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SKM

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

Outcomes of Consultation on Performance Standards and Indicators for the Fish River Water Supply Scheme

- Final
- 11 March 2005

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Executive Summary

State Water assumed responsibility for operation of the Fish River Water Supply Scheme from 1 January 2005. State Water's role in operating the scheme and the nature of its infrastructure is different to its operations throughout the rest of the State. For this reason, a set of performance standards and indicators has been specifically developed for the scheme, separate to performance standards and indicators for State Water's other water supply operations.

In December 2004, Sinclair Knight Merz (SKM) prepared a list of recommended performance standards and indicators for the Fish River Water Supply Scheme for inclusion in State Water's Initial Operating Licence. This list was prepared without consultation with customers of the scheme. State Water provided feedback that some of the proposed performance standards and indicators required modification and would benefit from further discussion.

A forum was held with State Water and representatives from the major consumers of the scheme at Wallerawang on 14 February 2005. The forum was attended by:

- Sydney Catchment Authority
- Delta Power
- Lithgow City Council
- State Water

Oberon City Council was unable to attend, but its interests are similar in nature to the other major consumers.

It was concluded from the consultation that the level of reporting by scheme operators is currently high and that the inclusion of performance standards and indicators in the operating licence will serve to formalise this reporting process.

The outcomes of the study are as follows:

- It is recommended that the performance standards, performance indicators and general reporting requirements presented in Table 1-1 be included in State Water's operating licence. These include actions to report on system yield, develop an algal management strategy and classify customer complaints by the end of the term of the Initial Operating Licence. The customer complaint classifications should include water pressure and water quality categories specific to the Fish River scheme.
- The water balance template for the Fish River scheme, presented in Table 1-2, should be included in State Water's operating licence. A system schematic to accompany the water balance would be beneficial when examining and interpreting the water balance table.

- The adoption of the above recommendations is not expected to create any additional financial burden on State Water.

Table 1-1 Proposed performance standards, indicators and general reporting requirements for the Fish River scheme [1]

Area of Operation	Reporting requirement	Description of standard or indicator
Water delivery	Performance indicator	▪ Percentage of time that daily minimum flow targets are met.
	Action	▪ State Water should report on system yield by the end of the Initial Operating Licence at a specified level of reliability developed in consultation with the Customer Advisory Committee.
Water quality	Performance indicator	▪ % compliance with Australian Drinking Water Guidelines at the points of delivery to State Water's customers for e-coli, colour, turbidity, iron, manganese, aluminium and pH. The guideline value for turbidity should be the value at which there is a risk of ineffective disinfection.
Customer service	Performance indicators	▪ Number of customer complaints to State Water ▪ Number of complaints for arbitration
	Action	▪ State Water should develop a system for classifying customer complaints which includes categories relevant to the Fish River scheme.
Asset management	Performance standard	▪ The response time for unplanned supply interruptions to be within 24 hours
	Performance indicators	▪ The number of planned water supply interruptions ▪ The number of unplanned water supply interruptions ▪ The average duration of planned water supply interruptions ▪ The average duration of unplanned water supply interruptions

Area of Operation	Reporting requirement	Description of standard or indicator
Business development	Performance indicators	▪ Training costs per employee ▪ Training costs as a proportion of total labour costs ▪ Research and development expenditure ▪ Degree of participation in Statewide and national forums (no. and type)
Environment and Recreation	Action	▪ Develop algal management strategy for Oberon Dam and Duckmaloi Weir as part of a Dam/Weir Management Plan. ▪ Report on incidents of environmental harm as part of Statewide memoranda of understanding with government agencies.

Note: (1) Other indicators, such as the degree of metering for each customer group and unaccounted for water, are incorporated into the water balance recommended for the Fish River scheme.

- **Table 1-2 Draft water balance template (dummy values used in example)**

Water balance component	Sources of water		Distribution of water		% of volume metered
	Volume (ML)	% of total	Volume (ML)	% of total	
Storage volume					
Volume in storage at start of year	20,485				
Volume in storage at end of year	15,986				
Change in storage	**4,499**	**9%**			**100%**
Inflows					
Oberon Reservoir Inflows	17,548	33%			100%
Duckmaloi Weir Diversions	26,683	55%			100%
Subtotal	**44,231**	**91%**			**100%**
Supply					
Delta Electricity			6,734	14%	100%
Lithgow Council			968	2%	100%
Sydney Catchment Authority			3,005	6%	100%
Oberon Council			732	2%	100%
Minor consumers			216	0%	0%
Subtotal			**11,655**	**24%**	**98%**
Losses					
Storage net evaporation			4,170	9%	100%
Unaccounted for water			1,065	2%	100%
Subtotal			**5,235**	**11%**	**100%**
Outflows					
Oberon Dam spills and non-riparian releases			2,080	4%	100%
Minimum passing flow (2)			29,760	61%	100%
Subtotal			**31,840**	**65%**	**100%**
TOTAL	**48,730**	**100%**	**48,730**	**100%**	**100%**

Notes:

(1) Notes to the table as appropriate

(2) Riparian releases as measured at v-notch weir downstream of Oberon Dam

Contents

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1. Introduction

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In December 2004, Sinclair Knight Merz (SKM) prepared a list of recommended performance standards and indicators for the Fish River Water Supply Scheme for inclusion in State Water's Initial Operating Licence. This list was prepared without consultation with customers of the scheme. State Water provided feedback that some of the proposed performance standards and indicators required modification and would benefit from further discussion.

A forum was held with State Water and representatives from the major consumers of the scheme at Wallerawang on 14 February 2005. The forum was attended by:

- Sydney Catchment Authority
- Delta Power
- Lithgow City Council
- State Water

Oberon City Council was unable to attend, but its interests are similar in nature to the other major consumers.

This report presents the recommended list of performance standards and indicators for the Fish River Water Supply Scheme for the Initial Operating Licence arising from this consultation.

