.00	98.00	0.85	92.01
Newman	0.00	100.00	0.77	97.79
Northam	0.29	100.00	0.43	96.29
Perth	6.37	97.70	0.49	93.40
Pinjarra	0.61	96.00	2.33	99.51
Port Hedland	0.57	100.00	0.61	97.62
South Hedland	0.52	100.00	0.53	98.84
York	1.33	100.00	0.50	92.29
AVERAGE (All Towns)	6.01	n/a	n/a	93.34
AVERAGE (Excluding Perth)	4.59	n/a	n/a	93.13
MINIMUM TARGET	n/a	95.00	n/a	75.00

Note: Data for Eaton and Australind was combined by the OWR to enable both these towns to be included in the aggregate assessment. This was necessary as much of the data reported by the Water Corporation for Australind included Eaton but did not distinguish it.



Table 15

Standardised and Aggregate Performance Scores (Benchmark Values) for Selected Indicators of Water Quality and Supply Continuity

DATA ELEMENT	WATER QUALITY		CONTINUITY OF SUPPLY		AGGREGATE PERFORMANCE SCORE (out of 100)
	Number of Water Quality Complaints per 1000 Properties Served	Micro-biological Compliance Total Coliforms	Average Duration of Interruptions	% of Services <u>NOT</u> Experiencing Drinking Water Supply Interruptions > 1 Hour	
Town/Unit	Score	Score	Score	Score	
Carnarvon	100.00	100.00	99.20	99.96	99.79
Kununurra	99.33	100.00	98.91	98.54	99.19
South Hedland	99.50	100.00	98.30	98.84	99.16
Dongara Denison	99.41	100.00	98.04	98.00	98.86
Newman	100.00	100.00	97.52	97.79	98.83
Port Hedland	99.45	100.00	98.04	97.62	98.78
Northam	99.71	100.00	98.62	96.29	98.66
Broome	98.86	100.00	98.01	96.88	98.44
Geraldton	98.81	100.00	98.36	96.27	98.36
Karratha	99.38	100.00	97.30	96.26	98.23
Derby	98.56	98.00	96.50	99.41	98.12
Katanning	100.00	100.00	93.09	98.94	98.01
Dunsborough Yallingup	94.76	100.00	97.14	100.00	97.97
Collie	98.47	100.00	98.39	94.43	97.82
York	98.71	100.00	98.39	92.29	97.35
Pinjarra	99.40	96.00	92.51	99.51	96.85
Narrogin	100.00	98.00	97.27	92.01	96.82
Kalgoorlie Boulder	99.32	99.00	98.42	90.51	96.81
Manjimup	98.78	96.00	97.01	95.28	96.77
Mandurah	97.12	96.00	95.53	98.28	96.73
Perth	93.82	97.70	98.42	93.40	95.83
Australind Eaton	91.50	99.00	98.65	93.41	95.64
Esperance	99.60	98.00	97.97	83.69	94.82
Busselton (Water Board)	90.78	99.28	99.77	85.86	93.92
Albany	95.97	92.00	97.78	86.65	93.10
Margaret River Gnarabup	80.54	94.00	97.94	99.12	92.90
Bunbury (Water Board)	79.82	100.00	98.46	90.58	92.22
Merredin	98.34	100.00	77.49	88.65	91.12
Denmark	97.03	92.00	95.05	76.43	90.13
Bridgetown	98.53	96.00	95.21	60.80	87.64
Harvey Wokalup	94.47	96.00	96.72	59.40	86.65
SCORE – (ALL TOWNS)	94.17	n/a	n/a	93.34	
SCORE – (EXCLUDING PERTH)	95.54	n/a	n/a	93.13	



Note: Towns in the table have been sorted (or ranked) according to the Aggregate Performance Score obtained. The higher the score the better the performance. Towns towards the top of the table performed better overall than towns towards the bottom with respect to water quality and supply continuity as a whole, for the four (4) indicators evaluated.

Definitional differences for water quality complaints may exist between providers. For example, it is believed that the Water Corporation's water quality complaint data includes only the complaints that were attributable to failures in the Corporation's assets. Bunbury and Busselton do not appear to have made this distinction.

Were the complaints data to be omitted from the above table, the major changes to ranking would be: Dunsborough Yallingup from 13th to 3rd place, Pinjarra 16th to 22nd place, Narrogin 17th to 24th, Kalgoorlie Boulder 18th to 23rd, Australind Eaton 22nd to 16th, Margaret River Gnarabup 26th to 15th and, Bunbury 27th to 20th.

3.2.2 Interpretative Context

A high benchmark value (aggregate score) in Table 15 signifies that a town has performed better against the four selected indicators considered as a whole when compared with other towns that achieved a lower score. The value is an assessment of relative (or comparative) performance and is not intended to express the performance of any town in absolute terms.

Although probable, it does not follow that a town with a high aggregate score (performance index) has performed to the same or even a high level against every one of the four indicators. Nor is it the case that a relatively low score necessarily means an unacceptable level of performance. Of course, had other indicators been used and/or indicators removed from or included with those selected, the outcomes of the comparative assessment may have been quite different.

