QUEENSLAND COMPETITION AUTHORITY

Draft for Comment

Gladstone Area Water Board: Investigation of Pricing Practices

December 2004

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This report is a draft only and is subject to revision.

Level 19, 12 Creek Street Brisbane Qld 4000
GPO Box 2257 Brisbane Qld 4001
general.enquiries@qca.org.au
www.qca.org.au

SUBMISSIONS

Public involvement is an important element of the decision-making processes of the Queensland Competition Authority (the Authority). Therefore, submissions are invited from interested parties concerning its assessment of the pricing practices for GAWB. The Authority will take account of all submissions received.

Written submissions should be sent to the address below. While the Authority does not necessarily require submissions in any particular format, it would be appreciated if two printed copies are provided together with an electronic version on disk (Microsoft Word format) or by e-mail. Submissions, comments or inquiries regarding this paper should be directed to:

Queensland Competition Authority
GPO Box 2257
Brisbane QLD 4001
Telephone: (07) 3222 0544
Fax: (07) 3222 0599
Email: gawb.investigation@qca.org.au

The closing date for submissions is 11 February 2005.

Confidentiality

In the interests of transparency and to promote informed discussion, the Authority would prefer submissions to be made publicly available wherever this is reasonable. However, if a person making a submission does not want that submission to be public, that person should claim confidentiality in respect of the document (or any part of the document). Claims for confidentiality should be clearly noted on the front page of the submission and the relevant sections of the submission should be marked as confidential, so that the remainder of the document can be made publicly available. It would also be appreciated if two copies of each version of these submissions (ie the complete version and another excising confidential information) could be provided. Again, it would be appreciated if each version could be provided on disk. Where it is unclear why a submission has been marked "confidential", the status of the submission will be discussed with the person making the submission.

While the Authority will endeavour to identify and protect material claimed as confidential as well as exempt documents (within the meaning of the *Freedom of Information (FOI) Act 1989*), it cannot guarantee that submissions will not be made publicly available. As stated in s187 of the *Queensland Competition Authority Act 1997* (the *QCA Act*), the Authority must take all reasonable steps to ensure the information is not disclosed without the person's consent, provided the Authority is satisfied that the person's belief is justified and that the disclosure of the information would not be in the public interest. Notwithstanding this, there is a possibility that the Authority may be required to reveal confidential information as a result of an FOI request.

Public access to submissions

Subject to any confidentiality constraints, submissions will be available for public inspection at the Brisbane office of the Authority, or on its website at www.qca.org.au. If you experience any difficulty gaining access to documents please contact the office (07) 3222 0555.

Information about the role and current activities of the Authority, including copies of reports, papers and submissions can also be found on the Authority's website.

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GLOSSARY

ACG	Allens Consulting Group
AIC	Average Incremental Cost
Capex	Capital Expenditure
CAPM	Capital Asset Pricing Model
COAG	Council of Australian Governments
CPI	Consumer Price Index
CPM	Callide Power Management
CSC	Calliope Shire Council
DORC	Depreciated Optimised Replacement Cost
DMP	Drought Management Plan
DNRME	Department of Natural Resources, Mines and Energy
DSD	Department of State Development
ECM	Efficiency carryover mechanism
FOI	Freedom of Information
FSL	Full Supply Level
GAWB	Gladstone Area Water Board
GCC	Gladstone City Council
GSL	Guaranteed Service Level
HNFY	Historic No Fail Yield
LRMC	Long run marginal cost
MJA	Marsden Jacob Associates
ML	Megalitre
NPV	Net Present Value
Ofwat	Office of Water Services, UK
QAL	Queensland Alumina Limited
QCA Act	Queensland Competition Authority Act (1997)
ROP	Resources Operations Plan
SMEC	Snowy Mountains Engineering Corporation
the Authority	The Queensland Competition Authority
WACC	Weighted Average Cost of Capital

EXECUTIVE SUMMARY

Ministerial Direction

On 16 April 2004, the Premier and the Treasurer directed the Authority to investigate the pricing practices relating to the declared activities of GAWB and investigate an appropriate framework for monitoring pricing practices including prices and contractual arrangements.

The Authority's Previous Investigation

In September 2000, the Ministers declared, under the *QCA Act,* the bulk water storage, delivery and treatment services undertaken by GAWB to be government monopoly business activities and directed the Authority to undertake an investigation of GAWB's pricing practices.

The Authority recommended pricing practices for GAWB in its September 2002 Final Report *Gladstone Area Water Board: Investigation of Pricing Practices*. The Ministers accepted the Authority's recommendations.

Structure of the Report

This Draft Report is structured as follows:

- Chapter 1 – Ministerial Direction and the process of the investigation;
- Chapter 2 – overview of GAWB's business and contractual arrangements;
- Chapter 3 – the regulatory framework;
- Chapter 4 – pricing framework for GAWB;
- Chapter 5 – GAWB's projected demand and water supply;
- Chapter 6 – GAWB's regulatory asset base;
- Chapter 7 – cost of capital for GAWB;
- Chapter 8 – return of capital for GAWB;
- Chapter 9 – efficient operating costs for GAWB;
- Chapter 10 – regulatory arrangements; and
- Chapter 11 – implications of the proposed regulatory and pricing arrangements for GAWB.

Key Findings and Conclusions

Regulatory Framework

Objectives of Monopoly Prices Oversight: Monopoly prices oversight is intended to ensure that prices or pricing practices achieve economic efficiency and revenue adequacy, and promote the public interest.

Approach to Regulation: The current hybrid approach to price regulation combining cost-of-service and incentive regulation should be retained for GAWB.

GAWB's Commercial Risks: GAWB's key commercial risks relate to:

- demand for water services from existing customers, expected new customers, and currently unidentified new customers;
- supply of water services including planning risks associated with inaccurate estimates of demand, the appropriateness of infrastructure responses to assessed levels of demand, and resource risks including hydrology, drought and water quality; and
- other risks including the financial risks related to loan repayments, default risk, contract risk, regulatory risks, risks relating to general economic conditions, and operational and management risks.

Customers' Commercial Risks: Customers are best placed to assess their own demand for water from GAWB.

Allocation of Risks: Risks should be allocated to those parties best able to manage them. In GAWB's circumstances:

- demand risk is best managed by relevant customers;
- planning and infrastructure risks are best managed by GAWB, as the owner and manager of infrastructure;
- hydrology risk is not manageable by any party as it is essentially unpredictable and the costs of changes should be to the account of customers;
- drought risk is best allocated to GAWB as it is in the best position to manage overall supply options and any relevant restrictions; and
- water quality risk is best managed by GAWB.

The Authority considers that:

- contractual arrangements should be put in place which promote the efficient allocation of risks;
- GAWB should facilitate the tradeability of contracted amounts between customers; and
- GAWB should exercise its discretion to vary contracted amounts upon request by customers. However, GAWB should not unilaterally vary contracted amounts.

Form of Regulation: Price cap regulation should be maintained. It will provide a means to ensure GAWB is appropriately incentivised to put in place appropriate contractual arrangements to effectively manage relevant risks.

Planning Period: A planning period of 20 years is appropriate for GAWB.

Approach to Estimating Price Caps: A cashflow model should be adopted to calculate GAWB's MRR.

Regulatory Review Period: A five year regulatory review period should be adopted, with the next review to occur in 5 years (from 1 July 2005).

Pricing Framework

Efficient Pricing: Prices should incorporate the LRMC of providing infrastructure services.

Tariff Structures: GAWB should apply a two part tariff structure for each of storage and delivery services. The components of that structure should be held constant in real terms over a regulatory period.

Estimating LRMC: LRMC may be estimated by either the Turvey or Average Incremental Cost (AIC) method provided that all augmentations in a planning period and associated residual values are incorporated. The AIC method is preferred as being more transparent and explainable.

Application of Two Part Tariffs to GAWB: Two part tariffs should be applied separately to storage and delivery services for each customer. They should also incorporate a 100 % take-or-pay access charge based on contracted volumes, although GAWB should be able to exercise discretion to change contracted volumes in response to customer requests. It is proposed that where actual demand exceeds the contracted volume for industrial customers, unless otherwise negotiated with GAWB, a load factor of:

- 25% apply to the access charge where actual consumption is between 110% and 125% of the contracted volume; and

- 50% apply to the access charge where actual consumption is higher than 125% of the contracted amount.

Where actual demand exceeds the contracted volume for Council customers, unless otherwise negotiated with GAWB, a load factor of 10% should apply to the access charge where actual consumption exceeds 125% of the contracted amount.

Geographic Differentiation: Prices should be differentiated for all customers according to their utilisation of specific components of GAWB's infrastructure network.

Differentiation between Councils: A pooled price should be maintained for Gladstone City Council and Calliope Shire Council on the basis that past government policy was designed to provide a least cost solution for the regional community as a whole.

Differentiation between Existing and New Customers: As a general principle, the cost of common infrastructure should be allocated to all existing and expected new customers, provided the costs represent the least cost option to meet projected demand. Access charges and queuing strategies proposed by GAWB are, in principle, valid commercial arrangements.

Differentiation on the basis of Supply Reliability and Service Standards: Prices should reflect service quality to the extent this involves cost differentials, and GAWB should develop full product descriptions for contractual purposes, in conjunction with its customers.

Other Price Differentials: Price differentiation on the basis of credit risk, length of contract and for other differences is appropriate to the extent that the proposed response is commensurate with the cost of service provision.

Adjustments for Capital Contributions and Contributed Assets: The Authority considers that:

- contributed assets should be recognised where there is appropriate documentary evidence of a contractual or policy nature, provided the contribution is not a prepayment for

services; has not been fully repaid or rebated; and the associated assets have not expired or have been replaced at the service provider's expense;

- where contributed assets are recognised, they should be included in the asset base for the purpose of determining the revenue requirement and prices;

- unless otherwise specified, rebates for future contributed assets should include the return on capital and return of capital components, provided their contribution was intended to reduce prices in this manner;

- in some circumstances, particularly where contracts stipulate, the rebate may be equal to the return on capital component only; and

- where a capital contribution attracts a tax liability, the net cost should be included in customer prices.

Pricing for Exceptional Circumstances including drought: The Authority considers that:

- prices should incorporate the costs of investment, operational and managerial responses where:

  – the risk is commercially relevant;

  – GAWB has acted prudently and could not have acted any earlier to address the risk at lower cost;

  – GAWB is the most appropriate party to bear the risk; and

  – the response is cost-effective;

- higher prices are justifiable during droughts to promote efficient water use. However, where they are not cost related, and other resource rent arrangements are not applicable, the revenues should be returned to users at a later stage on the basis of a proportionate reduction in all customers' access charge; and

- GAWB should release its Drought Management Plan prior to the finalisation of the Authority's investigation to enable any related costs to be incorporated in indicative prices.

Transitional Pricing: Price transitioning can be appropriate for significant price increases, having regard to the provider's financial viability, users' capacity to pay and the extent to which increases could have been anticipated.

GAWB's Water Supply and Demand

Supply: Planning and prices for services provided by Awoonga Dam should be based on the most recently established historic no failure yield (HNFY) of 78,000ML.

Demand: For pricing purposes, the demand scenario for the regulatory pricing period commencing 1 July 2005 should reflect anticipated customer contractual requirements and also allow an amount for future unknown demand nominated by GAWB (and which has been supported by MJA). The Authority proposes to adopt the demand estimates provided by MJA. Customers are to be invited to comment on estimated demand.

Regulatory Asset Base

Approach to Asset Valuation: GAWB's assets should continue to be valued on the basis of DORC.

Approach to Revaluation: Due to significant changes in GAWB's circumstances, and given that the Authority's previous recommendations are not yet reflected in customer contracts, a revaluation of GAWB's asset base is recommended. It has been adopted for the purposes of determining indicative prices for individual customers.

Optimisation of Assets: An incremental optimisation approach should apply for the purpose of establishing GAWB's revised regulatory asset base.

Land and Easements and Other Assets: Land should be valued at market value and easements be valued at their historic cost indexed for inflation.

Work in Progress: Work in progress should be capitalised using WACC and be recognised in the asset base for pricing purposes once it is fully completed and able to contribute productive capacity to the system.

Other Assets: Consistent with the previous investigation:

- the DORC of the recreational facilities and fish hatchery assets should be included in the asset base; and
- the cost of assets necessarily relocated should be incorporated into the asset base at their cost of relocation.

DORC Valuation of Assets: The Authority proposes to adopt the revised DORC asset valuation estimated by SMEC, including land at market value and easements at indexed historic value. As at 1 July 2005, GAWB's DORC valuation is estimated at $352.64 million.

Working Capital: If necessary working capital would be determined on the basis of debtors less creditors plus inventories. However, as GAWB has moved to a position where accounts receivable is less than accounts payable, and there are no material inventories, there is no need for a working capital amount.

Contributed Assets: Contributed assets which were previously recognised by the Authority should continue to be recognised on the basis of their DRC values.

Rate of Return

Review of the Rate of Return Framework: No changes to the Authority's previously recommended approach for determining the cost of capital are proposed in regard to:

- the use of the Officer CAPM for determining the cost of equity capital;
- the value of gamma of 0.50; and
- a risk-free rate based on a 20-day average of the 10-year government bond rate.

The following elements are proposed to be changed:

- the debt beta, to be estimated as the mid-point between zero and the upper bound including the default premium on corporate debt; and
- the levering formula, to the Conine beta levering formula which incorporates the imputation adjusted corporate tax rate.

Risk Free Rate: The risk-free rate should be 5.41%, based on a 20-day average of the yield on a 10-year Commonwealth government bond.

Market Risk Premium: 6.00%.

Asset Beta: 0.4 and the corresponding equity beta is 0.64.

Capital Structure: 50% debt and 50% equity, with an associated credit rating of BBB.

Cost of Debt: 6.77%, based on a risk-free rate of 5.41% and a total margin of 136 basis points above the risk-free rate.

Gamma: 0.50.

Expected Inflation: 2.6%.

Estimated WACC: nominal post-tax WACC is 8.02% compared with 8.72% at the time of the previous investigation.

Return of Capital

Depreciation: Return of capital should be based on straight line depreciation for all GAWB's assets.

Operating Expenditure

Cost Allocation: General administration costs are proposed to be allocated on the basis of 10% to customer service allocated equally to each customer; and 90% to demand based functions, allocated to storage, raw water delivery and treated water delivery according to relative administrative effort. The relative effort weightings are:

- 0.5 x ML delivered for supplies out of Awoonga Dam;
- 1.0 x ML delivered for supplies to treated water customers; and
- 2.0 x ML for supplies to treated water customers.

Efficient Costs: The Authority proposes to include efficient operating costs in the cash flows for pricing purposes rather than implement a CPI-X regulatory arrangement.

Efficiency Carryover Mechanisms: While an ECM may provide incentives for GAWB to innovate, it is not considered appropriate at this time.

Ongoing Regulatory Arrangements

Cost pass-through: Material exogenous changes in expected costs may be passed through to customers, subject to approval by the Authority. Eligible costs include changes in taxation; changes in government charges such as resource management charges; changes in compliance requirements; changes in law; and changes in government policy.

Review Triggers: The Authority proposes that a review should be triggered if there is, or there is expected to be, a sustained variation of 15% or more in GAWB's aggregate revenue.

Escalation Factor: A CPI measure based on the Brisbane All Groups classification should be used for the purpose of annual price adjustments between price reviews.

Adjustments over Time: Where prices are smoothed over a planning period greater than the regulatory period, prices in the next regulatory period should incorporate an adjustment to account for the effects of price smoothing.

Monitoring Pricing Practices including prices and contractual arrangements: The Authority proposes to monitor the application of Ministerially approved pricing practices by reviewing prices and arrangements in contracts prior to their completion.

The Authority recommends that consideration be given to amendments to the *QCA Act* to enable the Authority to resolve disputes where the parties agree without the need for a Ministerial reference for this purpose.

Monitoring of Service Standards: An appropriate framework for monitoring pricing practices must also involve the monitoring of service standards. It is proposed that GAWB establish appropriate key performance indicators and annually report service quality against the standard adopted for regulatory pricing purposes.

Aggregate Implications

Transitioning of Prices: New prices may be implemented without any transition period from 1 July 2005. Prices corresponding to its recommended pricing practices will be provided on a confidential basis to individual customers.

Aggregate Revenue Projections. A comparison of projected revenues for the current investigation with those of the Final Report recommendations from the previous investigation is shown in Table 1.

The key recommendations of the Authority's investigation are compared with the previous recommendations in Table 2 which incorporates the position adopted by GAWB in respect of each item.

Table 1: Summary of Aggregate Revenue Projections ($m)

	2005-06	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2019-20*	*2024-25*
2002 projected revenue (existing contract prices where in place)	32.74	33.88	35.33	36.30	41.81	52.50	61.37	n/a
Current projected revenue (existing contract prices where in place)	21.28	22.22	23.20	26.05	29.85	37.20	45.40	55.34
Current projected revenue (assuming no contractual constraints)	22.52	23.55	24.60	27.70	31.15	38.90	47.39	57.67

Table 2 Summary of Key Previous and Current Recommendations

Issue	Previous Recommendation	GAWB Response	Current Recommendation
Regulatory Framework			
Regulatory Approach	Hybrid	No specific comment	Hybrid
Form of Regulation	Price cap	Fixed revenue cap with an unders and overs account, annual QCA approval of GAWB reference tariffs.	Price cap
Modelling approach and planning period	Cash flow model over a 20-year planning period.	Cash flow model over at least 20 years	Cash flow model over a 20-year planning period.
Review period	5 years	5 years	5 years
Pricing Framework			
Basis for pricing	LRMC estimated using Turvey method	LRMC estimated by either Turvey or AIC method	LRMC estimated by either method, AIC preferred as more transparent and explainable.
Tariff Structure	Two-part tariff, with fixed charge based on contracted volume or anticipated demand.	Two-part tariff with separate tariffs for storage and delivery. Fixed charges based on contract volumes with load factors for use in excess of contracted volume.	Two-part tariff with separate tariffs for storage and delivery. Fixed charges based on contract volumes with load factors for use in excess of contracted volume.
Differential pricing	Differentiated geographically according to use, no differentiation between existing and new customers.	Differentiated geographically according to use, no differentiation between existing and new customers.	Differentiated geographically according to use, no differentiation between existing and new customers.
Council price equalisation	Council prices equalised on the basis of a historical agreement and continued acceptance of this agreement.	Councils to manage this process outside the regulatory process.	Council prices equalised on the basis of a historical agreement.
Contributed assets – pricing approach	Include assets in asset base and provide a price rebate for the return on capital component as indicated in current contracts.	No specific comment.	Include assets in asset base and provide a rebate for the return on capital component as indicated in current contracts. In future cases, the rebate should also include both the return on capital and return of capital components to provide the full benefit to the contributor.

Issue	Previous Recommendation	GAWB Response	Current Recommendation
Exceptional circumstances - Drought	Insurance costs to be included in cash flows. Drought management costs to be incorporated in cash flows, after review by GAWB of Drought Management Plan	Preparatory costs of agreed contingency responses to be included. Only actual costs included after droughts occur.	Prices should incorporate costs where the risk is commercially relevant, GAWB has acted prudently and could not have acted any earlier at lower cost.
Supply and Demand			
Supply	Safe yield of 87,900ML	Revised safe yield of 78,000ML	Revised safe yield of 78,000ML
Demand Projections	Based on SMEC preferred planning scenario.	Conservative over-forecasting approach for planning purposes.	Based on MJA estimates of demand which reflect anticipated customer contractual demand.
Asset Valuation			
Method of valuing assets	DORC	DORC	DORC
Revaluation	No specific recommendation.	Roll-forward of 2001 DORC valuation. Periodic revaluation at 10-year intervals	Revaluation is required due to significant changes in GAWB's circumstances and as previous recommendations are not yet reflected in contractual prices.
Optimisation approach	Incremental	No specific comment.	Incremental
Land and easements	Indexed historic cost	No specific comment.	Land valued at market value. Easements valued at indexed historic.
Rate of Return			
Approach	WACC/CAPM	WACC/CAPM	WACC/CAPM
Risk free rate	20 day average of 10-year bond rate – 6.02%	No specific comment	20 day average of 10-year bond rate – 5.41%
Market Risk Premium	6%	No specific comment	6%
Betas	Asset beta of 0.45 and equity beta of 0.63. Upper bound debt beta applied in Brealey Myers relevering formula.	Asset beta of 0.60, as applied by ACCC to Central West Pipeline.	Asset beta of 0.40 and equity beta of 0.64. Mid-point debt beta applied in the Conine beta levering formula.
Capital structure	50% debt to total assets	No specific comment	50% debt to total assets.

Issue	Previous Recommendation	GAWB Response	Current Recommendation
Cost of debt	160 basis points reflective of BBB credit rating	No specific comment	136 basis points reflective of BBB credit rating.
Gamma	0.5	No specific comment	0.5
Nominal post-tax WACC	8.72%	No estimate provided.	8.02%
Return of Capital			
Approach	Straight line depreciation over asset design lives.	Straight line depreciation, with accelerated depreciation for potentially redundant assets.	Straight line depreciation over asset design lives. Accelerated depreciation appropriate for prudent investments that could later become redundant.
Operating Costs			
Cost Allocation	Common costs allocated 10% by customer and 90% by administrative effort.	Common costs allocated 10% by customer and 90% by administrative effort.	Common costs allocated 10% by customer and 90% by administrative effort.
Efficient costs	CPI-X approach not appropriate for GAWB. Appropriate efficient costs included in cash flows based on independent assessment.	CPI-X approach not appropriate for GAWB. Appropriate efficient costs included in cash flows based on independent assessment.	CPI-X approach not appropriate for GAWB. Appropriate efficient costs included in cash flows based on independent assessment.
Efficiency Carryover Mechanisms	No specific recommendation.	Supports in principle the sharing of efficiency gains across regulatory periods, but that implementation be deferred until regulatory arrangements are more stable.	Supports in principle the sharing of efficiency gains across regulatory periods, but that implementation be deferred until regulatory arrangements are more stable.
Ongoing Regulation and Monitoring			
Cost pass-through	Variations in exogenous costs may be passed to customer subject to assessment of materiality by the Authority.	Additional cost pass-through for government declared emergency, disaster or extraordinary circumstance.	Variations in exogenous costs may be passed to customer subject to assessment of materiality by Authority.
Review triggers	Review triggered if revenues vary by more than 15%.	Additional trigger for investment over $5 million.	Review triggered if revenues vary, or are expected to vary, by more than 15%.
Escalation Factor	CPI	Brisbane all groups March Quarter CPI.	Brisbane all groups CPI.

Issue	**Previous Recommendation**	**GAWB Response**	**Current Recommendation**
Regulatory consistency	Future reviews to take into account the basis for previous pricing recommendations, but no specific constraints placed on future investigations.	Fixed revenue cap with unders and overs facilitates inter-period consistency.	Where prices are smoothed over a planning period greater than the regulatory period, prices in the next period should incorporate an adjustment to account for price smoothing where possible.
Monitoring	QCA not actively monitor prices in contractual arrangements. Monitoring limited to review triggers and cost pass-throughs.	QCA should not monitor individual contracts. Monitoring limited to annual approval of reference tariffs.	QCA to monitor prices, contracts and service standards. Consideration should be given to amendments to the *QCA Act* to allow the Authority to resolve disputes where both parties agree.

1. BACKGROUND

Summary

The Authority has been directed by the Ministers to investigate the pricing practices and appropriate framework for monitoring pricing practices including prices and contractual arrangements relating to the declared activities of GAWB.

The purpose of this Draft Report is to provide a basis for comment by stakeholders.

1.1 The Direction

On 16 April 2004, the Premier and the Treasurer (the Ministers) issued the following referral notice under Sections 23 and 24 of the *Queensland Competition Authority Act 1997* (*QCA Act*).

> As the Premier and the Treasurer of Queensland, we hereby refer under Section 23 of the *Queensland Competition Authority Act 1997* the declared government monopoly business activities of the Gladstone Area Water Board (GAWB) to the Queensland Competition Authority (QCA) for the following:
>
> (a) an investigation about the pricing practices relating to the declared activities; and
>
> (b) an investigation of an appropriate framework for monitoring pricing practices (including prices and contractual arrangements) relating to the declared activities.
>
> Under Section 24 of the *Queensland Competition Authority Act 1997* we direct the QCA in relation to this referral to:
>
> (a) provide a Draft Report on the investigation by 31 December 2004, with the Final Report to be provided by 21 March 2005;
>
> (b) consult with GAWB, GAWB's customers and other relevant stakeholders; and
>
> (c) advise, on a confidential basis, individual customers of indicative prices consistent with the Authority's recommended pricing practices.

1.2 Previous Investigation

In September 2000, the Ministers declared the bulk water storage, delivery and treatment services undertaken by GAWB to be government monopoly business activities and directed the Authority to undertake an investigation of GAWB's pricing practices.

The Authority recommended pricing practices for GAWB in its September 2002 Final Report *Gladstone Area Water Board: Investigation of Pricing Practices*. The Ministers accepted the Authority's recommendations.

1.3 Objectives of Current Investigation

The Authority's previous investigation identified a number of issues that required further investigation and noted the prospect of changes in circumstances which may warrant a reconsideration of its recommendations. In response to changes in circumstances which have occurred, GAWB has submitted a number of new proposals relating to future pricing practices.

In responding to the current Ministerial Direction, the Authority is therefore seeking to:

- identify the impact of changed circumstances including hydrology, demand and drought management arrangements on previously recommended pricing practices; and

- assess pricing practices currently being proposed by GAWB in respect of these changed circumstances.

GAWB is also proposing new contractual arrangements with customers, some of which may not be fully developed until after the due date for the Authority's Final Report.

1.4 Approach to the Investigation

In undertaking the current investigation of GAWB's pricing practices, the Authority has:

- publicly released an Issues Paper to facilitate submissions from interested parties on relevant matters;

- taken into consideration all views expressed in submissions when formulating its Draft Report;

- commissioned advice from independent consultants where appropriate on technical issues including pricing frameworks, asset valuations, efficient operating costs and the cost of capital; and

- consulted with GAWB and other stakeholders to gain a further understanding of matters relevant to the investigation.

The Authority's Final Report is to be submitted to the Ministers by 21 March 2005 and will be released publicly in accordance with Section 34 of the *QCA Act*.

1.5 Structure of the Report

The Draft Report is structured as follows:

- Chapter 2 – overview of GAWB's business and contractual arrangements;

- Chapter 3 – the regulatory framework;

- Chapter 4 –pricing framework;

- Chapter 5 –GAWB's projected demand and water supply;

- Chapter 6 –GAWB's regulatory asset base;

- Chapter 7 –cost of capital;

- Chapter 8 –return of capital;

- Chapter 9 –operating costs;

- Chapter 10 – ongoing regulatory arrangements; and

- Chapter 11 –implications of the proposed regulatory and pricing arrangements for GAWB.

2. BUSINESS OVERVIEW

Summary

GAWB is a commercialised statutory authority which has responsibility for providing water storage and delivery services to industrial, electricity generation and local government customers in the Gladstone area.

Since the Authority's previous pricing investigation, GAWB has initiated discussions with customers to implement previously recommended pricing practices. However, at the time of writing, there are no new contracts.

2.1 Nature and Scope

GAWB is a Category 1 Water Authority[1] and registered Service Provider established under the *Water Act 2000.* It operates as a commercialised statutory authority. Under the *Water Act*, GAWB is required to be commercially successful in its business activities and efficient and effective in providing goods and services, including CSOs.

As a commercialised government owned entity, GAWB is required to adopt commercial pricing practices consistent with the Council of Australian Governments (COAG) principles of full cost recovery and consumption-based pricing. The COAG principles also require the implementation of two-part tariffs for urban water services where cost effective.

Consistent with the requirements of the *Water Act 2000,* GAWB is required to:

- **commercially manage** contracts with suppliers and customers, regulatory pricing oversight arrangements with the Authority and a debt portfolio and related treasury functions, and investigate commercial opportunities to improve financial performance;

- **plan and deliver future water supply capacity, reliability and quality**. This involves identifying likely demand scenarios and evaluating water supply and demand management options, including responses to future material reductions in supply;

- **develop the treated and untreated water delivery system**. This involves assessing the network's existing capacity and condition, and identifying emerging planning issues and appropriate capital or operating responses;

- **manage water quality**. GAWB is required to maintain acceptable water quality for customers and for discharge; and

- **manage the water distribution system**. GAWB must operate and maintain a water distribution network of pump stations, pipelines and reservoirs.

2.2 Assets

GAWB owns and operates:

- the Awoonga Dam on the Boyne River in Calliope Shire;

[1] A Category 1 Water Authority under the *Water Act 2000* is subject to the principles of commercialisation. GAWB, along with the Mt Isa Water Board, are identified as Category 1 Water Authorities in the Act.

- delivery pipelines being 147 km for delivery of untreated water to treatment plants and industrial customers, and 58 km for delivery of treated water to the Gladstone City Council and Calliope Shire Council water reticulation systems and to other industrial consumers;
- water treatment plants in Gladstone City and at Yarwun in Calliope Shire;
- untreated water pumping stations at Awoonga and Boat Creek, and treated water pumping stations at Benaraby, Calliope, Glen Eden, Boat Creek;
- Gladstone Water Treatment Plant (High Lift & Low Lift) and Yarwun Water Treatment Plant;
- untreated water reservoirs at Boat Creek, Gladstone (Fitzsimmons Street) and Toolooa, and treated water reservoirs at Boyne Island, East End, Golegumma and South Gladstone;
- the Lake Awoonga Recreation Area adjacent to Awoonga Dam; and
- a fish hatchery in Gladstone City.

A map of major assets including Awoonga Dam and pipelines is provided in Figure 1.

2.3 Customers

GAWB's major customers are CS Energy, Callide Power Management and Queensland Alumina Limited (QAL), which together account for 75% of GAWB's total demand. Other industrial customers include Gladstone Power Station, Boyne Smelters, Orica, Comalco and the Gladstone Port Authority. Gladstone City Council and Calliope Shire Council account for most of GAWB's treated water demand, which in total accounts for almost 20% of total demand.

2.4 Commercial Arrangements

Past Practices and Contractual Arrangements

Since GAWB became a commercialised entity in October 2000, it has sought to establish a new pricing framework which reflects COAG water pricing principles. The key differences between the pricing framework introduced in October 2000 and previous pricing practices were as follows:

- the inclusion of a rate of return commensurate with market returns on capital. This return was applied to the reproduction cost of the dam and delivery infrastructure, replacement cost for plant and equipment and market values for land, buildings and improvements, in place of the previously used actual interest and redemption costs; and
- the use of different average asset lives in different segments, rather than an overall average of 62 years, to determine a return of capital using a financial annuity.

GAWB's existing water supply agreements typically include a specified volume, referred to as a 'deemed quantity', and a price per megalitre which is indexed each year by the CPI. Customers are typically contracted to minimum 'take-or-pay' arrangements requiring them to pay for 75 to 85% of the deemed quantity.

The terms of existing contracts vary, from 1 to 30 years or, in one case, in perpetuity. They are also based on different pricing policies and conditions depending on when the contracts were

struck. Unless renegotiated, 25% of total 2003-04 water sales volume will remain in binding contracts beyond 1 July 2005.

Table 2.1 provides a summary of the current status of GAWB's contracts and the percentage of total volume (ML) affected.

Table 2.1: Summary of contractual status of GAWB's customers, 2003-04

Customer Category	*% of Supply, 2003-04*
Customers subject to existing formal contracts beyond 1 July 2005	25
Customers subject to existing formal contracts due to expire from 1 July 2005.	26
Customers subject to rolling contractual conditions (contracts expired and currently subject to re-negotiation)	46
Existing customers with no contract	3

Previous Pricing Investigation

Following the Authority's earlier investigation of GAWB's pricing practices, the Ministers accepted the Authority's recommendations that:

- GAWB take into account relevant demand scenarios and alternate supply options;
- GAWB's asset base be determined using the depreciated optimised replacement cost approach, with the value of contributed assets to be recognised where there was evidence that the contribution was made with the intent of obtaining future price benefits;
- capital costs of future augmentation for both the raw and treated water systems be based on the optimal scale and timing of augmentations;
- the maximum revenue requirement incorporate a return on capital based on WACC/CAPM, depreciation, efficient operating costs and taxation adjusted for imputation. Prices by class of customers were to be smoothed over a 20 year period;
- prices be differentiated for each customer, with treated water to Gladstone City Council and Calliope Shire Council to be priced as a separate class;
- GAWB transition the introduction of its new prices over a three year period with full prices to apply from 2005-06;
- GAWB's pricing practices be reviewed by the end of December 2004, unless triggered earlier by a variation in revenue of more than 15%; and
- a price cap be applied for regulatory purposes, with monitoring limited to within period reviews, consistent with recommended review trigger mechanisms and with pass-through of approved costs.

Issues Foreshadowed

Several issues were foreshadowed in the Authority's previous investigation as requiring further consideration, either by the Authority or GAWB, including:

- ensuring a consistent approach to the application of the pricing framework between successive regulatory periods;
- a review of GAWB's drought management options with results to be incorporated into prices as appropriate;
- use of a renewals annuities approach rather than depreciation;
- the need for an activity based analysis to enable allocation of general administration costs; and
- further review of incentive mechanisms.

The Authority's previous investigation noted that prices derived from a 20-year cash flow analysis may result in a lower effective return on assets in the initial years and a higher return in later years. Accordingly, the Authority concluded that any future review of GAWB should take into account the previous recommendations so that GAWB is able to achieve a commercial return on its assets over the life of its assets. However, as regulatory principles and methods were still evolving, it was recommended that no specific constraints be placed on future investigations.

Changed Circumstances

Since the Final Report, changes in GAWB's circumstances indicate that the following matters may also need to be taken into account:

- the revised hydrological yield of Awoonga Dam and alternative sources of supply;
- changes in demand projections;
- supply and demand management initiatives;
- the relevance of the asset base identified for the purposes of the last investigation; and
- the nature of triggers and cost pass-through items.

GAWB's Proposed Commercial Arrangements

GAWB proposes to sell water in the future only under contract. The contractual arrangements are proposed to consist of a separate Water Contract (access to capacity) and Delivery Contract (for distribution) based upon similar periods, with a default term of 20 years, subject to a minimum of 5 years.

GAWB proposes that the Water Contract be based upon a set volume ('reservation amount'), with year-to-year variations in sales limited to reflect a trend in demand. Contracts are to reflect the prevailing reference tariff for a particular service which is proposed to be a two-part tariff comprising an access charge and a volumetric charge. The latter is to be based on long run marginal cost (LRMC) of services. The result would be separate two-part tariffs for water storage and distribution services.

Where a customer seeks to be insulated from the impact of regulatory adjustments to the reference tariff, GAWB proposes to offer 'contracts for differences' (CFDs) to customers, which would allow for a fixed price for the term of the contract, or any other non-standard pricing arrangement. GAWB proposes that revenues from CFDs would be quarantined as unregulated revenues.