2. Scheme Description

2.1 Scheme Infrastructure

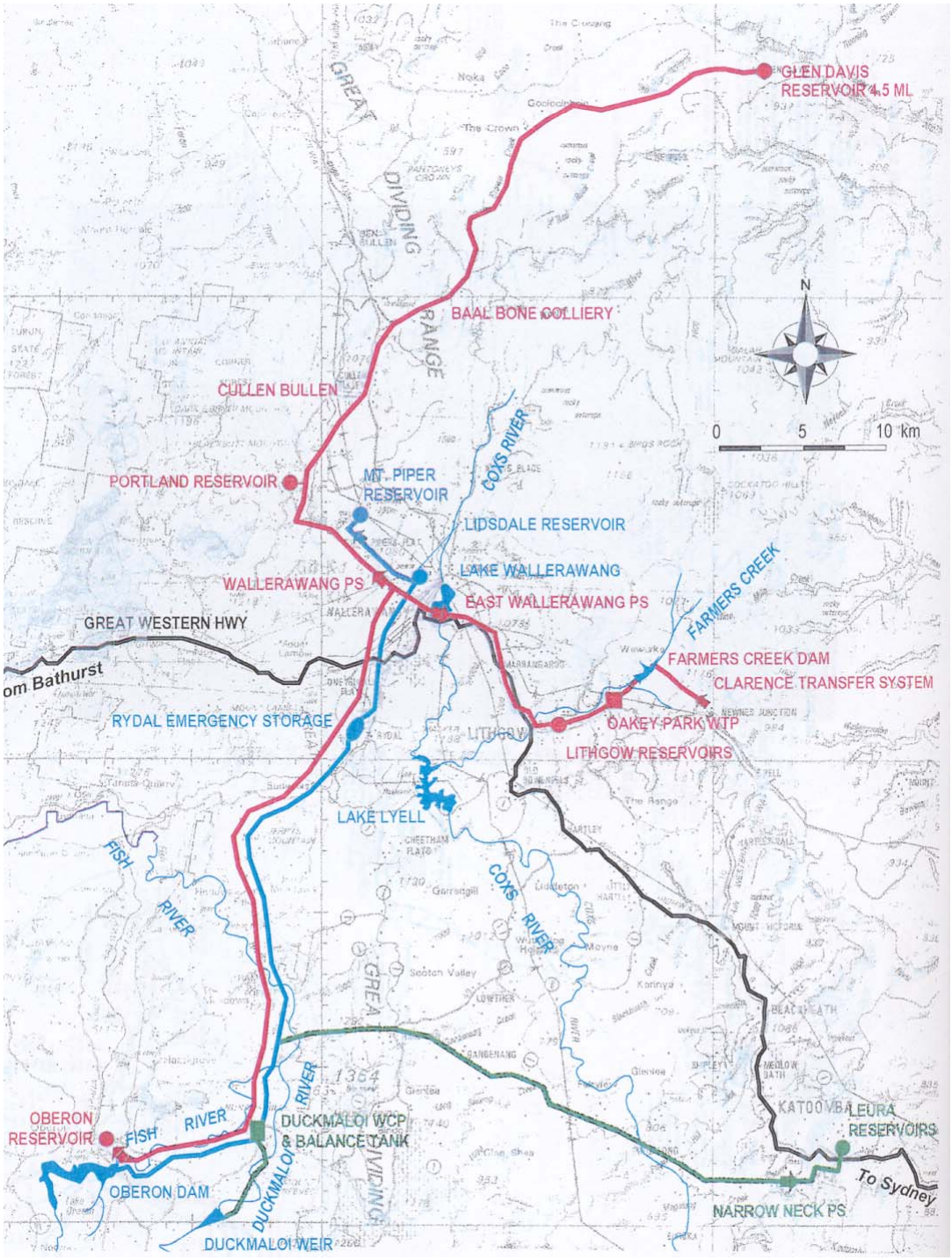
The Fish River Water Supply Scheme was previously described in SKM (2004). The scheme incorporates reservoirs and diversion weirs, similar to State Water's rural water supply operations, but also includes 230 km of supply mains, five pumping stations, two service reservoirs and water treatment facilities (AWA, 2002). The scheme layout is depicted in Figure 2-1.

The scheme's customers include four major consumers (Sydney Catchment Authority, Delta Power, Lithgow City Council and Oberon City Council), which account for 99% of the water supplied by volume. The scheme also includes around 200 smaller consumers, who account for the remaining 1% of supply.

The degree of water treatment varies for each customer group and reflects both the end use and the presence or absence of treatment facilities downstream of the point of delivery to the scheme's customers:

- Treated water is provided to Lithgow City Council and the villages of Rydal, Wallerawang, Cullen Bullen and Glen Davis. These customers are supplied from the "Stage 1" pipeline. Water is passed through a micro-filtration water treatment plant operated by State Water, which provides potable water supply.
- Disinfected raw water is provided to the Sydney Catchment Authority, Oberon City Council and Delta Power. Each of these customers has their own water treatment facilities where potable water is required. These customers are supplied from the "Stage 2" and "Stage 3" pipelines.
- The minor consumers receive either treated or disinfected water depending on whether they are connected to the Stage 1 or the Stages 2 and 3 pipelines. State Water has specified in its agreements with minor consumers that it has no obligation to provide water of a given quality.

Figure 2-1 Fish River Water Supply Scheme Layout



2.2 Regulatory Framework

Prior to 2005, the Fish River scheme was controlled and administered directly by the Minister administering the *Water Management Act 2000* and hence there was no licence issued for the operation of the works.

Provisions of the *State Water Corporation Act 2004* transfer responsibility for the scheme to State Water. Under Part 1 Section 3 of the *State Water Corporation Act 2004*, the water management works associated with the scheme comprise:

> "the concrete dam on Fish River at Oberon and Duckmaloi Weir, together with:
> (a) its associated gravitation main, concrete reservoirs,
> reticulation systems and treatment works, and
> (b) the pumping station at Oberon, and
> (c) all incidental and connected works, and
> (d) all additions, amplifications, improvements and extensions to
> that scheme."

The objectives and functions of State Water under the *State Water Corporation Act 2004* will equally apply to the objectives and functions for the Fish River scheme. These objectives and functions from Section 6 of the Act were presented in SKM (2004). They essentially require State Water to operate the scheme in an "efficient, effective, safe and financially responsible manner", "to operate at least as effectively as any comparable business" and "to conduct its operations in compliance with the principles of ecologically sustainable development".

The Fish River catchment is not currently covered by a Water Sharing Plan and therefore the provisions of the *Water Act 1912* will initially apply. In this context, State Water will assume the role of a water management authority and will be granted a water management licence under Part 9 of the *Water Act 1912*. Under the Act, a water management licence authorises its holder:

> "(a) to take and use water from any water source, and
> (b) to construct or use a water management work"

Water management licence conditions are to be specified by DIPNR. The conditions on the water management licence are being drafted by State Water before being finalised by DIPNR and were not available in a draft form at the time of preparing this report (P.Percival, State Water pers.comm. 25/2/2005). The conditions on the licence are expected to be minimal to the extent that they reflect the current operating rules for the scheme, but no additional or changed conditions. The water management licence will specify the provision of currently agreed riparian releases and the volume of water to be delivered to each user group, as specified in existing contracts.

Once a Water Sharing Plan is specified for the catchment, which is likely to occur over the lifetime of the Initial Operating Licence as part of a Statewide project (B.Guardoll, DIPNR, pers.comm. 12/11/2004), the legislation governing State Water's operation of the Fish River scheme will change. State Water will become a water supply authority and its water management licence will be converted to a major or local utility access licence plus a Water Supply Works Approval under the *Water Management Act 2000*. The functions of a water supply authority under Clause 292 of the *Water Management Act 2000* are:

"(a) subject to the Minister's approval, to construct, maintain and operate water management works and other associated works,
(b) to conduct research, collect information and develop technology in relation to water management,
(c) to do anything for the purpose of enabling the objects of this Act to be attained."

State Water will have various functions under part (c) of Section 292 of the *Water Management Act 2000*, namely that it may:

- Enter into commercial operations with the approval of the Governor;
- Provide assistance to other statutory bodies with the consent of DIPNR;
- Enter land to read meters and carry out works;
- Break up roads (in relation to water management works);
- Alter the position of conduits; and
- Dig up ground to find the source of pollution.