As mentioned earlier, that there have been no weighting factors applied to the different indicators must also be appreciated. This has been a conscious decision by the OWR for reasons that include:

- ▲ awareness of a need to keep the assessment method as simple as possible;
- ▲ minimisation of any potential for debate or conjecture about which of the indicators are more important than others and what the appropriate weightings should be and, most importantly;

- ▲ according with the findings of the OWR's Customer Survey which rated the importance of both water quality and reliability of supply equally.

Bearing the above factors in mind, Carnarvon gained the highest score (99.79) and was ranked first. At the other end of the scale, Harvey Wokalup with a score of 86.65 ranked last (thirty-first). Perth ranked twenty-first, scoring 95.83. Bunbury was twenty-seventh (92.22) and Busselton ranked twenty-fourth (93.92).

Generally, towns in the north of the State performed better than towns in the south and south-west. A contributing reason for this appears to be that northern centres tended to score consistently better on microbiological compliance for total coliforms, almost without exception scoring 100. To a lesser extent, the same towns also performed better against the indicator for supply interruptions greater than 1 hour. For the other two indicators, the northern towns do not appear to have scored significantly higher than towns in the south.

Placing all of this in perspective, the relative performance difference between the highest (99.79) and the lowest (86.65) scores is only slightly more than 15%. In practical terms this means that while (say) Perth may be ranked 21st and Carnarvon ranked 1st out of the 31 towns benchmarked, the difference between their aggregate performance scores is only about 4%.

Explaining it another way, Carnarvon's performance is only 4% 'better' than Perth's performance. Similarly, the difference between Busselton's performance and that of Bunbury is just 1.84%. The difference between Perth's performance and that of Busselton is only 2%, and so on.

A final guide to interpretation is that nearly two-thirds of the towns scored higher than the average of all the aggregate scores (95.98). Further, the difference between this score and that for Perth (95.83) is negligible – as might be expected given the influence that Perth performance has on the average performance of all the benchmarked towns.

3.3 The 'Average' Benchmarked Town

It has been shown that different towns may share comparable demographic or performance-related characteristics but there is clearly no town that could be described as average or typical amongst those benchmarked.

On the other hand, the magnitude of water services operations in the Perth area compared with all other towns has a significant impact on the average values obtainable for any set of benchmarking data, Perth



constituting by far the major component of the Water Corporation's water service operations.

Further, since the Water Corporation itself is the largest of the three water services providers, the Corporation's service profile in Perth has a major influence on the overall status of the water industry in Western Australia when gauged by the performance of all towns taken together.

As a result, the Office of Water Regulation believes it would be useful to conclude this report by bringing together in one place some pertinent facts, figures and performance characteristics that summarise the water services industry in terms of an 'average' benchmarked town (*Table 16*). A further benefit of doing so is the prospect of longitudinal benchmarking of the vital statistics for this 'average' town with its equivalent when the data for 2000-2001 becomes available.

Table 16

Vital Statistics for the 'Average' Town in 1999-2000

Description	Units
Population Served	49,940
Properties Served	23,025
Residential Properties Served	19,373
Non-residential Properties Served	3,652
Total Water Consumption	8,894 megalitres
Residential Water Consumption	6,522 megalitres
Non-residential Water Consumption	2,372 megalitres
Weekly Consumption	171 megalitres
Peak Week Consumption	335 megalitres
Annual Consumption per Capita	178 kilolitres
Annual Consumption per Residential Property	337 kilolitres
Annual Consumption per Non-residential Property	650 kilolitres
Daily Consumption per Residential Property	922 litres
Daily consumption per Non-residential Property	1,780 litres
Total Volume of Water Extracted	10,392 megalitres
Water Extracted from Impounding Reservoirs	4,672 megalitres
Water Extracted from Groundwater	5,720 megalitres
Unaccounted for Water	1,601 megalitres
Unaccounted for Water per Property Served	65 kilolitres
Ratio of Residential to Non-residential Properties	5.30:1
Ratio of Residential to Non-residential Consumption	2.75:1
Unaccounted for Water as % of Volume Extracted	14.4%
Unaccounted for Water as % of Volume Consumed	16.9%
Disinfection-only Water Treatment	59.0%
Disinfection & Filtration Water Treatment	4.0%
Disinfection, Filtration & Additional Water Treatment	37.0%
Length of Water Mains	498 kilometres
Number of Water Quality Complaints	138
Number of Water Quality Complaints per 1000 Properties	6.01
Number of Confirmed Service Interruptions > 1 Hour	1,533
Service Interruptions > 1 Hour per 1000 Properties	67
Services NOT Experiencing Supply Interruptions > 1 Hour	93%





PERFORMANCE PROFILE CONTINUED

Number of Water Main Leaks & Bursts	13.5
Number of Bores	13.0
Number of Service Reservoirs & Tanks	7.4
Number of Pump Stations	6.3
Average Annual Residential Bill	\$339.77
Total (Trading) Revenue from Water Operations	\$12.76 million
Revenue from Usage Charges	\$5.31 million
Revenue from Access Charges	\$3.95 million
Revenue from Other	\$3.50 million
Operating Cost	\$4.48 million
Current Replacement Value of Systems Assets	\$123 million
Written Down Replacement Value of Systems Assets	\$106 million

Note: Although not significant, anomalies in the averaged data for Table 16 are acknowledged and this reflects anomalies found in the raw data. For example, Total Consumption (8,894 ML) plus Unaccounted for Water (1,601 ML) would normally be expected to equal the Total Volume of Water Extracted (10,392 ML). This is not so although the difference is just 1%.