Water Contracts are to include a provision for tradability, with trades to be subject to approval by GAWB. Customers purchasing water 'reservation amounts' from other customers would pay charges reflective of the costs of servicing the purchasing customer.

GAWB's proposed contractual arrangements include provisions to vary the reservation amount as follows:

- where the customer requests a reduction, GAWB proposes to consider such issues as the financial impact on GAWB, the ability to resell the volume, the amount of spare capacity in the system and the current and forecast scarcity of water. The request may be granted in whole or in part;

- where the customer requests an increase, GAWB proposes to consider its other present and anticipated requirements, spare capacity and the public interest. The increase may be granted in whole or in part;

- GAWB may review and increase the customer's reservation amount where volumes taken for the previous two consecutive financial years exceed 110% of the aggregate of the customer's water demand in each of the years; and

- GAWB may review and decrease a customer's reservation amount if the aggregate of the volumes for the previous two consecutive financial years is less than 90% of the aggregate of the customer's water demand for each of the financial years.

In its submissions to the Authority in response to the Issues Paper, GAWB has raised a number of further issues with implications for pricing. The more significant relate to the form of regulation (price caps or revenue caps), the pricing framework (the application of two-part tariffs and other pricing structures), and certain elements of the maximum revenue requirement, particularly in relation to the rate of return.

3. REGULATORY FRAMEWORK

Summary

The regulatory framework establishes the overarching rules which govern how regulated businesses pursue their business interests and manage their commercial risks. To ensure that service providers do not take advantage of their monopoly position, pricing practices must be consistent with the regulatory objectives of economic efficiency and revenue adequacy, and take account of the public interest.

Recent events have defined more clearly the nature of the commercial risks confronting GAWB. Of particular relevance is the extent of demand risks and the supply risks following from the 2002 drought.

The Authority has sought to define the nature of the risks confronting GAWB and to ensure that the regulatory framework provides incentives for those risks to be allocated to the party best able to manage them.

A regulatory framework based on price caps is considered to remain the appropriate form of regulation for GAWB. While the Authority understands the reasons behind GAWB's proposal to adopt a revenue cap approach, a price cap approach provides the best means of ensuring that GAWB manages its key risks, especially demand risk as it relates to future expansion.

Price caps will ensure that GAWB will not expand its infrastructure unless there is corresponding demand and/or unless there are contracted arrangements in place to offset the risks.

Contracts should act to insulate GAWB's existing customers from errors in estimating demand by other existing users, and particularly from the risks associated with excessive expectations of future demand. This is of particular importance as GAWB's industrial customers are mainly international price takers. For those customers where reliability of supply is more critical than price, contracts provide a means for defining and securing their requirements.

Once price caps are in place, they also provide an incentive for GAWB to sell any excess capacity available after major augmentations and should thus improve GAWB's financial viability.

The Authority proposes also that while prices should be reviewed every 5 years, a long term, 20 year planning period should be adopted to ensure that prices provide appropriate signals for long term planning by customers.

3.1 Regulatory Framework

A regulatory framework establishes the overarching rules which govern how regulated businesses pursue their business interests and manage their commercial risks. To be effective, these rules should induce the regulated business to act in a way that also achieves desired regulatory objectives (Train, 1991).

The design of the regulatory framework, therefore, typically involves a consideration of regulatory objectives and approaches to regulation.

3.2 Objectives of Monopoly Prices Oversight

A monopoly or near monopoly service provider can exercise market power by restricting services, increasing prices, lowering quantities available for sale, or providing a lower standard of service or product quality, without the threat of competitive sanction.

Specific regulatory objectives of monopoly prices oversight are not defined in the *QCA Act*. However, section 26(1) emphasises particular matters which the Authority must have regard to:

- the need for efficient resource allocation, to promote competition and protect consumers from abuses of monopoly power;
- the cost of providing the goods and services in an efficient way and the actual cost of providing the goods and services;
- the standard of the goods and services including quality, reliability and safety; and
- the appropriate rate of return on assets.

Section 26(1) of the *QCA Act* also requires the Authority to have regard for a range of public interest matters such as: the impact on the environment of prices charged; demand management; social welfare and equity implications; the promotion of investment and innovation; ecologically sustainable development; workplace health and safety requirements; and, economic and regional development.

In broad terms, these are typically considered to require the Authority to ensure that prices or pricing practices achieve economic efficiency and revenue adequacy, and promote the public interest.

The Authority considers that a properly functioning competitive market is the appropriate benchmark for establishing efficient outcomes. Such a market:

- is forward looking in nature;
- is responsive to consumer demand;
- ensures profits are sufficient for efficient investment and innovation;
- ensures production costs are not excessive and inefficiency not rewarded;
- allows a rate of return which reflects the market risks involved;
- may provide a degree of market power for a period. However, prices will not remain above long-run average full costs over a sustained period; and
- results in prices which reflect full economic costs and do not involve cross subsidisation over the longer term.

The key focus of revenue adequacy is to ensure regulated businesses have appropriate incentives to undertake new investment. However, this objective does not extend to guaranteeing the service provider's financial viability under all circumstances.

The Authority considers that monopoly prices oversight is intended to ensure that prices or pricing practices achieve economic efficiency and revenue adequacy, and promote the public interest.

3.3 Approach to Regulation

Prices of monopoly or near monopoly businesses may be regulated directly, or indirectly by setting constraints on the revenues they are able to earn. General approaches to the regulation of prices applied by monopolies providing infrastructure services include:

- cost-of-service, or rate of return regulation – where regulators determine the revenue required in order to recover an allowed rate of return on the business' asset base, plus an amount to cover its variable and other fixed costs;

- external benchmarking/incentive regulation – where adjustments to existing prices or revenues are made without direct reference to the provider's cost of service provision; or

- hybrid approaches – where cost-of-service and benchmarking/incentive regulation approaches are applied together to define maximum revenue or prices over a defined regulatory period.

The Authority has typically adopted a hybrid approach to economic regulation, to avoid embedding past inefficiencies, while still providing incentives for efficiency improvement that are achievable by the entity.

In mature regulatory environments, such as in many European countries, there is an increasing interest in alternative approaches to regulation, reflecting an evolution from ex ante approaches with high information requirements to light handed ex post approaches with the regulator focused on monitoring and facilitating greater contestability (see for example PC, 2001; Farrier Swier Consulting, 2003 and Bogetoft, 2002, 2004). Approaches relating to the latter include yardstick regulation which relies on external benchmarking, and regulatory menus which enable a selection of regulatory approaches or parameters.

However, the alternative regulatory approaches emerging in mature regulatory environments are not appropriate to this stage of the regulatory pricing oversight of GAWB. For instance:

- the alternative approaches are generally considered relevant only after an appropriate revenue or price benchmark is initially established and after assessing the financial and service performance of the regulated entity. As noted by the Productivity Commission (2001), prices should be 'in the ball park' before progress can be made towards more light-handed regulatory approaches; and

- external benchmarking requires suitable comparators and robust models. These have not been developed to a suitable level to provide a basis for regulatory pricing for GAWB.

More traditional and predictable approaches to regulation for GAWB, such as the hybrid approach, are appropriate. Moreover, a more radical approach to regulation may unduly increase regulatory risk.

The Authority considers the current hybrid approach to price regulation (combining cost-of-service and incentive regulation) should be retained for GAWB.

3.4 GAWB's Commercial Risks

To promote the lowest cost of providing services, risks should optimally be allocated to the party best able to manage the likelihood or impact of the risk (Posner and Rosenfeld, 1977).

Stakeholder Comments

Many stakeholders commented on the risks associated with the supply of water and their appropriate allocation. The key risks identified by stakeholders included:

- demand risk (Callide Power Management (CPM), Calliope Shire Council (CSC), Gladstone City Council (GCC), Coolum Beach Progress & Ratepayers Association (CBP&RA), CS Energy and GAWB);
  - CPM submitted that many of the pricing issues relate directly to the forecasting of demand. CPM commented that a central component of price cap regulation is that the regulated supplier carries demand risk;
  - CSC and GCC submitted that new demand primarily related to new industrial demand and therefore these customers were a higher risk group;
  - Comalco submitted that customers should not be disadvantaged from reducing their demand as it increases the resource capacity of GAWB and defers the need for augmentation;
  - CBP&RA submitted that service providers must balance the scale effects of adding capacity in large increments against the uncertainty implicit in demand forecasting which favours flexibility through small increments. They suggested benchmarking of system utilisation against enterprises with similar climatic conditions, end use patterns, demand growth and service standards;
  - CS Energy noted the risk faced by GAWB where customers use a different volume of water to that contractually allocated;
  - GAWB submitted that it faces significant risk from its exposure to large industrial projects and the markets that influence project proponents that make the process of estimating long run demand challenging. GAWB proposes to sell water in the future only under contract;
- the risk of changing hydrology (CPM, CSC, GCC, GAWB, DNRME and Treasury);
  - CPM accepted that changing hydrology was a risk outside of GAWB's control and that GAWB should be able to recover the cost of water storage infrastructure from the reduced yield, provided the raised dam remains the least cost option;
  - CSC and GCC noted recent changes in hydrology and that a lower yield would impact on GAWB's financial and planning decisions;
  - GAWB submitted that it was practically certain that the Historic No Failure Yield (HNFY) of Awoonga Dam will be revised downward again sometime in the future;
  - DNRME noted that any future significant variability in hydrology may cause the timing of projected augmentations and hence pricing to change;
  - Treasury considered the risk of changing hydrology affecting future augmentation was sufficient to justify a review trigger;
- drought risk (CSC, GCC, DSDI and GAWB);

- CSC and GCC submitted that the risk of drought should be handled by GAWB in such a way that the price of water reflects the different reliability products provided to various customers;

- DSDI submitted that developments to address security of supply may not be consistent with the 'just in time' basis of the previous asset valuation;

- GAWB stated its drought management plan was being revised to reflect lessons learnt in the recent drought;

- supply risks relating to infrastructure investments (CPM, CSC, GCC and GAWB);

  - CPM submitted that the risk of a decreased least cost of supply should be allocated to the service provider;

  - CSC and GCC stated that shifts in demand and supply required a revaluation of the asset base and operating costs should be similarly optimised, allocating risk to GAWB. Conversely, CSC also recognised the risk that optimisation posed to GAWB and suggested that processes be put in place to ensure investment certainty;

  - GAWB submitted that its investments are large and infrequent and have significant price and service implications for customers. It submitted that it faces significant asset stranding risk from implicit frequent asset revaluations and technological development; and

- regulatory risks (CSC and GAWB);

  - the risk of increased environmental releases (CSC submitted these should be funded by a CSO rather than by customers); and

  - GAWB submitted that it faced price investigations of uncertain frequency and scope determined by discretionary Ministerial discretion, asset revaluation risk, and no regulatory mechanisms to offset future high returns against low initial returns.

In general, GAWB submitted that its regulatory and commercial environment exposes it to more risk than many other utilities.

However, Comalco submitted that GAWB's risks are very low, as evidenced by the nature and quality of its assets and its customer base, low complexity involved in service delivery and stable cash flows. Comalco submitted that GAWB's risks should be assessed on: security and certainty of cashflows; customers' credit ratings; price risk environment; technological environment; threat of competition; debt levels; and, service levels.

QCA Analysis

Demand Risks

GAWB's demand risk applies to existing customers, expected new customers and unidentified new customers in the event there is a need or desire to provide for future demand..

In relation to existing customers:

- except for the impact of the recent drought, annual volatility in demand is typically low;

- future demand trends by existing customers are, however, not predictable with absolute certainty:
  - further substantial reductions in demand in the short term are not likely unless prices rise considerably or supply is restricted as a result of drought, reduced reliability, lower long term yield or water quality;
  - GAWB may, of course, seek to influence the demand of existing customers through the introduction of new demand management initiatives, although GAWB has not identified any such initiatives at this time; and
  - over the longer term, there may be further reductions in demand if customers substitute sea-water for cooling purposes or adopt alternative technologies or competing sources of supply such as stormwater and waste water recycling;
- growth in the demand for treated water over the next 20 years is expected to lag the growth expected prior to the last drought as a result of the application of two-part tariffs by Gladstone City Council and leakage reduction initiatives by both Councils; and
- GAWB's small customer base does not provide significant opportunities for diversification and the loss of any of the larger customers could have a material impact on GAWB's financial position, or conversely customers (depending upon the nature of the regulatory framework).

GAWB has proposed the contractual allocation of volume risk to existing customers, through take-or-pay arrangements and long term contracts with specified review periods. GAWB also proposes that, where a customer requests a reduction or an increase in its contracted amount, GAWB may grant the request in whole or in part, depending on financial impacts, other demand and system capacity. GAWB also proposes to review customers' contracted amounts where volumes taken in the previous two consecutive years fall below 90% or above 110% of the contracted amount.

While not yet implemented, GAWB is also proposing the following initiatives to reduce risks to existing customers:

- tradeability of contracted demand; and
- disaggregation of prices for storage and delivery services.

Expected new customers are typically large industrials with identifiable projected demand, albeit with some uncertainty surrounding their establishment and the timing and staging of demand. Their demand may be driven by national or global macro-economic variables and trends outside GAWB's control.

Depending upon their expectations of the responses by GAWB and the regulator, new customers may have an incentive to overestimate demand if they consider that they will not bear the cost implications. However, GAWB is proposing to require customers to make capital contributions and pay access reservation fees to cover GAWB for the risks involved with any expansion of infrastructure for expected new demand. Such an initiative should also provide an incentive for existing customers to more accurately estimate demand.

Requirements of unidentified customers have been incorporated in demand estimates in the past and, in many cases, failed to materialise. The volume and timing of demand from unidentified new customers cannot be predicted with any certainty.

Where demand differs from that originally anticipated, there are consequences for GAWB and its customers, particularly for infrastructure planning and associated costs. From a regulatory perspective, GAWB may have an incentive to overestimate demand if the regulatory framework permits it to pass excess costs to customers. Alternatively, GAWB may have an incentive to underestimate demand if it anticipates that this will result in higher per unit prices under the regulatory framework. The desired framework should promote a neutral stance by GAWB.

Supply Risks

Supply risks fall into three main categories: planning risks associated with inaccurate estimates of demand; infrastructure risks associated with inappropriate responses to assessed demand; and resource risks.

Planning and infrastructure risks are relevant as the minimum efficient economic scale for capacity expansion is typically large and lumpy resulting in the potential for excess capacity. In particular:

- supply planning risks affect the location, scale and timing of infrastructure development;
  - where demand is underestimated, the risk for GAWB is that infrastructure capacity will not be available, or only available at high cost, and customers may seek alternative sources of supply. These could include local seawater, desalinised or otherwise, or a competing fresh water source. In response to the recent drought conditions, one of GAWB's major customers substituted sea water for a significant proportion of their fresh water demand, other customers investigated air cooling substitution and a committed new project reconfigured its specification to reduce fresh water requirements;
  - where demand is overestimated, GAWB may be left with substantial excess capacity. Such risks are exacerbated by the large and 'lumpy' nature of demand associated with large projects which are prominent in Gladstone. Responsibility for such errors can arise from either customers or GAWB; and
- inappropriate infrastructure responses to assessed demand may affect GAWB's ability to provide desired services at least cost.

The key sources of resource risk are:

- volume of available supply or hydrology risk. GAWB currently operates well within the catchment's hydrological capacity as the Resources Operations Plan (ROP) indicates the catchment has the capacity to service a larger dam of up to 97,000ML. Key hydrological risk relates to GAWB's HNFY for Awoonga Dam at its current level of development, which is based on simulation data for rainfall, stream flow and storage level information developed from records since 1891. GAWB's HNFY is currently 78,000ML after allowing for environmental flows as specified under the ROP. The HNFY has been revised downwards three times since 1985, the most recent being in 2003 subsequent to the drought. Increasing evidence of climatic change with a declining average rainfall over the last 25 to 30 years imposes risks of further downgrades in Awoonga Dam HNFY in future. GAWB is not able to predict or manage the occurrence of these hydrology risks;
- drought risk. Drought risk refers to short term seasonal and annual downturns in rainfall patterns. Neither GAWB nor its customers have the ability to predict the occurrence of non-seasonal drought conditions. GAWB's response in the recent drought was to impose supply restrictions to ration the supply of water and extend availability to priority

customers. GAWB is presently revising its Drought Management Plan (DMP) and expects to have it completed and available for input into the current price investigation (although it is not yet available to the Authority).

Drought management planning is designed to minimise supply risks to customers. While it affects customers, responsibility typically falls to the service provider as the service provider has the best information on the availability of supply and is best placed to prioritise overall supply in consultation with all customers. Flexible trading and pricing arrangements proposed by GAWB can, within limits, minimise the impact of drought by allowing customers a direct role in managing this risk; and

- water quality risk. Supply quality risk refers to deteriorations in overall water standards such as turbidity, salinity, colour, odour and taste or contamination from blue green algae, giardia or cryptosporidium. Low storage levels exacerbate the impacts of water quality risks. Water quality issues can only be addressed by GAWB as owner and manager of the physical infrastructure and land catchment.

Other Risks

GAWB's key finance risk relates to the cost of, and ability to make payments on, loan obligations arising from the Awoonga Dam upgrade.

Constrained sales during recent drought conditions and delays in negotiating new contracts may have increased this risk. GAWB's financial performance suffered from the drought conditions, with operating income (after tax) declining from a surplus of $3.1 million in 2001-02 to a loss of $3.4 million in 2002-03. However, GAWB has retained a BBB credit rating, partly by holding additional cash reserves until sales demand generates a sufficient margin over cash required to service debt financing.

Finance risk should be allocated to GAWB as it is the only party able to manage such considerations. GAWB is also exposed to the risk of customers making late payments or permanently defaulting.

In addition to these key risks, GAWB must manage various contract risks, operational and management risks, legislative risks and risks relating to government regulation, policy and general economic conditions.

The Authority considers GAWB's key commercial risks relate to:

- **the demand for water services from existing customers, expected new customers, and currently unidentified new customers;**
- **the supply of water services including planning risks associated with inaccurate estimates of demand, the appropriateness of infrastructure responses to assessed levels of demand, and resource risks including hydrology, drought and water quality; and**
- **other risks including the financial risks related to loan repayments, default risk, contract risk, regulatory risks, risks relating to general economic conditions, and operational and management risks.**

3.5 Customers' Commercial Risks

As noted previously, GAWB's major customers include CS Energy, CPM and Queensland Alumina Limited (QAL), which together account for 75% of GAWB's total demand. Other industrial customers include Gladstone Power Station, Boyne Smelters, Orica, Comalco and the Gladstone Port Authority. GCC and CSC account for most of GAWB's treated water demand.

Customers such as QAL, Comalco and Boyne Smelters that sell an international product face the risk of volatility in cash flows due to changes in global demand and supply. These can be affected by weather patterns, industrial demand and global economic growth, sovereign political risks, competitive risks and policies relating to international trade. Customers such as the electricity generators must manage risks associated with domestic economic conditions. Customers are best placed to assess these trends and their implications for their demand for water.

Customers are also more able to take steps to mitigate their operational exposure to lack of water supply by:

- investment in alternative sources such as recycled water or saltwater cooling;
- investment in new technology to reduce reliance on water from GAWB; and
- contractual arrangements which provide priority access to volumes required.

In general, the demand for water by GAWB's existing customers has been relatively predictable.

The Authority considers that customers are best placed to assess their own demand for water from GAWB.

3.6 Allocation of Risks

To ensure that least cost of supply is achieved, regulatory and commercial arrangements should promote the allocation of risk to those parties best able to manage the risks.

Ability to Manage

The more substantial risks involved in the supply of water and the parties best able to manage them would appear to be as follows:

- risks of estimating the relevant demand of individual existing, identifiable and potential future customers are best managed by those customers;
- planning risks arising from responding to estimates of demand, are best managed by GAWB, as the owner and manager of infrastructure;
- infrastructure risks of investments to meet estimated demand are GAWB's responsibility (consistent with its mandated responsibilities);
- risks of hydrological changes are not manageable by any party as they are essentially unpredictable. However, it is reasonable that the cost of any changes be passed through to customers;

- drought risks, while difficult to predict, would be best allocated to GAWB as it is in the best position to manage overall supply options and any relevant restrictions; and

- water quality risk is best managed by GAWB.

Least Cost Outcomes

Estimates of future demand have in the past been subject to significant uncertainty and have usually been overestimated. Augmentation options are typically large and lumpy. The costs of any errors to GAWB and its customers are potentially significant.

Under these circumstances, long term contracts would appear particularly relevant to GAWB for significant trades in water, as:

- where customers must pay for specified volumes, it places an onus on customers to manage their demand, and any demand management initiatives, and gives GAWB some certainty of demand around which to plan its next augmentation;

- by setting prices, contracts can protect individual customers from the costs of other customers' inaccurate estimates of demand or costs arising as a result of inappropriate infrastructure investments by GAWB in response to uncontracted future demand; and

- responsibilities and expectations relating to the allocation of risks can be clearly established.

The Authority notes that the Gladstone Port Authority currently only invests in new infrastructure if it has customers contracted to support the new investment, so that excess capacity is limited to no more than 10% of installed capacity.

GAWB proposes to sell water in the future only under contract and has proposed to put in place the following contractual arrangements:

- it will request reasonable forward estimates of demand from customers. While GAWB will consider any customer request for a change in demand taking into account its financial impact and other factors, it does not consider it is obliged to grant the request. This will place the onus on customers to accurately negotiate for expected demand and manage demand to this level;

- the demand risk of new customers will be mitigated through upfront capital contributions or pre-payments for capital charges and options to reserve available water in advance through the payment of access charges in the intervening period; and

- customers requiring price protection will be offered a 'contracts for differences', with revenues or losses being dealt with outside of regulated revenue.

In general, the Authority considers that customers should bear the risk of variations in their own demand, and contracts should explicitly define the basis for variations in contracted amounts. GAWB should be able to exercise its discretion to alter contracted amounts upon request by customers. However, the Authority considers that GAWB should not unilaterally vary contracted amounts. The Authority supports tradeability as providing a means of offsetting this risk for customers, to allow contracted volumes to be made available to other customers, particularly during times of scarcity or where augmentations become necessary.

As well as being a mechanism for allocating risks, contracts can provide greater certainty in the face of significant uncertainties for future business and investment decisions by both parties and

can avoid underinvestment in specialised assets. In general, the greater the specialised investment, the longer the duration of contracts required to justify the original investment (Joskow 1989).

The Authority considers that risks should be allocated to those parties best able to manage them. In GAWB's circumstances:

- **demand risk is best managed by relevant customers;**
- **planning and infrastructure risks are best managed by GAWB, as the owner and manager of infrastructure;**
- **hydrology risk is not manageable by any party as it is essentially unpredictable and the cost of changes should be to the account of customers;**
- **drought risk is best allocated to GAWB as it is in the best position to manage overall supply options and any relevant restrictions; and**
- **water quality risk is best managed by GAWB.**

The Authority considers that:

- **contractual arrangements should be put in place which promote the efficient allocation of risks;**
- **GAWB should facilitate the tradeability of contracted amounts between customers; and**
- **GAWB should exercise its discretion to vary contracted amounts upon request by customers. However, GAWB should not unilaterally vary contracted amounts.**

3.7 Form of Regulation

The most common forms of regulation are revenue and price caps.

Revenue Caps

A revenue cap provides a service provider with the flexibility to vary the level and structure of their prices, provided the revenue constraint is not breached. The pricing flexibility available to the business under pure revenue caps may result in cross-subsidies between individual customers. In practice, therefore, the revenue cap is often accompanied by pricing principles which limit inappropriate pricing.

Revenue caps are designed to provide the entity with sufficient revenue to be financially viable provided it operates in an efficient manner. However, if demand is higher than expected, and additional unanticipated capital investment is incurred, the extra revenues required to repay any new investment may not be available until the next price review if no arrangements are in place for cost pass-through or review triggers.

There are three common forms of revenue caps:

- fixed revenue caps, which set a maximum total revenue that may be collected from the regulated service over a defined period;

- average revenue caps (or the 'revenue yield approach'), which set controls on per unit revenues; and

- variable revenue caps, where allowed revenues are linked by a predetermined formula to variables such as demand growth or cost drivers.

Price Caps

Price cap regulation aims to control the prices charged by the service provider, rather than its total or average revenue. That is, price caps restrict the regulated entity to a price per unit regardless of the total volume sold. Under price cap regulation, there is no effective limit on revenue as it depends on the volume sold.

Where price caps are based on costs for different service and customer groups, they limit the prospects for cross-subsidies between those groups. Price caps usually result in the service provider bearing the financial risk associated with variations from projected demand. If demand is lower than expected, the entity cannot increase prices to offset lower sales.

The Authority's previous investigation recommended that a price cap approach be adopted, on the basis that GAWB was better placed to manage relevant risks and that it should receive appropriate incentives and rewards to manage them effectively. Under this form of regulation, the possibility of increased sales and profits was considered appropriate to compensate GAWB for the (few) risks then envisaged.

Other Jurisdictions

The ICRC (2004) concluded that an average revenue cap (per unit) was an appropriate form of regulation for regulated water services as 'it provides an appropriate balance of risk between ACTEW and customers and at the same time provides incentives for ACTEW to reduce costs and provide services in response to customer demand'.

The ESC's (2004) guidance to Victorian service providers on its intended approach to reviewing Water Plans indicated that it considers individual price caps to be the most appropriate form of price control in the first regulatory period. The ESC did express a willingness to consider proposals from businesses for a tariff basket approach, although it generally considered that the costs of complexity are likely to outweigh any benefits in the initial three year regulatory period.

The ESC's key concern is to ensure that the form of price control is consistent with the need for prices to signal efficient costs and provide appropriate incentives to customers. The ESC is concerned that, if individual prices or at least tariff structures were not defined, then there would be little certainty that these requirements were being met.

When making determinations regarding pricing for government monopoly services, IPART in NSW is limited by government regulation to fixing the maximum price or setting the methodology for fixing the maximum price. To date, the principal focus has been fixing maximum prices.

In the UK, OFWAT has applied price caps to regulated water service providers.

Stakeholder Comment

GAWB has proposed that the form of regulation adopted should be a revenue cap, with side price constraints limiting increases to CPI+5% where the accumulated balance in the 'overs and unders' account is less than 20% of maximum allowable revenue. Beyond this point, GAWB proposed that it should agree with the Authority an appropriate price path for recovering allowed revenue.

GAWB also submitted that in its circumstances a revenue cap was more appropriate for a number of reasons, including that it:

- results in an efficient allocation of volume risk;
- is less sensitive to inaccurate demand forecasts;
- manages drought risk more effectively, as it does not require estimates of the future costs of drought;
- is not biased against demand side management;
- is more likely to maintain regulatory consistency and revenue adequacy across time due to the unders and overs regime which considers past returns; and
- is consistent with the Authority's 2003 decision to retain fixed revenue caps for Queensland electricity distributors.

GAWB submitted that, under a revenue cap, reference tariffs would be set annually in relation to standard contractual services. Non-standard services would receive different prices, as negotiated between GAWB and the relevant customer. For example, GAWB proposed that contract lengths shorter than the standard 20 years would attract a price premium. GAWB also proposed 'contracts for differences' or CFDs, which would provide a fixed price or other non-standard arrangement in contracts and would be handled outside the revenue cap. Any profit or loss on CFDs would be quarantined from other regulated revenues, while customers would benefit from greater price certainty.

GAWB stated that if a price cap was adopted, it would investigate modifying its demand forecasts by an empirically calibrated scale factor reflecting past overestimates in demand.

Few customers commented on the form of regulation. Those that did favoured price caps, or were neutral. GAWB recognised in its submission that customers almost universally express a preference for price predictability and regime stability.

CPM observed that subsequent to the raising of Awoonga Dam, a number of events have challenged some of the Authority's previously held assumptions, and how the Authority responds should be guided by a clear position on which party should carry certain risks. CPM submitted that:

- under a price cap GAWB is responsible for demand risk within the regulatory period, and should not be permitted to recoup revenue shortfalls from users where demand is less than that forecast including under drought conditions; and
- pricing should ensure customers have incentives to continue to pursue 'cost-effective and socially responsible' demand management measures.

Comalco stressed that pricing should not provide a disincentive for customers to manage their own demand, as this strengthens the resource capacity of GAWB and defers the need to spend on augmentation. Comalco suggested, however, that under a price cap, GAWB faces more risk and may have an incentive to increase sales and exacerbate drought impacts. Comalco noted that under a revenue cap the risk to GAWB is low as it is similar to a 'take or pay' environment.

CS Energy submitted that in between price reviews, prices should be escalated by a CPI-X formula, indicating support for a price cap approach.

QCA Analysis

Drawing on the issues identified above including those raised by stakeholders, the key matters relevant to determining the appropriate form of regulation for GAWB include:

- the appropriate allocation of risks, including:
  - demand risk and the sensitivity of the form of regulation to inaccurate demand forecasts;
  - supply risks, including drought risks and demand side management, environment, system failure, water quality and hydrology;
- pricing efficiency, including the removal of cross-subsidies, flexibility in pricing design and pricing certainty to customers;
- regulatory consistency; and
- transparency and administrative complexity.

Demand Risk Management

A primary focus in arriving at the appropriate form of regulation is ensuring risks are borne by the parties best able to manage them. While revised contractual arrangements have been proposed by GAWB, they have not yet been put in place.

Thus, accepting that more significant trades should be subject to contractual arrangements, there is a case for the form of regulation to provide GAWB and its customers with the incentive to put appropriate contractual arrangements in place.

A revenue cap may not provide GAWB with sufficient incentive to put in place relevant contractual arrangements as prices can be varied to achieve allowable revenues within the regulatory period. Nor would it necessarily provide customers with an incentive to correctly estimate demand as they are not bound by their forecasts. History indicates that estimates of demand exceed those achieved. Further, the Authority does not consider it appropriate that existing users should bear the costs of managing the risks associated with uncontracted demand (predominantly relating to new users) unless they choose to do so. This could occur, for example, where new augmentations result in lower costs.

Price caps expose GAWB to downside risks. It thus provides GAWB with a clear incentive to put in place contractual arrangements based on agreed volumes (as being proposed by GAWB). Price caps also provide GAWB with the incentive to promote sales where spare capacity exists (usually after major augmentations), consistent with the efficient use of available infrastructure.

It is noted that price caps can provide GAWB with an incentive to underestimate future demand to obtain a higher price for services. However, this is mitigated to some extent by the potential for redundant infrastructure to be removed from the asset base and for fixed overhead costs to be adjusted.

GAWB has proposed that, if revenue caps are not adopted, it intends to submit a revised demand projection. To overcome such issues and to ensure demand estimates are not subject to bias, the Authority has relied on independently verified demand forecasts in its calculation of the maximum revenue requirement (chapter 5).

In summary, the Authority considers that a price cap provides GAWB with the best incentives to manage demand risk through contractual and other commercial arrangements.

The Authority notes that GAWB has proposed that customers requiring pricing certainty be offered 'contracts for differences' (CFDs). These arrangements can effectively protect customers from the risk of pricing variability and cross-subsidisation. However, while it remains unclear how the negotiated 'fixed' price would be determined, if customers voluntarily elect to negotiate such arrangements, these would be a commercial matter between the customers and GAWB.

Supply Risks, Environment and Demand Management

Supply risks relating to system failure and resource risks such as water quality, are best managed by GAWB as owner and manager of infrastructure and as service provider. The costs of managing these risks would be incorporated in either a revenue or price cap. Under both forms of regulation, GAWB has an incentive to put in place the most appropriate least cost relevant infrastructure. That is, either revenue or price caps will address supply risks of this type.

With no party effectively able to manage risks of changes to hydrology, relevant costs should be borne by customers. A similar approach applies to changes in environmental releases that may be required by relevant agencies. This is best addressed through cost pass-through arrangements. Either price or revenue caps would require adjustment for this purpose.

Drought risks appear best managed by GAWB as these typically require management of overall demand and prioritisation of supply, and any required differentiation of water reliability. These issues are being addressed by GAWB under its forthcoming Drought Management Plan (DMP). Where expected costs of droughts, including those associated with the DMP, are incorporated into cash flows on an ex ante basis, they would be incorporated in revenue and price caps. The costs of unexpectedly rare and severe droughts may not be able to be estimated in advance and may need to be addressed after the event. Demand management can play a large role in avoiding or ameliorating drought conditions although there are limits on the extent to which they can be effective.

GAWB's customers would prefer that the form of regulation retains incentives for them to put in place effective demand management options. Price caps provide an incentive for customers to do so, as lower volumes purchased result in overall savings to users within a regulatory period and by potentially delaying the timing of future augmentations. Under a revenue cap, the impact on costs of reduced demand can be immediately passed through to customers within the regulatory period, subject to contractual conditions.

For GAWB, the opposite incentives apply. Under a revenue cap, GAWB can implement demand management initiatives and recover the lost revenue by increasing prices. Under a price cap, GAWB has no incentive to implement demand management practices unless it can on-sell saved water.

Demand management becomes a key issue during periods of drought or when capacity limitations are being reached. Water supply from the catchment is not a limiting constraint for the foreseeable future. Drought management arrangements are yet to be prepared.

Any potential for reduced sales should be reflected in customers' estimates of future demand as they alone are in a position to estimate their potential gains. Under the proposed contractual arrangements, customers will be required to pay the access charge but the volumetric component will be based on actual demand. Under a revenue cap there will be no incentive for such demand initiatives by customers within a regulatory period. A price cap will provide an incentive for contractual arrangements to be put in place and therefore focus customers on long term demand management possibilities. Where savings become evident, it will be open to companies to negotiate with GAWB to reduce their contractual commitments (as is being proposed by GAWB). GAWB will have an incentive to do so where new demand arises.

Pricing Efficiency

Pricing efficiency relates to whether prices are cost reflective, and whether there is flexibility in pricing design and the pricing certainty provided to customers.

Under a pure revenue cap, GAWB may have less incentive to price in a manner which would provide signals in regard to supply availability or reliability as it would recoup all costs from users irrespective of such signals. In a segmented system such as that operated by GAWB, prices should vary according to the level of service and infrastructure involved to ensure cost reflectivity. However, provided that revenue caps are complemented with appropriate side constraints, and these are adhered to, both forms of regulation could have equivalent levels of pricing efficiency.

Certainty

Price caps would provide GAWB's customers, including those who are international price takers, with greater certainty in prices within the regulatory period. Greater pricing variability would be possible under revenue caps. GAWB has sought to mitigate price volatility through side constraints which would limit increases to CPI+5%. Price caps may also promote financial viability but do so in defined circumstances through triggers and cost pass-through events.

The issue of pricing certainty over successive periods is further discussed in chapter 10. The Authority has dealt with the issue of flexible pricing for non-standard services (including price premiums for shorter than normal contractual periods) in chapter 4.

Certainty for GAWB in meeting its revenue requirement would arise from contractual and other commercial arrangements that guaranteed revenue in relation to existing or expected demand. The Authority proposes that, if a user fails to take up the quantity nominated in contracts and it could not be sold to another party, then the customer would be required to compensate GAWB for the lost revenue. Under such an arrangement, neither other customers nor GAWB would be responsible for errors in that customer's estimates of demand.