It is also the duty of a water supply authority to exercise its functions consistently with the principles of ecologically sustainable development (ESD), as described in section 6 (2) of the *Protection of the Environment Administration Act 1991*. The development of specific ESD indicators is beyond the scope of this study, but would transferable from the set of indicators developed by Sydney Water, Hunter Water and the Sydney Catchment Authority as part of their operating licences.

The transfer of the water management licence to the works approval and access licence will involve separating activities associated with works from those associated with the taking and using of water. This transition should occur without significant changes to the conditions under which the scheme operates, with the main change being the potential addition of any requirements specified in the Water Sharing Plan.

2.3 Existing Customer Agreements

State Water currently has existing long-term (20 year) agreements with the major consumers. These agreements were recently re-formatted into a simpler language and re-signed, and hence are not expected to expire over the life of the Initial Operating Licence. The agreements can however be amended at any time by mutual agreement. Minor consumers are supplied water by agreement with no expiration date specified on the agreement. State Water indicated that the agreements with the minor consumers do not place any performance requirements on State Water (W.Battye-Smith, pers.comm. 14/2/2005).

From these agreements, it would appear that the major consumers are able to negotiate the inclusion of any relevant performance indicators or standards within their individual agreements and will have a level of protection and reporting suitable to their individual needs. Minor consumers are less likely to be able to negotiate the same level of protection as they are not essential to the profitability of the Fish River scheme.

The agreements with major customers are commercial-in-confidence, but in general terms they cover the quality of water to be supplied, the volume to be supplied on an annual and daily basis, conditions about metering accuracy, dispute resolution procedures and specific services or expenses for which Fish River Water Supply (now State Water) is to be reimbursed by the customer.

Consultation with the major consumers indicated that the inclusion of the proposed performance standards and indicators would not contravene their existing agreements with State Water.

2.4 Strategic Business Plan Levels of Service

The Fish River Water Supply Scheme currently has a number of targets for providing a certain level of service. These are specified in its business plan (FRWS, 2002) and can be found in Appendix A. These include targets for:

- Peak and average volume deliverable;
- Response times for unplanned interruptions;
- Frequency of unplanned interruptions;
- Water restriction frequency and minimum storage during design drought; and
- Water quality guideline compliance.

It can be seen in the performance targets in Appendix C that the level of service for response times for unplanned interruptions is lower for the minor consumers than it is for the major consumers. This reflects the greater consequence of the interruption to services to major customers and perhaps also illustrates the hypothesis that minor consumers are unable to negotiate the same level of service as major consumers.

3. Existing Scheme Performance Reporting

3.1 Introduction

The level of performance reporting for the Fish River scheme is currently quite high and the Initial Operating Licence may formalise some of the reporting activities that scheme managers are currently undertaking. The two areas of current public reporting of scheme performance are presented below.

3.2 Quarterly and Annual Reporting

The Fish River Water Supply Authority currently prepares quarterly and annual reports for its Customer Advisory Committee, which consists of its four major consumers. These reports include the following information:

- Monthly rainfall totals;
- Monthly volume in Oberon Dam, which is the main water supply storage in the system;
- Rate of change in the volume in Oberon Dam and forecast storage volumes;
- Monthly volume supplied to consumers and long-term average volume supplied;
- Monthly volume released from Oberon Dam and Duckmaloi Weir;
- Non-revenue water volume and percentage of total intake;
- Raw water quality (total coliforms, e.coli, colour, turbidity, iron, manganese, aluminium and pH) and comparison against drinking water quality guidelines;
- Filtered water quality (total coliforms, e.coli, colour, turbidity, iron, manganese, aluminium and pH) and comparison against drinking water quality guidelines;
- Number of water supply pipeline breaks and number of leaks repaired;
- A summary of capital works activities;
- Reportable incidents for occupational health and safety;
- A summary of any environmental issues encountered; and
- Details of water restriction levels.

3.3 National Benchmarking

The Australian Water Association (AWA) produced an annual performance monitoring report on non-major urban water utilities from 1999 to 2002 (eg AWA, 2002). This included the Fish River Water Supply Authority. The performance monitoring report includes a utility profile that indicates the type of service that each utility provides. Fish River provides bulk storage, bulk

transfer and water treatment services but unlike many other water utilities in the report, it does not provide water reticulation, sewage treatment or sewerage reticulation services.

The AWA report presents around 100 performance indicators, which are too numerous to reproduce in this report. Many of these indicators are not relevant to the Fish River scheme, because it does not have a reticulation or wastewater business. Excluding sewage management, the performance indicators and standards covered the following areas: business performance; employment, outsourcing and capital expenditures; environmental management systems; climate; water system characteristics such as population serviced; number of water assets employed; water supplied by sector; water consumption characteristics; system water losses; sources of water; bulk water reconciliation; levels of water treatment; recycled water supplied by sector; residential pricing and tariff structure; sources of revenue; average residential water bills; economic returns and asset renewals for water utilities; water quality compliance; demand management; environmental and public health incidents and investments; customer interruptions; costs and cost recovery ratios for operation, treatment and energy.

The AWA's benchmarking report has not been produced since 2002 because of lack of funding. Much of the information contained therein will be relevant for several years to come and it forms a useful reference for comparison of the Fish River scheme with other similar businesses. The performance standards and indicators recommended for the operating licence, discussed in Section 4, distil the most relevant indicators from the AWA benchmarking report. The recommended indicators are presented in a form that will enable comparison against this historical data set.

4. Performance Standards and Indicators

4.1 Introduction

The process for developing performance standards and indicators for the Fish River scheme is the same as that used to develop performance standards and indicators for State Water's rural bulk water supply business, previously presented in SKM (2004). In essence, the process involved consideration of:

- the regulatory environment in which the scheme operates;
- stakeholder views; and
- current industry practice.

This section of the report presents the outcomes of this process and the justification for recommending particular performance standards, performance indicators or general reporting requirements. Recommendations are presented for each area of operation of the scheme. A general reporting requirement is recommended where State Water is in the best position to report on a particular indicator of public interest, but where it cannot control performance against that indicator.

In comparing the performance standards and indicators for the Fish River scheme with those of State Water as a whole, it should be noted that performance indicators and standards relating specifically to the operation of a natural waterway as a carrier to deliver water will not apply to the Fish River scheme. These include the time required to contact licence holders about non-complying orders, the percentage of orders delivered with complying notice, the time required to announce supplementary water announcements, the operational surplus and the time required to process temporary transfers.

4.2 Water delivery

Performance standards and indicators for water delivery are as follows:

Percentage of time that daily minimum flow targets are met – State Water has minimum flow targets that it has traditionally been required to meet. These targets are not binding until they are formalised by DIPNR into the water management licence for the scheme. As noted in Section 2.2, DIPNR is not expected to change these passing flow requirements until a Water Sharing Plan is introduced for the catchment at some time after the commencement of the Initial Operating Licence. The minimum flow is specified as a riparian release of 2.4 ML/d (1 cubic metre per second) as measured at the V-notch weir downstream of Oberon Dam (W.Battye-Smith, State Water pers.comm.14/2/2005). There are no passing flow requirements on Duckmaloi Weir. There is some regulatory overlap if IPART adopts this indicator, because it is also likely to be specified by DIPNR in its works approvals. However, given the concerns of environment groups, the ease

with which this indicator can be reported on and the potential consequences of not providing minimum environmental flows, this indicator should be adopted for the period of the Initial Operating Licence. If minimum flow targets are not met then State Water is not releasing enough water from Oberon Dam, which is likely to be detrimental to the environment.