Not all of what might be considered pertinent is included in the vital statistics. A case in point is microbiological water quality. Units of measure for this do not enable the derivation of a meaningful performance average.

Other limitations relate to the quantum of the data (eg. 5 weirs in total) and/or the uniqueness of data to some towns (eg. referable dams apply only to 14 of the 32 towns benchmarked). Similarly, the numbers and types of treatment works prohibit the reporting of an indicative average.

A final impediment to the reporting of vital statistics has been the absence of raw data for some data elements. The most obvious example of this relates to Capital Works.



APPENDIX 1



Benchmarked Towns	
Albany	Kalgoorlie Boulder
Australind	Karratha
Bridgetown	Katanning
Broome	Kununurra
Bunbury (Water Board)	Mandurah
Bussellton (Water Board)	Manjimup
Carnarvon	Margaret River Gnarabup
Collie	Merredin
Denmark	Narrogin
Derby	Newman
Dongara Denison	Northam
Dunsborough Yallingup	Perth
Eaton	Pinjarra
Esperance	Port Hedland
Geraldton	South Hedland
Harvey Wokalup	York





Data Element
<p>CUSTOMER BASE Population served Number of properties served Number of residential properties served</p>
<p>WATER CONSUMPTION Total annual consumption Total residential consumption Peak week consumption Average weekly consumption</p>
<p>WATER SUPPLY Volume from impounding reservoir Volume from river extraction Volume from groundwater Bulk supplies (raw) Bulk supplies (treated) Unaccounted for water (delivered less metered consumption)</p>
<p>WATER QUALITY Microbiological compliance – total coliforms Microbiological compliance – thermo-tolerant coliforms Microbiological compliance – amoebae Health-related chemical Non-health related chemical (includes physical characteristics)</p>
<p>WATER TREATMENT No treatment – number of sources No treatment – volume of water supplied Disinfection only – number of works Disinfection only – volume supplied Disinfection and filtration – number of works Disinfection and filtration – volume supplied Disinfection, filtration & additional processes – number of works Disinfection, filtration & additional processes – volume supplied</p>
<p>ASSETS Number of dams Number of weirs Number of bores Number of service reservoirs & tanks Number of pump stations Length of mains Customer Service & Asset Condition Number of water quality complaints Total number of confirmed service interruptions (incidents) Average duration of all interruptions Water main breaks (leaks & bursts) Water restrictions applied Average Annual Bill for Residential Customers</p>
<p>FINANCIAL Annual Bill for Residential Customer using 415kL/year Real increase over previous year's bill for Residential Customers using 415kL/year Total Revenue from Water Operations Revenue from Usage Charges Revenue from Access Charges Revenue from Other Operating Cost (OMA) Treatment (OMA) Cost Depreciation Capital expenditure Annual Total Capital expenditure New Works Capital expenditure Subdivider / development Capital expenditure other Current Replacement Cost of System Assets Written Down Replacement Value of System Assets</p>





USEFUL DEFINITIONS

- ▲ **Average Weekly Consumption** – total annual consumption divided by 52.
- ▲ **Ground Water** – water pumped or drawn from underground aquifers for the purposes of urban water supply.
- ▲ **Impounding Reservoirs** – a dam for the purposes of seasonal storage as distinct from daily reticulation supply.
- ▲ **Interruption to Water Supply** – an interruption commences when water is no longer available at the customer's first cold water tap and ceases when normal service is restored. A 'planned' interruption requires that customers be notified at least 24 hours in advance.
- ▲ **Leaks and Bursts (Water Mains Breaks)** – exclude 'weeps' which do not require immediate repair.
- ▲ **Residential Consumption** – total metered and estimated non-metered consumption by domestic residential and multiple residential properties.
- ▲ **Residential Property** – properties used as single dwellings receiving water for domestic purposes but not factories, offices or commercial premises. Includes cases where a single aggregate bill is issued to cover separate dwellings having individual meters/assessments.
- ▲ **Revenue from Operations (or trading)** – includes receipts from Government for Community Service Obligations (CSOs) but excludes abnormal revenue, investment income and receipts from Government to cover deficits on operations.
- ▲ **Service Reservoirs and Tanks** – storages used in providing supply to particular towns (including town storage tanks) Storages can supply more than one town and are counted for each town they serve.
- ▲ **Unaccounted for Water** – the difference between water supplied from all sources and total metered consumption.
- ▲ **Water Mains** – includes all trunk and reticulation mains (of all diameters) expressed in kilometres.
- ▲ **Water Quality Complaint** – communications from customers relating to water quality, including non-health related quality, and attributable to a utility's assets. This WSAA definition was applicable to and used by the Water Corporation.
- ▲ **Water Treatment Plant** – individual location where raw or partially-treated water is treated prior to being made available for deliver to customers.