In respect of unidentified future customers, it is open for GAWB to determine whether expenditure on infrastructure should occur to meet this demand. Having regard to the lumpiness of additional capacity, past lack of forecasting success, and inability of existing customers to carry any errors, it is open to GAWB whether it wishes to take this risk. However, if it does, and no existing or prospective customers are prepared to commit to such capacity, there is a case for GAWB to carry the attendant risks.

Regulatory Consistency

While the Authority notes that the form of regulation should remain as consistent as possible to minimise regulatory compliance costs, it may change over time subject to developments in regulatory practice and actual outcomes.

As noted above, GAWB proposed that to adopt a revenue cap would be consistent with that adopted for the electricity industry. However, the electricity industry is generally characterised by greater predictability and certainty of future (non-peak) demand than GAWB. The ability of the various parties to manage and absorb relevant risks is different. It is not appropriate therefore to base any recommendation on the appropriate form of regulation for GAWB upon that adopted for electricity or any other sector without an analysis of the underlying conditions.

Transparency and Administrative Complexity

In GAWB's circumstances, there is little difference in the transparency of a revenue cap with appropriate side constraints and a price cap. Neither would involve complex algebraic formulae.

However, revenue caps, with under and over accounts and side constraints as proposed by GAWB, are relatively more administratively complex than price caps. In particular, they require a greater degree of annual information gathering, and ongoing price approval and monitoring. Although GAWB's customer base is small, a revenue cap would require GAWB to develop sufficient internal capacity to calculate proposed prices on an annual basis.

Conclusion

While the Authority understands the reasons behind GAWB's proposal to adopt a revenue cap approach, a price cap approach provides the best means of ensuring that GAWB manages its key risks, especially demand risk as it relates to future expansion.

Price caps will ensure that GAWB will not expand its infrastructure unless there is corresponding demand and/or unless there are contracted arrangements in place to offset the risks.

In addition, once price caps are in place, they also provide an incentive for GAWB to sell any excess capacity available after major augmentations and should thus improve GAWB's financial viability.

In terms of supply risks, pricing efficiency, regulatory consistency, transparency and complexity, there is no overwhelming argument in favour of any particular approach. While price caps may have some benefits in encouraging customers to adopt demand management strategies within a regulatory period, the extensive implementation of demand management practices since the recent drought and the likelihood that contracts will limit such incentives, minimises these advantages.

A number of additional matters have been raised by GAWB and stakeholders relating to the nature of the appropriate response to identified risks. These include: implications for the risk premium; differential pricing for customers with different risks; the application of load factors to non-contracting parties; and, the implication of the approach to regulation for asset revaluation and more specifically optimisation of the asset base. These matters are addressed in subsequent chapters.

The Authority proposes to maintain price cap regulation as a means to ensure GAWB has the right incentive to effectively manage relevant risks.

3.8 Establishing Price Caps

Planning Period

The Authority's previous investigation adopted a 20 year assessment period for pricing matters. The longer time frame was adopted to ensure that a long term perspective, most relevant to water service providers, is maintained. Such a perspective reflects:

- the expected time required for the additional supply capacity from the Stage 1 augmentation of the Awoonga Dam to be utilised; and
- project evaluation conventions for the use of a 20-30 year evaluation period for water infrastructure projects.

Establishing the planning period according to the time required to effectively utilise an asset's service potential is also consistent with price stability and intergenerational equity objectives.

Other Jurisdictions

Ofwat (2002) notes that although price limits are set for five years, they need to be established 'within a longer term context, taking into account the likely needs of the industry well beyond 2009-10 where these are relevant now'. A longer period might offset some of the inevitable uncertainty associated with the periods around price reviews but against that would be the difficulty of making robust forecast for many years ahead.

Stakeholder Comment

GAWB's submission supported the continued use of a 20 year perspective for planning purposes as it does not anticipate supply constraints until approximately 2023.

However, GAWB has proposed a 5 year pricing horizon, under which prices would be set so that the present value of costs and revenues are balanced over 5 years. GAWB submitted that any longer period exposes GAWB to significant revenue risk and raises the potential for considerable intergenerational inequity in cost recovery. Specifically, GAWB argued that historical overestimates of demand have resulted in a 'value transfer' from the Queensland Government to existing customers due to GAWB not receiving required revenues, and that future customers may be forced to make up for this transfer, in the form of higher future prices.

QCA Analysis

The key objectives which should guide the selection of the length of a planning period relate to the need for prices to provide appropriate signals for long term planning by customers. This is important to deal with any efficient excess capacity and provide consistent and stable pricing signals given the lumpiness of infrastructure investments. Under a shorter pricing period:

- current customers would be forced to pay for excess capacity inherent in lumpy capacity expansion, albeit optimal to meet long term demand;
- significant price shocks may result if a price smoothing period is adopted which is shorter than that required to utilise the capacity of major infrastructure. For example, such an approach would potentially result in much higher prices in earlier regulatory periods, declining in subsequent periods until the next major augmentation; and

- future additional demand, once the asset is utilised, could be priced at a relatively lower amount due to the larger denominator used in pricing calculation at that time and would not signal the correct marginal cost to new consumers.

At the time of the last review, the appropriate planning period was considered to be 20 years and it is proposed that this longer period be maintained for pricing and planning purposes.

The Authority considers a planning period of 20 years is appropriate for GAWB.

Approach to Estimating the Price Caps

Price caps are estimated on the basis of a maximum annual revenue requirement (MRR) which establishes the total amount of revenue that an efficiently operated business would need to remain commercially viable, but not enjoy monopoly profits.

Price caps are typically calculated for each class of customer to minimise the possibility of cross-subsidy and ensure cost reflectivity.

MRR can be calculated using either a NPV cash flow model or a building blocks model. Where identical assumptions are employed relating to the planning period and other variables, consistent results are derived from both approaches. The Authority believes that the building blocks model provides greater transparency of the pricing components typically being:

- a return *on* capital;
- a return *of* capital; and
- efficient operational costs (and actual tax expenses, net of imputation credits).

The Authority developed both the cashflow and building blocks model to ensure the accuracy of results. The adoption of a cashflow model ensures all out of period costs are taken into account.

The Authority considers a cashflow model should be adopted to calculate GAWB's MRR.

3.9 Regulatory Review Period

The regulatory period must be long enough for management initiatives to be implemented and take effect. It should also be short enough for the regulator to forecast reasonable cost estimates and (where relevant) retrospectively validate efficiency gains. Most Australian regulators have adopted a review period of 3 to 5 years.

Where an investment is associated with a high level of risk, a longer review period may help ensure returns commensurate with that risk, by averaging out fluctuations over the relevant period. Conversely, where risk arises due to uncertainties over future developments or regulatory gaming of cost projections, then a shorter regulatory period may be adopted to allow prices to be reset once the information is available.

Other Jurisdictions

Ofwat has adopted a regulatory period of five years for major 'periodic reviews' at which maximum price limits are set. Ofwat is presently considering between one and three year extensions to the regulatory period as 'some water companies believe that a five-year horizon does not provide sufficient stability for an industry that must plan to provide water services much further into the future' (Ofwat, 2002).

The Victorian Government will approve water prices for a 3-year regulatory period commencing on 1 July 2005. Future regulatory periods will be set by the Essential Services Commission (ESC).

IPART's price determinations for NSW water businesses usually apply for a regulatory period of five years, with a general mid-term review. However, more recently a 2 year period was adopted for Sydney Water reflecting medium term uncertainties.

The ICRC (1999) established a five year regulatory period for ACTEW's 1999/00 to 2003/04 price direction, consistent with the requirements of their terms of reference, noting the benefits this time period provides in terms of regulatory certainty. More recently the ICRC (2004) finalised a price direction for ACTEW for the period 2003/04 to 2007/08, adopting a four year period, although indicating it will consider the benefit of returning to a five-year timeframe in the subsequent regulatory period during the next review.

GPOC has undertaken two investigations into the pricing practices of the three Tasmanian Water Authorities, establishing a three year regulatory period in both cases (GPOC 2004).

Stakeholder Comments

GAWB has proposed a 5 year regulatory period on the basis that it would:

- provide a reasonable opportunity to evaluate the success of GAWB's proposed changes to the regulatory framework and pricing arrangements; and

- facilitate the most rapid implementation of proposed future QCA recommendations, by aligning the regulatory review process with GAWB's contractual periods.

CS Energy submitted that overly frequent price reviews are in conflict with the concept of stability of long term agreements, particularly when the impetus is based on objectively determined issues, which may prove to be neither consistent nor accurate. CS Energy submitted that price reviews should be held every 5 years or when there is a significant change in GAWB's asset base or customer base.

DNRME suggested that the investigation identify price floors and caps to guide future contractual negotiations, and that updates to the price limits coincide with regulatory review periods or significant changes in GAWB's circumstances.

CPM submitted that the regulatory pricing period should be truncated to the date of the next proposed augmentation or 5 years, whichever is the shorter.

Comalco supported the use of 5 year regulatory periods within long term contractual arrangement.

CS Energy expressed its preference that price reviews should be held every 5 years, or whenever there is a significant change in GAWB's asset base.

QCA Analysis

Comments by GAWB and its stakeholders generally support a regulatory pricing period of 5 years, which is consistent with the Authority's previous conclusions that the regulatory pricing period should, where practical, correspond to the timing of contract reviews.

For GAWB's present circumstances, it would appear that costs can be adequately forecast for the forthcoming five year period. Although uncertainties exist regarding future demand, yield

and augmentation options, a shorter regulatory period would not resolve those uncertainties. Where significant changes occur within such a period which may warrant a review of price settings, these can be addressed through alternative mechanisms (addressed in Chapter 10).

The Authority considers a 5 year regulatory review period should be adopted, with the next review to occur in 5 years (from 1 July 2005).

4. PRICING FRAMEWORK

Summary

The Authority considers that prices should be based on long run marginal costs (LRMC) of supply, with two-part tariffs applied separately for storage and delivery services and incorporating a take-or-pay access charge based on contracted volumes. Penalty load factors are considered appropriate to apply to access charges to provide the incentive for customers to accurately estimate their consumption. Further, the Authority considers that:

- *tariffs be differentiated between users according to their utilisation of specific components of GAWB's infrastructure network; and*
- *a pooled price be adopted for Gladstone City Council and Calliope Shire Council for the next regulatory period.*

On other pricing matters, the Authority proposes that:

- *where contributed assets are recognised, they be included in the asset base for the purpose of determining the revenue requirement and prices;*
- *for a past capital contribution, a rebate equal to the return on capital be provided to the contributor;*
- *for future contributions, rebates may also include the return of capital component, provided their contribution is intended to reduce prices in this manner; and*
- *in general, drought risk is best managed by GAWB and GAWB is entitled to pass on the cost of managing this risk to customers.*

4.1 Regulatory Pricing Objectives

To be consistent with the regulatory objectives, prices should reflect efficient outcomes, provide GAWB with revenues necessary to promote sustainable investment and take account of the public interest (Section 3.2). While revenue adequacy is intended to ensure regulated businesses have appropriate incentives to invest in regulated service provision, there should be no guarantee a return will be achieved on all investments made by a service provider, or that its financial viability will be maintained under all circumstances.

4.2 Efficient Pricing

Alternative Approaches

There are a number of alternative approaches to pricing, including average cost pricing and marginal cost pricing.

Average cost pricing is effective for ensuring sufficient revenue to sustain the investment made by the regulated business. However, because prices are not based on the cost of the additional unit of consumption, it does not generally promote efficient outcomes. Average cost pricing generally fails to signal the implications of continued growth in demand or upcoming capacity constraints.

Marginal Cost Pricing

Marginal cost pricing can provide the correct economic signals for water use decisions and best reflect the outcomes of a competitive market. There are two broad options for determining efficient prices - short run marginal cost and long run marginal cost.

Short run marginal cost (SRMC) is the change in total costs when an additional unit of output is produced in the short term. If a small increase in demand can be accommodated within the existing capacity, then prices will be low as they reflect only the SRMC. However, as capacity is utilised, operating costs will eventually increase. After an investment response, prices based on SRMC would typically decline. This results in prices fluctuating, sometimes widely, producing a 'saw-tooth' pattern. The typically cyclical pattern in pricing is generally not acceptable to users desiring price stability, nor does it necessarily send a long term signal about the costs of future supply.

Long run marginal cost (LRMC) is the change in total costs when capacity is increased to produce an additional unit of output. LRMC comprises the SRMC as well as marginal capacity costs (MCC) associated with any unit capital costs of expansion. LRMC pricing is therefore a forward-looking concept incorporating the longer term cost implications of any augmentations arising from an increase in current demand expectations. In effect, LRMC smoothes the 'saw-tooth' pricing pattern characteristic of SRMC. LRMC reduces to the SRMC where no augmentation is considered necessary.

Other Jurisdictions

IPART's price determination for Sydney Water for 2003-05 notes that although LRMC is theoretically correct and generally accepted, there is no definitive empirical evidence that it is effective (IPART, 2003). IPART's determination recommended an increased emphasis on usage charges, to provide a greater incentive for customers to manage their water consumption.

For the ICRC's 2004-05 to 2007-08 ACTEW price direction, regard was given to the LRMC of supply (ICRC, 2003). However, it was not the primary determinant of volumetric prices. The ICRC's final determination addressed the consistency of the tariff structure against a spectrum of public interest matters.

GPOC (2004) recommended LRMC pricing for Tasmanian bulk water providers, tailored to the circumstances of each supplier. GPOC recommended that the volumetric price at each node (supply point) should reflect the LRMC.

Ofwat (2003) has adopted LRMC pricing as a general principle in its tariff determinations for UK water companies, requiring that volumetric rates be set to reflect LRMC as closely as possible, to provide appropriate incentives to promote economy in the use of water.

ESC (2004b) has not indicated a specific view in relation to LRMC, but has indicated that service providers will be required to propose prices that are structured to provide incentives for the sustainable use of Victoria's water resources, by providing appropriate signals to customers about the costs of providing particular services. The ESC's initial view is that water businesses are best placed to design tariff structures that reflect the underlying costs of providing services.

Stakeholder Comment

GAWB supported the Authority's previous recommendation that 'variable prices' be based on estimates of LRMC.

QCA Analysis

The principles of LRMC pricing appear to have been widely accepted among water pricing regulators. The approaches adopted by IPART and ICRC for setting volumetric charges have had regard to LRMC and other more subjective parameters, such as the impact of changes in technology and policy on the cost and availability of supply augmentation options. IPART (2002b) noted that the estimate of LRMC would vary over time due to these factors. GPOC and Ofwat reinforce the importance of prices reflecting LRMC as closely as possible.

In assessing pricing matters, the Authority is required by the *QCA Act* to have regard to a range of economic efficiency and public interest matters (Section 3.2). The Authority considers that setting volumetric charges according to LRMC is generally consistent with delivering these outcomes. In regard to economic efficiency, the Authority considers that LRMC:

- provides a signal to consumers in terms of the long term costs of supply, recognising that current consumption has implications for future capital investment as well as current operating costs; and

- compared with SRMC pricing, promotes stability of variable and fixed charges, in a manner which reinforces relevant pricing signals.

LRMC prices also satisfy public interest objectives by encouraging strategies such as demand management and alternative water use technologies which may defer investments in major augmentations. At the same time, LRMC pricing is consistent with ensuring that socially desirable investment is not discouraged and that services are available to consumers. LRMC based pricing is of particular relevance to GAWB as the augmentation options it confronts are typically large. Furthermore, the major customers are long term industrial users typically seeking pricing certainty.

Where there is no imminent capacity augmentation, or there is substantial uncertainty regarding augmentation, the LRMC estimation may be equivalent to short run marginal cost (SRMC). This issue was also emphasised by Turvey (1976), Ofwat (2001) and more recently by GPOC (2004).

The Authority proposes that prices should incorporate the LRMC of providing infrastructure services.

Tariff Structures

A concern with marginal cost pricing is that, where marginal costs are below average costs, prices based purely on marginal cost will not generate sufficient revenue to maintain the provision of services. Alternatively, where marginal costs are above average costs, prices will result in excess revenue being generated.

Where the marginal costs of production decrease with output growth, the resulting revenue shortfall is typically addressed by using a two part (or a multi part) tariff incorporating a volumetric or usage charge and a 'fixed' (not related to actual consumption) or 'access' charge.

Where the business exhibits increasing marginal costs, prices based on marginal costs may generate an excess of revenue above that required to maintain revenue adequacy for the entity. Options on how any excess revenues should be allocated include: the payment of additional dividends to shareholders; the establishment of sinking funds to provide for future

augmentation; or the provision of a rebate to users, in the same way that a surcharge or an access component would be applied when marginal cost is falling.

In its previous investigation of GAWB's pricing practices, the Authority recommended that GAWB apply two-part tariffs, with a volumetric charge set to promote efficiency and an access charge set to promoting revenue adequacy.

Stakeholder Comments

GAWB supported the application of two-part tariffs based on LRMC. However, GAWB proposed a change to how LRMC-based two-part tariffs are derived over time. It suggested that access charges should be fixed for a 5-year period with variable charges based on LRMC allowed to escalate or deflate in each year of the 5-year period, in line with LRMC estimates, as future capacity augmentations approach.

GAWB noted that under LRMC pricing, the volumetric charge would increase as augmentation nears, requiring the access component to be reduced as a proportion of the total charge. GAWB's proposal was that, rather than reduce the access charge in these situations, it should be kept constant. This would result in the total price increasing prior to augmentation, and then decreasing once the augmentation is in place.

QCA Analysis

In the Authority's previous recommendations, the volumetric component of the two-part tariff was to be set according to LRMC, with the access charge derived as the residual to meet GAWB's revenue requirement. Under the Authority's approach, the LRMC was based on a 20-year planning horizon, with LRMC re-estimated at the commencement of each 5-year review period. The tariff was to be established for the initial year of the regulatory period and escalated by CPI for each subsequent year of the regulatory period. It was proposed to retain the same tariff structure throughout the regulatory period and reset it at the next review. Hence, if a major augmentation becomes imminent, at the time of the next review the volumetric charge would increase and the access charge decrease within the total charge. After the augmentation, the volumetric charge would decrease and the access charge would increase at the time of the next review.

GAWB has instead proposed that the access component be held constant for each year within the 5-year regulatory period, and that the volume component should be recomputed each year to reflect changes in LRMC. Such a proposal might provide greater revenue certainty for GAWB at the expense of greater uncertainty and price volatility for customers who are international price takers. It would also involve greater administrative complexity and more scope for disputation.

The Authority proposes that a two-part tariff with a volumetric charge based on LRMC be adopted over a regulatory period with no annual adjustment to the LRMC or to the access charge. LRMC would be re-estimated at the commencement of the next regulatory period. As an augmentation comes closer, the LRMC will increase and the proportion of the access charge in the total charge will decline.

The Authority is aware that, as the access charge is progressively reduced, there may be incentives for customers to contract for additional volume to lower their holding costs for any planned increase in demand or to secure additional allocation in times of impending scarcity. However, once the augmentation is in place, the LRMC would decline and the access charge would again increase. Hence, customers should have an incentive to ensure that contracted volumes closely match actual demand volumes over the long term.

The Authority's proposed approach would provide stability in the total price and certainty for customers over the regulatory period, while meeting the objectives of efficient prices and revenue adequacy. It also provides sufficient signalling of any impending augmentations, while recognising that LRMC is subject to change over time as technology, government policy and other circumstances change.

The Authority proposes that GAWB should apply a two part tariff structure. The components of that structure should be held constant in real terms over a regulatory period.

Estimating LRMC

A major drawback with using LRMC is the difficulty of estimation. In an analysis for IPART, the CIE (2004) noted that LRMC can be difficult to estimate, because it is a forward looking measure dependent upon demand and future capital works programs (and therefore technology and unit cost forecasts), timing issues and changes in operating costs.

The Authority's previous GAWB investigation identified two alternatives for measuring LRMC:

- the present worth of incremental costs as devised by Turvey (1976) and applied by Hanke (1981). Turvey's method determines LRMC as the difference between the present worth of the next planned capital investment and the present worth of delaying that capital investment by one year. The result is then divided by the increment in demand, to arrive at a unit marginal capacity cost. The difference in the marginal operating costs associated with the delay is also included; or

- average incremental costs (AIC). This approach essentially determines an average incremental cost over a designated planning horizon. It takes additional operating costs in each year (compared to present operating costs) plus capital expenditure and expresses the result in present value terms on a unit basis. It requires estimates of cash flows over a nominated planning horizon, which may incorporate future augmentations.

It was subsequently recommended that, subject to the revenue adequacy requirements of GAWB, GAWB's prices be based on the long run marginal costs of providing services, on the basis of the Turvey method. The Authority considered that the Turvey method provided a more appropriate estimate of LRMC than the average incremental cost (AIC) method - as it more closely reflected incremental costs.

The Authority has since become aware that, in a number of instances (not related to GAWB), the Turvey and AIC methods have been applied with significant differences in estimates of LRMC being derived.

Other Jurisdictions

Ofwat (2001) has noted Turvey and AIC as the two leading alternatives for estimating LRMC, but has not indicated a preference for either method. However, AIC has more recently been identified by Ofwat as the more common methodology adopted by water companies in the UK.

Stakeholder Comments

GAWB indicated that it does not have a strong preference for either the Turvey or AIC methods.

GCC and CSC submitted that the estimation of LRMC can differ markedly depending on the methodology employed and that the different methods for deriving marginal cost and average cost should be reviewed. The Councils suggested that perhaps an average of the Turvey and AIC method should be taken to prevent significant changes between regulatory reviews.

QCA Analysis

Published literature on the approach for calculating LRMC is limited and has not been significantly advanced since the early defining works were written by Turvey (1976), Hanke (1981) and Mann et al (1980).

The Authority commissioned Marsden Jacob Associates (MJA) to undertake a review of alternative methods for estimating LRMC, focusing on the Turvey and AIC methods. A more comprehensive overview of the two methods, based on analysis by MJA, is provided in Appendix 1.

MJA noted that both approaches incorporate a component for SRMC and a marginal capacity cost (MCC). In both methods, the SRMC is based on estimated marginal operating costs.

MJA's interpretation of the Turvey method is based on published literature which recognises only the next increment in capacity and ignores any future increments that may exist in the planning period.

MJA also note that, based on the literature, there is some uncertainty as to whether the SRMC in the Turvey method should be based on the immediate SRMC or the SRMC following the first upgrade. The Turvey method may also be appropriately adjusted to account for residual values at the end of the planning period.

In the AIC approach, SRMC is the present value of marginal operating costs over a designated planning period. The AIC method estimates the MCC as the present value of a stream of capital costs needed to satisfy projected demand increments, divided by the present value of the stream of demand increments. Where the AIC method is not derived over the full asset life, a residual value should be established at the end of the planning horizon.

Two additional issues are relevant. The first is the reason for adopting demand rather than capacity in the denominator when the LRMC is effectively seeking to defer capacity augmentation. Setting prices against capacity and then charging on the basis of contracted volumes would result in a revenue shortfall wherever there is efficient excess capacity (as occurs in GAWB). A second issue is reliance upon discounted demand in the denominator. With revenues discounted, and a unit cost measure required, discounting of demand is required for consistency.

MJA noted that the two approaches would generally not give the same estimates for marginal capacity cost (MCC). MJA assessed the alternative approaches against the key principles of:

- *demand efficiency* - users should be charged no more or no less than it costs to produce the unit of service to them;
- *supply efficiency* - the water utility should be able to recover sufficient costs to sustain the provision of services required by customers;
- *a solid theoretical foundation* – any cost concept or methodology employed should be based on solid theoretical framework;

- *fairness and objectivity* – the pricing methodology should be based on objective decision criteria and result in a fair outcome;

- *pricing stability* – the charges, and components making up the charges, resulting from application of the methodology should not fluctuate substantially from year to year;

- *transparency and reliability* – the pricing regime should be explainable and credible to consumers and defendable to government and regulators and minimise potential for error;

- *practicality and ease of understanding* – the pricing methodology should be understandable, easy to use and practical; and

- *flexibility* – the methodology when applied to different circumstances should be adaptable and sensibly yield different outcomes.

MJA's analysis concluded that both methods meet the criteria of demand and supply efficiency, are based on a solid theoretical foundation (despite some lack of clarity in specification of the Turvey method) and are fair and objective. However, MJA's assessment of the practical application of the two approaches favoured the AIC approach on the grounds that:

- the AIC approach incorporates all augmentations over the planning period, not just the first augmentation as is the case with the Turvey method. Hence, it will produce more stable prices over the planning period;

- it has advantages in cost and decision rules being fully transparent and readily explainable to stakeholders; and

- it is easy to understand and computationally straight forward, despite a requirement for forward looking data for capital and associated marginal operating costs which is more comprehensive than that required for the Turvey method.

The Authority considers that the instability associated with the Turvey method could be rectified by taking into account all capacity increments envisaged over the planning period. Further, the Turvey method may also be appropriately adjusted to account for residual values at the end of the planning period.

A more fundamental issue with the Turvey method is that it has not been fully developed in the academic literature and there is some imprecision in its application. There is greater clarity on the practical application of the AIC method.

The Authority considers that the Councils' suggestion that both methods should be used and averaged would impose unnecessary additional computational constraints and would make the resulting LRMC less transparent and more complex.

Given that both methods are acceptable on conceptual grounds, the Authority considers that either method could be used provided that:

- all planned augmentations are incorporated – this is automatically the case with the AIC method. While the Turvey method can be adapted to incorporate all augmentations, it essentially then becomes a variation on the AIC method; and

- both incorporate a residual value.

However, based on MJA's analysis, the Authority is now predisposed toward the AIC method on the basis that it is more transparent and explainable, and is generally the preferred method in empirical practice, most notably by UK water businesses.

The Authority proposes that LRMC may be estimated by either the Turvey or Average Incremental Cost (AIC) method provided that all augmentations in a planning period and associated residual values are incorporated. The AIC method is preferred as being more transparent and explainable.

4.3 Application of Two Part Tariffs to GAWB

Background

In its previous investigation, the Authority recommended that a two-part tariff apply to each class of customer, with a volumetric charge based on LRMC estimated using the Turvey method and an access charge comprising the residual required to achieve required revenue. The two-part tariff was established for each customer by aggregating the estimated LRMC for each relevant segment and the estimated access charge for each segment.

Stakeholder Comments

GAWB proposes to implement contracts for all customers incorporating a two-part tariff with a 100 % take-or-pay access charge based on contracted volumes. GAWB has further proposed separate two-part tariffs for water availability and the delivery system, because of their different cost drivers. Water availability would reflect storage services and be provided under a Water Contract. The Water Contract would be based upon a set ('reservation') volume, with year-to-year variations in sales limited to reflect a trend in demand.

For storage services, GAWB proposed a two-part tariff comprising of:

- a Water Access Charge ($/ML) payable on the annual reservation volume calculated as a constant access charge (fixed for 5 years, or subject to annual CPI), and

- a Water Volume Charge ($/ML) paid on the actual volume consumed and based on the LRMC of storage services. In addition, a 50% load-factor is proposed where consumption exceeds the reservation volume. Where GAWB has been informed beforehand of the excess consumption and the impacts can be managed by GAWB at no additional cost, the excess charge would not be imposed.

GAWB also proposed a two-part tariff for delivery services comprising of:

- a Delivery Capacity Access Charge ($/ML/s) payable on the maximum instantaneous flow rate specified in the contract; and

- a Delivery Volume Charge ($/ML) paid on the actual volume of water delivered to the supply point and based on the LRMC of delivery services. An 'excess instantaneous charge' based on a 50% load-factor is proposed where the required maximum instantaneous flow rate exceeds the contracted rate. Where customers inform GAWB of a requirement to exceed their contracted instantaneous flow rate, and the additional consumption imposes no cost on GAWB or other customers, the excess instantaneous flow rate charge would not be applied.

GAWB proposed to introduce tradability for Water Contracts, with trades subject to its approval because of concerns over counter-party default risk. Customers who purchased water contracts from other customers would pay the associated storage access charge plus the standard volumetric rate for each unit of water consumed.

CS Energy considered that difficulties exist for GAWB in planning and price setting where there is a difference between volume of water actually used by customers compared with their individual contractual allocations.

Comalco submitted that a framework for water trading be established within the user community, or at least between entities related through ownership.

CPM submitted that the regulator's pricing calculation must be based on the higher of contractual or actual volumes as, if GAWB has a contractual requirement to provide capacity to a certain customer, the costs of doing so must not be carried by other users. Further, regulatory pricing should also accommodate 'banking' of water entitlements (i.e. it would be more efficient for CPM to store water in Awoonga Dam, as property of CPM, until it is required).

QCA Analysis

Issues in applying two-part tariffs to GAWB include:

- the proposal to separate charges for the storage and delivery components (separate two-part tariffs) rather than in a single two-part tariff;
- the basis for establishing access charges for storage services, with options including actual usage, contracted entitlements or anticipated demand;
- the basis for volumetric charges for storage;
- the basis for establishing access charges for delivery services, with reference to instantaneous flow rates;
- the basis for volumetric charges for delivery;
- the use of load factors where customers seek more storage or delivery services than specified in their contracts; and
- 'banking of water'.

Separate Two-Part Tariffs

GAWB's proposal to separate storage and delivery two part tariffs is consistent with the approach adopted in the Authority's previous investigation. The Authority's previously recommended prices were based on the LRMC-based volumetric charges for each segment. Storage and delivery charges were separable although indicative prices were expressed as a single price. The Authority considers that GAWB's proposal provides greater transparency and opportunities for greater flexibility for customers.

Basis for Access Charges - Storage

GAWB's proposal to calculate access charges for the storage two part tariff using contracted demand is considered appropriate as contracted demand (or the reservation amount) is a key driver of capacity and therefore costs.

Such an approach, however, could result in higher costs for existing customers where these customers have over time reduced their demand relative to that specified in historical contracts.

Existing customers in this position could trade their unused contract volumes to other customers. However, such opportunities may be limited when GAWB has additional capacity available for new customers. Nevertheless, as customers' requirements drive capacity, these arrangements are considered appropriate.

Customers will need to accurately forecast long term consumption in order to ensure a close match between contracted and actual usage. Any strategies by customers to take advantage of lower access charges where an augmentation is imminent would need to be balanced against the cost of meeting higher access charges once the augmentation is in place.

Basis for Volumetric Charges for Storage

As noted in Section 4.2 above, the Authority proposes that the volumetric charge be based upon the LRMC, estimated using the AIC method. GAWB's proposal is consistent with the proposed approach to estimating LRMC.

Basis for Access Charges - Delivery

GAWB's proposal for delivery system charges is based upon the maximum instantaneous flow rates required to service each customer.

GAWB's proposal to adopt this may result in significant permanent increases in access charges for customers with low levels of 'normal' demand but high peak demand relative to other customers in the network segment. However, given that their usage patterns require such capacity, such an outcome would be consistent with cost reflectivity.

Load Factors

GAWB has proposed a 50% load factor for excess storage and/or delivery usage as an incentive for customers not to understate anticipated demand and the associated contract reservation volumes. The load factor is proposed to apply to the access charge or take-or-pay component.

Where customers underestimate their demand they face the prospect of a lack of supply. However, they also potentially impose costs on other customers through higher prices due to the threshold effects associated with many costs. To remove the incentive for such strategic approaches to estimating demand, and having regard to the costs imposed, some form of penalty is therefore considered necessary.

The arrangements proposed by the Authority in the Dalrymple Bay Coal Terminal (DBCT) draft decision (QCA 2004) provide for:

- a 25% additional infrastructure charge to apply to incremental throughput levels between 110%-125% of contracted capacity; and

- a 50% additional infrastructure charge to apply to incremental throughput levels greater than 125% of contracted capacity.

Such a potential penalty should provide the necessary incentive for industrial customers to estimate demand appropriately. Progressively higher penalties provide some buffer for genuine exigencies related to such forecasting.

However, having regard to the greater inherent difficulties associated with estimating urban demand by Councils, it is proposed that:

- no additional infrastructure charge apply where demand is less than 125% of the contracted amount; and

- a 10% nominal additional infrastructure charge apply where demand is more than 125% of the contracted amount.

Where customers overstate demand in contracts, they can impose additional infrastructure capacity costs and it is considered appropriate that GAWB recover such costs through the access charge for the contracted volume. This is consistent with GAWB's proposals and the Authority's arrangements relating to the DBCT although, in that case, take or pay arrangements operate within a band of 90 to 110% of the contracted amount.

Banking

Banking of water demand for future use is a valid prospect. However, in the absence of any particular proposals, specific comments cannot be provided.

The Authority proposes that:

- **two-part tariffs be applied separately to storage and delivery services for each customer;**

- **a 100% take-or-pay component should be incorporated in access charges based on contracted volumes. GAWB should be able to vary contracted volumes at its discretion in response to customer requests;**

- **where actual demand exceeds the contracted volume for industrial customers, unless otherwise negotiated with GAWB, a load factor of**

  - **25% apply to the access charge where actual consumption is between 110% and 125% of the contracted amount; and**

  - **50% apply to the access charge where actual consumption is higher than 125% of the contracted amount;**

- **where actual demand exceeds the contracted volume for Council customers, unless otherwise negotiated with GAWB, a load factor of 10% apply to the access charge where actual consumption exceeds 125% of the contracted amount.**

The Authority invites specific proposals on the 'banking' of water for future use.

4.4 Differential Pricing

Where there are differences in the cost of providing services, differential prices provide appropriate incentives to users and service providers to use resources and services in a cost-effective manner. At the same time, it may not be possible or cost-effective to differentiate in this manner.

Key issues in regard to price differentiation relate to geographic differences, the pooled pricing arrangements for GAWB's Council customers, pricing between new and existing customers,

and pricing for different supply reliability standards. Other potential sources of price differentials include counter-party default risk and contract length.

Geographic Differentiation

The Authority's previous investigation recommended that differentiated prices be adopted for each of the identified geographic segments of the network, as GAWB's water supply system has a number of clearly defined components and involves specific infrastructure to supply customers in defined geographic areas.

The Authority noted that the establishment of prices for each class of customer is more cost reflective than equalised or system wide charges, and does not add to administrative costs or complexity, as GAWB already identifies costs on such a basis.

Stakeholder Comments

GAWB's submission supported retention of geographically differentiated pricing for delivery services.

CPM submitted that customers served directly from Awoonga Dam should not have to pay proportionately for the costs of augmentations elsewhere (e.g. Castle Hope Dam) where they do not receive proportional benefits. CPM further argued that the Authority should maintain a 'dam only' segment for price differentiation.

QCA Analysis

The Authority recognises that GAWB's water supply system has a number of clearly defined network components which result in significant differences in costs for servicing customers according to their location. Consistent with cost-reflective pricing principles, geographically differentiated prices should continue to be applied by GAWB.