It is envisaged that this indicator would be in place for the duration of the Initial Operating Licence and would be removed in subsequent licences once DIPNR has its compliance framework in place. Reporting against the provision of environmental flow freshes (ie high flow releases for environmental benefit downstream of Oberon Dam) or specific deliveries for wetlands in the future Water Sharing Plan is not recommended for the operating licence. These cannot be as easily audited as minimum flows and the short-term consequences of not providing these flows are in most cases not as drastic as not meeting minimum flows. This is because the provision of high flow events occurs naturally on an infrequent basis and whilst important in the long-term, ecosystems are better adapted to coping in the short-term with extended periods without freshes. Ecosystems are not as well adapted to changes in the frequency and duration of cease to flow events (ie when a river stops flowing) and the environmental consequences of mismanagement of minimum flows can be dire in the short-term. For these reasons it is recommended that these other aspects of environmental flow provision in the future Water Sharing Plans should not have performance indicators assigned to them as part of the operating licence.

Standard: No standard is recommended for this indicator. No standard has been recommended, because there is a risk that a standard specified in the operating licence would be in conflict with any standard specified by DIPNR, creating confusion and usurping DIPNR's role in assessing compliance with current riparian releases or future Water Sharing Plans. Unlike end of system minimum flow targets for State Water's other supply systems, State Water has direct control over riparian releases from Oberon Dam and there should be no external influences that will prevent State Water from meeting the current minimum flow target every day. It is therefore recommended that this indicator be calculated on a daily basis. This may need to change to a seven day rolling average if the Water Sharing Plan specifies flow targets further downstream.

Unaccounted for water as a percentage of total volume diverted (%) – Unaccounted for water (also known as non-revenue water or system losses) is an indicator of water supply system efficiency. It is a widely used measure in urban water supply systems and is currently reported by the Fish River scheme in its annual report. Unaccounted for water is defined as the difference between the volume of water diverted and the volume of water delivered to customers. It typically includes pipe leakage, treatment plant losses, metering errors, illegal connections, mains flushing and unmetered water used for legitimate purposes such as firefighting. In most situations, pipe leakage will be the main influence on the value of unaccounted for water and hence this indicator is a measure of State Water's ability to detect and repair leaks in the system. A high value of unaccounted for water will result in waste of water and the imposition of more frequent restrictions.

This indicator has been incorporated into the water balance for the scheme, subsequently discussed in Section 4.12.

Standard: No standard is recommended for this indicator. Unaccounted for water has equalled 6%, 10%, 3% and 4% over the last four years (FRWS, 2004 and AWA, 2002). The figure of 10% was prior to the scheme's pipe replacement program, which commenced in 2002. As a guide for auditing, achieving an unaccounted for water of less than 10% will place the Fish River scheme in the top 30% of comparable businesses across Australia (AWA, 2002). If unaccounted for water was greater than 10%, then further investment in infrastructure or pro-active maintenance may be required.

System yield and reliability of supply – The reliability of supply is a measure of the proportion of the time that water restrictions are likely to occur, whilst the system yield is a measure of the average annual volume that can be diverted by the water supply system at that reliability. Both of these indicators in conjunction measure the long-term performance of the scheme. When the reliability of supply drops below the desired reliability (or when average annual demand exceeds the yield), customers will experience restrictions more frequently than they expect under their level of service objective.

It is not considered appropriate to include performance standards and indicators for reliability of supply in the operating licence because it is a long-term measure that only needs to be updated around every five years as demands change and additional streamflow data is collected. The Sydney Catchment Authority sees value in reporting the yield of the system under designated level of service criteria in a similar manner to the condition in its own operating licence and would like to see the yield reported after the level of service objectives have been set. This information is essential for prudent planning and addresses the basic question of how often and for how long customers can expect to experience restrictions. It also triggers the need to further encourage demand management or augment supplies.

It was agreed during the stakeholder consultation that an action should be directed for State Water to report on the yield of the system at a specified reliability of supply developed in consultation with its major consumers. This should occur by the end of the term of the Initial Operating Licence. This should be assessed using a long-term (> 30 years) water resource model of the system in order to incorporate adequate climatic variability into the assessment. Specifying this action will ensure that consumers are aware of the likelihood of restrictions on their water supply.

Water pressure – No performance indicators are recommended for minimum water pressure. This is because the Fish River scheme is not a reticulated water supply scheme and does not provide reticulated water supply to the majority of its customers. For those that do receive water directly from the water supply pipeline, pressures are well above minimum standards of 15-20 m head, with

water delivered at pressures of around 60-70 m head (W.Battye-Smith, FRWS, pers.comm. 1/11/2004). Consumer agreements specify that consumers must have their own water supply tank in order to receive water and that delivery pressures downstream of the landholder's tank is the landholder's concern. This means that any pressure standards are not required. If this becomes a concern because of very low pressures (<15m), this will be detected in complaints from the minor consumers, which is a separate indicator. If a minimum pressure standard were to be adopted for consumers that take directly off the supply mains, a minimum pressure of 15-20 m head at the property boundary is a standard minimum.

4.3 Water quality

Performance standards and indicators for water quality are as follows:

Percentage compliance with 1996 Australian Drinking Water Guidelines at the points of delivery to State Water's customers for colour, turbidity, iron, manganese, aluminium, pH and e-coli – These guidelines (NHMRC and ARMCANZ, 1996) cover minimum water quality requirements for potable water supply. These guidelines are the desirable water quality target for drinking water throughout most of Australia and are utilised by 70% of Australia's non-metropolitan urban water utilities (AWA, 2002). More recent guidelines for drinking water quality were released in 2004 (NHMRC, 2004), but unlike the 1996 guidelines, have not yet been endorsed by the NSW Department of Health. It is expected that the 2004 guidelines will be endorsed over the term of the Initial Operating Licence and that water utilities will progressively move towards reporting compliance against the new guidelines over the next few years. On this basis, for the Initial Operating Licence it is recommended that the 1996 guidelines are used, with a review of this decision at the end of the term of the Initial Operating Licence. For the parameters to be reported in the operating licence, there is no difference between the two sets of guidelines.

The guidelines include minimum standards for public health as well as minimum standards for aesthetic values of taste, visual appearance and odour. The current annual reporting format used by the Fish River scheme is appropriate, with the exception of turbidity reporting. The scheme currently reports on the aesthetic guideline for turbidity (% of samples above 5 Nephelometric Turbidity Units or NTU) rather than the guideline for public health (% of samples above 1 NTU). It is recommended that the 1 NTU threshold be adopted, because the guidelines state that there is an increased risk of ineffective disinfection at turbidities above this value. The scheme currently reports on the degree of compliance against e-coli (faecal coliforms), colour, turbidity, iron, manganese, aluminium and pH, with separate reporting for filtered water quality (Stage 1 customers) and disinfected raw water quality (Stage 2 and 3 customers). In 2003/04, the scheme achieved 100% compliance with the Australian Drinking Water Guidelines with samples taken from Oberon Dam, the Duckmaloi Water Treatment Plant and 12 locations within the distribution

system (FRWS, 2004). 100% compliance includes a tolerance defined in the guidelines for statistical sampling errors.