POPULATION AND PROPERTIES SERVED

DATA ELEMENT	Population Served	Number of Properties Served	Number of Residential Properties Served	Number of NON Residential Properties Served
Unit	No.	No.	No.	No.
Albany	24,571	11,323	8,734	2,589
Australind	8,695	4,007	3,153	854
Bridgetown	2,873	1,324	937	387
Broome	9,262	4,268	3,174	1,094
Bunbury (Water Board)	32,000	14,000	11,000	3,000
Busselton (Water Board)	15,000	8,000	6,600	1,400
Carnarvon	4,935	2,274	1,708	566
Collie	8,266	3,809	2,989	820
Denmark	4,262	1,964	1,185	779
Derby	2,927	1,349	932	417
Dongara Denison	3,576	1,648	1,034	614
Dunsborough Yallingup	6,829	3,147	2,095	1,052
Eaton	5,937	2,736	2,238	498
Esperance	10,631	4,899	3,592	1,307
Geraldton	31,953	14,725	11,335	3,390
Harvey Wokalup	3,047	1,404	1,040	364
Kalgoorlie Boulder	27,924	12,868	10,504	2,364
Karratha	10,149	4,677	3,872	805
Katanning	4,286	1,975	1,451	524
Kununurra	3,129	1,442	1,094	348
Mandurah	53,419	24,617	19,203	5,414
Manjimup	5,195	2,394	1,838	556
Margaret River Gnarabup	5,195	2,394	1,531	863
Merredin	3,806	1,754	1,186	568
Narrogin	4,915	2,265	1,736	529
Newman	4,807	2,215	1,957	258
Northam	7,376	3,399	2,599	800
Perth	1,274,100	587,143	504,810	82,333
Pinjarra	3,531	1,627	1,152	475
Port Hedland	3,832	1,766	1,304	462
South Hedland	8,391	3,867	3,026	841
York	3,266	1,505	917	588
AVERAGE	49,940	23,025	19,373	3,652
AVERAGE less Perth	10,451	4,827	3,713	1,114
TOTAL ALL TOWNS	1,598,085	736,785	619,926	116,859

APPENDIX 5



WATER CONSUMPTION

DATA ELEMENT	Total Annual Consumption	Total Annual Residential Consumption	Total Annual NON Residential Consumption	Residential Water Consumption as %age of Total Consumption	NON Residential Water Consumption as %age of Total Consumption
Unit	ML	ML	ML	%	%
Albany	3,033	2,193	840	72%	28%
Australind	1,479	1,334	145	90%	10%
Bridgetown	320	244	76	76%	24%
Broome	2,737	1,524	1,213	56%	44%
Bunbury (Water Board)	5,541	3,616	1,925	65%	35%
Busselton (Water Board)	3,668	2,100	1,568	57%	43%
Carnarvon	1,299	832	467	64%	36%
Collie	1,359	1,102	257	81%	19%
Denmark	346	256	90	74%	26%
Derby	816	542	274	66%	34%
Dongara Denison	596	401	195	67%	33%
Dunsborough Yallingup	882	650	232	74%	26%
Eaton	1,051	970	81	92%	8%
Esperance	1,431	1,070	361	75%	25%
Geraldton	6,803	4,740	2,063	70%	30%
Harvey Wokalup	450	336	114	75%	25%
Kalgoorlie Boulder	7,848	3,614	4,234	46%	54%
Karratha	2,690	1,901	789	71%	29%
Katanning	882	455	427	52%	48%
Kununurra	892	628	264	70%	30%
Mandurah	6,721	5,907	814	88%	12%
Manjimup	706	517	189	73%	27%
Margaret River Gnarabup	628	420	208	67%	33%
Merredin	601	371	230	62%	38%
Narrogin	738	566	172	77%	23%
Newman	1,024	692	332	68%	32%
Northam	1,113	838	275	75%	25%
Perth	218,698	167,829	50,869	77%	23%
Pinjarra	543	409	134	75%	25%
Port Hedland	2,757	853	1,904	31%	69%
South Hedland	6,592	1,510	5,082	23%	77%
York	374	287	87	77%	23%
AVERAGE	8,894	6,522	2,372	73%	27%
AVERAGE less Perth	2,126	1,319	808	62%	38%
TOTAL ALL TOWNS	284,618	208,707	75,911		