GAWB has identified the same operational sectors as identified in the previous investigation:

- raw water sectors - Awoonga Dam; Awoonga to Toolooa; Toolooa to Gladstone (Fitzsimmons St Reservoir); Gladstone (Fitzsimmons St to Gladstone Water Treatment Plant); Gladstone to Boat Creek Junction (Mt Miller pipeline); Gladstone to Yarwun (existing Hansen Road pipeline); Boat Creek Junction to Yarwun Water Treatment Plant; Boat Creek Junction to Fishermans Landing; and Boat Creek Junction to Aldoga. In addition, there are customer spurlines from Toolooa to Boyne Island, Gladstone to Parsons Point and Boat Creek to East End Mine; and

- treated water sectors - Gladstone Water Treatment Plant to Gladstone City and Calliope Shire Councils, with specific sectors for Gladstone area industrial customers (including NRG, QAL and the Gladstone Port Authority) and to Boyne Island industrial customers (including Boyne Smelters Limited). Supply from the Yarwun Water Treatment Plant to the northern industrial area and Mt Larcom are recognised as separate sectors.

The future addition of new supply sources may require a reconfiguration of the operational sectors and different aggregations of common infrastructure for pricing. However, such reconfiguration is not envisaged at this stage.

The Authority concurs with CPM's comments regarding a dam only sector. However, the separation of a storage sector would become more complex should a storage augmentation be required in a different location, for example, the Fitzroy or Calliope River. Some customers

may be able to source water directly from both storages, while others may only be able to source water from one of the storages. The allocation of costs in such circumstances would need to be revisited. As noted above, the Authority agrees with GAWB's proposed separation of tariffs for storage and distribution services.

The Authority proposes that prices be differentiated for all customers according to their utilisation of specific components of GAWB's infrastructure network.

Differentiation between Councils

In its previous investigation, the Authority recommended that differentiated prices be adopted for all customers, with the exception of Gladstone City Council (GCC) and Calliope Shire Council (CSC) which were to be treated as a single entity. The exception for the two Councils was allowed on the basis of a joint submission made by the two Councils and CSC's advice that '*the decision to originally form the water board clearly shows that the provision of water supply to the region has no relationship to the location of local government boundaries*'.

Stakeholder Comments

GCC has submitted to the Authority's current investigation that the previous approach of price equalisation should no longer be adopted. GCC's submission noted a Council resolution that, in the interest of the City's ratepayers, representations should be made to the Authority for non-equalised pricing to be reconsidered as part of the current investigation. GCC argued that:

- the extent of cross-subsidisation between GCC and CSC was not fully appreciated at the time of the previous investigation;
- pooling prices with CSC would result in Gladstone end users paying more than otherwise would be the case, while Calliope residents would pay less; and
- had any alternative approach to supplying CSC been considered at the time of the original decision, it would have resulted in Calliope residents paying a significantly higher price for their water than currently.

CSC submitted that equity is a critical reason for the pricing review process. It argued that no thought has been given to the price implications of the pre-existing network configuration and the consequential winners and losers created by this configuration.

CSC submitted that GAWB's pricing should not adversely impact on Calliope customers, simply because of the current network configuration, which was constructed 'because of both historical and overall efficiency reasons'. Furthermore, CSC submitted that under differentiated pricing:

- Calliope would 'pay for 3 times the length of main that would be required if the treatment and delivery system was optimal for Calliope Shire residents'; and
- a greenfield approach to asset valuation and optimisation would be more equitable, which could include relocation of the existing water treatment plant to Benaraby, or establishment of a new water treatment plant.

GAWB submitted that the most appropriate method of delivering price equalisation across the Councils is for the Councils to directly manage the process, that is, outside the regulatory framework.

QCA Analysis

The basis for the Authority's previous recommendation to support common pricing was that:

- there was an historical arrangement for a common price between the two Councils, on the basis that GAWB was established as a regional service entity with no regard to local government boundaries; and

- the Councils continued to support pooled pricing in submissions to the Authority on the previous investigation.

Historical Arrangements

The Authority notes CSC's arguments that, at the outset of the water supply scheme, various matters were agreed in relation to infrastructure location and other decisions on the basis of future pooled pricing arrangements. In particular, the Authority has noted comments by the Co-ordinator General (July 1971) when proposing to increase the storage capacity of Awoonga Dam and the establishment of a Water Authority to manage the envisaged water supply augmentation programme for the Gladstone-Calliope area that:

> . The Calliope Shire Council has expressed its anxiety at the fact it has not been permitted to investigate its own independent source of water for supplying water to the newly developing areas in its shire. (This would, in effect duplicate part of Gladstone Town's system and would not lead to efficiency on an overall regional basis.)
>
> In the report [Gladstone Infrastructure for Development Report] and its substantiating reports the scheme envisaged to supply water to the Gladstone-Calliope Area is an integrated one, developing initially the full potential of the Boyne River Catchment.

It seems clear that, in establishing GAWB and its treated water distribution network, it was the Government's intention to adopt a regional approach for the supply of treated water for domestic consumers in both Councils. Government subsidies were provided for regionally based infrastructure to service domestic customers. There has been no departure from a common pricing policy for the two Councils since the inception of the Board.

It is evident, however, that when GAWB was established in 1976, water pricing was based on recovery of direct operational costs for water treatment and delivery only. Following commercialisation of GAWB and adoption of full-cost pricing including a return on capital and return of capital, the cost differentials between the two Councils have become more marked.

Issues relating to Differentiated Prices

Differential or nodal pricing for each Council, with separate prices for CSC according to its major geographic residential precincts, would be consistent with the cost-reflective pricing principles recommended for GAWB by the Authority.

Differential pricing under current supply arrangements and assuming no change to infrastructure would be likely to result in a substantial price rise for CSC and its domestic customers, while delivering slightly lower prices to GCC.

Differential pricing could induce CSC to put in place alternative arrangements to bypass GAWB's treated water supply.

Were CSC to actually adopt a bypass option, GAWB would likely have some redundant assets (such as the Gladstone Calliope pipeline and some water treatment capacity) and GCC (and other treated water customers) would be required to meet some of the cost of spare treatment

plant capacity. However, CSC would also incur costs involving treatment costs and trunk mains to supply Calliope and Tannum Sands.

Hence, overall regional supply efficiencies sought by the Queensland Government may not be achieved.

Conclusion

The Authority is generally predisposed to prices reflecting cost differences necessary to service different customer groups where these can be clearly identified. Differential pricing meets the objective of economic efficiency by providing appropriate pricing signals to different groups.

However, the Authority considers that pooled pricing should be maintained in this instance on the basis that past government policy was designed to provide a least cost solution for the regional community as a whole. There is no evidence that this intention was to only apply for a limited period of time, although the issue may be revisited once the installed assets require replacement.

The Authority considers that a pooled price be maintained for Gladstone City Council and Calliope Shire Council.

Differentiation between Existing and New Customers

Depending on the rate of growth in demand and the availability of augmentation options, augmentation may result in a significant level of excess capacity being present for a lengthy period of time.

GAWB, being a bulk water supplier primarily to large industrial customers, must manage potentially large demand increments. GAWB can respond to such demand growth in many ways. For example, it can expand capacity in anticipation of demand growth, adopt a just-in-time approach to capacity augmentation or adopt a lagged growth strategy with augmentation delayed until the costs of excess capacity are minimised.

Two key issues are:

- who should bear the costs of the augmentation - users of existing capacity (existing users), users of new capacity (new users), all users, the shareholders of GAWB or other sponsoring authorities (such as the Queensland Government which may wish reserve capacity to be held for development purposes); and

- how those costs should be allocated.

Stakeholder Comments

GAWB agreed with the Authority's previous recommendation that pricing should not differentiate between new and existing customers.

GAWB also proposed a mechanism to offset the infrastructure risk associated with new customers in the form of a requirement to pay access charges to secure an allocation prior to commencement. GAWB proposes to charge 'perhaps 25% of the associated access charge' where spare capacity exists, to avoid the situation where customers can take 'speculative free options over future capacity (and increase uncertainty about actual future requirements for capacity)'.

GAWB submitted that it 'will not commit to providing future water availability or delivery capacity without compensation for: the development costs of providing the additional resource; and/or the opportunity costs of not selling the water availability or delivery capacity to other customers'.

As an alternative, GAWB proposed that customers could lodge a formal request for future water availability or delivery capacity, which will be entered into a queue, with priority based on the order of receipt. GAWB submitted that customers would be removed from the queue if they did not enter into contracts (attracting access charges) when GAWB is required to spend money to develop additional capacity, or has a request from another customer willing to pay the access charges.

CSC's view was that 'if one customer can cause a major augmentation of the Board's infrastructure, it would seem unrealistic that they should not be called upon to pay some form of premium for the impact they have had on the Board's other customers.'

GCC and CSC proposed that potential future prices be compared under two scenarios - one for existing customers only, and without the demand and associated infrastructure of new customers (i.e. optimize out excess capacity), and the other with the demand and infrastructure of both new and existing users. They proposed existing customers should only pay the lower of these two options.

CSC also noted that:

- as the Authority's role is in pricing models, not in establishing new industry, Government could subsidise the water costs of new industry, thereby not impacting on the water price for existing water companies; and

- the cost per ML of each subsequent augmentation is likely to be higher than the previous augmentation, which means that the LRMC of water will increase as a result of each augmentation. These new customers should pay some form of premium or headworks charge to offset the negative impacts on existing customers.

Comalco noted that Government policy to establish Gladstone as a major regional industrial base should not be at the expense of generating risk to established and new users. Comalco argues that augmentation of existing water capacity should be paid for by existing users, to the extent that it is required to sustain their own business through organic business growth, but that existing users should not fund augmentation for potential future users.

QCA Analysis

The Authority has previously recommended that new and existing users pay the same price for the common infrastructure costs of providing water. The rationale was that it would be inequitable to charge a different price for the same service, and further that regional development would be promoted by such an arrangement.

The Authority notes CSC's comment that the Authority's role is in pricing and not in establishing new industries. Nevertheless, the Authority is required to take into account regional development effects of its pricing decisions.

To further expand on its previously stated position, the Authority considers that, where a facility requires expansion because of the demand of new users, both the existing and new user are in a position to adjust their demand to minimise the extent of augmentation required. Thus, to the extent that they utilise common infrastructure, both should receive the same price signal to review their requirements. Under the current contractual proposals, a reduction in demand by

an existing user in response to prospectively increased costs should result in a reduction in their access charge, as GAWB would be able to on-sell the associated surplus capacity to those users whose demand could otherwise create the need for the additional capacity. In this way, regional development is promoted because costs are kept at a minimum.

In regard to Comalco's concern that existing users should not fund augmentation for potential future users, the Authority has previously noted its preference for supply risks to be managed through contractual arrangements to avoid such a possibility. Should the Queensland Government require greater capacity to be available for regional development purposes than GAWB would wish to install for commercial reasons, then it is open to the Queensland Government to fund such an arrangement through a CSO or some alternative arrangement.

It should be noted that, in some instances, augmentation may result in the average cost to both parties being lower than would be the case in the absence of the augmentation (for example, where pumps might be used to increase flow rates). For this reason, it is critical that GAWB ensures that the augmentation is the least cost option consistent with possible commercial outcomes. The issue of optimisation of the asset base is addressed in Chapter 6.

The approach suggested by the two Councils of generating two sets of prices for existing customers, one including the augmentation and one excluding the augmentation, and taking whichever is lower, fails to signal the true resource costs to all users.

GAWB's proposal of an ongoing access charge to secure an allocation is considered to be a legitimate commercial practice. GAWB has also proposed, as an alternative, queuing arrangements as a strategy for managing uncertain demand risk relating to prospective customers. The Authority recognises that queuing principles are appropriate commercial practices for determining customer priority and level of commitment.

Issues related to differences in prices as a result of differences in customer risk are addressed in chapter 7 relating to WACC.

The Authority considers that, as a general principle, the cost of common infrastructure should be allocated to all existing and expected new customers, provided the costs represent the least cost option to meet projected demand.

The Authority also considers that access charges and queuing strategies proposed by GAWB are, in principle, valid commercial arrangements.

Differentiation on the basis of Supply Reliability and Service Standards

GAWB's contracts with customers reflect the 'historic no fail yield' of Awoonga Dam. The contracts do not currently incorporate any provision for different product specification which could be reflected in prices, or indeed, a standard level of service which may be used as a basis for pricing.

For regulatory purposes, specification of service standards and product descriptions are necessary as the service provider may exert its monopoly power by allowing service standards to decline in order to save costs in the short term.

Stakeholder Comments

GAWB has proposed that the Authority approve 'reference tariffs' for GAWB's standard reliability and quality products. GAWB proposes that it 'should be free to negotiate different prices for different products' with its customers and that prices for non-standard reliability

and/or quality products delivered through monopoly infrastructure should be negotiated between GAWB and its customers with the Authority's role limited to dispute resolution. Where prices can be determined through competitive markets, there would be no requirement for regulatory pricing.

CPM submitted that some users may be prepared to accept a 'standard' water supply arrangement, with supply from Awoonga Dam only, whereas others may be prepared to pay for a 'premium' service where supply reliability is bolstered by an alternative supply source.

CSC has submitted that customers should pay a water price that reflects their individual risk profiles, rather than a generic 'postage stamp' price for all customers that use each defined component of the network'. CSC argued that the Authority has not considered that some 'customers bear an increased risk profile than others', particularly where a higher level of drought supply restrictions are applied to Council customers than to industrial customers. CSC further submitted that customers should pay a water price that reflects their individual risk profiles, rather than a generic 'postage stamp' price for all customers that use each defined component of the network.

GCC also noted that Council customers face earlier and more severe restrictions during droughts than industrial customers. In order to be equitable, those customers who demand higher reliability should pay a premium for bulk water supply.

CS Energy submitted that, rather than vary reliability with regard to changes in hydrology, a scale of reliability with appropriate pricing will drive the customers to make their decisions on the basis of importance of continuity of water supply.

QCA Analysis

The Authority is aware that GAWB is examining options for alternative water products based on reliability of supply as part of its Strategic Planning Process, which includes the development of a Drought Management Plan (DMP). However, details of such water products and proposed arrangements to apply during periods of drought are not expected to be available until some time in 2005, and therefore cannot be considered in this investigation.

In principle, provided that proposed differences in reliability reflect differences in the cost of supply, differences in prices are appropriate. However, GAWB is yet to define different reliability products and it is not yet possible for the Authority to establish cost differentials for such products.

Consistent with the above, the Authority considers that there is merit in the arguments submitted by GCC, CSC, CPM and CS Energy, that customers should pay a price that reflects the risk profiles and reliability tolerances required by individual customers.

To provide a basis for such negotiations, the Authority considers that GAWB should, in conjunction with its customers, identify relevant characteristics suitable as a basis for contractual purposes. These could include:

- continuity of service, and the level of reserve or back-up supply where system outages or breakages occur, for example, hours of supply available;
- water quality and level of chemicals in treated water;
- pressure requirements for customers' needs and specialised purposes such as fire-fighting; and

- capacity and time taken to respond to system breakages and failures, such as lightning strikes and pump or pipeline failure.

The Authority considers that prices should reflect service quality and service standards to the extent this involves cost differentials, and that GAWB should develop full product descriptions for contractual purposes, in conjunction with its customers.

Other Price Differentials

Stakeholder Comment

GAWB proposed additional potential price differentiation to be negotiated on a customer basis. These include:

- charges to reflect counter-party risk, and the greater probability of certain customers not fulfilling their obligations to pay future capacity charges. GAWB argued that customers with a 'poor credit rating' should have a choice between paying higher annual charges (which include the cost of insuring against default), prepaying charges or lodging a bond;

- price differentiation to reflect contract lengths varying from 20 years, as 'long term contracts provide foundation revenue for GAWB'. GAWB proposes that customers requiring a contract duration shorter than (more than) 20 years would attract a price premium (price discount); and

- 'contracts for differences' (CFDs) proposed to be offered to customers as an option to guarantee price certainty through the term of a contractual arrangement. While the contract would specify the tariff to apply, the separately negotiated CFD would set out how changes to the tariff would be accommodated for the customer. GAWB argues that the CFD would constitute a privately negotiated financial mechanism outside of the regulatory process.

QCA Analysis

GAWB's proposals for price differentiation on the basis of credit risk reflect established commercial practices, involving the use of security deposits or pre-payments, to deal with potential credit risk.

Given that prices are based on recovering costs over a 20 year planning period, a price premium could be justified where customers seek shorter term contracts reflecting a possible higher level of commercial risk. Similarly, if customers voluntarily elect to negotiate a CFD then such arrangements would be a commercial matter between the customer and GAWB.

The Authority proposes that price differentiation on the basis of credit risk, length of contract and for other differences is appropriate to the extent that the proposed response is commensurate with the cost of service provision.

4.5 Adjustments for Capital Contributions and Contributed Assets

Contributed assets are those assets that are funded or otherwise provided by a water user, or group of users, for their own benefit, or for the collective benefit of water users associated with a particular supply system. Recognition of past capital contributions for pricing is proposed by users on the basis of equity, as contributors of assets should not be required to pay a price for water that includes a return on capital for assets that they have funded. Recognition is also

justified by its proponents on the grounds of economic efficiency in that future investment could be discouraged if those water users who are required to make capital contributions do not receive a benefit proportionate to their contributions.

The general principle that 'double-charging' should be avoided is recognised in the National Electricity Code (NEC) and the National Gas Code. It is also reflected in the Local Government Guidelines for Full Cost Pricing in Queensland, which states that councils should not double-charge for the capital component of servicing new development areas.

GAWB has received various forms of funding contributions over the years. These include:

- capital contributions towards specific assets such as Awoonga Dam;
- funding to cover operational deficits;
- security deposits for construction of spur-lines to supply individual customers; and
- capital grants and subsidies from the State Government.

The Authority previously recommended that:

- capital contributions be recognised where there is evidence that the contribution was made with the intent of obtaining future price benefits; and
- contributed assets be included in the asset base for the purpose of determining the revenue requirement. And further, that rebates be incorporated in the prices for the relevant customers equal to the return on capital for the contributed assets, and be deducted from GAWB's revenue requirement.

Spur line infrastructure costs are directly attributed to individual customers, and are excluded from the regulatory asset base in determining other customer prices in that segment.

Stakeholder Comments

GCC submitted that contributed assets should continue to reduce the net price for Councils.

Comalco submitted that the Authority's pricing principles have not fully recognised capital contributions made in the past by some customers to GAWB and that mechanisms should be established to recognise these contributions. However, Comalco acknowledges that past contributions have in some cases been directed to meeting GAWB's operating costs rather than capital costs.

GAWB supported the Authority's previous recommendation in relation to contributed assets, but seeks clarification of whether capital contributions should be treated on a:

- 'physical' basis – valued in terms of service potential and subject to depreciation over the economic life of the assets; or
- 'financial' basis – valued in terms of the purchasing power of the original contribution.

GAWB sought clarification of the tax effect of recognising capital contributions on allowed revenue. GAWB also requested that the QCA revisit the methodology used to value each current capital contribution, determine the current price impact of each capital contribution and a mechanism for regulatory (asset base and pricing) treatment of each capital contribution going forward.

CSC noted that there still exists a need to rationalise the ownership of assets between CSC and GAWB as no resolution has been reached and discussions are set to continue between the two parties. In this regard, CSC argued that the previous investigation set a 'third party access' charge for the use of the CSC's assets (the treated water pipeline from Mt Miller to Fishermans Landing which is owned by CSC but services GAWB's customers) for GAWB to provide water to its own customers. CSC questioned the Authority's mandate in this respect and believes that any access fee should be negotiated between the owner of the infrastructure and those seeking access. CSC argued that the Authority's role is to adjudicate on disputes relating to market power only.

QCA Analysis

In its previous investigation, the Authority recommended that the value of contributed assets be included in the regulatory asset base, but with a corresponding rebate provided to the contributor to reflect the return on capital component in prices applicable to the relevant DORC value of contributed assets. A rebate was not provided for the depreciation component as available contractual information only provided for the return on capital component to be rebated.

In the previous investigation, the Authority also identified relevant considerations as being whether:

- there is any evidence that the contribution was viewed as a prepayment for future services;
- past price reductions have compensated the contributor for that contribution (determined by whether any past price reductions have exceeded the return on capital); and
- the contributed asset has been consumed and replaced.

In some instances, formal agreements attesting to the quantum of the capital contribution, its nature, or its purpose, were not available or there was a lack of clarity regarding those arrangements. In these circumstances, evidence of a capital contribution was sought from:

- the nature of the pricing arrangements evident from other sources, such as stated pricing policies and/or tariff schedules;
- the management arrangements as they relate to responsibility for certain risks and costs;
- the financial accounts of the contributor which may indicate a right, claim or expectation of future benefits; and
- the existence of capital development or other such charges, details of which may indicate that they are of the nature of a capital contribution with certain price benefits.

The Authority proposes to continue with this approach to past capital contributions where guidance is available from previous arrangements. Otherwise, and particularly for future capital contributions, rebates may include both the return on capital and the return of capital components. Contributors would then be compensated for all capital costs - provided their contribution was intended to reduce prices in this manner.

The Authority notes Comalco's concerns that some past payments have not been recognised. However, the absence of relevant information or written agreements means that the nature of these payments and their purpose is unclear. The Authority is therefore unable to recognise them as capital contributions for pricing purposes.

In relation to other specific issues raised in submissions:

- GAWB's description of a 'physical' basis for the treatment of contributed assets more closely aligns with the Authority's proposed approach, than GAWB's description of a 'financial' approach. The former is more closely related to cost reflectivity;

- in relation to tax implications, the Authority considers it consistent that, where the capital contribution attracts a tax liability to GAWB, the net cost should be recovered in the relevant customer's prices; and

- with respect to CSC's 'third party access' comments, the Authority previously recognised that some of CSC's treated water distribution assets were being used to service GAWB's customers in the northern industrial area. The costs attributed to these assets were included in maximum prices on the basis that ownership of the assets would be rationalised and that the assets were to be sold to GAWB. This has not yet occurred. The Authority considers that, until such a transfer is achieved, GAWB should provide a rebate to CSC equivalent to the capital charges for the relevant assets. Any such arrangements between CSC and GAWB were and remain a contractual matter for negotiation between the two parties.

The Authority also proposes that, where agreements in regard to capital contributions are re-negotiated between GAWB and customers, this would be treated as a commercial arrangement and would be recognised for pricing purposes.

The Authority proposes that:

- **contributed assets should be recognised where there is appropriate documentary evidence of a contractual or policy nature, and provided the contribution is not a prepayment for services, has not been fully repaid or rebated, and the associated assets have not expired or have been replaced at the service provider's expense;**
- **where contributed assets are recognised, they be included in the asset base for the purpose of determining the revenue requirement and prices;**
- **unless otherwise specified, rebates for future contributed assets should include the return on capital and return of capital components, provided their contribution was intended to reduce prices in this manner;**
- **in some circumstances, particularly where contracts stipulate, the rebate may be equal to the return on capital component only; and**
- **where the capital contribution attracts a tax liability, this would be included in customers' charges.**

4.6 Pricing for Exceptional Circumstances (including drought)

The previous investigation recommended that:

- the cost of insurance premiums for insurable force majeure events and administration and contract management costs associated with force majeure events should be incorporated into cash flow estimates;

- the potential cost of uninsurable force majeure events should not be incorporated into cash flows given they cannot be estimated with accuracy, but that when such events occur, prices may be renegotiated; and

- a consistent approach to force majeure should be adopted in customer contracts.

In relation to drought, the Authority recommended that the cost impacts of drought should be included in the revenue requirement, and that GAWB, in consultation with its customers and the Authority, should review the drought management options available, with the results to be incorporated into prices as appropriate.

A key issue in terms of the pricing framework is what costs of drought management should be included in prices, particularly whether foregone revenues arising from supply restrictions should be included, and the appropriate method for including legitimate costs in prices.

The Authority has also reviewed these issues in its investigation of pricing practices in response to extraordinary circumstances. Although the Final Report is yet to be released by the Ministers, relevant issues identified in that report are discussed below.

Stakeholder Comments

GAWB noted that it is presently revising its Drought Management Plan (DMP). GAWB submitted that its drought warning and demand restriction levels will be based on 'forward looking projections', reflecting seasonal considerations, and 'take as much account as practical of the lead times required by the customers to respond' as the majority of low cost, short lead time responses have been implemented as permanent measures following the 1996-2003 drought.

GAWB submitted that it has not determined whether the DMP will contain a trigger for a 'contingency response' to source alternative supply, but does argue that, if this is pursued, any 'preparatory expenditure should be included in operating or capital expenditures' for pricing purposes.

DSDI's submission raised security of supply as an important issue, given the extended drought endured in Central Queensland and the impact of climate change on management practices and long term water planning.

DSDI argued it needs to be recognised that any development in respect of enhanced security of supply or alternate sources of supply by GAWB may not be consistent with the 'just-in-time' planning and development strategies upon which the current asset valuation methodology establishes maximum price setting.

Further, DSDI suggested that consideration could be given for the inclusion of excess capacity within the regulated asset base for prudential management reasons, with the additional infrastructure priced to reflect the enhanced security of supply to users.

CPM submitted that GAWB should not be able to increase charges to water customers if supply was constrained due to drought. CPM also noted that the DMP should be negotiated between GAWB and customers. CPM suggested that the DMP should consider the extent to which different customers can restrict their demand and the costs of doing so and apply restrictions with these in mind, and where the costs of supply curtailment are to fall disproportionately on certain customers (or groups of customers) then pricing should be adjusted to reflect this.

CS Energy submitted that, in the recent drought, GAWB did not adhere to its DMP, by invoking reductions ahead of schedule and restrictions were not lifted as soon as possible.

QER submitted that:

- there was a lack of consultation with major industry prior to introduction of restrictions during the 2001-02 drought;
- alternatives offered by GAWB were not practicable and inadequate; and
- the preferred approach is to have GAWB provide maximum possible lead time in advance of restrictions implemented and that restrictions should be incremental so as to reduce the initial impact upon industry operations.

QCA Analysis

In regard to exceptional circumstances, the Authority notes, in its draft *General Pricing Principles for Investments made in response to Extraordinary Circumstances* (QCA, 2004), that prices should incorporate the costs of investment, operational and managerial responses where:

- the risk is commercially relevant;
- the service provider has acted prudently and could not have acted any earlier to address the risk at lower cost;
- the service provider is the most appropriate party to manage the risk; and
- the response is the most cost-effective.

In general, the Authority considers that drought risk is best managed by GAWB. GAWB is best placed to manage aggregate consumption to prolong supply and to determine the viability of alternative supplementary options or investments in more efficient water use practices. GAWB is therefore entitled to pass on the cost of managing this risk to customers.

Commercially based insurance premiums should therefore be incorporated in the cash flows for pricing purposes. Where it is inappropriate for an ex ante provision to be made, ex post responses that form the least cost response would be incorporated in approved prices as appropriate. In some instances, there may be insufficient time available for undertaking detailed investigation, and consultative processes may need to be truncated.

The Authority's observations in relation to the costs of lost revenue from supply restrictions are that:

- if GAWB is not compensated for prudent drought supply restrictions, there is no incentive for GAWB to apply such restrictions in order to prolong supplies for the benefit of customers;
- supply restrictions are desirable to provide signals for customers to implement efficient water use practices and seek substitution options; and
- without compensation for revenues lost through supply restrictions, GAWB would not achieve its expected return on its investment over time.

In respect of DSDI's concerns about inclusion of excess capacity for prudential management, this is primarily an issue of least cost response on which the views of GAWB, users and independent engineers would be required. The nature of water infrastructure investments is such that spare capacity is available most of the time, and full utilisation is achieved only for short periods. Provided the spare capacity reflects the least cost option, it will be reflected in

customers' prices. If GAWB and its customers do not require the maintenance of an additional buffer as suggested by DSDI, and it is required by Government for regional development purposes, then a CSO or some other financial arrangement would seem appropriate, until customers utilise the capacity.

The scarcity value of water can provide a means of allocating water to those most requiring it and able to pay. To the extent that prices reflect anticipated conditions and thus full cost recovery, no further compensation is required for GAWB. If further costs need to be incurred because of the unexpected nature of the prevailing conditions, then these costs should also be recouped by GAWB, potentially through higher short term prices.

Prices in excess of full cost recovery could also be imposed in the short term to reflect scarcity values and to ensure that available supplies are allocated efficiently. However, unless other resource rent arrangements are in place, there would seem to be a case to rebate the excess revenues received back to users at a later stage. One option is to rebate the revenues on the basis of a proportional reduction in the access charge. Such an approach would remove any incentive for GAWB to intentionally limit infrastructure capacity.

Concerns related to the implementation of drought restrictions and adherence to the agreed drought management practices, are not a matter for the Authority.

As GAWB is yet to finalise its review of drought management options and has not proposed relevant cash flow estimates associated with drought, the Authority is unable to provide further comment. The Authority recommends that GAWB take into consideration the issues raised by stakeholders in its preparation of its DMP.

The Authority considers that:

- **prices should incorporate the costs of investment, operational and managerial responses where:**
  - **the risk is commercially relevant;**
  - **GAWB has acted prudently and could not have acted any earlier to address the risk at lower cost;**
  - **GAWB is the most appropriate party to bear the risk; and**
  - **the response is cost-effective;**
- **higher prices are justifiable during droughts to promote efficient water use. However, where they are not cost related, and other resource rent arrangements are not applicable, the revenues should be returned to users at a later stage on the basis of a proportionate reduction in all customers' access charges; and**
- **GAWB should release its Drought Management Plan prior to the finalisation of the Authority's investigation to enable any related costs to be incorporated in indicative prices.**

4.7 Transitional Pricing

It is possible that price resets, particularly those associated with significant changes in circumstances, such as hydrology and demand expectations, may be accompanied by significant price increases.

In its previous investigation, the Authority recommended that, for existing customers not subject to contracts, new prices be transitioned over three years (2002-03 to 2004-05).

For future price reviews, a number of issues need to be considered in determining whether price transitioning should apply, including:

- the trigger level or threshold sufficient to warrant transitioning;
- the period of time over which transitioning should occur; and
- the impact on the financial viability of customers and the service provider.

Other Jurisdictions

IPART's (2003) decision making process includes consideration of the likely impacts of prices on the affordability of services for different groups of consumers. For the 1 July 2003 to 30 June 2005 review, the final price determinations for NSW water suppliers required only a minor real increase in charges and hence a consideration of price transitioning was not required.

The ESC (2004) notes that, to the extent that customers and other stakeholders consider that proposed price increases are likely to be onerous in terms of the impact on customer bills, the business may need to consider:

- phasing in or reducing some service requirements or obligations;
- limiting the amount by which prices can increase on an annual basis; and
- applying concession arrangements and special policies for customers facing financial hardship (including delayed or waived payment terms).

QCA Analysis

Where significant changes in prices occur, there may be a need to consider the impacts on customers of an immediate pass-through versus the impact on GAWB's financial viability if it was not permitted to implement the full increase immediately.

While some customers may have a capacity to absorb significant price increases, particularly where water is only a small component of total production cost, such increases may be problematic for smaller industrial and some Council domestic customers.

The Authority considers that prices should be transitioned where there is a significant increase, and particularly where:

- there was no substantial notice of the price increase occurring or the increase could not reasonably have been expected;
- in the absence of transitioning, there are issues regarding customers' ability to pay the increased price or matters of public interest; and
- the service provider's financial viability and cash flows will not be significantly impacted by the transitioning arrangements.

The precise nature of the transition arrangements needs to be considered against the background of these considerations.

At the time of the last investigation, substantial price increases were recommended for some customers. These increases were to be transitioned over a recommended three year period.

The Authority considers that price transitioning is appropriate for significant price increases, having regard to the provider's financial viability, users' capacity to pay and the extent to which increases could have been anticipated.

5. GAWB'S WATER SUPPLY AND DEMAND

Summary

The expected supply of water and forecast demand are significant determinants of GAWB's costs of providing water, and thus, its price.

GAWB's water supply is subject to periodic external review of the historic no fail yield (HNFY). Although the Awoonga Dam's HNFY has been revised downwards three times, the most recent occurring in 2003 after the drought, it is not possible to predict the timing and magnitude of future downgrades. The Authority proposes to use the revised safe yield of Awoonga Dam of 78,000ML for pricing purposes.

The Authority commissioned Marsden Jacob Associates (MJA) to assess GAWB's demand forecasts. Estimates of demand for pricing purposes are based on the MJA projections as these most closely represent likely contractual demand, and also allow an amount for future demand nominated by GAWB (and supported by MJA).

5.1 Supply

GAWB presently sources all of its water from the Awoonga Dam. Over 2000-02, GAWB raised Awoonga Dam by ten metres in response to growth in projected demand. The augmentation increased storage capacity from 283,000ML to almost 800,000ML with a corresponding increase in the then assessed historic no fail yield (HNFY) from 49,400ML to 87,900ML.

The HNFY identifies the maximum annual supply available for consumptive use on a sustainable basis and is based on historic rainfall, runoff, storage capacity, evaporation and seepage, and environmental flow requirements. According to the *Boyne River Basin Resource Operating Plan (2003)* (ROP) and *Water Resource (Boyne River Basin) Plan 2000*, the HNFY of Awoonga Dam is based on a computer simulation using historic monthly rainfall and estimated monthly flows in the Boyne River from 1891 to 2004. The estimated HNFY is the volume of water delivered annually by the Dam with 100% monthly reliability over this historical period.

The HNFY of Awoonga Dam is generally accepted as a measure of water storage yield. However, it does not represent 100% daily reliability as there may be periods within a month when inflows are insufficient to meet an average daily yield. Further, as HNFY is historically based, it will change in response to actual rainfall patterns over time.

Where an estimate of 100% future daily reliability of supply is required, modelling on a daily basis with some adjustment to reflect any apparent climate change may be more appropriate. Preliminary analysis by GAWB indicates that to achieve 100% reliability of supply, based on a historic daily flow approach, the yield of Awoonga Dam may need to be reduced to 57,500ML. However, any consideration by GAWB to offer supply at a level of reliability in excess of that implied by HNFY would require more detailed analysis, including assessment of implications for pricing, in consultation with customers.

Following the severe drought in 2002-03, DNRME revised downward the yield of Awoonga Dam in the ROP by 11.3%. Details of Awoonga Dam's revised total HNFY after the 2000-02 'Stage 1' raising and a potential further 'Stage 2' raising are shown in Table 5.1.