Standard: No standard has been set for this indicator. Scheme operators currently record water quality results in the NSW Department of Health's drinking water quality database, which the Department has direct access to. The Department of Health periodically examines this information and expects it to be collected, but advises that State Water's monitoring and recording of water quality information into the database is by verbal agreement and is not a mandatory requirement (Peter Tissen, NSW Department of Health, pers.comm. 28/2/2005). This is because responsibility for public health lies with State Water's customers, even where State Water is providing treated water (Warwick Battye-Smith, State Water pers.comm.28/2/2005). Given that the Department of Health, which is responsible for ensuring a safe drinking water supply, does not formally require State Water to meet the standards in the Australian Drinking Water Guidelines, it is not recommended for the operating licence.

4.4 Flood Management

For the same reasons as State Water's business as a whole (SKM, 2004), no performance standards or indicators are recommended for inclusion in the operating licence for flood management.

4.5 Water Accounting and Billing

Similar to State Water's business as a whole, the water balance template (refer Section 4.12) will include reporting on the percentage of water metered by volume. Metering is to be in accordance with State Water's metering policy.

For the same reasons as State Water's business as a whole (SKM, 2004), no other performance standards or indicators are recommended for inclusion in the operating licence for water accounting and billing.

4.6 Policing

State Water can impose penalties on access licence holders if water is taken in excess of access licence conditions. State Water's policing role does not apply to the Fish River scheme because customers are supplied by agreement on demand and not under an access licence. For this reason, no performance standards and indicators are recommended for this area of operation for the Fish River scheme.

4.7 Customer Service

It is envisaged that customer service performance standards and indicators for the Fish River scheme will be measured and monitored in the same way as State Water's business as a whole. It will be important however that the proposed classification system for customer complaints

adequately differentiates between complaints made about State Water as a whole and those made specifically about the Fish River scheme. If the classification system includes detailed categories of complaint, due consideration should be given to categories relevant only to the Fish River scheme, such as water pressure and drinking water quality.

4.8 Asset Management

The asset management performance standards and indicators recommended in SKM (2004) for the Fish River scheme were accepted by State Water and the scheme's major customers without further changes. These standards and indicators listed below are in addition to the development of an asset management system for State Water as a whole.

Water supply interruptions – Interruptions to water supply can have significant consequences if they occur for extended periods of time. Some interruptions will be expected for general maintenance and occasional unplanned pipeline breakages. Water supply interruptions are often unplanned and sometimes beyond State Water's control, such as when earthmoving equipment damages a pipe. The frequency of pipeline breakages is expected to be small because the Fish River scheme does not operate a reticulated water supply. There will also be a supply buffer in most cases where State Water is supplying a balancing storage operated by its customers. Water supply interruptions are typically specified by four measures:

- The number of planned water supply interruptions;
- The number of unplanned water supply interruptions;
- The average duration of planned water supply interruptions; and
- The average duration of unplanned water supply interruptions.

The acceptable standard for each of these indicators can only be specified by agreement with customers of the Fish River scheme. If customers are aware of potentially long or frequent water supply interruptions, then they may be able to manage their own water supply differently, for example by maintaining a buffer in private tanks. For this reason, no standard is recommended for the operating licence. State Water should consult with customers of the Fish River Water Supply Scheme to determine an appropriate target for the number and duration of water supply interruptions. The Fish River Water Supply Scheme does however have an existing standard for the response time for water supply interruptions, which is discussed below.

Standard: The response time for unplanned supply interruptions to be within 24 hours. The response time is defined as the time between notification of the interruption until the time that State Water staff arrive on site to rectify the problem. Specifying an appropriate maximum response time is a tradeoff between the degree of inconvenience or hardship to customers from the interruption versus the financial cost of having enough staff on call to respond quickly to unplanned interruptions. A maximum response time of "one working day" is currently specified in

the Fish River Water Supply strategic business plan, with shorter response times specified for the major consumers by agreement. A maximum response time of 24 hours is recommended rather than "one working day" because it is considered that customers should not be required to wait until Monday morning to have their water supply resume if the interruption occurs on a Friday night. This adoption of a "one working day" response time would mean that a consumer could be without water for up to three days. A maximum response time of less than 24 hours is considered unnecessary for the Fish River Water Supply scheme because the majority of minor consumers will have an on-site storage to balance the high pressures they receive from the supply main. These on-site storages will help to maintain a continuous supply to minor consumers during periods of supply interruption. Complaints about response times collected during the period of the Initial Operating Licence will serve to identify whether this response time should be shortened in the future. Data available from the Australian Water Association (2002) indicates that the average duration of unplanned interruptions by almost all non-major water utilities is less than four hours. Maximum duration of interruptions was not available. This indicates that a 24-hour response time, which does not include the time required to fix the problem, should be easily achievable and scheme operators have indicated that this has been achievable to date. Scheme operators have indicated a clear willingness to minimise response times, not only because it inconveniences customers, but also because unplanned interruptions involve pipe breakages that cause unaccounted for water to increase significantly.

4.9 State Water personnel

No standards or indicators for staff management are recommended, for the same reasons as for State Water's business as a whole in SKM (2004). Employee training is relevant to State Water's business development functions, and is covered in Section 4.10.

4.10 Business development

Under the *Water Management Act 2000*, a function of a water supply authority is to "conduct research, collect information and develop technology in relation to water management." Consequently, the following indicators are recommended for the Fish River scheme:

- Training costs per employee
- Training costs as a proportion of total labour costs
- Research and development expenditure
- Degree of participation in Statewide and national forums (no. and type)

No standards are assigned to these indicators for the Initial Operating Licence. It is acknowledged that specifying indicators that report on expenditure do not indicate the quality or relevance of training, however apart from the indicator on participation in forums, there are no other appropriate indicators available for this purpose.

4.11 Environment and Recreation

The approach adopted in the operating licence for State Water's business as a whole should similarly be adopted for the Fish River scheme. It is acknowledged that State Water has very little, if any, control over performance in the area of environment and recreation, however it is in the best position to monitor performance in this area because of its local presence.

Potential environmental impacts from the operation of Oberon Dam are the same as the potential impacts from any of State Water's other major storages. These could include algal blooms, mobilisation of heavy metals from sediments, lack of fish passage, cold water pollution and bank slumping downstream of the dam. These environmental impacts will be managed by the Department of Infrastucture, Planning and Natural Resources, the Department of Environment and Conservation and the Department of Primary Industries. As with SKM's recommendation for State Water's business as a whole, scheme operators at Fish River should be required to report incidents of environmental harm at or immediately downstream of its two offtake structures as part of its memoranda of understanding with these other government agencies.

Recreational water use is discussed in the context of water quality. State Water has public liability obligations to ensure that its land and structures are safe for recreational users, however this will be fairly self-regulating because of the likelihood that State Water and/or its Board of Directors will be sued for any failure of duty of care. The safety of recreational water users therefore does not require regulation by IPART. Loss of amenity for recreational water users such as swimmers, anglers and sailors will not be self-regulating. Loss of amenity is generally driven by poor water quality, particularly algal blooms, and generally aligns with loss of environmental value.