WATER EXTRACTED BY VOLUME AND SOURCE

DATA ELEMENT	Volume from Impounding Reservoir	Volume from Groundwater	Total Volume from All Sources
Unit	ML	ML	ML
Albany	951	3,754	4,705
Australind		2,993	2,993
Bridgetown	373		373
Broome		3,177	3,177
Bunbury (Water Board)		6,893	6,893
Busselton (Water Board)		3,817	3,817
Carnarvon		1,565	1,565
Collie	1,692		1,692
Denmark	385		385
Derby		948	948
Dongara Denison		460	460
Dunsborough Yallingup		955	955
Eaton	in Australind	in Australind	in Australind
Esperance		1,739	1,739
Geraldton		9,528	9,528
Harvey Wokalup	679		679
Kalgoorlie Boulder	8,082		8,082
Karratha	1,695	1,688	3,383
Katanning	829		829
Kununurra		1,021	1,021
Mandurah	8,283	832	9,115
Manjimup	878		878
Margaret River Gnarabup	624		624
Merredin	699		699
Narrogin	710		710
Newman	n/a	n/a	n/a
Northam	1,300		1,300
Perth	121,366	133,410	254,776
Pinjarra	540		540
Port Hedland		2,941	2,941
South Hedland		7,336	7,336
York	427		427
AVERAGE			11,086
AVERAGE less Perth			2,509
TOTAL ALL TOWNS	149,513	183,057	332,570

APPENDIX 7



WATER TREATMENT BY PROCESS AND VOLUME

DATA ELEMENT	Disinfection only – Volume Supplied	Disinfection and filtration – volume supplied	Disinfection, filtration and additional processes – volume supplied	Disinfection only – number of works	Disinfection and filtration – number of works	Disinfection, filtration and additional processes – number of works
Unit	ML	ML	ML	No.	No.	No.
Albany	3,754	29	922	2	1	1
Australind			2,993			1
Bridgetown		373			1	
Broome			3,177			1
Bunbury (Water Board)		6,893			6	
Busselton (Water Board)		1,996	1,671		1	2
Carnarvon	1,566			1		
Collie	1,692			1		
Denmark			385			1
Derby			948			1
Dongara Denison	460			1		
Dunsborough Yallingup	955			1		
Eaton	in Australind	in Australind	in Australind	in Australind	in Australind	in Australind
Esperance		1,739			2	
Geraldton	9,528			2		
Harvey Wokalup		679			1	
Kalgoorlie Boulder	8,082			6		
Karratha	3,383			2		
Katanning	829			1		
Kununurra	1,021			1		
Mandurah	9,115			2		
Manjimup	878			1		
Margaret River Gnarabup	624			1		
Merredin	699			3		
Narrogin	761			1		
Newman	n/a	n/a	n/a	n/a	n/a	n/a
Northam	1,300			1		
Perth	138,605	2,089	114,082	21	1	6
Pinjarra	540			1		
Port Hedland	11,264			1		
South Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland
York	427			1		
AVERAGE						
AVERAGE less Perth						
TOTAL ALL TOWNS	195,483	13,798	124,178	51	13	13



UNACCOUNTED FOR WATER BY VOLUME AND PERCENT

DATA ELEMENT	Unaccounted for Water (Delivered Less Metered Consumption)	Unaccounted for Water per Property Served per Annum	Unaccounted for Water as a %age of Total Volume Gathered	Unaccounted for Water as a %age of Total Consumption
Unit	ML	KL	%	%
Albany	719	63	15.3%	23.7%
Australind	463	116	15.5%	31.3%
Bridgetown	53	40	14.2%	16.6%
Broome	439	103	13.8%	16.0%
Bunbury (Water Board)	1,352	97	19.6%	24.4%
Busselton (Water Board)	149	19	3.9%	4.1%
Carnarvon	266	117	17.0%	20.5%
Collie	333	87	19.7%	24.5%
Denmark	39	20	10.1%	11.3%
Derby	132	98	13.9%	16.2%
Dongara Denison	-136	-83	-29.6%	-22.8%
Dunsborough Yallingup	73	23	7.6%	8.3%
Eaton	in Australind	in Australind	in Australind	in Australind
Esperance	308	63	17.7%	21.5%
Geraldton	2,725	185	28.6%	40.1%
Harvey Wokalup	229	163	33.7%	50.9%
Kalgoorlie Boulder	233	18	2.9%	3.0%
Karratha	693	148	20.5%	25.8%
Katanning	-53	-27	-6.4%	-6.0%
Kununurra	129	89	12.6%	14.5%
Mandurah	2,394	97	26.3%	35.6%
Manjimup	172	72	19.6%	24.4%
Margaret River Gnarabup	-4	-2	-0.6%	-0.6%
Merredin	99	56	14.2%	16.5%
Narrogin	-28	-12	-3.9%	-3.8%
Newman	n/a	n/a	n/a	n/a
Northam	187	55	14.4%	16.8%
Perth	36,078	61	14.2%	16.5%
Pinjarra	-3	-2	-0.6%	-0.6%
Port Hedland	184	104	6.3%	6.7%
South Hedland	744	192	10.1%	11.3%
York	54	36	12.6%	14.4%
AVERAGE	1,601	65	14.4%	16.9%
AVERAGE less Perth	385	80	15.4%	18.1%
TOTAL ALL TOWNS	48,023			