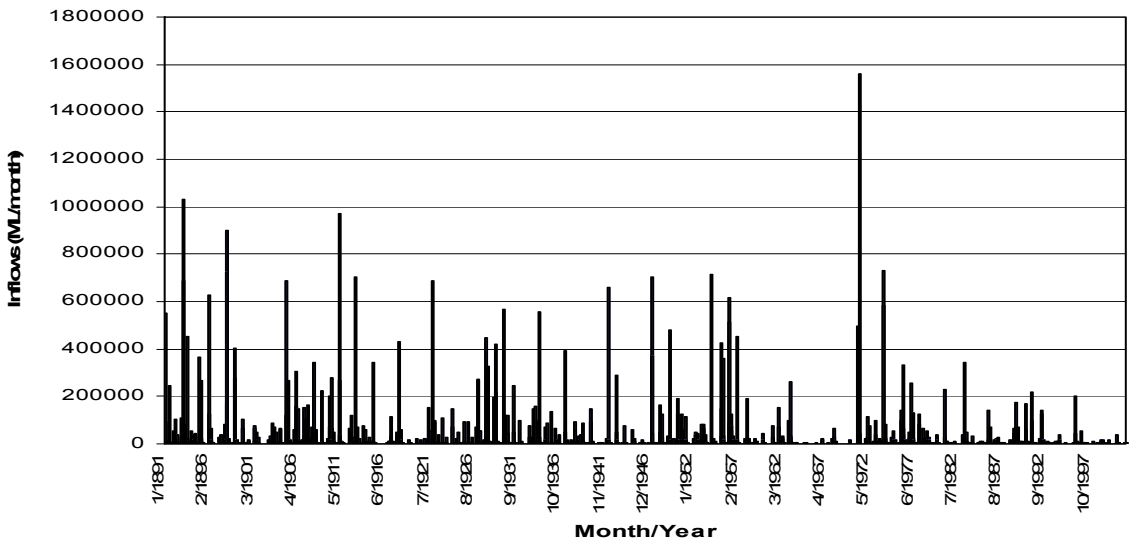
Table 5.1: Change in Awoonga Dam Supply Potential (based on monthly HNFY)

Augmentations	Previous Yield[1] (ML)	Revised Yield[2] (ML)	Percentage change
Stage 1 raising (2000-02)	87,900	78,000	-11.3%
Stage 2 raising (potential)	113,000	97,000	-14.2%

Source: *1. GAWB 2000; and*
2. Boyne River Basin Resource Operating Plan (July 2003), DNRME.

The reduction in the Awoonga Dam HNFY is supported by research by the Climate Impacts and Natural Resource Systems (CIRNS) group of DNRME which found that rainfall over the last 25 summers has been, on average, 23% below the 1891-1978 average. The frequency and duration of droughts appear to have increased since 1972 and a noticeable drop in inflows has occurred since that time. Awoonga Dam's historical pattern of inflows is shown in Figure 5.1, demonstrating the absence of major inflows over the last 30 years.

Figure 5.1: Awoonga Dam Monthly Inflows



Recent evidence of climatic changes includes changes in relative air pressure between southern Australia and Antarctica, which have resulted in fewer tropical cyclones than expected. The augmented Awoonga Dam relies on major cyclonic rainfall events to provide the major inflows. The evidence of climatic change is shown in Figures 5.2 and 5.3, which shows that cumulative flows over approximately 40-year periods have been gradually declining.

Figure 5.2: Comparison of Cumulative Inflows

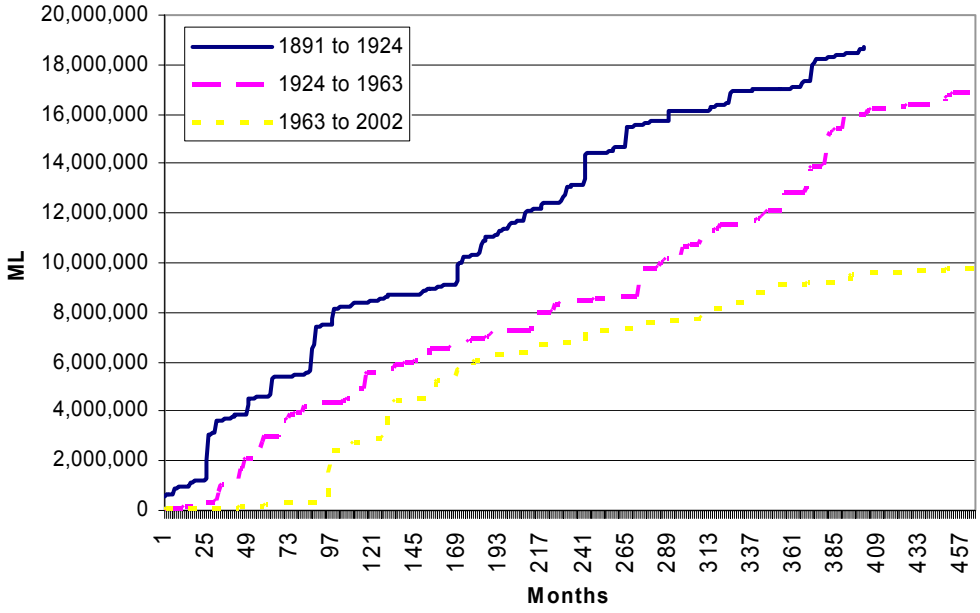
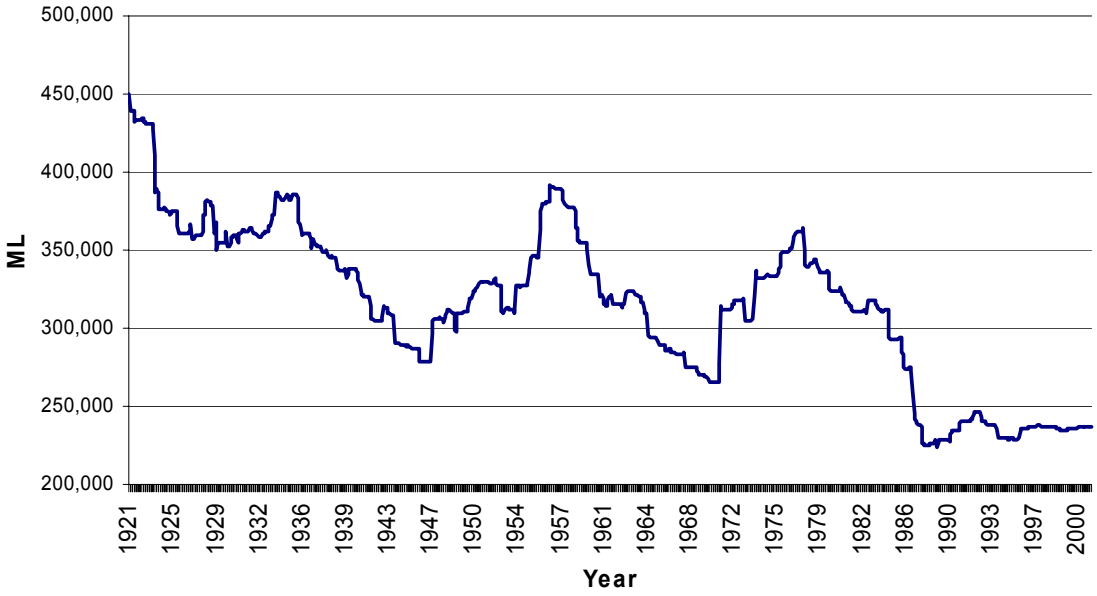


Figure 5.3: Cumulative Inflows, 40-year Moving Average, Awoonga Dam



The ROP places an additional constraint on GAWB's ability to commit to supplying water during the first filling phase of the upgraded Awoonga Dam. The ROP stipulates that until Awoonga Dam has filled to its new full supply level (FSL) of 40m, GAWB may only commit to future water supplies of an amount determined by the Chief Executive of DNRME. Currently, an interim ceiling of 67,800ML has been imposed on GAWB's allocation from the dam, some 11,000ML below the rated HNFY of 78,000ML.

Stakeholder Comment

GAWB noted that the DNRME has revised downwards the HNFY of Awoonga Dam three times since 1985, including following the recent drought conditions in 2002-03. GAWB

submitted that it is 'practically certain that the HNFY of Awoonga Dam will be revised downward again sometime in the future'.

GAWB argued that 'all options to gain a significant overall (as opposed to customer specific) improvement in reliability' will involve the development of an additional source of supply as 'a more conservative' utilisation of current capacity (ie at higher reliability) will bring forward the need for new capacity and that a second source itself will be 'inherently more reliable' than Awoonga Dam with 'the diversity effect of multiple sources' improving reliability.

GAWB advised that it is preparing a Strategic Water Plan in which various options for additional water supply or saving will be addressed. Details are not yet available to the Authority.

Callide Power Management (CPM) stated that 'GAWB should be permitted to recover the cost of its water storage infrastructure from the reduced yield provided the revised Awoonga Dam remains the least cost option'. CPM's view was that the interim yield of 68,000ML (*sic*) should not be used for pricing as it is a 'temporary phenomenon'.

DNRME suggested that the Authority should take into account the impact of the Central Queensland Regional Water Supply Study and the revised GAWB Strategic Water Planning Process, in particular on the timing, scale and type of planned augmentations and/or alternative water supply infrastructure investments.

QCA Analysis

In general, changes in hydrology are externally imposed upon GAWB and are beyond GAWB's control. Accepting the view that the current interim ceiling is only a temporary measure, the Authority proposes to adopt the revised HNFY of 78,000ML as an appropriate basis for planning and pricing.

The Authority also concurs with GAWB's view that the Awoonga Dam hydrology may again be revised in future years if climatic change continues along present trends. Where such changes are predictable and quantifiable, it is desirable that they be incorporated into cash flows for pricing purposes particularly where longer planning periods are being adopted, as previously proposed for GAWB. However, hydrological revisions occur infrequently and cannot be predicted, so generally ex post responses are more appropriate. In GAWB's case, a hydrological revision has only recently been made and it is improbable that any further revision is required in the near term. It is therefore proposed not to incorporate any potential changes into the cash flows.

The Authority also accepts GAWB's comment that a second source will lead to greater reliability and diversification of water sources. The Authority is aware that DNRME is currently undertaking a Central Queensland Water Supply Study which is expected to identify a preferred supply augmentation option for GAWB. GAWB is also undertaking its own planning process. Until these studies are completed, the Authority is unable to take account of them in its cashflow analysis.

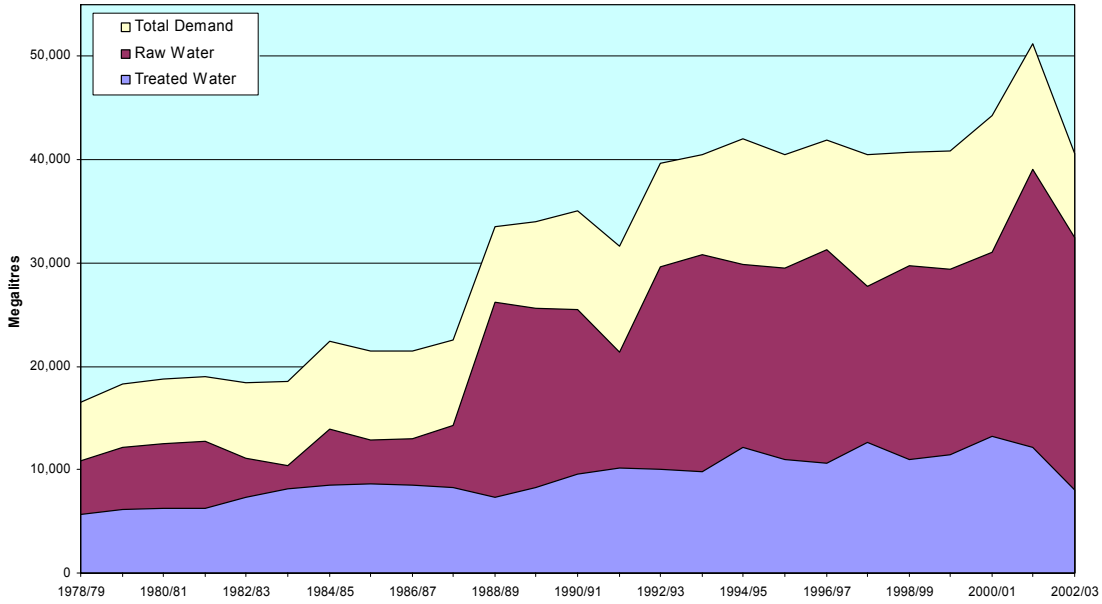
The Authority proposes that planning and prices for services provided by Awoonga Dam be based on the most recently established HNFY of 78,000ML.

5.2 Demand

History of Water Demand

Since 1978, consumption of water in Gladstone has more than trebled, with an average annual growth rate of 4.8% to 2001-02 (prior to drought restrictions). Annual growth in raw water averaged 5.3%, while growth in treated water averaged 3.2% over that period (Figure 5.4 refers).

Figure 5.4: Consumption of GAWB's Water 1978-79 to 2002-03



Source: QCA 2002.

Previous Estimates of Demand

In its previous investigation, the Authority recommended that in setting prices, GAWB take into account relevant demand scenarios, including demand side management and alternative supply options.

Demand projections were independently established by SMEC based on interviews with GAWB, the Councils, key industrial customers and the Gladstone Industry and Economic Development Board (GIEDB). SMEC also established low, medium and high risk categories on the basis of status of project planning, proximity to start-up and specific sensitivities such as environmental issues and market uncertainty. SMEC also sought to incorporate achievable demand management savings and noted that:

- for many larger industries which have already achieved efficiency savings, future savings from expected advances in water use efficiency were already built into forward projections;
- efficiency gains of between 5 and 15% were identified by some existing smaller customers;

- for the Calliope Shire Council, savings of 3% in 2005-06 rising to 8% by 2019-20 were expected to be achieved through reductions in system losses and demand management strategies; and

- for the Gladstone City Council, savings of 5% in 2005-06 rising to 12% in 2019-20 were expected due to reductions in system losses and the introduction of a two-part tariff.

The preferred planning scenario used by the Authority in the previous investigation is summarised in Table 5.2.

Table 5.2: 2002 Final Report - Preferred planning scenario (ML)

Type of Supply	*2002-03*	*2003-04*	*2004-05*	*2005-06*	*2009-10*	*2014-15*	*2020-21*
Raw water	42,276	44,529	49,306	52,162	58,534	62,853	62,736
Treated water	14,741	15,353	16,409	16,610	17,597	18,446	19,689
Total demand	**57,017**	**59,882**	**65,715**	**68,772**	**76,131**	**81,299**	**82,425**

Source: QCA (2002)

Current Demand

Since completion of the Authority's Final Report in 2002, GAWB has experienced a major drought during which severe water restrictions were imposed. As a result, some customers implemented permanent water use efficiency measures and some have substituted part of their supply. The total volume supplied during 2002-03 was only 40,593ML, reflecting a 29% shortfall against the preferred planning scenario expectations of 57,017ML (Table 5.3 refers).

Table 5.3: Summary of Demand – raw and treated water for 2002-03 (ML)

Type of Supply	*Preferred Planning Scenario*	*Actual Demand*	*Variation*
Raw water	42,276	32,614	-23%
Treated water	14,741	7,979	-46%
Total demand	**57,017**	**40,593**	**-29%**

Source: QCA (2002) and GAWB

There may also be further opportunities for adoption of water use efficiency measures by existing and new customers, which may impact on longer term demand projections. GAWB's estimated demand is outlined in Table 5.4.

Table 5.4: GAWB's Demand Projections (ML)

Type of Supply	*2005-06*	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2020-21*	*2024-25*
Raw water	36,426	41,102	42,336	47,291	52,276	60,578	63,518	65,470
Treated water	10,036	10,026	10,186	10,348	10,514	11,393	12,568	13,432
Total demand	**46,462**	**51,128**	**52,522**	**57,639**	**62,790**	**71,971**	**76,086**	**78,902**

Source: GAWB 2004

Stakeholder Comment

GAWB noted that it has 'developed and refined its methodologies for demand forecasting'. GAWB submitted that, in the past, its demand forecasts were prepared principally for infrastructure planning purposes and that demand was over-estimated as 'it is generally better to ensure that a conservative view of future water demands can be satisfied than constrain the region's growth through lack of infrastructure provision'.

GAWB submitted that, as its demand is dominated by large projects, forecasts must be based on estimates of the demand of specific future projects. GAWB proposed that demand forecasts be adopted for pricing purposes based on customer's reported intentions for water use which is 'likely to occur'. This demand scenario is less than customer's reported intentions of usage which 'might possibly occur' but greater than that which is 'practically certain' to occur.

GAWB proposed to apply different demand estimates under a revenue cap to those under a price cap form of regulation, due to remaining concerns that the 'inherent optimism of project proponents (and appropriate support for these projects by government agencies)' will lead to an overstating of likely future demand. GAWB submitted that, if a price cap form of regulation is recommended, it will 'investigate modifying its forecasts by a factor reflecting past differences between forecasts and outcomes'.

CPM raised concerns over adopting a too-conservative position on future demand, or projections of an overly-strong demand growth.

CPM also stated that the regulator's pricing calculation must be based on the higher of contractual or actual volumes on the basis that prices should reflect the capacity that GAWB is required to make available to a customer.

QCA Analysis

The Authority concurs with GAWB's comment that there has been a tendency in the past to over-estimate customers' requirements.

In recognition of the lumpiness of demand, uncertainty involved, and past propensity for overestimation, the Authority has noted the importance of contractual arrangements. Basing demand on estimates of likely demand independently of customers' proposed contractual amounts would provide a poor basis for future planning. Above all, errors could impose high costs on users and the community.

Such an approach was also supported by Marsden Jacobs and Associates (MJA) who noted that in a commercial environment, where there is a large sunk cost investment in infrastructure, relatively few customers and lumpy demand increments, suppliers would require a contractual approach to demand forecasting in respect of the more uncertain projects.

Accordingly, estimates of demand adopted by the Authority are those that reflect the most likely amount customers can be expected to contract.

To determine these amounts, and any other relevant matters, the Authority commissioned MJA to audit estimates of demand provided by GAWB. MJA's audit of demand found that some estimates of individual customers demand by GAWB did not correspond with those provided to the Authority by those customers.

MJA noted that since the last assessment by SMEC, a number of the then expected new projects, that were previously considered likely, have not proceeded and it was considered that some anticipated expansions were too uncertain. It is unlikely that customers would seek to commit themselves contractually to these projects at this time.

In any assessment of future demand, MJA recommended that risks should be assessed in terms of size of demand, volatility of expansion triggers (such as input and output prices, production technology, world growth and exchange rates), progress in planning and procuring other input contracts and history of previous delays.

MJA also noted that the drought promoted adoption of water use efficiency measures to an extent that had not previously been envisaged. MJA found that on-site water use efficiency measures by the large industrial customers such as leakage reduction and water recycling have largely been exhausted at this stage. GAWB's forecasts for demand management implemented by the two Councils were considered to be robust.

MJA considered that further savings by GAWB, driven by social and environmental objectives, have largely been reflected in GAWB's projections. These include the proposed Stag Creek pipeline to reduce delivery losses to the CS Energy and Callide Power Management power stations. Large scale substitution options by customers (such as desalination, seawater cooling and installation of air cooled condensers at Callide Power Station) were generally not considered viable at this stage. However, MJA's view was that some substitution possibilities could become significant within the planning horizon and should be monitored rigorously.

GAWB has proposed that forecast demand incorporate an amount of 300ML in year 2013-14 increasing annually to 3,600ML by 2024-25 to allow for 'undetermined' projects. MJA recommended that this demand for undetermined projects commence earlier, in 2010-11. Under the proposed pricing framework, GAWB would be responsible for the associated commercial risks of incorporating this demand volume. For this reason, the Authority has incorporated GAWB's estimate in the forecast demand, rather than MJA's estimate.

GAWB's demand projections included a 45% growth in Calliope Shire Council's water demand and a 46% increase in Gladstone City Council's demand over the 20-year period. These projections reflect an average of 2% growth per year. MJA concluded that these projections were reasonable, but that any improvements in distribution system efficiency and leakage reduction by GCC should be monitored.

The demand projections for raw and treated water, as revised by MJA, but incorporating GAWB's estimate for undetermined projects, appear in Table 5.5.

Table 5.5: Revised Demand Scenario (ML)

Type of Supply	*2005-06*	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2020-21*	*2024-25*
Raw water	36,446	37,632	38,546	41,028	46,032	50,500	53,362	55,314
Treated water	10,067	10,057	10,217	10,379	10,545	11,424	12,599	13,463
Total demand	**46,513**	**47,689**	**48,763**	**51,407**	**56,577**	**61,924**	**65,961**	**68,777**

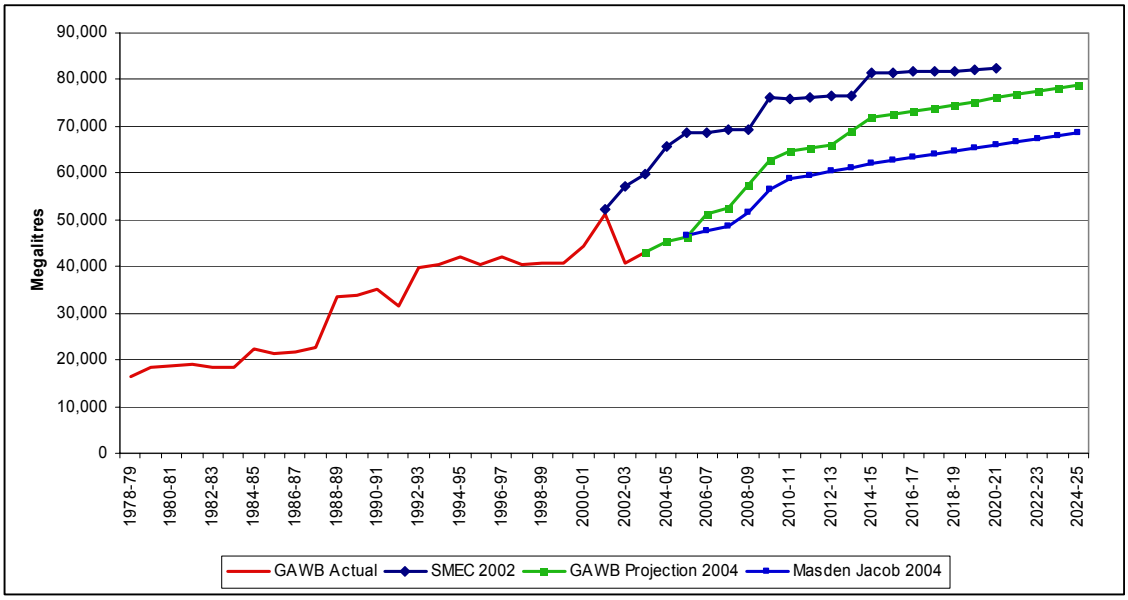
Source: Marsden Jacob Associates, GAWB

Table 5.6 and Figure 5.5 compare the preferred planning demand scenario from the previous investigation with GAWB's current demand projections and those recommended by MJA.

Table 5.6: Comparison of Alternative Demand Projections (ML)

Type of Supply	*2005-06*	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2020-21*	*2024-25*
Previous Investigation	65,715	68,772	68,789	69,241	69,419	81,299	82,095	na
GAWB's Projections	46,462	51,128	52,522	57,639	62,790	71,971	76,086	78,902
MJA Projection	46,513	47,689	48,763	51,407	56,577	61,924	65,961	68,777
Difference (GAWB to MJA)	**-0.1%**	**-6.7%**	**-7.6%**	**-10.8%**	**-9.9%**	**-14.0%**	**-13.4%.**	**-12.8%**
Difference (MJA to Previous)	**-29.2%**	**-30.6%**	**-29.1%**	**-25.8%**	**-18.5%**	**-23.7%**	**-19.7%**	**na**

Figure 5.5: Comparison of Alternative Demand Projections (ML)



Customers of GAWB are to be invited to confirm or re-estimate their individual proposed contractual volumes for the purposes of the Authority's estimated indicative prices consistent with the recommendations of the Final Report.

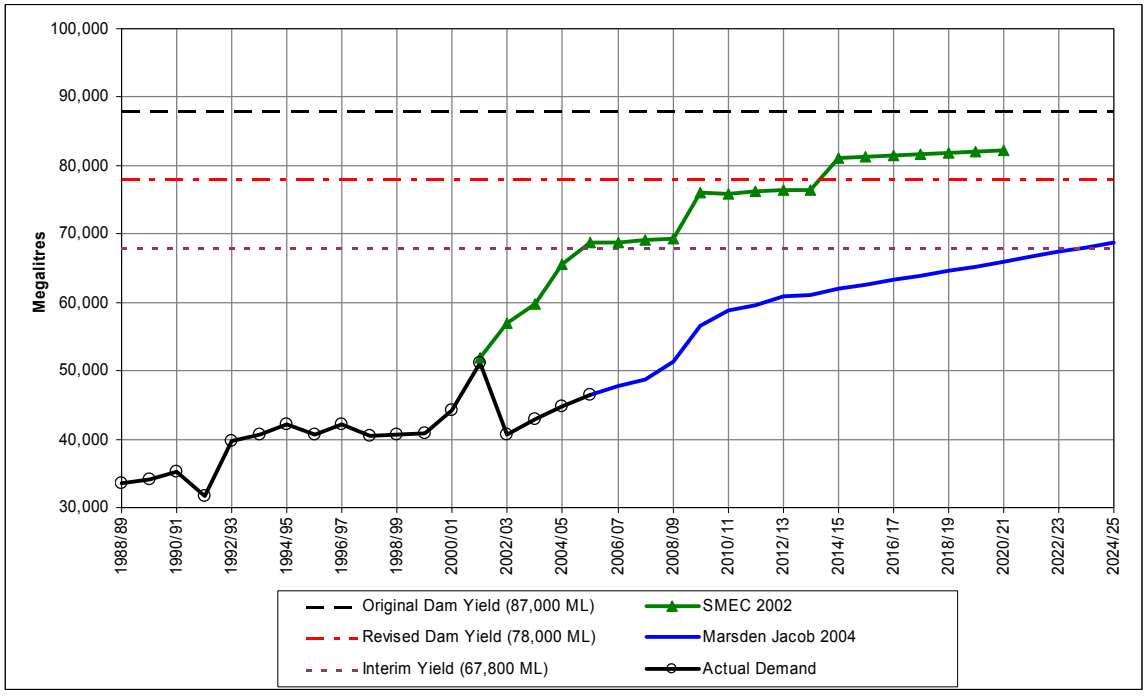
The Authority proposes that for pricing purposes, the demand scenario for the regulatory pricing period commencing 1 July 2005 should reflect anticipated customer contractual requirements, and allow an amount for future demand nominated by GAWB (and which has been supported by MJA). The Authority proposes to adopt the demand estimates provided by MJA.

5.3 Supply and Demand

Based on current yield and demand projections, GAWB has sufficient supply capacity to meet projected demand for the next 20 years. Even under the interim yield ceiling of 67,800ML (pending the filling of the raised dam) GAWB has sufficient capacity to meet the revised projected demand until 2022-23.

The extent of the changes in GAWB's demand since the Authority's previous investigation in 2002 is demonstrated in Figure 5.6.

Figure 5.6: Summary of GAWB's Supply Capacity and Demand (ML)



6. ASSET BASE

Summary

The Authority proposes to value the asset base on the basis of DORC.

The Authority recommends that GAWB's asset base be revalued due to the material changes to the key assumptions underpinning the prior valuation.

The Authority also proposes to estimate DORC using an incremental optimisation approach taking into account redundant assets, excess capacity and over-engineering. In addition, the Authority recommends that land should be valued at market value and easements be valued on the basis of indexed historic cost.

An independent assessment of GAWB's DORC was provided by SMEC. The key findings were that:

- *the additional dam wall height previously optimised out is now needed to meet maximum possible flood requirements;*
- *duplication of the Awoonga Dam pipeline previously deferred until 2004-05 is now included; and*
- *the Calliope River dam site land continues to be optimised out.*

The estimated DORC as at 1 July 2005 is $352.64 million.

6.1 Background

The value of the regulatory asset base underpins the return on capital and the return of capital, both components of regulated prices. GAWB's key assets include dams, pipelines, treatment plants, reservoirs, pump stations, buildings, land and easements.

6.2 Approach to Asset Valuation

There are a variety of methodologies available for valuing assets. However, in the context of regulatory valuations, asset valuation methods may be categorised under two main approaches – cost-based and value-based.

Cost-based approaches relate the value of an asset to the cost of purchasing the asset or the service potential embodied in the asset, either at original (historic) cost or current replacement cost. The most common cost-based approaches include:

- depreciated historic cost (DHC), also known as depreciated actual cost (DAC) - which uses the original cost of acquiring the asset, adjusted by the proportion of the service potential which has expired. A variant of DHC is depreciated inflated historic cost (DIHC) which adjusts the asset value for inflation; and
- depreciated optimised replacement cost (DORC) - which measures the current cost of replacing existing assets with a set of assets that are adjusted for depreciation and optimised to provide the required service potential in the most efficient way possible. Asset values are adjusted for any excess capacity, over-engineering, sub-optimal design (having regard to technological advancements) or poor location.

Value-based approaches determine the economic value of an asset from its net income earning capacity. Value-based approaches include:

- net present value (NPV) – which values an asset as the present value of the cash flows generated by the asset; and
- net realisable value (NRV) or fair market value – which is the price that the asset would achieve in an open market.

A hybrid approach, referred to as the optimised deprival value (ODV) method, values an asset as the loss that might be expected if the entity was deprived of the asset. ODV is the lesser of the depreciated optimised replacement cost (DORC) and the Economic Value (EV) of an asset, where the latter is the maximum of the asset's net present value (NPV) or net realisable value (NRV).

ODV has been endorsed by COAG as the preferred approach for valuing network assets for public reporting processes (performance monitoring) and by the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ) as a basis for water pricing, unless specific circumstances justify another method.

In the previous GAWB investigation (2002), the Authority adopted the depreciated optimised replacement cost (DORC) approach.

Other Jurisdictions

Generally, Australian regulators have used DORC to establish opening regulatory asset values. However, in determining maximum prices for NSW water agencies, IPART (2000a) calculated the net present value of existing cash flows projected into the future. IPARC's (1999) price determination for ACTEW's water and sewerage business was based on the net present value of existing cash flows, but it applied DORC to value electricity assets.

Stakeholder Comments

GAWB supported the use of DORC for determining the initial value of the regulatory asset base.

QCA Analysis

In competitive markets, asset values are determined by the income earning potential of the assets. That is, market forces determine prices for goods and services, which in turn determine, at the market rate of return, the value of the assets which provide those goods and services.

In non-competitive or monopoly markets, there is the problem of circularity. That is, the price charged for a good or service will determine the economic value of the assets used to produce the good or service. However, the economic value of the assets is needed by the regulator to determine the price.

The circularity problem effectively rules out using value based approaches in valuing regulated assets. Although the hybrid ODV approach provides an appropriate method for valuing assets, the circularity problem remains an issue where EV is selected for regulated industries. While there are a range of cost-based approaches available, debate centres on whether an historical cost approach (DHC) or a replacement cost approach (DORC) is more appropriate.

A historic cost approach avoids the expense and subjectivity associated with determining current asset values and can be easy to establish where data are available. However, as historical cost values do not have any relation to current market values or current replacement costs, the Authority considers that they do not provide the appropriate economic signals for future investment or consumption of services by users. Even when historical cost is adjusted to reflect inflation this fails to capture the effects of technological change or over-engineering.

The efficient use of resources requires pricing and investment decisions to be based on the real economic costs of usage in alternative activities (i.e. opportunity cost). In this regard, a current replacement cost valuation such as DORC is regarded as providing more relevant measures of value for the purposes of decision making than valuation based on historical cost.

DORC better approximates the actual cost of a new entrant into the market, more closely replicating the outcomes of a properly functioning competitive market. It also allows for technological change so that assets can be valued in a way that reflects current technology. Moreover, it allows the firm's financial records to be expressed in current terms and makes the relationship between costs are revenues more meaningful. The disadvantages of DORC include its complexity and subjective judgements involved surrounding replacement costs and optimisation. These can be overcome through the use of independent technical experts and ensuring the process is transparent.

The Authority notes that DORC is applied in most regulatory asset valuations in Australia and, while there is a degree of subjectivity associated with its application, it provides a conceptually sound basis for regulatory price setting.

The Authority considers that GAWB's assets should continue to be valued on the basis of DORC.

6.3 Approach to Revaluation

Given the Authority established a DORC asset value for GAWB in its previous investigation, a key issue for this investigation is whether this value should be rolled forward or revalued. A rolled forward asset value simply indexes and depreciates the prior asset value to the start of the next regulatory period, with adjustments for new assets and redundant or de-commissioned assets.

Other Jurisdictions

For subsequent regulatory periods, most Australian regulators have opted to roll forward the opening asset value, rather than revalue these assets. For example, in its 2004 investigation of water and wastewater services in the ACT, ICRC decided to roll-forward the ACTEW's 1998 regulatory asset base. The ACCC (August 2004) has expressed a preference to roll forward asset values in electricity transmission.

OTTER (2004) adopted a roll-forward of the previous asset base, but recognised that continually rolling forward the asset base may result in an increasing divergence between an asset value calculated on this basis compared to DORC and noted an intention to address the matter during the next regulatory period. It noted that factors that may cause differences between roll-forward and DORC valuations include:

- the impact of technological change on optimisation factors;
- movements in the foreign currency exchange rate which impact on the prevailing purchase price and, therefore, the replacement cost of assets;

- movements in the cost of commodities used in the construction of assets;
- changes in electricity demand which may impact on the assessed type, quantity or sophistication level of assets used in the DORC valuation to meet forecast demand; and
- changes in taxes which impact on the prevailing purchase price and value of assets.

Where regulators have rolled forward asset values, the prevailing demand for regulated services has typically been greater than that existing at the time of the initial asset valuation.

Stakeholder Comment

GAWB accepted that given the lumpy nature of demand and other factors, periodic revaluation (at perhaps 10 year intervals) may be appropriate. However, GAWB argued that re-valuing assets after only 3 years is 'unusual from an Australian regulatory perspective and provides poor incentives for future investment'.

GAWB submitted the following benefits of roll-forward:

- consistency with the approach adopted in other jurisdictions and delivering the lowest long-run sustainable prices;
- stable technology and cost, and low risk of bypass reduces the importance of a revaluation to ensure that the regulatory asset base represents an economically efficient level of cost; and
- no loss in pricing efficiency as variable rates based on an externally verified estimate of the LRMC of supply will be unaffected.

GAWB therefore proposed a roll-forward of the 2001 valuation, with appropriate adjustments for cost inflation, depreciation and capital expenditure (at the minimum of the 2001 forecast or actual spend, except where GAWB makes a specific case to justify higher expenditure).

Users preferred assets to be revalued at each regulatory review (CSC, GCC, CPM and Comalco):

- CSC and GCC submitted that the Authority should revalue the asset base rather than roll forward the previous asset value, due to recent shifts in both demand and supply. However, CSC also recognised GAWB's concerns relating to Authority reviews of GAWB investment decisions, and proposed that (in future) a procedure should be put in place that ensures investment certainty before a project commences;
- CPM submitted that GAWB's asset value for this price review should be subject to a full revaluation, as circumstances have changed substantially since the last review, with regard to water supply and demand projections. CPM submitted that if existing assets no longer represent the least cost supply option, their value should be revised downwards and GAWB's revenue requirement reduced. However, if existing assets remain the least cost supply option, prices may have to rise to meet that revenue requirement from a lower demand; and
- Comalco stated it had no objection to pricing based on an installed capital base valued using DORC, and that GAWB's overhead base should be reduced over time and the benefit passed through to customers, as many of GAWB's customers are price takers that need to constantly reduce costs to globally compete.