Recreational activities at Oberon Dam are limited. It was reported at the forum with the major consumers that the Oberon Sailing Club utilises Oberon Dam for sailing events, which could involve contact with the water. The likelihood of algal blooms is low because the catchment upstream of the dam is protected and to date no blooms have been sighted by scheme operators. Water quality testing for algae in Oberon Dam and Duckmaloi Weir is not currently undertaken.

State Water has indicated that it plans to develop an algal management strategy as part of its Dam Management Plan for Oberon Dam (Warwick Battye-Smith, State Water pers.comm. 14/2/2005). It is recommended that the operating licence formalise this initiative and require State Water to present an appropriate algal management strategy for its structures (including Duckmaloi Weir), which includes an algae monitoring program, by the end of the term of the Initial Operating Licence. It is acknowledged that State Water will have a very limited ability to prevent algal blooms, but will be in the best position to monitor them.

Table 4-1 Proposed performance standards, indicators and general reporting requirements for the Fish River scheme [1]

Area of Operation	Reporting requirement	Description of standard or indicator
Water delivery	Performance indicator	▪ Percentage of time that daily minimum flow targets are met.
	Action	▪ State Water should report on system yield by the end of the Initial Operating Licence at a specified level of reliability developed in consultation with the Customer Advisory Committee.
Water quality	Performance indicator	▪ % compliance with Australian Drinking Water Guidelines at the points of delivery to State Water's customers for e-coli, colour, turbidity, iron, manganese, aluminium and pH. The guideline value for turbidity should be the value at which there is a risk of ineffective disinfection.
Customer service	Performance indicators	▪ Number of customer complaints to State Water ▪ Number of complaints for arbitration
	Action	▪ State Water should develop a system for classifying customer complaints which includes categories relevant to the Fish River scheme.
Asset management	Performance standard	▪ The response time for unplanned supply interruptions to be within 24 hours
	Performance indicators	▪ The number of planned water supply interruptions ▪ The number of unplanned water supply interruptions ▪ The average duration of planned water supply interruptions ▪ The average duration of unplanned water supply interruptions

Area of Operation	Reporting requirement	Description of standard or indicator
Business development	Performance indicators	▪ Training costs per employee ▪ Training costs as a proportion of total labour costs ▪ Research and development expenditure ▪ Degree of participation in Statewide and national forums (no. and type)
Environment and Recreation	Action	▪ Develop algal management strategy for Oberon Dam and Duckmaloi Weir as part of a Dam/Weir Management Plan. ▪ Report on incidents of environmental harm as part of Statewide memoranda of understanding with government agencies.

Note: (1) Other indicators, such as the degree of metering for each customer group and unaccounted for water, are incorporated into the water balance recommended for the Fish River scheme.

4.12 Water Balance Template

A water balance template has been developed for the Fish River scheme, shown in Table 4-2, which is similar to that developed in SKM (2005) for State Water's business as a whole. There are slight differences which reflect the different nature of the supply system when compared with State Water's other supply systems. The reasoning for including the water balance template is to improve transparency in water management and accounting.

Key elements of the water balance are:

- The separate identification of deliveries to each customer group.
- The identification of unaccounted for water in State Water's water delivery system to form a complete water balance.
- A double accounting format, similar to a financial balance sheet, which clearly shows that inflows and outflows are equal.
- Subtotals of each of the major components of the water balance.
- The percentage metered (by volume) of each value, which illustrates the degree of confidence in each value in the water balance.

The inclusion of explanatory notes at the base of the table, as required by State Water to note any peculiarities in the values presented.

- **Table 4-2 Draft water balance template (dummy values used in example)**

Water balance component	Sources of water		Distribution of water		% of volume metered
	Volume (ML)	% of total	Volume (ML)	% of total	
Storage volume					
Volume in storage at start of year	20,485				
Volume in storage at end of year	15,986				
Change in storage	**4,499**	**9%**			**100%**
Inflows					
Oberon Reservoir Inflows	17,548	33%			100%
Duckmaloi Weir Diversions	26,683	55%			100%
Subtotal	**44,231**	**91%**			**100%**
Supply					
Delta Electricity			6,734	14%	100%
Lithgow Council			968	2%	100%
Sydney Catchment Authority			3,005	6%	100%
Oberon Council			732	2%	100%
Minor consumers			216	0%	0%
Subtotal			**11,655**	**24%**	**98%**
Losses					
Storage net evaporation			4,170	9%	100%
Unaccounted for water			1,065	2%	100%
Subtotal			**5,235**	**11%**	**100%**
Outflows					
Oberon Dam spills and non-riparian releases			2,080	4%	100%
Minimum passing flow (2)			29,760	61%	100%
Subtotal			**31,840**	**65%**	**100%**
TOTAL	**48,730**	**100%**	**48,730**	**100%**	**100%**

Notes:

(1) Notes to the table as appropriate

(2) Riparian releases as measured at v-notch weir downstream of Oberon Dam

4.12.1 Sources of water in the water balance template

The sources of water in the water balance template are Oberon Reservoir inflows and Duckmaloi Weir diversions. Duckmaloi Weir inflows and spills are not monitored and hence it is not currently possible to include these values in the water balance. This is considered appropriate because State Water has no downstream environmental flow requirements at the weir. If the Water Sharing Plan subsequently specifies minimum passing flows at the weir, then the water balance template should be amended to include reporting of spills over Duckmaloi Weir. This should be examined at the end of the term of the Initial Operating Licence.

Oberon Reservoir inflows may be determined in two ways, either by direct measurement at a streamflow gauge upstream of the reservoir or as the balancing item in a mass balance of the reservoir. The other items which must be measured to complete this mass balance are diversions from the reservoir, releases, spills, net evaporation and change in storage. It may not be practical to gauge inflows (eg because of poor hydrographic control sections or inaccessible streams), in which case a mass balance is the most appropriate method to estimate inflows. Reservoir mass balances are prone to error on a daily basis, reasonable on a monthly basis but generally acceptable on an annual basis. For this reason, if all other components are measured in a mass balance to determine inflows, the volume of the inflow that is metered should be presented as 100%. State Water advise that inflows upstream of Oberon Dam are gauged (W.Battye-Smith, State Water pers.comm. 11/03/2005).

Duckmaloi Weir diversions are measured with a flow meter downstream of the weir offtake (at the treatment plant), which is considered an appropriate approach.

Seepage from reservoirs is almost never measured and is assumed to be zero, both because its volume is negligible relative to other water balance components and because it is difficult to accurately measure. Excluding seepage from the water balance is appropriate unless there is clear evidence of seepage to groundwater. State Water monitor groundwater levels downstream of the dam and there are currently no signs of significant seepage from the dam (W.Battye-Smith, State Water pers.comm 11/03/2005).

The change in storage may be estimated from reading the water level within the storage at the beginning and end of each water year. It is considered that, in reporting this figure, there is value in reporting both the start and end of year storage values as well as the decrease (or increase) in storage. This informs the reader of the water in storage, which is an asset for the coming year, as well as the change in that asset that has occurred over the year.