APPENDIX 9



SUPPLY AND STORAGE ASSETS

DATA ELEMENT	Number of Dams	Number of Weirs	Number of Bores	Number of Service Reservoirs and Tanks	Number of Pump Stations
Unit	No.	No.	No.	No.	No.
Albany	1	3	40	10	7
Australind			6	4	7
Bridgetown	1			4	4
Broome			14	4	3
Bunbury (Water Board)			13		
Busselton (Water Board)			8		4
Carnarvon			35	7	1
Collie	1				1
Denmark				11	12
Derby			3	3	1
Dongara Denison			2	2	
Dunsborough Yallingup			12	6	3
Eaton	in Australind	in Australind	in Australind	6	in Australind
Esperance			36	10	3
Geraldton			19	11	7
Harvey Wokalup	1			2	2
Kalgoorlie Boulder		1		5	22
Karratha	1		10	25	2
Katanning				2	1
Kununurra			6	2	1
Mandurah	1		3	9	4
Manjimup	2			3	3
Margaret River Gnarabup	1			4	3
Merredin	1			1	10
Narrogin	1			1	3
Newman	n/a	n/a	n/a	n/a	n/a
Northam	1			2	4
Perth	9	1	205	97	86
Pinjarra	1				
Port Hedland			16	4	4
South Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland	in Pt Hedland
York	1			2	5
AVERAGE					
AVERAGE less Perth					
TOTAL ALL TOWNS	23	5	428	237	203



ASSET REPLACEMENT VALUES

DATA ELEMENT	Current Replacement Value of System Assets	Written Down Replacement Value of System Assets	Average Current Replacement Value of Systems Assets per Property Served	Average Written Down Replacement Value of Systems Assets per Property Served
Unit	\$'000	\$'000	\$/Property	\$/Property
Albany	88,185	54,941	7,788	4,852
Australind	38,945	28,969	9,719	7,230
Bridgetown	11,528	6,458	8,707	4,878
Broome	38,508	28,337	9,022	6,639
Bunbury (Water Board)	56,353	n/r	4,025	n/a
Bussellton (Water Board)	11,567	n/r	1,446	n/a
Carnarvon	17,060	11,124	7,502	4,892
Collie	22,365	12,853	5,872	3,374
Denmark	14,615	9,254	7,441	4,712
Derby	13,988	10,048	10,369	7,448
Dongara Denison	3,938	2,533	2,390	1,537
Dunsborough Yallingup	12,105	9,558	3,847	3,037
Eaton	38,945	28,969	14,234	10,588
Esperance	24,868	16,617	5,076	3,392
Geraldton	72,827	53,690	4,946	3,646
Harvey Wokalup	18,283	16,539	13,022	11,780
Kalgoorlie Boulder	182,298	158,665	14,167	12,330
Karratha	238,616	166,130	51,019	35,521
Katanning	18,064	11,334	9,146	5,739
Kununurra	13,819	9,042	9,583	6,270
Mandurah	124,657	88,269	5,064	3,586
Manjimup	20,868	11,944	8,717	4,989
Margaret River Gnarabup	19,403	17,498	8,105	7,309
Merredin	8,505	3,574	4,849	2,038
Narrogin	12,824	7,459	5,662	3,293
Newman	8,587	5,530	3,877	2,497
Northam	15,333	7,515	4,511	2,211
Perth	2,694,592	2,471,172	4,589	4,209
Pinjarra	10,054	5,967	6,179	3,667
Port Hedland	36,519	21,127	20,679	11,963
South Hedland	27,139	17,126	7,018	4,429
York	6,511	4,383	4,326	2,912

TRADING REVENUE

DATA ELEMENT	Total Revenue from Water Operations	Average Usage Charge Revenue per Property Served	Average Access Charge Revenue per Property Served	Other Revenue per Property Served
Unit	\$'000	\$/Property	\$/Property	\$/Property
Albany	7,098	200	207	220
Australind	3,284	400	241	179
Bridgetown	1,073	162	161	488
Broome	4,361	516	246	260
Bunbury (Water Board)	6,574	190	190	89
Bussellton (Water Board)	2,378	152	145	0
Carnarvon	3,220	511	212	693
Collie	3,141	313	155	357
Denmark	1,231	127	153	346
Derby	1,700	529	186	546
Dongara Denison	765	249	165	50
Dunsborough Yallingup	1,707	186	183	173
Eaton	3,222	586	352	239
Esperance	3,055	194	180	250
Geraldton	8,901	333	187	84
Harvey Wokalup	939	414	162	93
Kalgoorlie Boulder	18,344	815	203	408
Karratha	10,211	473	193	1,518
Katanning	2,909	420	112	941
Kununurra	2,572	495	237	1,051
Mandurah	12,313	203	218	78
Manjimup	1,832	231	198	336
Margaret River Gnarabup	1,954	184	201	431
Merredin	1,385	261	173	356
Narrogin	2,042	234	173	494
Newman	1,571	390	200	120
Northam	1,868	219	175	155
Perth	283,181	202	165	116
Pinjarra	845	232	162	125
Port Hedland	10,453	2,136	231	3,552
South Hedland	3,215	501	182	148
York	1,085	179	156	386