CBP&RA did not submit a preference for roll forward or revaluation, but stated that an appropriate DORC asset valuation should consider meaningful benchmarking of system utilisation against enterprises in similar climactic conditions, end use patterns, demand growth and service standards.

QCA Analysis

The Authority notes that while DORC is used for most initial regulatory asset valuations in Australia, roll forward of those values is generally adopted in preference to revaluation.

The Authority is generally supportive of the principle of roll-forward of asset valuations, on the basis that:

- rolling forward asset values is simpler and less costly. In many cases, the revaluing of assets is not justifiable on cost-benefit grounds; and

- if regulated assets are subject to an ongoing risk of being revalued downwards, this can affect the incentive to efficiently invest. Provided an investment in an asset is prudent and cost efficient at the time of installation, and continues to be so, it should remain in the asset base.

Where revaluations result in reductions, this can be addressed, at the regulator's discretion, by compensating the provider through accelerated depreciation or other mechanisms, or by ensuring the regulatory framework provides some upside potential to offset the risk of downwards revaluation. Such compensation may be limited if it was found that the service provider had previously misled the Authority, there is an actual threat of bypass, if users as a group are found to no longer have the capacity to pay the relevant charges, or in order to promote outcomes in downstream or upstream markets that were consistent with those of properly functioning competitive markets.

As noted by OTTER, a process of continued roll-forward can, however, lead to an ever increasing divergence between an asset value calculated on this basis compared to DORC.

The Authority notes that in respect of GAWB:

- there have been significant changes in GAWB's circumstances following the 2002 drought, particularly in relation to revised dam hydrology and permanent reductions in demand by major customers, which would affect asset values;

- the aggregate demand projections upon which the original valuation was based have proven to be significantly too optimistic. GAWB's actual demand for 2002-03 was 17.5% less than the demand envisaged as part of the original valuation. Moreover, GAWB's projected demand for 2005-06 is 32% below that forecast under the original valuation; and

- GAWB is yet to implement prices based on the initial regulatory asset value.

Arguably, therefore, the current investigation is setting the first asset valuation which fully reflects the circumstances within which GAWB must operate.

While a revaluation after 3 years is unusual in regulatory terms, the Authority considers that the circumstances indicate that a revaluation is appropriate. In response to GAWB's particular concerns:

- it is acknowledged that the timing of the current investigation is at a shorter interval than normally would be expected. However, it is designed to coincide with GAWB's proposed contractual pricing reviews and is therefore appropriate. The Authority has proposed a five year future regulatory review period which is consistent with stakeholder preferences and more typical regulatory periods; and

- while technological and bypass risks are currently relatively low, these are outweighed in this instance by other changes in GAWB's circumstances.

The Authority therefore generally concurs with the views expressed by CSC, GCC and CPM that changes in circumstances warrant a revaluation of GAWB's assets with a view to ensuring that the effects of the changes to hydrology and changes in demand are reflected in the asset base.

While the Authority anticipates that a roll-forward approach should be appropriate, the case for revaluation should be examined at each regulatory review in order to determine whether the relevant circumstances justify the complexity and cost of revaluation.

Due to significant changes in GAWB's circumstances, and given that the Authority's previous recommendations are not yet reflected in customer contracts, a revaluation of GAWB's asset base is recommended. It has been adopted for the purposes of determining indicative prices for individual customers.

6.4 Optimisation

A key issue in establishing DORC is the basis for optimisation. In general, optimisation may be undertaken from two general perspectives – brownfields or greenfields.

A brownfields, or incremental optimisation approach, is based on the premise that the existing assets would be replaced using fundamentally the same configurations as presently used, with adjustments introduced to ensure that only assets relevant to providing the desired level of service potential are included. That is, an incremental approach seeks to optimise out any over-capacity in assets, over-designed assets, and redundant or abandoned, but listed, assets.

Conversely, a greenfields approach to optimisation assumes a 'clean slate'. That is, the assets can be completely redesigned to develop whatever is believed to be currently necessary to deliver the services required.

The principles underlying optimisation of the asset base are of particular relevance to GAWB for a number of additional reasons:

- revaluation of the asset base as opposed to the adoption of a roll forward approach, raises the prospect that some assets may no longer be necessary to deal with the lower levels of anticipated demand now envisaged; and

- from previous chapters, issues arose relating to how under a price cap regime, investments undertaken by GAWB in the absence of contracted demand are recommended to be treated in the future if demand subsequently failed to materialise.

Stakeholder Comments

GAWB has proposed that to reduce the risks associated with the future regulatory treatment of investments, and therefore to achieve lower prices, an ex ante test be applied to investments by an Investment Review Panel (IRP). GAWB has proposed that future major investments

('perhaps greater than $5m') would be reviewed by the IRP for efficiency before construction, using criteria similar to the ACCC's regulatory test.[2] These investments would be rolled-in to the asset base at an ex-ante approved value, rather than actual cost, so that GAWB has the maximum incentive to reduce its costs.

QCA Analysis

The Authority has previously applied an incremental (brownfields) approach to optimisation on the basis that it more closely aligns with the process of decision-making over time. A greenfields optimisation approach would potentially penalise service providers for past decisions in regard to the essential system configuration that were prudent at the time, and may remove their incentive to undertake future augmentations.

In addition, from the regulator's perspective, a greenfields approach requires a comprehensive 'what-if' analysis of alternative configurations which could provide only subjective estimates of asset values, and would involve considerable cost.

The Authority considers that the brownfields approach provides appropriate signals to the service provider to ensure that it is not rewarded for sub-optimal excess capacity, gold-plating of assets or redundant assets.

A key issue in applying brownfields optimisation is that over time, assets that, even if initially prudent and optimal, may become redundant or sub-optimal due to changes in technology, demand expectations or other circumstances. The Authority's general approach is not to optimise these investments without some form of compensation to the service provider unless the regulator had previously been misled in some way, if there are actual bypass options or other issues in relation to customers' capacity to pay, or in order to promote outcomes in downstream or upstream markets that are consistent with those of properly functioning competitive markets.

Under this approach:

- establishment of an Investment Review Panel would provide greater assurance that investments being proposed were prudent. The Authority notes, however, that determinations by such a panel, even if it included the Authority, could not be binding as in most instances GAWB would still be in the best position in terms of the information relevant to such decisions. Furthermore, given the high degree of uncertainty that has historically attached to future estimates of demand for new projects it is not evident how to establish that certain investments are 'prudent' without introducing potentially spurious probabilities. Indeed, the approach proposed by GAWB and supported by the Authority would be to only put in place infrastructure supported by contracts. This would not preclude putting in place additional capacity where existing users were prepared to contract for the associated risk. This could occur where substantial price reductions were associated with the forecast demand and customers were prepared to accept such risks;

- in the absence of any evidence to the contrary, the changes in hydrology and demand are considered to have been unforeseeable at the time prior to their occurrence, and the Authority would consider that augmentations undertaken at that time were prudent. However, if no longer relevant because there exists a by-pass option, whether they should be removed and the nature of the compensation becomes an issue related to the specific investment in question; and

[2] The ACCC's regulatory test consists of three limbs: an interconnector limb, involving NPV analysis; the reliability limb involving a cost-effectiveness test; and the market benefits limb which also involves NPV analysis (ACCC 2004).

- the treatment of investments undertaken by GAWB in response to uncontracted potential future demand is a key concern. Investments of such a nature would, at least in the light of recent experience, not be considered to be prudent in the future (even though they may have been in the past) given associated significant costs and high uncertainty associated with the likelihood of the demand materialising. A question arises as to how to treat such assets and, in part, that depends on their relevance to GAWB's capacity for future service delivery. If removed from the asset base, issues of compensation arise. Such investments could be re-incorporated in the asset base if demand is subsequently achieved, in which case an appropriate return on the investment could then be capitalised into the asset base.

The Authority proposes to apply an incremental optimisation approach for the purpose of establishing GAWB's revised regulatory asset base.

6.5 Valuation of Other Assets

Land and Easements

A water business typically holds land for buildings, reservoirs and treatment plants, as well as the area submerged and adjacent to storages. Many water businesses also hold land for potential future dam sites. Easements are a right to construct and operate a pipeline and do not involve ownership of the land involved.

In the previous investigation, the Authority recommended that GAWB's land and easements be included in the asset base at historic cost indexed for inflation. The basis for this approach was the state of the then debate on land and easement valuation, and particularly the decision by the ACCC to adopt historic valuations for the Sydney Airport.

QCA Analysis

In March 2004, the Authority released its final decision on the consideration of an appropriate future valuation methodology to apply to easements for Queensland's electricity distributors. The Authority concluded that easements be valued for regulatory purposes on the basis of their historical acquisition cost maintained in real terms. The indexed historic valuation was considered to:

- maintain the incentive for operators to continue to invest in easements by ensuring that the real value of their past and future acquisitions are preserved over time;
- not create an incentive for inefficient bypass of the regulated network; and
- result in easement values being consistent with the real values for all other distribution assets.

On the basis of these conclusions, the Authority proposes to continue to value easements at indexed historic cost. The Authority's previous historic valuations for GAWB's easement assets, excluding the Castle Hope Dam site land were indexed to 30 June 2002 by applying the Brisbane CPI. When indexed to 1 July 2005 dollar values, these total $0.65 million.

The Authority has also previously applied indexed historic valuations to land assets including GAWB. However, in the Authority's draft decision on the Dalrymple Bay Coal Terminal, land valuations were based on fair value (market values) for land at the terminal and associated non-infrastructure improvements. Market value was considered to provide a better indication of

opportunity cost to the owner of the assets and was more consistent with the asset value which would be faced by a new entrant to the market.

In GAWB's case, it is also proposed to value land on the basis of market value as being more representative of opportunity costs. However, a revised market value for land was not available for the current investigation. Accordingly, it is proposed to adopt an interim estimate for the Draft Report based on a market value assessed by Herron Todd White for the previous investigation indexed forward using CPI. Market value at 1 July 2001 was $10.29 million, equivalent to $11.42 million at 1 July, 2005. This compares to an indexed historic value at 1 July 2005 of $18.73 million.

The Authority recommends that land be valued at market value and easements be valued at their historic cost indexed for inflation.

Work In Progress

In the Authority's previous investigation, capital expenditure involving work in progress for more than 12 months was accumulated and capitalised annually using WACC. However, it was not included as part of the asset base for pricing purposes until fully completed and able to contribute productive capacity to the system. The rationale for this approach was that these costs represent an unavoidable component of the capital expenditure for new assets which would be incurred in the competitive market.

The Authority proposes to continue including the capitalised cost of work in progress.

The Authority recommends that work in progress be capitalised using WACC and be recognised in the asset base for pricing purposes once it is fully completed and able to contribute productive capacity to the system.

Other Assets

Recreational Facilities

In the previous investigation, it was recommended that the DORC of the recreational facilities be included in the asset base as a significant proportion of the capital involved in the provision of recreational facilities is required for the provision of water catchment and site management services (for example, dam operations management, care-takers' facilities, boat ramps and other facilities). Offsetting revenues from recreational facilities were incorporated in GAWB's MRR.

The Authority proposes to maintain this approach for the current investigation.

Environmental Assets

Environmental assets operated by a water business may include such structures as fish ladders and monitoring equipment. These assets are required to address the externalities or resource management requirements of operating water storages and managing catchment impacts.

GAWB has already addressed some of its externalities through the operation of its fish hatchery to maintain fish populations in Awoonga Dam.

In the previous investigation, it was recommended that the DORC of the fish hatchery be included in the asset base on the basis that the fish hatchery addresses the environmental impacts of storage activities. Offsetting revenues from the operations of the fish hatchery were recognized in the revenue requirement. This approach is proposed to be maintained for the current investigation.

Relocated Assets

GAWB's proposed capacity augmentation included capital costs for relocation of road, rail, telecommunications and electricity services.

Where there is no market for a relocated asset, but the owner has a genuine intention to continue to use the asset, the appropriate measure of compensation for the resumption of the asset is the cost of reinstating or replacing the asset, taking into account its condition. Where a market does exist market value is appropriate.

In the previous investigation, the Authority recommended that the cost of assets necessarily relocated should be incorporated into the asset base at their cost of relocation. The Authority proposes to maintain this approach.

The Authority recommends that consistent with the previous investigation, that:

- **the DORC of the recreational facilities and fish hatchery assets be included in the asset base; and**
- **the cost of assets necessarily relocated should be incorporated into the asset base at their cost of relocation.**

6.6 Estimating DORC for GAWB

In the previous investigation, the Authority identified the DORC of GAWB's assets to be $302.4 million as at 1 July 2002, after optimising out $25.8 million of assets, some of which re-entered the asset base in later years.

Replacement Cost of Assets

The replacement cost under DORC measures what it would cost today to replace the existing asset with an asset which can provide equivalent services at least cost.

The Authority engaged SMEC to determine the depreciated replacement cost of GAWB's assets as at 30 June 2004. SMEC was required to have regard to the regulatory asset base established by the Authority as at 1 July 2002, new assets incorporated into the asset base since 1 July 2002, assets de-commissioned since the 2002 review, and any changes to the remaining useful life of assets previously estimated by SMEC. In particular, SMEC was required to take into account the effects of the drought on the condition of the assets.

SMEC reviewed price movements for various asset types from June 2002 to July 2004 and consequently applied a CPI index (for building materials other than housing) to dams, pumps, administration assets, plant and improvements. The Rawlinson's Construction Inflation Index was applied to buildings and the fish hatchery. SMEC identified specific price indexes for pipes, reservoirs and the treatment plant.

Optimisation of Assets

In the previous investigation, the Authority adopted an incremental brownfields approach, using estimates independently derived by SMEC. SMEC's optimisation was based on a 'just-in-time' approach taking into account the development timeframe, reasonable technical and economic considerations and the demand outlook. Specific recommendations made were that:

- in regard to storage infrastructure:
  - the current location and storage construction technology is considered appropriate;
  - the dam raising to FSL 40 represented the least cost supply option with the exception that $2.4 million in construction costs that were incurred in preparation for a raising to FSL 45, should be excluded from the asset base for pricing purposes; and
  - sufficient capacity cushion exists under the revised preferred planning scenario to defer the Stage 2 augmentation from current pricing considerations.
- with regard to the scale and timing of raw water distribution augmentation, capital costs of $23.1 million that have already been incurred for the Awoonga to Gladstone pipeline could have been deferred until 2004/05 and that $1.9 million in pipelines serving the Fishermans Landing area could have been delayed until 2002/03 if a 'just-in-time' approach were adopted. SMEC also identified the need for further expansion of the network as follows:
  - Awoonga to Toolooa: a third pump at Awoonga Pump Station in 2013-14 at a cost of $2.3 million;
  - supply to northern industrial area: the realignment of the Mt Miller pipeline from Gladstone, rather than Toolooa, at a cost of $14.96 million. A new reservoir and booster pump would be installed at Mt Miller tank in 2007/08 at a cost of $6.1 million, with a further booster to be installed in 2013/14 at a cost of $0.3 million; and
  - supply to Aldoga: the pipeline, boosters, pump and tank should be installed in 2003/04 at a revised cost of $7.62 million;
- the existing treated water system was either at or below optimum. SMEC recommended:
  - the Gladstone Water Treatment Plan be upgraded in 2002-03 at total cost of $1.5 million;
  - duplication of the Gladstone low-lift raising main in 2002-03 for $0.7 million;
  - upgrade of the rising main to Boyne Island/Tannum Sands in 2007-08 for $4.2 million;
  - duplication of the South Gladstone/Toolooa pipeline in 2002-03 at $2.85 million; and
  - expenditure on the Yarwun Water Treatment Plant of $0.3 million in 2002-03 to improve treated water quality and $0.39 million in 2002-03 to increase capacity.

Stakeholder Comment

CSC submitted that a greenfields approach to optimisation should be considered, particularly given the reduced yield from the dam and demand implications from the drought. CSC stated its residents are being harshly and unfairly treated when they are being potentially asked to pay over 70% more for their water than Gladstone residents, who live over twice the distance from the source of the water.

CSC proposed two alternative options which it stated would result in a more optimal cost of supply to the Council, including:

- relocation of existing water treatment plant to Benaraby, before distribution to the two Councils, with raw water separately routed from Benaraby to Gladstone industrial customers; and

- establishment of a new water treatment plant at Benaraby to supply CSC, and the existing plant to supply GCC.

CSC's comments were made in the context of differential pricing to the two Councils. This issue is discussed further in chapter 4.

DSDI stated that developments in relation to enhanced security of supply or alternative sources of supply may not be consistent with the 'just in time' planning and development strategies upon which the prior asset valuation method was based. It stated that excess capacity could be included in the asset base for prudential management, and prices to reflect increased supply security.

GAWB stated that a further review of the Mt Miller pipeline or other delivery assets is not justified so soon after they were accepted by SMEC and the QCA as prudent.

QCA Analysis

CSC's proposal involves an alternative treated water distribution system which bypasses parts of the present distribution system. This issue is addressed in Chapter 4.

In regard to the issue of prudent excess capacity raised by DSDI, with a new augmentation in place, there is significant spare storage capacity in Awoonga Dam. Should there be any requirement for additional capacity for regional development purposes, it should be addressed through appropriate CSO funding to GAWB.

The Authority engaged SMEC to undertake an optimisation assessment of GAWB's asset base over the 20-year planning period, taking into account the previous optimisation, changes in GAWB's circumstances including hydrology and demand, and the impacts of other external requirements where identified. SMEC's recommendations were that:

- in regard to storage infrastructure:

  – the current location and storage construction technology is considered to remain appropriate;

  – the dam raising to FSL 40 remains the least cost supply option. Although demands are lower than predicted at the time of the augmentation, this is offset by the lower system yield. SMEC noted that despite the changes in circumstances, the augmentation remains in the 'just-in-time' category and not too early; and

- at the time of the raising, GAWB built in provision for future raisings in the form of an additional 2.6m of embankment height, an investment of $2.4 million which was previously optimised out. Its current equivalent value is $2.8 million. SMEC indicated that this embankment is now required to meet a recent revision in the Probable Maximum Flood (PMF) level that Awoonga Dam is required to withstand. In this regard, the left abutment of the dam wall adjacent to the spillway remains lower than required for the PMF, but SMEC considers that the additional cost of this should not be included until further analysis is completed to ensure that it would be necessary;

- with regard to the scale and timing of raw water distribution augmentation:

  - the duplication of the Awoonga to Gladstone pipeline to the Mt Miller offtake, previously optimised out and re-instated in 2004-05, is retained in the asset base from 2005-06. While demand is lower than in the previous investigation, the additional capacity in this segment is required to service the Mt Miller pipeline and the northern industrial area. SMEC also advised that while an alternative specification would have involved smaller diameter pipes with higher pumping duties, there was no cost advantage in present value terms;

  - the $1.9 million in pipelines serving the Fishermans Landing area, which in the previous investigation were optimised out and re-instated in 2004-05, are considered a necessary part of the northern area supply and no optimisation is required;

  - the third pump at Awoonga Pump Station was previously optimised out until 2013-14, but is now considered necessary to manage the risk of lightning strikes or other breakdowns which could restrict supply;

  - the Mt Miller pipeline supply to northern industrial area which was brought into operation in mid 2004 is considered by SMEC to be 'just-in-time' to meet northern area demands and has a valuation at July 2005 of $14.69 million, at a saving of $1.4 million against the valuation used in the previous investigation. The pipeline has a domino effect which means that all previous raw water distribution upgrades from Awoonga to Gladstone including the Toolooa 50ML storage and the new Awoonga pumps are now necessary to service the northern area;

  - a new reservoir would be installed at Toolooa in lieu of Mt Miller in 2009-10 at a cost of $4.0 million;

  - a duplicate pipeline from Toolooa to the Mt Miller offtake is required in 2012-13 to provide sufficient flow into Gladstone and maintain supplies to Fishermans Landing ($4.6m);

  - a duplicate pipeline from the end of Mt Miller pipeline to Fishermans landing is required in 2020/21, at an estimated cost of $1.1 million; and

  - the pipeline, boosters, pump and tank which previously were to be installed for supply to Aldoga in 2003-04 are now deferred indefinitely. This results in a reduction of $8.3 million compared to the previous asset valuation.

- in regard to the existing treated water system, SMEC's revised assessment recommends that:

- the Gladstone Water Treatment Plant upgrade foreshadowed in the previous investigation is now required for water quality reasons and to meet Occupational Health and Safety issues;

- duplication of the South Gladstone/Toolooa pipeline foreshadowed in the previous assessment was required to meet increasing demands and to improve reliability of supply during peak periods. This work has now been completed at a cost of $1.8 million more than that previously estimated;

- the previously proposed upgrade of the rising main to Boyne Island/Tannum Sands in 2007-08 is no longer required due to reduced urban demand; and

- no further expenditure to upgrade the Yarwun Treatment plant was considered necessary. This has resulted in a reduction in previously estimated capital expenditure of $1.1 million.

SMEC has identified a number of assets which are redundant, either on a temporary or permanent basis, and which have been optimised out. These include:

- the future Castle Hope dam site, which may not be needed for more than 20 years and may not be required at all. As in the previous investigation, this land is excluded from the regulatory asset base;

- the Hanson Road main from Gladstone to the Yarwun treatment plant. In the previous investigation, this pipeline was optimised to 5% of its value reflecting its availability as a back-up supply;

- the raw water Aldoga/Kirkwood offtake which was installed prior to the Mt Miller pipeline. The location of the offtake was subsequently changed and the installed offtake is no longer required; and

- Boat Creek Reservoir, which was previously excluded from the asset base, is currently redundant and not included in the asset base.

SMEC's total valuation as at 1 July 2004 was $348.66 million, but included land at GAWB's book value. The Authority substituted indexed market values for land as estimated for the previous investigation. This has resulted in a reduction in land values of $7.31 million.

SMEC's valuation also included $2.7 million in DORC for the Serrent road fire-fighting pipeline which services the Gladstone Port Authority. The Authority has excluded this pipeline from the asset base as it is considered that pricing in regard to specific fire-fighting infrastructure should be a commercial matter between the two parties. The valuations were then indexed forward to 1 July 2005 values.

The revised DORC valuations, including land (at market value), easements (at indexed historic cost), environmental and other assets, are shown in Table 6.1. For comparison, SMEC's valuations for total DORC, as applied in the previous investigation, are shown in the table.

Table 6.1: Revised Regulatory Asset Base – GAWB ($m, opening values) [1]

	2005-06	*2006-07*	*2007-08*	*2008-09[1]*	*2009-10*	*2014-15*	*2019-20*	*2024-25*
SMEC Valuations 2002 Final Report	364.06	367.52	373.70	390.22	394.11	423.80	453.71	n/a
SMEC Valuations Final Report, July 2005 estimates	352.64	358.23	363.33	368.76	374.37	410.88	442.62	479.96

1. *Note that the 2002 Final Report values were inflated using actual inflation to July 2005 dollar terms. An annual inflation rate of 2.6% is applied to all values from 2005-06 onwards.*

Table 6.1 shows that SMEC's revised valuations are generally lower than the equivalent used in the Authority's previous investigation. For example, the July 2005 valuation of $352.64 million compares to a valuation of $364.06 million which would have applied had the previous valuation simply been rolled forward using CPI. The main adjustments, as at July 2005, are summarised below in Table 6.2. A significant portion of the net change is due to the use of market values for land, which are lower than indexed historic values.

Table 6.2 – Regulatory Asset Base Reconciliation – GAWB, 1 July 2005

	$ million
2002 Valuation Carried Forward by CPI	**364.06**
Plus – re-inclusion of dam wall works previously optimised out	+2.80
Less – lower cost for Mt Miller pipeline than previously expected	-1.40
Less – deferral of Aldoga Pipeline and removal from asset base at July 2005	-8.30
Plus - South Gladstone to Toolooa pipeline and rising mains	+1.80
Less – removal of proposed upgrade of Yarwun Water Treatment Plant	-1.10
Plus - other revaluation adjustments	+2.09
Valuation Adjusted for Assets	**359.95**
Less Change in Land Valuation to Market Value	-7.31
Revised Valuation at 1 July 2005	**352.64**

The Authority proposes to adopt the revised DORC asset valuations estimated by SMEC, that is, $352.64 million as at 1 July 2005.

6.7 Other Asset Valuation Matters

Working Capital

In the previous investigation the Authority recommended that working capital be included in the total value of assets.

The Authority recommended that working capital should be determined on the basis of debtors (accounts receivable) less creditors (accounts payable), plus inventories, taken pre-augmentation and expressed on a megalitre basis. In the absence of any reliable data, the requirement post-augmentation is then determined by applying the per megalitre value to delivered quantities expected over the review period. This gave an amount of $15.50 per megalitre allowed in 2001-02 for its previous investigation which was included in the asset base.

QCA Analysis

Based on advice from SMEC, the Authority has again adopted an estimate of working capital be assessing accounts receivable less accounts payable. However, SMEC has advised that GAWB has moved to a position where accounts receivable is less than accounts payable, there are no material inventories, and there is no need for a working capital amount. Accordingly, no provision for working capital is now necessary in GAWB's asset base.

The Authority recommends that, if necessary, working capital would be determined on the basis of debtors less creditors, plus inventories. However, as GAWB has moved to a position where accounts receivable are less that accounts payable, and there are no material inventories, there is no need for a working capital amount.

Contributed Assets

The justification and basis for recognising contributed assets and the manner for their recognition in prices were addressed in Chapter 4.

The Authority is not aware of any changes regarding contributed assets since its previous investigation. Therefore, it recommends that contributed assets previously identified by the Authority continue to be recognised on the basis of their DRC values.

The Authority proposes that contributed assets which were previously identified by the Authority should continue to be recognised on the basis of their DRC values.

7. RATE OF RETURN

Summary

The Authority recommends that CAPM/WACC should be used to determine the appropriate rate of return for GAWB. Consistent with its other recent regulatory decisions, a post-tax nominal approach is proposed. Bracketed amounts are those adopted for the purposes of the Authority's previous investigation.

The Authority proposes a WACC of 8.02% (8.72%), based on the following parameters:

- *risk free rate of 5.41% (6.02%);*
- *debt margin of 136 basis points (160);*
- *capital structure of 50% debt and 50% equity (50/50);*
- *market risk premium of 6% (6%); and*
- *an asset beta of 0.40 (0.45) and an equity beta of 0.64 (0.63).*

7.1 Introduction

Having determined the asset base, it is then necessary to determine the allowed rate of return on those assets. The rate of return is a forward-looking concept based on estimated future returns and expected future risk.

There are a variety of approaches to calculating the regulated rate of return. There has been significant new research and in some recent regulatory considerations, stakeholders have raised issues with the Authority's approach. Cost of capital matters, such as the appropriate term for the risk-free rate and the value of dividend imputation credits (ie 'gamma'), have stimulated significant interest and debate at the national level over the past several years among regulators, regulated businesses and customer groups.

In light of these factors, the Authority has recently reviewed its methodology for determining the cost of capital. As part of the Authority's assessment of the draft access undertaking for the Dalrymple Bay Coal Terminal (DBCT), occurring concurrently to the GAWB investigation, the Authority undertook an independent and comprehensive technical review of the approach to estimating the cost of capital (QCA 2004). The Authority's review was informed by a report prepared by Dr Martin Lally of Victoria University (Wellington, New Zealand). The review has involved an extensive process of public consultation.

As a result of this review, the Authority has adopted several changes to its previous approach. These changes were informed by the latest academic and regulatory thinking, recent empirical research, and stakeholder comments. By their nature, these issues are non-specific technical matters of methodology – none require a consideration of industry or business-specific factors such as those relating to the circumstances of GAWB.

Given the recent nature of this review, the need for regulatory efficiency and consistency, and as no overwhelming reason for change has been identified, the Authority's revised approach is proposed to apply to GAWB.

To assist GAWB stakeholders, a summary of key issues and the main reasons behind any changes to the approach adopted in the Authority's prior GAWB investigation (2002) are provided for comment. Please refer to the Authority's draft DBCT decision (QCA 2004) for the

complete technical review contained in Appendix 1 of that report. Of course, while the changed approach may be generic, the value of certain parameters will be determined by GAWB's particular circumstances. These issues are fully discussed in the relevant sections.

7.2 Overview of the Authority's Previous Approach

In its previous GAWB investigation, the Authority employed the Officer (1994) version 3 weighted average cost of capital (WACC) formulation. This approach defines firm cash flows in nominal, company post-tax terms and modifies the cash flows, as opposed to the discount rate, for the tax effects of both debt and dividend imputation.[3] With regard to the latter, the Authority adopted a value of 0.50 for gamma.[4] Allowing for the cash flow adjustments described, the discount rate WACC is:

$$(1) \qquad WACC = \hat{k}_e(1-L) + k_d L \,,$$

where L is firm leverage (debt to total value), $\hat{k}_e$ is the cost of equity with dividends defined to include imputation credits to the extent that they are usable, and k_d is the cost of debt.

The WACC model, therefore, comprises three primary components: the cost of equity, the cost of debt, and the capital structure of the firm.

Cost of Equity

The cost of equity capital was derived using the Officer version of the Capital Asset Pricing Model (CAPM). In the Officer CAPM, returns are defined to include imputation credits to the extent that they are usable, i.e:

$$(2) \qquad \hat{k}_e = R_f + \left(\hat{k}_m - R_f\right)\beta_e \,,$$

where:

R_f = risk-free rate

$\hat{k}_m$ = expected rate of return on the Australian market portfolio (inclusive of dividend imputation credits to the extent that they are usable)

β_e = equity beta (defined relative to the Australian market index)

The equity beta is related to the asset beta (β_a), the debt beta (β_d) and leverage (L) via the Brealey-Myers levering formula:

$$(3) \qquad \beta_e = \beta_a\left[1 + \frac{L}{1-L}\right] - \beta_d \frac{L}{1-L} \,.$$

The debt beta in (3) is determined as the ratio of the debt margin to the market risk premium, i.e.:

[3] Officer (1994) presents four versions of the model that vary according to the definition of company post-tax net cash flows.

[4] The tax parameter, 'gamma', is the product of the utilisation rate (U) and the ratio of imputation credits to tax paid (IC/Tax). The Authority has adopted estimates for these two parameters of .625 and 0.80 respectively, giving an estimate of 0.50 for gamma.

(4) $$\beta_d = \frac{\rho}{\hat{k}_m - R_f},$$

where ρ is the appropriate debt margin.

Cost of Debt

The cost of debt (or the promised yield) is the sum of the risk-free rate and the debt margin:

(5) $k_d = R_f + \rho.$

Capital Structure

In relation to the relative proportions of debt and equity finance, the Authority determined an 'optimal' capital structure by examining the average level of leverage in the water industry (after also looking at other regulated industries). Simulation techniques confirmed that GAWB could operate commercially at that level of leverage.

7.3 Review of the Rate of Return Framework

The Authority's technical review of the rate of return framework focused on five principal issues and recommendations for change made by Dr Lally:

- choice of CAPM version – modifying the Authority's cost of capital model to recognise the differential treatment of ordinary income and capital gains in the current Australian tax environment;
- the value of gamma – employing an estimate of gamma near (or equal to) one, consistent with the domestic CAPM;
- the basis for the risk-free rate – using a risk-free rate with a maturity that matches the regulatory cycle;
- debt beta – setting the debt beta to zero; and
- the beta levering formula – changing the beta levering formula to be internally consistent with the assumed values of gamma and the debt beta.

Choice of CAPM Version

The Officer CAPM assumes that capital gains and interest income are equally taxed. Lally's view was that the Officer CAPM's exclusion of the differential taxation of capital gains and interest income is unrealistic given the current tax environment in Australia, and results in a systematic bias in estimating the cost of equity capital for regulated businesses.

Lally recommended an alternative model, the Brennan-Lally CAPM, for regulatory decision-making. However, in the Authority's consultations in regard to the draft access undertaking for DBCT, most stakeholders rejected adopting the Lally CAPM, primarily on the basis of a lack of empirical support, parameter estimation difficulties and practical considerations (QCA, 2004).

The Authority recognises there is theoretical merit in recognising the differential taxation of interest income and capital gains as suggested by Dr Lally. However, the Authority considers that further work needs to be done to estimate the required parameters in the Australian context

such as the average tax rate on ordinary income for individuals. The verdict is still out on whether recognising the differential treatment of capital gains income actually provides additional explanatory power with respect to required investor returns. Finally, adopting such an approach would introduce a substantial learning curve for both the regulator and regulated firms including GAWB.

On this basis, the Authority considers that there is not a sufficient robust case to move away from its current method at this time, and proposes to continue using the Officer CAPM in determining the cost of equity capital.

Value of Gamma

The primary tax parameter that arises in the Officer Model is gamma (γ). Formally, gamma is defined as the product of two elements, the utilisation rate of imputation credits (U) and the ratio of imputation credits to company tax paid (IC/Tax). The value of gamma ranges between zero and one (inclusive) and can be recognised in the cost of capital model through either an adjustment to the regulated firm's cash flows or to the discount rate. There is an inverse relationship between the gamma parameter value and regulated prices. That is, the closer gamma is to one, the lower is the regulated price.

To date, the Authority has employed a gamma of 0.50, which comprises a value of 0.625 for the utilisation rate and 0.80 for the ratio of imputation credits to tax paid ratio. The Authority models the impact of gamma in the firm's cash flows.

Issues in the context of determining the appropriate value of gamma include:

- exclusion of foreign investors and the identity of the marginal investor – it has been argued that the marginal investor in regulated businesses is foreign and therefore imputation credits have little value; and

- empirical evidence – a recent study by Cannavan et al (2004) indicates that the value of imputation credits is, on average, less than the commonly accepted 0.50 by regulators, partly due to foreign investors.

Lally refuted the proposition that the value of imputation credits is determined by a marginal foreign investor on the grounds that it is inconsistent with the theoretical underpinnings of the Officer CAPM and that introducing the concept of a foreign investor is inconsistent with a domestic CAPM. Lally reasoned that in the context of a domestic CAPM, the value of gamma should be one.

The Authority considers that Lally made a strong case that the value of utilisation rate in the context of the Officer CAPM should be one, for consistency with the domestic framework of the model. The Authority acknowledges that in regulatory practice to date, values of about 0.60 have been employed, in part, based on an *ad hoc* recognition of foreign investors and on the basis of achieving compromise over a controversial issue.

The Authority considers that employing a value of one for the utilisation rate to achieve consistency in the current context would only be appropriate if the CAPM version also recognises the differential taxation of capital gains, which generally has the opposite impact on allowed revenues for regulated firms.

In terms of the other component of gamma, the ratio of imputation credits to company tax paid, the Authority acknowledges that its value is likely to be closer to one than to the current value of 0.80, depending on the relevant industry. However, increasing the value of this ratio would increase the value of gamma, resulting in a decrease in the revenues of the regulated firm, all

else being equal. The Authority considers that such a change is not appropriate at this time in view of the specification of the Officer model not to recognise capital gains, which would, in general, increase the revenues of regulated firms.

Given that the Authority has decided to retain the Officer CAPM, the Authority considers that no change in the value of gamma is warranted at this time.