If the change in storage is an increase, then this item should appear on the right hand side of the water balance as a distribution of water. This practice is evident in State Water's 2003/04 water balances, which display separate columns for the increase and decrease in storage. This practice

avoids the use of negative numbers in the water balance and ensures that both the sources and distribution of water are equal.

4.12.2 Distribution of water in the water balance template

State Water should continue its current practice of reporting on metered consumption at the point of delivery to its major consumers. The volume metered should only be recorded as 100% of the volume delivered if the meter is installed and maintained in accordance with State Water's metering policy. State Water advise that all customers, including minor consumers, are currently metered (W. Battye-Smith, pers.comm.11/3/05).

Storage net evaporation from Oberon Reservoir should be determined using time series evaporation data in conjunction with a reservoir rating table linking surface area to recorded water level. State Water will be in the best position to determine the most appropriate evaporation data to use in this process.

Unaccounted for water is as defined in Section 4.2 of this report and is essentially the difference between the volume of water diverted from stream/reservoir offtakes and the volume of water delivered to customers.

Outflows from Oberon Dam are separated into riparian releases and other outflows. The riparian release of 2.4 ML/d (1 cubic metre per second) is measured at the V-notch weir downstream of Oberon Dam. If flows at the V-notch weir are greater than 2.4 ML/d, for example because of reservoir spills, the total flow will be recorded. The 2.4 ML/d can be deducted from the total flow to determine the magnitude of "Oberon Dam spills and non-riparian releases" in the water balance.

4.12.3 Auditing of the water balance

The water balance presented should be auditable. For audit purposes the following minimum information should be available:

- Records of all streamflow measurements and climate data used in preparing the water balance;
- Records of all storage level measurements and reservoir rating tables used in estimating change in storage;
- Records of all metered consumption; and
- Records of calculations used in developing estimates for any unmetered consumption and clear explanations of the methodologies used.

4.12.4 Schematic

It would be beneficial for the water balance to be accompanied by a schematic of the scheme to aid in interpreting the water balance. The schematic currently reported in the Fish River Water Supply Annual Report is considered adequate to accompany the water balance.

4.13 Implications of Adopting the Proposed Performance Standards and Indicators

The proposed performance standards and indicators are not considered to create any additional financial burden on State Water, other than those actions previously identified with developing performance standards and indicators for State Water's business as a whole (SKM, 2004). These included developing a classification system for categorising customer complaints and separately accounting for employee time spent on training. When assessing system yield, it is assumed that the Department of Commerce can continue to provide long-term water supply modelling results to State Water on request at no cost to State Water.

5. Conclusions and Recommendations

This study discussed and recommended performance standards and indicators for the Fish River Water Supply Scheme. This list was amended from those previously presented in SKM (2004) following consultation with representatives from the major consumers and further consultation with State Water. General agreement with the proposed standards and indicators was achieved during the consultation. It was concluded from the consultation that the level of reporting by scheme operators is currently high and that the inclusion of performance standards and indicators in the operating licence will serve to formalise this reporting process.

The outcomes of the study are as follows:

- It is recommended that the performance standards, performance indicators and general reporting requirements presented in Table 4-1 be included in State Water's operating licence. These include actions to report on system yield, develop an algal management strategy and classify customer complaints by the end of the term of the Initial Operating Licence. The customer complaint classifications should include water pressure and water quality categories specific to the Fish River scheme.
- The water balance template for the Fish River scheme, presented in Table 4-2, should be included in State Water's operating licence. A system schematic to accompany the water balance would be beneficial when examining and interpreting the water balance table.
- The adoption of the above recommendations is not expected to create any additional financial burden on State Water.

6. References

Australian Water Association (AWA) (2002) *Performance Monitoring Report 2000-2001. Australian Non Major Urban Water Utilities*.

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National Health and Medical Research Council (NHMRC) and the Agriculture and Resource Management Council of Australia and New Zealand (1996) Australian Drinking Water Quality Guidelines 1996.

National Health and Medical Research Council (NHMRC) and Natural Resource Management Minsterial Council (NRMMC) (2004) *Australian Drinking Water Quality Guidelines 2004*. Endorsed by NHMRC 10-11 April 2003.

SKM (2004) *System Performance Standards and Indicators for State Water Corporation*. Final. 9 December 2004. Prepared for IPART.

SKM (2005) *State Water Operating Licence – Water Balance Template*. Final. 2/03/2005.

Appendix A Fish River Water Supply Business Plan Performance Standards

Levels of Service

The expectations of all the stakeholders, whether it is the community, government, or commercial customers, need to be clearly defined and gaps between current and target performance identified. The Levels of Service demonstrate that FRWS recognises and is positively responding to these needs.

- They serve to communicate the standards required from the water supply system.
- They define FRWS's deliverables, and
- They can be used as a basis for review and shaping FRWS's plans for the future.

It must also be understood that there can be no negotiation with customers on Levels of Service which are of lower standard than regulatory requirements.

In determining the Levels of Service, the standard of service desired, must be balanced with the cost of providing the service. The Levels of Service are designed to represent the best level of service possible for a cost that the consumers are willing to pay and that is sustainable in the long term.

The Levels of Service define the deliverables and are the driving force for the water supply schemes' management and development. Achieving the target Levels of Service is the Primary Objective.

The Levels of Service are the primary means of establishing FRWS's service and performance goals. These need to be regularly reviewed and updated as part of the process of continual improvement. Service targets reflect a balance between the desired service and what is practical and affordable in the current circumstances. These considerations take into account legislative requirements, industry standards and customer demands.

Future changes may occur with consumer demand and industry trends. Environmental protection legislation is a major influence. Increasing environmental standards may force FRWS to review its Levels of Service to meet higher standards of service. An increase in costs may result.

The current and target Levels of Service set out in the following tables have been set in consultation with the major consumers. All the detailed planning in this document is based on achieving these goals. It is intended that the business plan will be regularly reviewed and the Levels of Service will be reassessed where necessary.

The Levels of Service outlined in this plan represent the performance levels the Scheme intends to provide and aim for. They are not intended as a formal customer agreement, but rather a goal which FRWS intends to achieve through a process of continual improvement.

Water Quality

FRWS currently supplies water to all its major and minor consumers. Supplies to Lithgow City Council[2], Cullen Bullen and Rydal[3] are clarified at Duckmaloi Clarification Plant before supply via the Stage 1 pipeline. Oberon Council and all consumers on the Stage 2 and 3 pipelines receive raw water, from Oberon Dam.

FRWS is a bulk water supply authority and water delivered to customers will not generally meet the 1996 NH&MRC/ARMCANZ Guidelines for Drinking Water.

Based on historical records the water quality targets below are achievable and are those, which will be used by the FRWS until the water quality review has, been completed

All the major consumers are kept informed of the water quality provided by the Scheme through a monthly report which details the water quality results for their sampling area.