COSTS TO CUSTOMERS

DATA ELEMENT	Average Annual Bill for Residential Customers	Annual Bill for Residential Customer Using 415kL per Year	Real Increase Over Precious Year's Bill for Residential Customers Using 415kL/Year
Unit	\$	\$	%
Albany	257	357	2.39
Australind	367	357	2.39
Bridgetown	255	358	2.39
Broome	474	348	2.00
Bunbury (Water Board)	277	315	0.00
Bussellton (Water Board)	231	285	n/r
Carnarvon	406	348	0.02
Collie	331	357	0.02
Denmark	232	358	0.02
Derby	476	348	0.02
Dongara Denison	352	348	2.00
Dunsborough Yallingup	306	357	2.39
Eaton	375	357	2.39
Esperance	286	357	2.39
Geraldton	381	357	2.39
Harvey Wokalup	299	357	2.39
Kalgoorlie Boulder	307	358	2.39
Karratha	416	348	2.00
Katanning	290	358	2.39
Kununurra	476	348	2.00
Mandurah	300	357	2.39
Manjimup	275	358	2.39
Margaret River Gnarabup	312	357	2.39
Merredin	286	358	2.39
Narrogin	294	358	2.39
Newman	360	348	2.00
Northam	297	357	2.39
Perth	324	361	2.43
Pinjarra	327	357	2.39
Port Hedland	581	348	2.00
South Hedland	428	348	2.00
York	292	358	2.39

APPENDIX 13



KEY PERFORMANCE INDICATORS – SUPPLY CONTINUITY

DATA ELEMENT	Leaks & Bursts per 100 kms Main	% of Services NOT Experiencing Drinking Water Supply Interruptions > 1 Hour	Number of Confirmed Service Interruptions (INCIDENTS) per 1000 Properties Served	Number of Supply Interruptions > 1 Hour per Incident per 1000 Properties
Unit	No.	%	No.	No.
Albany	9.55	86.6%	87	1.54
Australind	10.10	93.4%	49	1.34
Bridgetown	26.15	60.8%	43	9.11
Broome	11.64	96.9%	12	2.56
Bunbury (Water Board)	22.22	90.6%	n/a	n/a
Busselton (Water Board)	19.10	85.9%	n/a	n/a
Carnarvon	5.73	100.0%	3	0.14
Collie	25.00	94.4%	49	1.13
Denmark	16.90	76.4%	37	6.43
Derby	8.89	99.4%	126	0.05
Dongara Denison	28.89	98.0%	69	0.29
Dunsborough Yallingup	3.61	100.0%	1	0.00
Eaton	in Australind	in Australind	in Australind	in Australind
Esperance	24.39	83.7%	62	2.64
Geraldton	17.34	96.3%	106	0.35
Harvey Wokalup	52.17	59.4%	51	8.03
Kalgoorlie Boulder	35.31	90.5%	82	1.16
Karratha	7.52	96.3%	130	0.29
Katanning	19.10	98.9%	3	3.50
Kununurra	3.77	98.5%	71	0.21
Mandurah	6.60	98.3%	3	5.49
Manjimup	19.18	95.3%	30	1.55
Margaret River Gnarabup	15.52	99.1%	22	0.40
Merredin	54.46	88.7%	5	22.11
Narrogin	14.84	92.0%	39	2.03
Newman	8.70	97.8%	134	0.16
Northam	16.11	96.3%	51	0.73
Perth	12.25	93.4%	63	1.05
Pinjarra	7.06	99.5%	2	2.67
Port Hedland	47.22	97.6%	75	0.32
South Hedland	18.46	98.8%	92	0.13
York	19.28	92.3%	47	1.66
AVERAGE	13.48	93.3%	59	n/a
AVERAGE less Perth	16.59	93.1%	46	n/a
TOTAL ALL TOWNS				