Risk Free Rate

The risk-free rate is the rate of return on an asset with zero default risk. In setting the risk-free rate, there are three issues to consider:

- choice of proxy instrument;
- measurement period; and
- term of the risk-free rate.

In recent investigations, including GAWB (2002), the Authority has benchmarked the risk-free rate with reference to Commonwealth government bonds, averaged the rate over the twenty days preceding the start of the regulatory cycle, and determined the rate with reference to the yield on a 10-year maturity bond.

A 10-year Commonwealth bond rate has been consistently applied in recent water industry regulatory decisions. IPART (2003), in its medium term price paths for Sydney Water, Hunter Water, Gosford City Council and Wyong Shire Council, has adopted an average of the 10-year bond rate over 20 days prior to a nominated date. The ICRC (2004) used the same measure for its investigation into ACTEW's prices for water and wastewater services in the ACT. GPOC (2004) used a 45-day moving average of the ten-year bond rate and indexed bond rate in its bulk water pricing final report for Tasmanian water businesses.

In its review of these issues, the Authority noted that a Commonwealth Government bond is generally accepted as an appropriate proxy for a risk-free asset, due to its very low risk. The Authority considers that it remains an appropriate instrument for this purpose.

In relation to the measurement period, while an on-the-day rate offers the most current information, it possesses potential drawbacks in exposing producers and consumers to aberrant transactions on the specified date and inviting manipulation of the rate in the interest of maximising the allowed output price. On the basis that it contains the most recent information on prices, balanced by a mechanism that removes short-term spikes, the Authority proposes to continue using a 20-day averaging period.

In relation to the term of the risk-free rate, Lally recommended using a bond with a term equal to the length of the regulatory cycle. He argued that this term is the only one that satisfies the basic regulatory principle that the net present value of the expected future cash flows should equal the initial investment of the regulated firm. Lally submitted that the matching of the term of the bond to the regulatory cycle is robust to cost and demand shocks and to risks arising from asset valuation methodologies.

In general, the Authority accepts the merit in Lally's arguments. However, despite the theoretical appeal of estimating the risk-free rate with reference to the length of the regulatory period, the Authority does not propose to alter its current approach to determining the risk-free rate with reference to the 10-year bond. Relevant factors are that the use of a 10-year bond is consistent with commercial practice and, since the ACT's decision on GasNet, all Australian regulators currently set the risk-free rate on the basis of a 10-year bond.

In summary, the Authority proposes to continue to benchmark the risk-free rate with reference to a 10-year Commonwealth Government bond, averaged the rate over the twenty days preceding the start of the regulatory cycle.

Debt Beta

The debt beta represents the share of an asset's systematic risk that is borne by debt providers. In many of its prior regulatory decisions, including GAWB (2002), the Authority determined the debt beta by 'reverse-engineering' the CAPM:

$$R_d = R_f + \beta_d (R_m - R_f) \Rightarrow \beta_d = \frac{R_d - R_f}{R_m - R_f}$$

where:

R_d = expected return on debt

R_f = risk-free rate

R_m = expected return on the market portfolio

β_d = debt beta

In adopting this approach, the Authority typically used the promised yield on debt as a proxy for the expected return on debt, R_d.

SFG Consulting (SFGC) and Lally both observed that equating the promised yield on debt to the return on debt is not appropriate because the promised yield exceeds the expected return by, among other things, an amount equal to the default premium on corporate debt. Since the default element does not reflect systematic risk, SFGC submitted that the Authority's previous approach generates an estimate of the debt beta that is greater than its true value and is at its upper bound.

Lally observed that the promised yield also embeds an allowance for the inferior liquidity of corporate bonds relative to government bonds. Lally concluded that it is difficult to obtain accurate estimates for both the premium for expected default losses and the premium for inferior liquidity. As a result, an accurate estimate of the debt beta is difficult to derive. Lally recommended that the debt beta should be simply set to zero as the effect on the cost of capital from omitting the debt beta completely will be slight and, if anything, positive.

There have been various approaches adopted for estimating the debt beta in recent water regulatory decisions in other jurisdictions. IPART (2003) used a range of estimates for the debt beta of 0.06 to 0.14 for the major metropolitan water businesses. This range compares to an upper bound or 'reverse-engineered' debt beta of 0.17. In effect, IPART's approach spans most of the potential range of the debt beta. The ICRC (2004) used a debt beta of 0.06, below the estimated mid-point of 0.10 for the ICRC's case. GPOC applied a debt beta of 0.12, equivalent, in its case, to the upper bound, 'reverse- engineered' estimate.

The Authority's view is that its previous approach was likely to overstate the value of the debt beta. In other words, the previous approach to estimating the debt beta attributes the entire debt margin to systematic risk, i.e. it treats both default and liquidity premium allowances as systematic.

Approaches to dealing with this issue include setting the debt beta at zero, removal of the default premium using recent empirical research, or adopting a mid-point of upper and lower estimates. In choosing among the three approaches, the preferred approach should be the one that leads to estimating the debt beta with the least error.

The Authority notes that the suggested empirical approach suffers from the problem that it ignores the liquidity premium. Given standard regulatory assumptions on credit ratings and debt margins and evidence on the implied default premia, the Authority considers that the empirical approach remains likely to substantially overstate the true value of the debt beta.

Of the remaining approaches, setting the debt beta at zero or adopting the midpoint of lower and upper estimates, empirical limitations prevent determining which approach results in less error. In light of this indeterminacy, and since the Authority's view is that the debt beta is positive, the Authority's view is that the midpoint approach is preferable and will lead to less error than its previous approach.

Therefore, this represents a change from the previous approach adopted by the Authority in GAWB (2002). The impact of this change is that, all other factors being equal, the equity beta will be marginally higher, giving a slightly higher cost of equity and therefore, WACC. However, the change in approach will ensure that the debt beta is internally consistent with the CAPM approach and theoretically robust.

Levering Formula

Beta levering formulas adjust betas for the effects of financial leverage. The choice of a particular levering formula depends on several factors, including the firm's debt policy, the tax environment, the systematic risk of debt and sources of financing for the firm. In many of its prior regulatory decisions, including GAWB (2002), the Authority re-levered the equity beta using the Brealey-Myers formula:

$$\beta_e = \beta_a \left[1 + \frac{L}{1-L} \right] - \beta_d \frac{L}{1-L}$$

where:

β_e = equity beta

β_a = asset beta

β_d = debt beta

L = leverage (debt to total value)

However, as noted in the Authority's recent review (QCA 2004), the Brealey-Myers formula is inconsistent with other aspects of the cost of capital method. In particular, the formula does not account for the relevant tax environment and the effect of imputation, and effectively assumes that the imputation-adjusted tax rate (gamma) is zero. As noted above, the Authority considers a more appropriate value of gamma is 0.50.

The Authority therefore considers that an internally consistent approach to re-levering, which takes account of Australia's corporate tax environment, is the Conine formula:

$$\beta_e = \beta_a \left[1 + (1 - T_e) \frac{L}{1-L} \right] - \beta_d (1 - T_e) \frac{L}{1-L}$$

where the imputation-adjusted tax rate is $T_e = T_c(1-\gamma)$.

In effect, the previously used Brealey-Myers formula is a special case of the Conine formula that ignores taxes. The approach of using the Conine formula represents a shift away from that adopted in GAWB (2002), but is internally consistent, as it accommodates any assumptions that the Authority makes in regard to the value of gamma or the debt beta.

The Authority proposes to make no changes to its approach for determining the cost of capital in regard to:

- **the use of the Officer CAPM for determining the cost of equity capital;**
- **the value of gamma of 0.50; and**
- **a risk-free rate based on a 20-day average of the 10-year government bond rate.**

The Authority proposes to change the following elements of its approach:

- **the debt beta, to be estimated as the mid-point between zero and the upper bound including the default premium on corporate debt; and**
- **the levering formula, to the Conine beta levering formula which incorporates the imputation-adjusted corporate tax rate.**

7.4 Cost of Capital for GAWB

The changes to the Authority's cost of capital approach have been applied to GAWB.

Risk Free Rate

Determining the return on equity in the CAPM requires a risk-free rate. The risk-free rate represents the rate of return on an asset with zero default risk. In the previous investigation of GAWB, the Authority derived the risk-free rate based on a 20-day average of the 10-year Commonwealth bond yield, as at a preset date.

No submissions were received on this issue.

QCA Analysis

As discussed earlier, the Authority's preferred approach to determining the risk free rate is with reference to a Commonwealth government bond with a 10-year maturity, averaged over a 20-day period.

For the 20 day trading period ending 27 October 2004, the Commonwealth government bond rate averaged 5.41%.

The Authority considers that the risk-free rate for GAWB should be 5.41%, based on a 20-day average of the yield on a 10-year Commonwealth government bond.

Market Risk Premium

The market risk premium represents the reward that investors require to accept the uncertain outcomes associated with equity investment, relative to the return provided by the risk-free rate. This premium is determined with reference to the market portfolio, which is defined as the value-weighted portfolio of all risky capital assets. Since the true market portfolio is not observable, the most commonly used proxy is listed equity in a share market index, such as the All Ordinaries Index in Australia. The corresponding risk premium provided by these equities, comprised of dividend yield and capital gain, is provided by the All Ordinaries Accumulation Index.

Based on the historical average of the risk premia provided by the Australian equity market, using the All Ordinaries Accumulation Index, the Authority has adopted a market risk premium of 6% in its previous regulatory determinations. A full analysis of relevant information was provided in the Authority's previous GAWB investigation (2002).

No submissions were received on this issue.

Other Jurisdictions

Recent water industry regulatory decisions from IPART (2003), ICRC (2004) and GPOC (2004) all adopted a market risk premium of 6%.

QCA Analysis

Based on surveying a range of different estimation methodologies, including historical averaging, historical estimation, and forward-looking estimation, Dr Martin Lally concluded that the Authority's current estimate of 6% is reasonable in the context of the Officer CAPM (QCA 2004). On this basis, he recommended no change from the current estimate.

The Authority concurs with Dr Lally and supports the continued use of a base estimate of 6% for the market risk premium.

The Authority considers that an appropriate value for the market risk premium is 6.00%.

Asset and Equity Betas

An asset beta represents the business risk arising from the sensitivity, or covariance, of a firm's operating cash flows relative to the market. Asset betas are not directly observable and therefore must be derived from (observable) equity betas. The difference between an asset beta and an equity beta reflects the extent to which debt is used to finance the firm's assets. As a consequence, a firm's equity beta reflects both the underlying business risk associated with its assets and the financial risk borne by shareholders due to the firm's use of debt financing. Equity betas can be estimated from the historic returns of publicly listed companies.

Given this standard relationship between asset and equity betas, there are four basic steps for determining the underlying (asset) beta for the regulated firm:

(i) apply statistical techniques to estimate the equity beta from the firm's observable historic returns;

(ii) if returns are unavailable (i.e. the firm is not publicly listed) then identify comparator firms that match the firm of interest on the basis of explanatory factors for its beta (i.e.

systematic risk), such as the nature of the product and customer, the pricing structure and extent of monopoly power, the duration of supplier contracts, the presence and type of regulation, etc.;

(iii) after estimating equity betas for one or more comparator firms, use a levering formula and a value for the comparator firm's leverage to convert the estimated equity betas to the underlying asset betas; and

(iv) pool the derived asset betas in some manner to arrive at a single estimate for the regulated firm of interest, e.g. a simple pooling method is to select the median asset beta to eliminate the effect of outliers.

In its prior regulatory decision for GAWB (2002), reflecting the absence of listed comparators, the Authority considered the appropriate asset beta for GAWB, taking into account regulatory comparators and relevant risk factors. Then, the Authority re-levered the selected asset beta to account for GAWB's capital structure.

In deriving the asset beta for GAWB, the Authority concluded on the basis of other regulatory decisions and stakeholder comments that asset betas for the water industry typically fall within a range from 0.30 to 0.45, with most falling around 0.30 to 0.40.

The main factor which supported a beta towards the upper bound of the range for GAWB was uncertainty associated with future sales and thus future revenue stability. By comparison with other water businesses, GAWB was considered to be smaller, less diversified and more exposed to a proportionately higher level of excess capacity and medium term demand risk. The implications of the then drought and potential for GAWB's historic no failure yield to be reviewed also suggested significant revenue uncertainty. On these grounds, the Authority opted for an asset beta of 0.45 in its previous investigation, which, combined with a debt beta of 0.27 and a capital structure of 50%, was equivalent to an equity beta of 0.63.

Other Jurisdictions

Betas adopted in other recent regulatory pricing decisions in the water industry are noted in Table 7.1 below.

Table 7.1 Regulatory Determinations on Beta – Water Industry

Regulator	*Year*	*Gearing*	*Debt beta*	*Asset beta*	*Equity beta*
GPOC	2004	50	0.12	0.3-0.55	0.50 – 0.96
ICRC	2004	60	0.06	0.4	0.90
IPART	2003	60	0.06-0.14	0.3-0.45	0.65-0.9
QCA	2003	50	0.3	0.35	0.4
QCA	2002	50	0.27	0.45	0.63

Source: Regulatory decisions as reported in ACG 2004.

Stakeholder Comments

Comalco submitted that the previously recommended WACC was very high and not reflective of the business environment in which GAWB operates. It stated that GAWB's risk was very low, and recommended that it be reassessed based on a number of factors including:

- security and certainty of cash flow;

- credit rating of individual customers;
- price risk environment;
- technological environment;
- threat of competition;
- debt levels; and
- service levels.

Comalco proposed that a nominal WACC based on the risk free rate plus 1.2% (reflecting an appropriate equity beta) be used as it was commensurate with competitor infrastructure service providers in the global environment. Comalco also stated that for those customers that require greater supply security, a compensating increase in the WACC rate could be determined.

Both CSC and GCC argued that industrial customers are a higher risk customer group relative to Councils and should be priced accordingly. They suggested that the higher financial/investment risk to GAWB from industrial customers be considered when prices are formulated, possibly through a higher rate of return on capital (via specific customer group betas in the WACC calculation). CSC stated that to be equitable, those customers who demand higher reliability should pay a premium which reflects the additional infrastructure costs to deliver that surety.

GAWB proposed that the asset beta should be in excess of 0.45, and suggested that it be set at 0.60, similar to the value applied to the Central West Pipeline (CWP) by the ACCC. This would equate to an equity beta of 0.97. GAWB submitted that it shares many similarities with CWP including uncertain future revenue and a regional industrial customer base.

GAWB noted that water businesses are generally considered to be inherently less risky than other industries, because of low technology risk, the absence of substitutes and the essential nature of water as a commodity. However, it proposed that GAWB is different, as:

- only a small proportion of sales is used for sustaining life – everything else is essentially discretionary and dependent on economic factors;
- more than 50% of water supplied is used in cooling processes, for which substitutes exist and technology risk of stranding is much higher than applies to potable water reticulation;
- the regulatory regime provides a higher risk (threat of asset optimisation, uncertain regulatory period, uncertain scope of future regulatory intervention);
- there is higher demand and cash flow uncertainty; and
- there is a higher correlation of its returns with market returns.

GAWB submitted that other urban distribution businesses have lower systematic risk because their returns are dependent on 'migration, birth rates and local economic performance (and other specific factors such as take-up rates of air-conditioning etc.)' and therefore their returns are likely to be uncorrelated with market returns. By comparison, GAWB submitted that its industrial demand varies with changes in international markets. GAWB proposed that its business risk is more similar to the 'electricity generator providing energy to Gladstone's industrial customer base than with urban water distribution utilities'.

Alternatively, GAWB submitted that, should the Authority retain an asset beta in the range of 0.45, the Authority should 'de-risk' the regulatory framework to better align GAWB's regulated business risk with its allowed return.

Consultant's Report

In light of the divergence in submitted betas for GAWB (eg equity betas ranging from 0.06 to 0.97) and absence of listed comparators, the Authority engaged the Allen Consulting Group (ACG) to undertake an independent study to determine an appropriate asset beta for GAWB.

In doing so, ACG noted that GAWB had not demonstrated any relationship between the domestic economic cycle and its own revenues to justify its claim for an asset beta of 0.60. Indeed, ACG's examination of historical revenues from GAWB's major customers demonstrated a negligible sensitivity to the domestic economic cycle.

The ACG undertook a 'first principles analysis' of GAWB's business characteristics to identify the underlying explanatory factors for beta. This analysis suggested some key countervailing influences on beta:

- as a regulated monopoly service provider, GAWB would have a lower beta than the average company in the market;
- the demand for water is stable relative to the economic cycle, and would suggest a lower beta than, say, electricity distributors;
- GAWB's pricing structure has a significant fixed component which will cushion the impact of a reduction in volumes due to a downturn in the economy, suggesting a lower beta;
- relative to water companies serving large metropolitan areas, GAWB's demand is more heavily weighted towards industrial demand, which should have a higher systematic risk than domestic demand. However, for untreated water, the vast majority of existing demand is due to QAL. QAL is dependent on the world market for alumina, which is not correlated with the domestic economic cycle, suggesting that a large part of GAWB's existing industrial load is uncorrelated with the domestic cycle;
- the utilisation of GAWB's spare capacity by new demand is likely to be dependent on the domestic economic cycle which would suggest a higher level of systematic risk and a higher beta. However, given that the demand forecasts in utilising spare capacity are not aggressive, this mitigates any systematic risk arising from the existence of excess capacity;
- while a price cap will negatively impact a utility in a downturn due to exposure to volume risk, it is unlikely to have an appreciable effect on low or very low levels of systematic risk as is the case for GAWB; and
- GAWB's average operating cost ratio was found to be low relative to that of Victorian metropolitan and rural water utilities. However, this ratio was found to be significantly more variable over time than US water companies, indicating that GAWB's relative risk may be higher.

Taken as a whole, and after weighing the countervailing influences on beta, ACG advised that GAWB faces a similar level of systematic risk as a metropolitan water utility. However, there are no listed Australian water companies from which to derive an equity beta from market data.

On the basis of these characteristics, ACG therefore reviewed betas of listed Australian energy distribution and transmission businesses, nine US and six UK water businesses. ACG compared rolling averages taken over 60 weekly observations and 60 monthly observations (Table 7.2).

Table 7.2. Observed Equity Betas – Comparator Markets

	60-month average pre-dot-com bubble	***60-month average, current***	***60 week average, current***
Australian Energy (re-levered to 60%)	At June 1999	At Oct 2004, monthly	At Nov 2004, weekly
	0.70	0.21	0.73
US water businesses (re-levered to 50%)	At June 1997, monthly	At Oct 2004, monthly	At Nov 2004, weekly
	0.34	-0.02	0.86
UK water businesses (re-levered to 50%)	At June 1998, monthly	At Sept 2004, monthly	At Oct 2004, weekly
	0.96	0.23	0.17

Source: ACG, 2004

ACG proposed that the current 60 month averages are likely to be significantly understated, as they use data from the unusual 'dot-com' stock market bubble period. During this period in the early 2000's, the increased demand for utility stocks relative to the market depressed observed betas to low or negative values. ACG submitted that utility stocks were undervalued during this period and did not reflect a typical, long-term relationship with the market. ACG therefore proposed that beta estimates prior to and after this period should be used, as they are more indicative of future values. Adopting a 60 week average, ACG estimated equity betas for Australian energy companies of 0.73, US water companies of 0.86, and UK water companies of 0.17.

Based on its analysis of underlying factors and beta estimates of selected comparators, the ACG recommended an asset beta for GAWB of 0.40. Assuming leverage of 50% and applying the Authority's revised approach to the debt beta and levering formula, the ACG's recommendations are consistent with an equity beta of 0.64.

QCA Analysis

The Authority notes that the factors proposed by Comalco as relevant to determining the relevant WACC generally relate to the variability of cashflows. These factors have been taken into account in ACG's analysis of the appropriate level of beta.

ACG also took account of other infrastructure providers domestically and internally, as proposed by Comalco. However, the Authority notes that Comalco's suggestion of a 1.2% premium on WACC above the risk free rate would equate to an asset beta of around 0.15 and an equity beta of around 0.17, which would be inconsistent with these comparators.

In relation to the issues raised by the Councils, the Authority notes that its assessment of GAWB's WACC is an entity-wide assessment, based on net cash flows. The Authority does not consider the variability in the service provided and related risk between industrial customers and Councils to be sufficient to justify determining separate rates of return. However, the Authority considers that prices to these customers should be determined separately and should reflect the costs of relevant infrastructure, including any additional security requirements (Chapter 4).

In relation to the issues raised by GAWB, the Authority considers:

- GAWB's proposed asset beta of 0.60, based on the ACCC's CWP decision, is not appropriate. This beta was predicated on CWP's newly constructed infrastructure and absence of established market for services and contractual arrangements (ACCC 2000). In contrast, the Authority notes that GAWB has a number of existing customers predominantly under contract with an established market for its services;

- GAWB faces a relatively low risk environment due to the low level of technology risk, absence of reasonably priced substitutes, and the essential nature of water as a commodity, including its uses for sustaining life and as a reasonably priced cooling agent. It is the affordability of GAWB's water that ensures substitutes are unlikely to pose an immediate or medium term threat to its provision of water services;

- by determining key pricing principles in advance, the regulatory regime provides a stable and known environment for commercial decision making. In particular, the risk of asset optimisation, regulatory periods and future regulatory intervention are known in advance;

- demand estimates for the current investigation are based on contracted volumes which are relatively certain, with only a small component to account for future undetermined demand growth; and

- GAWB's cashflows are not highly correlated with domestic market returns, as demonstrated by ACG. In particular, the demand derived from GAWB's key industrial customer, QAL, is correlated to the international market for alumina, which has not been highly correlated to the domestic market.

The Authority's view is that ACG makes a compelling case that GAWB's systematic risk is relatively low and, on this basis, accepts ACG's recommendation of 0.4 for the asset beta for GAWB, given current arrangements. Based on leverage of 50% (see discussion below), and employing the Authority's proposed approach to the levering formula and debt beta, the resulting equity beta is 0.64.

The Authority notes that this asset beta is lower than its previous estimate of 0.45 (QCA 2002). However, the Authority's revised approach to the debt beta and levering formula results in a higher WACC than would otherwise apply, all other things being equal. Moreover, the current proposed pricing framework allows GAWB to recover capacity costs based on a conservative demand profile incorporating essentially contracted and reasonably certain demand growth. The price cap approach also allows GAWB to take advantage of any upside to this demand projection during the regulatory period. This reduces GAWB's systematic risk exposure and justifies a lower asset beta than previously.

The Authority considers that an appropriate asset beta for GAWB is 0.40, with a corresponding equity beta of 0.64.

Capital Structure

A firm's weighted average cost of capital is the weighted average cost of servicing the various classes of financial claims on the firm. Capital structure refers to the relative weights of debt and equity that together finance the company's asset base. Each source of capital or financial claim will involve different risks and, therefore, different costs. Business or operating risk reflects the risk of the firm when it is solely financed by equity funds. The addition of debt financing increases the risk to equity holders. The risk from financial leverage is known as

financial risk and is the result of the capital structure decision. The higher the level of debt, the higher the equity beta will be and the higher the cost of equity.

The Authority's typical approach to determining the capital structure for a regulated business involves benchmarking an 'optimal' capital structure by examining the average level of leverage in an industry (or set of related industries) and regulatory precedents, and using simulation techniques.

In the previous GAWB investigation (QCA 2002), the Authority noted that, while the average gearing for water service providers was less than 50%, this was expected to rise with a greater emphasis on commercial practices. At the time, GAWB and its customers generally supported a gearing of 45 to 50%. The Authority considered that the lumpiness of water industry capex was a major constraint on the capital structure, and that because of the resulting need for adequate coverage of debt payments associated with augmentation, a benchmark level of gearing for GAWB of 50% was recommended.

No submissions were received on this issue.

Other Jurisdictions

Gearing levels adopted in other recent regulatory pricing decisions are noted in Table 7.3 below.

Table 7.3 Regulatory Determinations on Capital Structure

Regulator	*Year*	*Industry*	*Gearing (%)*
Ofwat*	2004	Water (UK)	55
GPOC	2004	Water (Tas)	50
ICRC	2004	Water	60
IPART	2003	Water	60
QCA (Burdekin)	2003	Water	50
QCA (GAWB)	2002	Water	50
ICRC	2004	Electricity distribution	60
IPART	2004	Electricity distribution	60
ACCC	2003	Electricity transmission	60
ACCC	2002	Electricity transmission	60
QCA	2001	Electricity distribution	60
OffGAR	2003	Gas transmission	60
ACCC	2003	Gas transmission	60
NTUC	2002	Gas supply	60
ORG	2002	Gas distribution	60
QCA	2001	Gas distribution	60
QCA*	2004	Ports	60
QCA	2001	Rail	55
ORG	2000	Ports	40

** Preliminary/draft position*
Source: Regulatory decisions as reported in ACG 2004.

Consultant's Report

The Authority engaged ACG to assess the optimal capital structure and associated credit rating of GAWB on a stand-alone basis. The ACG assessed GAWB against actual and regulatory capital structures for water and other regulated entities in Australia and overseas.

In relation to actual capital structures, ACG noted that:

- actual capital structures of Australian water entities are typically low. Gearing levels generally lie below 20%, partly due to the public ownership of assets and non-commercial asset valuation techniques. Gearing tends to rise in response to commercialisation. Given these considerations, the commercialised Melbourne Water's 45% gearing probably provides the best available individual benchmark; and

- water companies in the US and UK have gearing levels within the 50% to 60% range, supporting the view that Australian water companies can support higher levels of debt than those currently observed. However, these results relate to larger water companies with stable domestic and industrial demand that do not have the reserve capacity that affects GAWB's operations.

ACG noted that recent regulatory decisions have favoured capital structures in the range of 40% to 60% (Table 7.3):

- in the energy sector, regulatory practice has uniformly been a 60% gearing assumption;

- for water companies, gearing levels have varied from 50% to 60%, reflecting the water industry's lesser capacity than the energy sector to generate consistent and stable cash flows required to support debt. These gearing levels relate to relatively large water companies with stable domestic and industry demand; and

- for ports and rail, 40% to 60% gearing has been assumed.

After comparing GAWB with these entities, ACG advised that GAWB is less able to support debt than energy companies, due to the lumpy nature of GAWB's demand and capital investments with large amounts of reserve capacity. GAWB faces greater volatility in earnings than these companies. Moreover, ACG considered GAWB was less able to support debt than larger, more diversified water companies, given its level of reserve capacity, weather risks and demand factors.

In summary, ACG concluded that a gearing level below that of energy companies and at the lower end of the range applied to water companies should apply. Consequently, ACG recommended that gearing of 50% for GAWB would be appropriate for regulatory purposes. Given a gearing of 50%, ACG recommended a credit rating of BBB on the basis of cash flow and ratio sensitivity analysis and comparisons with rated comparables.

QCA Analysis

The Authority considers that using an optimal capital structure for the regulated firm is appropriate. This structure should be based on examining the average level of leverage in the industry or in a set of related industries, and regulatory comparators. Simulation techniques can also be adopted to check that regulated revenues can support this optimal capital structure.

ACG has determined an optimal capital structure and associated credit rating for GAWB on the basis of an analysis of actual structures, regulatory comparators and financial ratios. Energy companies are typically geared at 60% for regulatory purposes and large water companies are

geared at between 50 to 60%. However, GAWB's operations are characterised by greater periods of excess capacity for long periods and weather risks relative to these businesses.

The Authority therefore accepts ACG's recommended capital structure of 50% debt, and associated credit rating of BBB, on the basis that GAWB's circumstances impose additional constraints on capital structure compared to energy companies and other water business comparators.

The Authority considers that an appropriate capital structure for GAWB is 50% debt and 50% equity, with an associated credit rating of BBB.

The Cost of Debt

The cost of debt is the marginal rate at which a firm can raise debt financing, or alternatively, the cost that the firm's debt holders demand on new borrowings. It is usually expressed as the sum of the risk-free rate and a debt premium or debt margin.

The cost of debt depends on a variety of risk factors, including liquidity and default, the latter of which is, in turn, affected by the firm's leverage, the short term volatility of cash flows and the long term security of revenue.

For regulatory purposes, the cost of debt should reflect the current market rate for debt for a firm that is efficiently financed, having regard to any obligations that the firm is required to meet. For example, GAWB is required to maintain at least a BBB credit rating. A further issue relates to debt issuing costs, which can be included within the cost of debt or treated separately in cash flows.

In the previous GAWB investigation, the Authority used a debt margin based on the differential between the risk-free rate and BBB rated 10-year debt, estimated at June 2002 to be 160 basis points. No submissions were received on this issue.

Other Jurisdictions

Debt margins adopted in other recent regulatory pricing decisions are noted in Table 7.4.

Table 7.4 Regulatory Determinations on Debt Margins

Regulator	*Year*	*Industry*	*Margin* (basis points)*	*Benchmark credit rating*
GPOC	2004	Water (Tas)	70	n.a.
ICRC	2004	Water and elec distribution	112	BBB+
IPART	2003	Water	70-100	n.a.
QCA	2003	Water (Burdekin)	180	BBB
QCA	2002	Water (GAWB)	160	BBB
IPART	2004	Electricity distribution	90-110	BBB to BBB+
ESCOSA**	2004	Electricity transmission	150	BBB+
ACCC	2003	Electricity transmission	91	A
ACCC	2002	Electricity transmission	110	A
OffGAR	2003	Gas transmission	120	n.a.
ACCC	2002	Gas transmission	159	BBB+
ESC	2002	Gas distribution	165	BBB+
QCA**	2004	Ports	117.5	BBB+

** Margin excludes allowances for debt-raising costs*
*** Preliminary/draft position*
Source: Regulatory decisions as reported in ACG 2004.

Consultant's Analysis

The Authority engaged the ACG to undertake an analysis of GAWB's cost of debt, based on the previously determined optimal capital structure and credit rating.

The ACG examined evidence for determining current yields on BBB rated entities from these sources:

- recent BBB+ and BBB rated bond issues;
- CBASpectrum and Bloomberg estimates; and
- other bond-issuing options.

ACG observed that there is presently only one 10 year fixed-rate BBB rated bond in the Australian market, and its current yield is about 127 basis points above the 10-year government bond rate. As a consequence, direct market evidence for 10-year, BBB rated debt in Australian markets is very thin and, therefore, somewhat uncertain.

Estimates from CBA Spectrum and Bloomberg services are derived from optimisation models that estimate a 'fair market' yield for various maturities and rating for Australian corporate bonds. ACG observes that these models also rely on available market data as an input. As a result, the uncertainty surrounding the market data also affects their estimates. CBA Spectrum data suggests a yield of 110 basis points and Bloomberg suggests a yield of around 135 basis points above the 10-year government bond rate.

ACG observed that higher leveraged infrastructure utilities typically take advantage of major debt-raising options, such as 'credit wrapping', where a financial organisation provides a non-revocable financial guarantee to the bondholder to make good the principal and interest that was not paid by the issuer. These organisations, known as 'monolines', are rated AAA and provides their own credit rating to the issue for an annual fee. Indirect evidence of 10-year credit wrapped bonds issued in the Australian market by energy and transport infrastructure companies over the past two years suggests that credit wrapping may enable Australian infrastructure companies to issue at debt margins that are lower than the CBA Spectrum and Bloomberg 10-year bond rate estimates. Further, many such Australian firms currently seek funding for long-term debt in extremely competitive US private placement markets, and evidence from these markets also suggests that firms can obtain 10-year debt at a margin that is substantially below the CBA Spectrum and Bloomberg estimates.

However, given the lack of direct evidence on the above matters, the ACG recommends continued use of the CBA Spectrum and Bloomberg benchmarks. Using an average over the 20 days preceding 27 October 2004, the range is 110-135 basis points for the debt margin, exclusive of debt-issuing costs.

The typical range that regulators provide for debt-issuing costs is 10-15 basis points. The ACCC established an allowance of 12.5 basis points applied to companies with a BBB+ credit rating, on the basis of advice from Westpac and detailed analysis of its own. The 12.5 basis points allowance has since been revised upwards to 25 basis points by the Australian Competition Tribunal (ACT) in the GasNet and EAPL appeals, but based on little empirical support.

ACG considered that whether the allowance of 12.5 basis points (based on BBB+ rated debt) should be revised upwards if GAWB has a benchmark rating of BBB was ultimately an empirical question. It noted the evidence in the Australian market is very thin, and US studies suggest that for bond issues rated above investment grade (BBB or better), gross underwriter spreads have little correlation with the bond rating. As underwriter fees form the majority of issuing costs, ACG considered that these costs will be similar for BBB and BBB+ rated bonds.

In summary, the ACG recommended a range of 110 to 135 basis points for the debt margin. Including the proposed allowance of 12.5 basis points for debt-issuing costs results in a range of about 123 to 148 basis points for the total margin about the risk-free rate.

QCA Analysis

The Authority has sought to estimate the cost of debt for GAWB based on: the risk-free rate derived from the yield on the 10-year Commonwealth government bond; an optimal capital structure of 50%; and a credit rating of BBB. It is appropriate to consider a range of evidence for determining current yields on BBB rated entities.

Estimates from CBA Spectrum and Bloomberg services suggest a margin spread within which lies the single market observation for fixed rate 10-year BBB rated debt. However, as there is only one market observation, it is uncertain how much reliance can be placed on it. Other market evidence, based on bond-issuing options, indicates it is likely that infrastructure firms are able to secure debt financing at a margin that is lower than both the Bloomberg and CBA Spectrum estimates. The Authority also notes that regulators' use of these estimates provides firms an incentive to seek innovative financing.

Taking all of these factors into account, the Authority accepts ACG's recommended range of 123-148 basis points. Given that there is some inherent uncertainty in determining a firm's efficient cost of debt, and that the observed value for 10 year BBB rated debt lies in between these values at 127 basis points, the Authority's view is that an average of the estimated lower

and upper bounds should be adopted. Therefore, an allowance of 136 basis points for the cost of debt, including debt-issuing costs, is appropriate. This allowance gives GAWB a cost of debt of 6.77%.

The Authority considers that an appropriate cost of debt for GAWB is 6.77%, based on a risk-free rate of 5.41% and a total margin of 136 basis points above the risk-free rate.

Gamma

In the context of the Officer model version 3, the Authority treats dividend imputation in the cash flows. No submissions were received on this issue.

Other Jurisdictions

IPART (2003) adopted a range of 0.30 to 0.50 for gamma for the four urban water businesses. The ICRC (2004) and GPOC (2004) both applied a gamma of 0.50 for their recent water-related pricing investigations.

QCA Analysis

The Authority notes that gamma is not a company-specific parameter and, therefore, the identity of the marginal investor in the context of GAWB is irrelevant. As noted above, the Authority will retain a value of gamma of 0.50 in the context of the Officer WACC3 model.

The Authority considers that a gamma of 0.50 is appropriate.

Expected Inflation

In applying its preferred nominal post-tax approach, the Authority requires a projection for inflation over the regulated period. No submissions were received on this issue.

QCA Analysis

The Authority's preferred approach is to estimate inflation as the difference between the nominal bond rate and capital indexed bonds over the same period (that is, utilising the Fisher equation).