Parameter	Criteria	Measure	Level of Service	
			1999/2000 Compliance (%)	Target Compliance (%)
CLARIFIED WATER				
Faecal Coliforms	0	Organisms /100mL	100	100
Coliforms	10	Organisms / 100mL	98	95
True Colour	15	True Colour Units (TCU)	100	95
Turbidity	5	Nephelometric Turbidity Units (NTU)	99	95
Iron	0.3	mg/L	99	85
Manganese	0.1	mg/L	100	80
Aluminium	0.2	mg/L	84	85
pH	6.5-8.5		76	95
UNCLARIFIED WATER				
Faecal Coliforms	0	Organisms /100mL	96	100
Coliforms	10	Organisms / 100mL	95	95
True Colour	50	True Colour Units (TCU)	100	95
Turbidity	5	Nephelometric Turbidity Units (NTU)	100	95
Iron	0.3	mg/L	100	85
Manganese	0.1	mg/L	95	80
Aluminium	0.2	mg/L	99	85
pH	6.5-8.5		100	95

Some complaints about the Scheme's water quality were made in 1996 and 1997 by Lithgow City Council's customers. These were mainly the result of having two separate water sources

[2] This excludes Lidsdale which is currently on the Stage 2 pipeline. FRWS intends to supply Lidsdale from Stage 1 in the near future.

[3] Both the stage 1 and 2 pipelines run through Rydal. The majority of Rydal is supplied from Stage 1, however there is a small number of consumers currently supplied with chlorinated water from Stage 2.

and have been partly resolved by the clarification of all Stage 1 water, sourced from both Duckmaloi Weir and Oberon Dam. The quality of water provided to these consumers will be improved with the construction of the filters at Duckmaloi Clarification Plant.

More generally, FRWS is initiating a water quality review in order to address water quality issues for all consumers. This will include a review of the requirements of all the major consumers and establish new water quality Levels of Service for the Scheme.

Required Annual Supply

Under the current system, each major consumer is allocated a minimum annual quantity of water (MAQ), which they are required to pay for, whether it is taken up or not. The Department of Land and Water Conservation has previously reviewed the policy of implementing a capacity sharing arrangement to replace this system.

The introduction of capacity sharing would mean that each major customer would be allocated a share of inflows and a vertical slice of the Oberon Dam storage. Under this scheme each major consumer will be able to operate their 'sub-storage' to best meet their needs and transfers between consumers would also be allowed to occur. However, capacity sharing would not fully meet Treasury requirements for the Scheme to operate on a commercial basis.

In place of a MAQ, a required annual supply (RAS) has been determined for each major consumer group. Total supplies proposed under the RAS have remained the same for Delta Electricity, Sydney Catchment Authority and Lithgow City Council, but have significantly increased for Oberon (from 264ML to 750ML) and the Minor Consumers (from 60ML to 300ML).

	Unit	Level of Service			
		1998/99 Usage	1999/00 Usage	MAQ	RAS
Delta Electricity	Megalitres per annum	8,153	6,050	8,184	8,184
Sydney Catchment Authority	Megalitres per annum	3,242	3,262	3,650	3,650
Lithgow City Council	Megalitres per annum	1,003	859	2,092	2,092
Oberon Council	Megalitres per annum	871	765	264	750
Minor Consumers	Megalitres per annum	164	182	60	300
Total		**13,333**	**11,118**	**14,250**	**14,976**

Peak Daily Demands

As part of the Levels of Service, FRWS has agreed to supply a certain peak day demand to the major consumers as shown below.

	Unit	Level of Service
		Peak Demand
Wallerawang and Mount Piper Power Stations	Megalitres	27.25
Sydney Catchment Authority	Megalitres	16
Oberon Council	Megalitres	4.7
Lithgow	Megalitres	7.29
Wallerawang	Megalitres	1.2
Lidsdale	Megalitres	1.2
Rydal	Megalitres	0.06
Portland	Megalitres	1.4
Cullen Bullen	Megalitres	0.15
Glen Davis	Megalitres	0.4
Total		**59.65**

Currently the Scheme is meeting these targets by supplying the demand quantity (57.79ML peak day release from the dam was measured on 12 January 2001). However it is expected that the construction of the Duckmaloi Filtration System will restrict the peak daily demand supplied to the Lithgow City Council's customers to an expected maximum flow of 6 megalitres per day.

Response Times to Supply Interruptions

The response time is defined as the time between notification of FRWS of the interruption, to the time a crew arrives on site to commence rectification. This component of the Levels of Service sets out the response times that consumers can expect when an unplanned interruption occurs to supply. An unplanned interruption to supply is an incident where normal water services are not available and no prior notice is provided by FRWS. Due to the size of the Scheme total response times are difficult to set, but all reasonable effort will be made to reduce any impact of failure.

	Level of Service	
	Current	Target
Category 1 Failure – Major Consumers Failure to maintain continuity or quality of supply to one or more major consumers or any major failure. ***(Typical causes of this type of failure would be water main breaks, pumping station failure or valve failure. Typical effects would include major property damage, large volumes of water wasted, risk of personal injury or to public health or major environmental impacts.)***	2 hours during working hours 3 hours outside working hours	2 hours during working hours 3 hours outside working hours
Category 2 Failure – Minor Consumers Failure to maintain continuity or quality of supply to a number of minor consumers. ***(Typical causes would be minor water main breaks, leaking connections or partial valve failure. Typical outcomes of this type of failure include minor property damage or minor environmental damage.)***	4 hours during working hours 5 hours outside working hours	4 hours during working hours 5 hours outside working hours
Category 3 Failure – All Consumers Failure to maintain continuity or quality of supply to a single consumer. ***(Typical causes would be from a water main or hydrant, inadequate maintenance of pipes or partial failure of connections. Typical effects would include poor pressure or reduced flow, reduced aesthetic quality of the water without a health risk, minimal impact on the environment.)***	One working day	One working day
Minor Problem or Complaint – All Consumers A minor problem or complaint which can be dealt with at a time convenient to the customer and water authority.	Within 2 weeks	Within 2 weeks

Frequency of System Failures (Unplanned Interruptions)

The table below shows how many interruptions of this nature each consumer should expect and in some cases the currently agreed targets. FRWS will monitor performance and make estimates of the likely duration of the interruption. FRWS would seek to meet these targets in 1999 and improve on these statistics in the future. Through a process of continual improvement FRWS aims to reduce response times and improve the condition of the system's assets.

	Level of Service	
	Current	Target
Delta Electricity		
Wallerawang Power Station	Operations: 80 hours (prelimin.) Domestic and Fire	Operations: 80 hours (prelimin.) Domestic and Fire
Mount Piper Power Station	6 hours per 7 days	6 hours per 7 days
Sydney Catchment Authority	3-5 days Not more than twice yearly Not more than once monthly	3-5 days Not more than twice yearly Not more than once monthly
Oberon Council	1 day per 2 years	1 day per 2 years
Lithgow City Council	1-4 hours: 3 monthly 4-8 hours: 6 monthly Over 8 hours: never	1-4 hours: 3 monthly 4-8 hours: 6 monthly Over 8 hours: never
Minor Consumers	Not more than two working days on any occasion Not more than twice in any one year	Not more than two working days on any occasion Not more than twice in any one year

Water Supply Restrictions

In order to meet the Levels of Service outlined above in prolonged dry weather conditions, FRWS may need to impose water supply restrictions in accordance with the drought contingency plan which supports the 5/10/20 percent rule as specified below.

	Level of Service
Restrictions will not be applied for more than	5% of the time
Restrictions should not be imposed more than	Once per 10 year period on average
Through a repeat of the worst drought on record the system should not be restricted by more than	20% of normal demand