KEY PERFORMANCE INDICATORS – WATER QUALITY

DATA ELEMENT	Number of Water Quality Complaints per 1000 Properties Served	Microbiological Compliance – Total Coliforms	Microbiological Compliance – Thermo-tolerant Coliforms	Microbiological Compliance – Amoebae
Unit	No.	%	%	%
Albany	4.15	92.00	96.00	100.00
Australind	8.73	98.00	98.00	100.00
Bridgetown	1.51	96.00	96.00	100.00
Broome	1.17	100.00	100.00	100.00
Bunbury (Water Board)	20.79	100.00	100.00	100.00
Busselton (Water Board)	9.50	99.28	99.28	100.00
Carnarvon	0.00	100.00	100.00	100.00
Collie	1.58	100.00	100.00	100.00
Denmark	3.05	92.00	97.00	100.00
Derby	1.48	98.00	100.00	100.00
Dongara Denison	0.61	100.00	100.00	100.00
Dunsborough Yallingup	5.40	100.00	100.00	100.00
Eaton	8.77	100.00	100.00	100.00
Esperance	0.41	98.00	98.00	100.00
Geraldton	1.22	100.00	100.00	100.00
Harvey Wokalup	5.70	96.00	96.00	100.00
Kalgoorlie Boulder	0.70	99.00	100.00	100.00
Karratha	0.64	100.00	100.00	100.00
Katanning	0.00	100.00	100.00	100.00
Kununurra	0.69	100.00	100.00	100.00
Mandurah	2.97	96.00	98.00	100.00
Manjimup	1.25	96.00	100.00	100.00
Margaret River Gnarabup	20.05	94.00	100.00	100.00
Merredin	1.71	100.00	100.00	100.00
Narrogin	0.00	98.00	98.00	100.00
Newman	0.00	100.00	100.00	100.00
Northam	0.29	100.00	100.00	100.00
Perth	6.37	97.70	97.70	100.00
Pinjarra	0.61	96.00	100.00	100.00
Port Hedland	0.57	100.00	100.00	98.00
South Hedland	0.52	in Pt Hedland	in Pt Hedland	in Pt Hedland
York	1.33	100.00	100.00	100.00
AVERAGE	6.01			
AVERAGE less Perth	4.59			
TOTAL ALL TOWNS				

OTHER FINANCIAL DATA REPORTED – 1

DATA ELEMENT	Depreciation	Capital Expenditure New Works	Capital Expenditure Subdivider/ Development	Capital Expenditure Other
Unit	\$'000	\$'000	\$'000	\$'000
Albany	1,017	n/a	n/a	n/a
Australind	761	n/a	n/a	n/a
Bridgetown	184	n/a	n/a	n/a
Broome	652	n/a	n/a	n/a
Bunbury (Water Board)	944	542	127	591
Busselton (Water Board)	863	678	422	220
Carnarvon	224	n/a	n/a	n/a
Collie	260	n/a	n/a	n/a
Denmark	232	n/a	n/a	n/a
Derby	265	n/a	n/a	n/a
Dongara Denison	54	n/a	n/a	n/a
Dunsborough Yallingup	250	n/a	n/a	n/a
Eaton	761	n/a	n/a	n/a
Esperance	458	n/a	n/a	n/a
Geraldton	1,102	n/a	n/a	n/a
Harvey Wokalup	96	n/a	n/a	n/a
Kalgoorlie Boulder	4,641	n/a	n/a	n/a
Karratha	3,180	n/a	n/a	n/a
Katanning	223	n/a	n/a	n/a
Kununurra	213	n/a	n/a	n/a
Mandurah	2,057	n/a	n/a	n/a
Manjimup	310	n/a	n/a	n/a
Margaret River Gnarabup	292	n/a	n/a	n/a
Merredin	139	n/a	n/a	n/a
Narrogin	156	n/a	n/a	n/a
Newman	137	n/a	n/a	n/a
Northam	262	n/a	n/a	n/a
Perth	46,737	n/a	n/a	n/a
Pinjarra	144	n/a	n/a	n/a
Port Hedland	554	n/a	n/a	n/a
South Hedland	353	n/a	n/a	n/a
York	95	n/a	n/a	n/a

OTHER FINANCIAL DATA REPORTED – 2

DATA ELEMENT	Operating Cost (OMA)	Treatment (OMA) Cost	Economic Real Rate of Return
Unit	\$'000	\$'000	%
Albany	3,220	n/a	5.21
Australind	1,183	n/a	4.63
Bridgetown	469	n/a	6.50
Broome	1,934	n/a	6.26
Bunbury (Water Board)	3,893	1,718	8.78
Busselton (Water Board)	1,165	506	0.03
Carnarvon	911	n/a	18.74
Collie	1,155	n/a	13.43
Denmark	664	n/a	3.62
Derby	751	n/a	6.81
Dongara Denison	505	n/a	8.13
Dunsborough Yallingup	390	n/a	11.16
Eaton	1,183	n/a	4.41
Esperance	1,877	n/a	4.33
Geraldton	3,036	n/a	8.87
Harvey Wokalup	219	n/a	3.77
Kalgoorlie Boulder	16,703	n/a	-1.89
Karratha	3,485	n/a	2.13
Katanning	1,669	n/a	8.97
Kununurra	588	n/a	19.59
Mandurah	3,197	n/a	8.00
Manjimup	625	n/a	7.51
Margaret River Gnarabup	366	n/a	7.41
Merredin	508	n/a	20.65
Narrogin	1,637	n/a	3.34
Newman	673	n/a	13.76
Northam	926	n/a	9.05
Perth	84,475	n/a	6.15
Pinjarra	228	n/a	7.93
Port Hedland	2,608	n/a	34.51
South Hedland	2,599	n/a	1.54
York	371	n/a	14.12

NOTES





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