The benefit of such an approach is that it delivers a forward looking estimate of inflation rather than an historic measure. This method is also consistent with the approach adopted by other regulators. Being forward looking, it is more indicative of the underlying inflation rate exclusive of one-off impacts such as the introduction of the GST.

Consistent with the view that information should be as up to date as possible, the Authority has calculated an expected inflation rate based on the difference between the ten year bond rate and a similar maturity indexed bond rate, averaged over the 20 trading days to 27 October 2004. The implied inflation rate is 2.6%.

The Authority proposes to apply an inflation rate of 2.6%.

7.5 Summary of WACC Parameter Values

The Authority's analysis gives a cost of equity capital for GAWB of 8.85%, based on a risk-free rate of 5.41%, a market risk premium of 6.00% and an equity beta of 0.64. The cost of debt capital is estimated at 6.77%, based on the risk-free rate of 5.41% and a total margin of 1.36%. Applying a capital structure of 50% equity and 50% debt yields a nominal, post-tax WACC for GAWB of **8.02%**. Table 7.5 summarises Comalco and GAWB's positions where available, along with the Authority's draft position, on the cost of capital for GAWB.

Table 7.5: GAWB Cost of Capital Parameter Values

Parameter	***Comalco****	***GAWB***	***Authority Draft Position***
Risk-free rate (%)	-	-	5.41
Market risk premium	-	-	6.00
Debt margin	-	-	1.36
Debt beta	-	-	0.11
Capital structure (% debt)	-	-	50
Asset beta	-	0.60	0.40
Equity beta	0.17	-	0.64
Gamma	-	-	0.50
Officer WACC3	**6.61**	**9.13**	**8.02**

* Comalco submitted that GAWB's nominal WACC be based on the risk free rate plus 1.2% (reflecting an appropriate equity beta). The equivalent equity beta using the Conine levering formula is 0.17.

8. RETURN OF CAPITAL

Summary

Return of capital (or depreciation) is a measure of the rate of consumption of an asset's service potential.

While there a number of approaches for calculating depreciation, the Authority has concluded that depreciation for the regulatory pricing period commencing on 1 July 2005 should be based on straight-line depreciation calculated using DORC asset values and condition-based estimated remaining asset lives. Straight-line depreciation is appropriate as it best reflects the average pattern of deterioration for GAWB's asset types.

While the Authority considers a renewals annuity to be a suitable alternative to depreciation for longer life assets that are renewable rather than replaceable, its application is not possible as GAWB is yet to finalise its strategic asset management plan (SAMP).

8.1 Background

Return of capital (depreciation) is a measure of the rate of consumption of the service potential of assets. It is measured with reference to either depreciation charges or (where appropriate) renewals expenditures. As such, it is included as a cost of service provision.

Methods of dealing with asset consumption include:

- a periodic depreciation charge can be allocated to assets. This periodic depreciation charge can be set using either accounting or economic depreciation methods; or
- a renewals annuity approach which assumes that, through regularly planned maintenance and renewals programmes, the system as a whole does not lose service potential and therefore does not need to be depreciated.

8.2 Approaches to Return of Capital

Accounting Depreciation Approach

An accounting depreciation approach depreciates assets over the term of their useful lives. A number of central issues need to be addressed in determining accounting depreciation, including:

- the opening and closing values of the asset;
- an assessment of the useful life of the asset, to determine the period of time over which the reduction in service potential for an asset should be charged; and
- the pattern or method of depreciation. Central to this choice is a consideration of the elements of consumption that drive changes or reductions in the service potential of assets. Different approaches may therefore be appropriate for different assets.

Where a smoothed pattern of the erosion of asset value over time is adopted, the best-known options are:

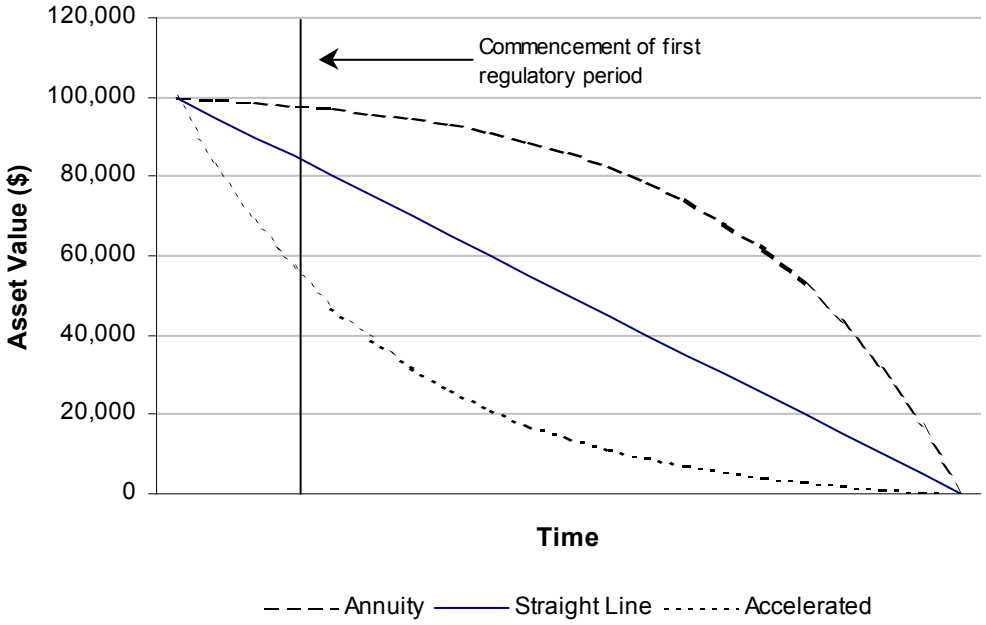
- straight line (or linear consumption) depreciation – this method provides for an equal amount of depreciation each year, found by dividing the difference between opening value and salvage value by the expected life of the asset. This is a simple approach that is well understood and widely accepted, and is suited to assets where the rate of consumption is stable from year to year;

- annuity based depreciation or constant efficiency – this method is most suited when assets maintain full productive capacity until they reach the end of their useful life, like a light bulb for instance; and

- accelerated depreciation – this method is most suited when productive capacity declines at a constant rate, for example, 25% per year, like radioactive decay or a melting block of ice. Maintenance must grow at an increasing rate to sustain output. Accelerated depreciation, or the diminishing value method, results in higher depreciation early in the asset's life. Under this method, a fixed percentage is written off each year, calculated on the declining balance at the beginning of each period.

Asset valuation patterns for an equivalent asset under each of these alternatives are illustrated in Figure 8.1. Equivalent assets are valued more highly under the annuity depreciation approach compared to either the straight line depreciation or accelerated depreciation approaches.

Figure 8.1: Depreciation Schedules



Where the erosion of asset value over time is not smooth, the units of production method assigns a depreciation charge according to the asset's use or productive output. This approach is appropriate where water asset usage varies substantially from year to year. The main drawback is the difficulty of establishing an effective measure of use that reflects the decline in the value of the asset.

For the water industry, cost based depreciation may result in a depreciation charge which exceeds the actual revenue requirement for the maintenance of the service potential of the asset, particularly because of the inability to accurately determine the lives of some water assets (for

which the useful life may extend beyond 100 years). Under this approach, there is a tendency to under-estimate the useful lives of long-lived water supply assets such as dams and pipelines.

Where depreciation is applied, it is important to ensure that it extinguishes the asset value over the remaining productive life of the asset. That is, the methodology adopted should be tested to ensure it results in an asset value of zero at the end of the economic life of the asset.

Economic Depreciation Approach

One approach to economic depreciation measures the change in the economic value of the entity, measured as the difference between the value at the beginning of the period and at the end of the period. For regulated monopolies, this introduces a circularity problem as their economic value is dependent on the prices allowed by the regulator which are in turn dependent upon the level of depreciation allowed.

Another approach to economic depreciation, as accepted by the ACCC in its Central West Pipeline decision (2000), allows for under-recovery in the early years of a start-up project's development, and over-recovery in later years. In this formulation, economic depreciation is deducted from the capital base each year to reflect the extent to which total revenue has covered costs. Costs incorporate accounting depreciation. If costs are not covered in the initial regulatory period, economic depreciation will be negative. This results in an increase in the capital base over the period.

8.3 Renewals Annuity

Under the renewals annuity approach, the asset network is considered to be an integrated, renewable system to be maintained in perpetuity, rather than a collection of individual assets each with their own asset lives and maintenance requirements.

The renewals annuity approach is generally considered to be valid only for infrastructure assets satisfying the following characteristics:

- the asset system is renewable rather than replaceable. In other words, the components of the system will be replaced according to their own useful lives, but the operating capacity of the system as a whole will be maintained; and

- for the foreseeable future, demand is such as to warrant continual renewal of the asset system so that the assumption of an infinite asset life is warranted.

The essential input to a renewals annuity approach is an asset management plan. GAWB is required to develop a strategic asset management plan (SAMP) under the *Water Act 2000*. Taking account of the age, condition and service capacity of the system, a total maintenance plan is developed which identifies the most effective operating lives and times for replacement of all assets which together comprise the system or network. An expenditure programme, in some cases for a period as long as 35 years, is then developed to both replace component parts of the system when required and to carry out all other operations and maintenance.

Major expansions to the network, such as the addition of a new storage or transmission link, would form part of the capital expenditure. These would need to be dealt with separately, as would other 'assets' that do not comprise part of the overall network (such as office equipment, motor vehicles and other ancillary assets used by a water services business).

The potential advantages of the renewals annuity approach include:

- the existence of higher quality information about the total system or network that the overall plan provides;
- the reduced requirement for determining the lives of long life assets (as compared to conventional depreciation approaches); and
- the smoothing of lumpy annual operating and maintenance costs.

The renewals annuity approach is well suited to the water industry, which comprises network assets that are renewable rather than replaceable.

The major disadvantage of a renewals annuity relates to the difficulty of developing long term asset management plans, particularly plans encompassing realistic engineering and financial estimates. The approach is rendered more complex where expansion of the network is occurring, and where there is potential for asset components to become redundant in the future.

A renewals annuity approach also requires a decision on the time scale over which the renewals charge would be determined, and its frequency of adjustment. Where it has been applied in rural water businesses, the renewals annuity is typically determined over a rolling 30-year period, with yearly or five-yearly adjustments. However, if a significant peak or trough can be foreseen beyond the chosen time horizon, it is prudent to extend it to smooth the annuity charges. The choice of an earnings rate is also an issue, and the tax implications of these earnings may also need to be recognised in determining revenue requirements.

In its previous investigation of GAWB's pricing practices (2002), the Authority stated that in principle it would prefer to apply a renewals annuity approach to long-lived infrastructure. However, as GAWB had yet to finalise its strategic asset management plan, which is essential for the effective application of a renewals annuity, this was not possible. Consequently, the Authority recommended that straight-line depreciation be used for all of GAWB's assets.

Approaches Adopted in other Jurisdictions

The potential for renewals annuities in the water industry has been recognised by ARMCANZ in its water pricing guidelines. These guidelines state that '*an annuity approach should be used to determine the medium to long term cash requirements for asset replacement/refurbishment where it is desired that the service delivery capacity be maintained*'. ARMCANZ further noted that in defining the minimum level of cost recovery for a water business to ensure viability, the return of capital should be a '*provision for future asset refurbishment/replacement'*, using the annuity approach. In defining the maximum level of cost recovery, to avoid monopoly rents, ARMCANZ considered a '*provision for the cost of asset consumption*' appropriate.

As a consequence, renewals annuities have been widely adopted in the irrigation sector. Irrigation service providers such as Murray Irrigation Limited (NSW) and SunWater base their pricing policies on renewals annuities.

Variations on the renewals annuity approach have been adopted by a number of other jurisdictions, including Ofwat in the United Kingdom.[5] Ofwat has established an annual infrastructure renewals charge calculated as the average over several years of the forecast infrastructure renewals expenditure required to maintain the serviceability of the infrastructure network. The infrastructure renewals charge effectively takes the place of both depreciation and major maintenance expenditure. Differences between actual infrastructure renewals expenditure

[5] To be more precise, Ofwat uses a form of renewals accounting, of which the annuity approach is a subset.

and the estimated infrastructure renewals charge are carried forward in the business's balance sheet as an accrual or a pre-payment, with major differences redressed at price reviews.

In Queensland, amendments to the *Local Government Act 1993* have been effected to allow local governments (when applying competitive neutrality reforms to a water business activity) to apply a renewals approach to asset consumption charges for pricing purposes. A number of councils have adopted this method for their water and sewerage business activities.

The Government Prices Oversight Commission of Tasmania (GPOC) recommended in its 1998 investigation of bulk water services that authorities prepare information to allow return of capital to be based on a renewals annuity approach. In its 2004 investigation, GPOC adopted straight line depreciation for pricing purposes, but compared these estimates with estimated renewals annuities for the major water authorities to ensure that they were financially sustainable (ie that the depreciation amount more than covered the provision for asset refurbishment and replacement).

Recent regulatory decisions have been virtually unanimous in their choice of straight line depreciation for valuing return of capital (see Table 8.1). The only exception was IPART's decision on bulk water prices for the Department of Land and Water Conservation (DLWC) which was based on a renewals annuity. This renewals annuity included major periodic maintenance and replacement expenditure expected over a rolling 30-year period.

Table 8.1: Summary of other regulators' approaches to return of capital

Regulator	*Industry/Businesses*	*Depreciation method*
IPART (2003)	Hunter and Sydney Water Corporations, Gosford and Wyong Councils.	Straight Line
IPART (2001b)	Bulk water prices – Department of Land and Water Conservation	Renewals Annuity
ICRC (2004)	ACTEW (Water and Wastewater)	Straight Line
GPOC (2004)	Bulk water pricing	Straight Line
IPART (2004)	Electricity distributors	Straight Line
ESC (2004)	Electricity distributors	Straight Line
QCA (2001)	Electricity Distribution	Straight Line
QCA (2001)	Below rail coal network	Straight Line

Recent history suggests that renewals annuities have been adopted where there is a dominance of renewable long-life assets such as dams and earthen channels, as is the case for irrigation water suppliers.

Stakeholder Comment

GAWB submitted that a renewals annuity may have advantages over other forms of depreciation allowance for some utility assets (particularly if the expected asset life is greater than that of its components). However, GAWB submitted that the approach may not be valid for much of GAWB's asset base because sea water technologies and alternatives to fresh water cooling processes have the potential to significantly reduce the remaining economic life of

GAWB assets below their technical life. GAWB also advised that it has yet to finalise its strategic asset management plan.

GAWB proposed to maintain straight line depreciation for existing assets and minor new assets, as this approach is 'simple and well understood', and to make a case for accelerated depreciation where particular assets are identified that are likely to face shorter economic lives.

GAWB also proposed that if a revenue cap form of regulation is not adopted then economic depreciation (similar to that approved by the ACCC for the CWP access arrangement) be applied for significant new investments to de-risk new investment and ensure a consistent treatment of investments over several regulatory periods.

On the other hand, both CSC and GCC supported a renewals annuity approach. CSC stated that if the Authority feels that the renewals annuity method is the more suitable basis for the calculation of depreciation, then a direction should be given that GAWB implement this and a suitable transition path be put in place. GCC stated that renewals annuity is preferable to straight-line depreciation given that long lived assets generally feature lives well in excess of traditional lives.

CBP&RA stated that the renewals annuity approach has the disadvantage of encouraging continued use of present day technological approaches to service delivery and exacerbates the barrier to entry for smaller scale innovative decentralized technologies.

QCA Analysis

The Authority notes that most water industry decisions have proposed a straight line method for calculating depreciation, on the basis that, if a single approach is to be applied, straight line approach best reflects the average pattern of deterioration of all types of assets.

However, the Authority acknowledges that no single depreciation profile is consistent with the loss of service potential pattern applicable to all asset classes, as the applicable pattern depends upon the combination of the particular degenerative characteristics of each asset.

The particular degenerative characteristics of water supply and distribution assets fall broadly into three categories:

- assets that never need to be replaced (such as land and easements);
- assets that have a very long useful life and require very low annual maintenance, such as dams, reservoirs and some major pipelines; and
- assets that need a relatively constant or increasing maintenance schedule as the life of the asset increases, such as smaller pipelines, pumps, valves etc.

Dams generally have very long lives requiring minor maintenance, and thus maintain much of their productive capacity. Such assets can be maintained indefinitely, providing an appropriate periodic maintenance and renewal programme is put in place, and the major threat is likely to be technical obsolescence rather than deterioration.

Other long-life assets such as pipelines may lose value more evenly over their useful lives, best fitting the straight line depreciation profile. Assets such as pumps and motors exhibit linear consumption or geometric asset consumption patterns.

As noted in its previous investigation, in principle, the Authority would prefer to apply a renewals annuity approach to long-lived infrastructure that is renewable and for which ongoing

demand is envisaged. The Authority accepts that this approach may not be appropriate for assets subject to technological or economic redundancy, which may require a greater emphasis on the return of capital to ensure incentives to invest.

However, as GAWB is yet to complete its SAMP, which is essential for the effective application of a renewals annuity, the adoption of this approach for relevant assets is not possible. In relation to GAWB's SAMP, and in response to CSC, the Authority notes that:

- GAWB's SAMP was due to be finalised for consideration by DNRM, the technical SAMP regulator, by 1 October 2002; and

- while the pricing implications of adopting a renewals annuity for relevant assets are not likely to be large for the next pricing period, they may become so over time, although the precise pricing implications cannot be calculated for GAWB in the absence of a SAMP.

The Authority therefore encourages GAWB to finalise a satisfactory SAMP for consideration by DNRM, the technical regulator.

In relation to whether economic depreciation is required to 'de-risk' new investment if a revenue cap is not adopted, as argued by GAWB, the Authority considers that the regulatory framework appropriately allocates risks to the party best able to handle them, as noted in Chapter 4. Moreover, the Authority has accepted that any further optimisation of assets requires compensation to ensure appropriate incentives to invest, subject to the provisos set out in Chapter 6. There is therefore no reason to further 'de-risk' new investments for regulatory pricing purposes. Furthermore, GAWB should be able recover its costs in the years in which they are incurred, and therefore economic depreciation is not required.

As a result, the Authority recommends straight line depreciation for all assets over the condition-based remaining asset lives identified by SMEC, as summarised in Table 8.2.

Table 8.2: Asset lives for GAWB assets

Asset Type	*Remaining Asset Life (Years)*
Dam earthworks and spillways	150
Dam outlets	100
Bridges	100
Roads and pavements	30
Electrical/power	35
Switchboards	20
Flow meters	15
Pumps, electric motors, cranes and mechanical	25
Pipelines (asbestos cement, reinforced concrete, fibre resin cement)	50
Pipelines (ductile iron, mild steel, poly vinyl chloride)	70
Valves	30
Concrete reservoirs, buildings and other concrete structures	50
Steelwork	35

The Authority's approach uses SMEC's depreciated asset values as the starting values for DORC for each asset, with straight line depreciation applied over the remaining lives.

The Authority considers that the use of renewals annuities should be reviewed when GAWB develops an appropriate SAMP.

The Authority proposes that return of capital be based on straight line depreciation for all GAWB's assets.

9. OPERATING COSTS

Summary

The Authority engaged SMEC to establish the efficient operating costs for GAWB. Relative to the previous investigation, GAWB's operation and maintenance costs are lower, due to lower demand, although some of these savings are taken up in earlier years largely due to the backlog of maintenance. However, general administration costs are higher, reflecting higher commercially-based salaries and increased costs for managing workplace health and safety issues.

Because of the complexity and administrative costs associated with an efficiency carryover mechanism (ECM), the Authority has concluded that an ECM is not appropriate for GAWB at this point in time.

9.1 Background

GAWB's operating costs include electricity, chemicals, asset maintenance, employment, rent, insurance, administration, and corporate overheads.

9.2 Cost Allocation

In general, the greater the degree to which costs can be related to the provision of services, the greater the cost reflectivity of the pricing structure, and the more effective the pricing signals. To achieve this, costs should be directly allocated where a verifiable relationship is ascertainable between the expenditure and an individual product or service.

In its previous investigation, the Authority allocated costs as follows:

- certain costs (referred to as direct costs) were directly attributable to segments of the network. These included operating, maintenance, chemicals and electricity costs. These were then allocated according to the users' share of the segments throughput;

- other cost items which could not be directly attributed to the raw water system and treated water system were allocated to each segment on the basis of the segment's share of total direct costs and then to users according to their share of throughput; and

- general administration costs were distributed according to whether they related to management/administration efforts or customer related activity.

General administration costs were found to comprise about 30% of total operating costs in the previous investigation. On the basis of an analysis of GAWB's general ledger entries and an assessment of its operations, SMEC concluded that approximately 10% of general administration costs were customer based, including such costs as billing, customer contract administration, customer enquiries and pricing matters.

The remaining 90% of operating costs was allocated according to administrative effort in each major segment (dam, raw water delivery and treated water delivery). This relative administrative effort was approximated by the relative operating and maintenance costs per megalitre. This resulted in the following weights:

- 0.5 x ML delivered for supplies out of Awoonga Dam;

- 1.0 x ML delivered for supplies to raw water customers; and

- 2.0 x ML delivered for supplies to treated water customers.

The Final Report noted that further analysis of general administration costs, on an activity basis, was warranted. Any further development by GAWB of its accounting information may provide the basis for an improved activity based cost allocation system. Relevant issues include the appropriateness and justification of any cost drivers, their administrative complexity and cost.

Stakeholder Comment

GAWB proposed to retain the cost allocation methodology recommended by SMEC in 2001. GAWB submitted that they have yet to consider the benefits of the activity based costing model discussed in the Authority's previous investigation and that the allocation is not critical as the costs correspond to less than 8% of GAWB's maximum revenue requirement.

CSC suggested that while the existing cost allocation method seems reasonable, industrial customers may place a greater burden on planning than Council customers and hence the overhead cost allocation may need to be revised to reflect this. Financial evaluations, planning and the collection of bulk water charges need to be considered.

CBP&RA stated that for a capital intensive enterprise, allocation of general administration costs should follow the patterns of efficient capital investment.

QCA Analysis

As GAWB has two water products, raw and treated water, and geographically defined classes of customer, the Authority considers that efficient operating costs should be identified for each segment of GAWB's water supply system, wherever possible. In addition to identifying efficient direct costs, efficient indirect and general administration costs should be identified and allocated using appropriate cost drivers. Some costs, such as those related to the maintenance of customer spur-lines, would be directly attributable to those customers.

The Authority engaged SMEC to undertake further analysis of the allocation of costs between customers and system segments.

SMEC identified three main cost pools:

- system direct costs, those costs specifically attributable to system segments, which include operations, maintenance, electricity and chemicals costs;

- system overhead costs, or costs which are attributable to raw water or treated water service provision, but not to a specific segment. SMEC considered that the amount of system overhead costs allocated to an individual segment would vary in proportion to its operations and maintenance costs incurred on a year by year basis; and

- general administration costs, or those costs which could not be attributed to a particular service or segment.

SMEC proposed to allocate general administration costs to two cost pools – customer service functions and demand based functions. SMEC's analysis of the GAWB's general ledger accounts was consistent with the previous recommendations, with 10% of common costs being attributed to customer service functions (including billing, customer contract administration, queries and customer pricing matters) to be evenly distributed between GAWB's customers. For demand based functions which make up the remaining 90% of common costs, SMEC's conclusion was again consistent with the previous recommendations. SMEC considered that the

relative management effort between the three major segments is inversely proportional to the volume of water delivered to each segment. In general, the lower the value adding, in the form of, for example, water treatment or pumping to higher reservoirs, the lower the management effort will be. On 2003-04 deliveries, volumes were 45,240ML delivered from the dam, 29,140ML through the raw water distribution system to Toolooa, and 13,400ML through the treated water system. This gives approximate relative effort weightings of:

- 0.5 x ML delivered for supplies out of Awoonga Dam;
- 1.0 x ML delivered for supplies to raw water customers; and
- 2.0 x ML for supplies to treated water customers.

In its submission to the Authority, GAWB supported the continued use of these weightings. In regard to the issue raised by CSC, the costs associated with planning are likely to be similar for services provided to industrial and Council customers. For example, the addition of a major new industrial customer may require planning for treated water system upgrades to meet the needs of any increased demand from associated population growth. The Authority could not identify any basis to differentiate customers on the basis of planning costs.

It is proposed to allocate general administration costs on the basis of 10% to customer service, allocated equally to each customer; and 90% to demand based functions, allocated to storage, raw water delivery and treated water delivery according to relative administrative effort.

9.3 Efficiency of Operating Costs

Efficient costs should reflect costs that would normally be expected to occur in a competitive environment. That is, there is a need to reflect the impact of changes in technology, developments in economies of scale, and productivity improvements in response to increased competition and inflation.

The attainment of efficient operating costs in a regulatory sense may be through:

- a benchmarking or company-specific activity based costing exercise to establish efficient costs; and/or
- using incentive mechanisms such as CPI-X to encourage the service provider to seek out efficiency savings.

A combination of the approaches may be adopted, for example, where benchmarking is used to establish an appropriate X factor to apply in incentive mechanisms.

The most common approach to setting efficient cost targets is a CPI-X mechanism, where the CPI is a price escalation inflator and X is a pre-determined index reflecting the perceived capacity of the regulated business to realise cost savings. The X factor may be determined by an assessment of overall efficiency linked to costs, or assessments not specifically linked to costs.

Cost-linked benchmarking measures involve comparisons to similar businesses (benchmarking across the industry), with the previous performance of the organisation (benchmarking over time), or with the best performer in an industry (performance targeting). The unlinked approaches, or global efficiency measures, include total factor productivity (TFP) and data envelopment analysis (DEA).

However, limited sample size and wide variations in the nature of water businesses mean that global efficiency measures have not been widely adopted by Australian water industry regulators.

In its previous GAWB investigation, the Authority recommended that the CPI-X approach was not appropriate for GAWB at the time. Rather, estimated cost savings were explicitly included in operating costs in the cash flows, based on estimates provided by SMEC. SMEC's analysis reflected the findings of a benchmarking analysis using a range of broad productivity measures.

The rationale for this approach was that GAWB's operating cost base is relatively small and the scope for savings over the regulatory period was also likely to be small. However, the Authority recommended that a further review of incentive mechanisms be undertaken as part of the next review of prices, and that in the interim, GAWB should undertake to develop an activity based costing approach for its operating costs.

Other Jurisdictions

Other Australian water regulators, including IPART (2003), ICRC (2004) and GPOC (2004) have generally employed partial factor productivity benchmarking key performance indicators (KPIs) in combination with activity based costing reviews.

Ofwat (1999) reviewed the actual cost structure of each company as the basis for determining current efficiency and areas where future efficiency gains could be achieved over the regulatory period. Ofwat has also adopted econometric modelling using Ordinary Least Squares (OLS) approaches and has cross-checked these methodologies with DEA and stochastic frontier analytical techniques.

Stakeholder Comment

GAWB proposed that efficiency savings continue to be directly incorporated in operating costs, based on 'expert opinion' of the efficient level of expenditure. GAWB argued that no additional x-factor adjustment should be applied for 'speculative unanticipated efficiency improvements', submitting that the CPI-X type of mechanism does not itself promote further efficiency gains, as the financial incentives for cost savings are independent of allowed costs.

CS Energy submitted that CPI–X price escalation should be used between price reviews.

QCA Analysis

The Authority considers that the approach used in the previous investigation remains valid for the current review. That is, efficiency gains in operating costs should be identified by means of an appropriate independent assessment and directly incorporated in the MRR.

In effect, an X-factor is pre-determined and applied to GAWB's costs on a yearly basis through the regulatory period. This approach is appropriate for an entity such as GAWB which is a relatively small regulated entity and which has a relatively low level of operating costs as a proportion of total costs.

The Authority is of the opinion that GAWB's maximum revenue requirement should be based on the recovery of an efficient level of operating costs, with specific adjustments over time to reflect expected on-going efficiency gains.

In determining efficient cost targets it is important to understand that quantitative benchmarking approaches provide point in time estimates only and are not forward looking. As such, activity

based costing reviews remain necessary, as a minimum, for assessments of likely changes in future cost structures. This is because costs in a competitive environment are subject to changes in productivity, economies of scale and increased competition over time.

For this investigation, the Authority engaged SMEC to estimate efficient costs for GAWB.

SMEC undertook a benchmarking study, but noted that benchmarking is severely restricted due to a lack of comparative data from GAWB and other bulk water supply entities. However, SMEC compared GAWB to various water businesses including ACTEW, Sydney Water, Metro Water, Hunter Water Corporation, Power and Water Corporation, Brisbane Water, SA Water Corporation, Melbourne Water and the Water Corporation of WA.

The broad findings from SMEC's analysis are shown in Table 9.1.

Table 9.1. Benchmarking Analysis[1]

Key Performance Indicator (KPI)	*GAWB*	*Average*	*Rank[2]*
Costs as a proportion of total asset value	1.63%	7.1%	2
Costs per ML delivered	$111/ML	$401/ML	2
Costs per kM of pipeline	$25,018/km	$16,015/km	9

2. *Data for 10 utilities only.*
3. *The lower the rank, the better the performance against others.*

SMEC noted that although GAWB has lower unit operating costs than those used in the benchmarking study, this was expected as the major urban entities have more extensive networks. SMEC concluded that due to the lack of sufficient data, there is no direct assignment of efficiency savings to future operating costs as a result of the benchmarking analysis.

SMEC then undertook an activity based analysis of GAWB's operating costs. This assessment focused on asset and financial management, mechanical and electrical operations and maintenance, backlog of planned works and maintenance and levels of customer service. SMEC assessed activity, system and overhead costs against such parameters as asset condition and maintenance regimes, levels of service, and effectiveness of operational control of such variable costs as electricity and chemicals. The analysis sought to identify key areas of improvement in asset management and financial and administration management.

SMEC's general conclusions were that:

- workplace health and safety requirements are becoming more stringent and are adding to GAWB's operating costs;
- a number of facilities, including Calliope Booster Station and Toolooa and South Gladstone Reservoirs require backlog maintenance and periodic maintenance costs are not reflecting an adequate level of expenditure. SMEC considers that GAWB will require one position dedicated to condition assessment;
- there are some safety deficiencies which need to be addressed such as ventilation, gas detection and warning systems;
- existing automation and telemetry appear appropriate for efficient operations; and
- there is limited scope for further savings in electricity costs.

Relative to the previous investigation, GAWB's operation and maintenance costs are lower, due to lower demand, although some of these savings are taken up in earlier years largely due to the backlog of maintenance. However, general administration costs are higher, reflecting higher commercially-based salaries and increased costs for managing workplace health and safety issues. SMEC's estimated efficient operating costs are summarised in Table 9.2.

Table 9.2. Summary of Operating Costs ($'000), opening values

Cost Element	*2005-06*	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2019-20*	*2024-25*
Previous Investigation								
Operation and Maintenance	5,449	5,625	7,103	7,513	7,893	9,440	11,144	n/a
General Administration	1,942	1,993	2,044	2,098	2,361	2,685	3,052	n/a
Total	**7,391**	**7,618**	**9,147**	**9,611**	**10,254**	**12,125**	**14,196**	**n/a**
Draft Report								
Operation and Maintenance	5,132	5,065	5,208	5,247	5,755	6,741	7,991	9,413
General Administration	3,017	3,095	3,176	3,259	3,344	3,804	4,327	4,922
Total	**8,149**	**8,160**	**8,384**	**8,686**	**9,099**	**10,545**	**12,318**	**14,335**

Source: SMEC

The Authority proposes to incorporate efficient operating costs in the cash flows for pricing purposes rather than implement a CPI-X regime.

9.4 Efficiency Carryover Mechanisms

Under the proposed price cap regulatory approach, GAWB has an incentive to outperform in achieving cost savings, regardless of whether or not a CPI-X mechanism is applied.

However, in the absence of a continuous incentive, there is a risk that GAWB will target efficiency gains, in excess of those identified in SMEC's analysis, in the early years of a regulatory review period and defer any cost savings that may be achievable at the end of the period to maximise the period over which the gains can be retained.

A key element of the review of incentive mechanisms is to assess the potential for applying efficiency carryover mechanisms (ECMs) to GAWB, to supplement the proposed arrangements. ECMs are intended to provide a regulated business with an ongoing incentive to operate efficiently throughout the regulatory period.

ECMs are designed to reward the service providers own efforts in delivering efficiency gains and should not apply to windfall gains or other fortuitous cost savings. In a properly functioning competitive market, windfall gains are likely to be passed through to customers relatively quickly as they are likely to benefit all competitors.

Various types of efficiency gain carry-over mechanism may be used to define the magnitude and timing for retention of out-performance efficiency gains by a regulated business. The main two types, differentiated mainly in relation to timing, are:

- glide path, which allows for savings to be passed to customers in a staged manner over time. For example, the benefits may be allocated to customers at 20% per year for 5 years; or

- rolling carryovers, which allow efficiency gains to be retained by the entity for a set period of time, regardless of when they are achieved, and then passed to the customers as a one-off price reduction.

The glide path approach will not necessarily eliminate all timing issues as the business can still achieve a greater benefit by strategically biasing its savings initiatives towards the front of the regulatory period. This timing issue is eliminated with the rolling carryover mechanism. However, a disadvantage of the rolling carryover mechanism is the level of detail that may be required to track efficiency gains across the years.

Effective implementation of an ECM requires a suitable approach for identifying efficiency gains, as distinct from windfall gains, and for the treatment of both operational and capital cost gains. Approaches for identifying efficiency gains include self-assessment by the service provider, ex-ante business case proposals, third party certification, desktop review or detailed assessment by the regulator.

The expected scope and controllability of a service provider's cost items is also critical. Application of an ECM is likely to be warranted only for those cost items which have a prima facie potential to be reduced through innovation in work practices and technology and/or contract renegotiation.

An important consideration is that reductions in costs can be pursued at the expense of the quality of service standards. Therefore, an ECM should incorporate adequate monitoring to avoid rewarding sub-economic outcomes.

The design, implementation and monitoring of an ECM can be an expensive exercise, both for the regulator and the regulated entity. As a minimum, unless an ECM is cost-effective to the service provider, there are unlikely to be any gains to distribute.

Other Jurisdictions

ECMs have not been explicitly addressed by all Australian regulatory jurisdictions. However, where they have been considered, increasing support has emerged for rolling carryover mechanisms, principally to address concerns with gaming related to pricing periods.

The ACCC has adopted a rolling ECM to apply to operating costs only for electricity (1999) and gas transmission (GasNet, 2002). ESC has adopted a rolling ECM for electricity and gas distributors. IPART (2004b) also noted the strong theoretical arguments for a fixed-term efficiency carryover mechanism.

IPART (2004b) has opted against the use of a 'fixed-term' ECM for electricity distribution this regulatory period (due to the costs associated with its establishment). However IPART has flagged its intention to re-assess the issue for the next pricing period from 2009 and expects to do the same for Sydney Water from 2005 (IPART 2003).

The Authority's 2001 electricity determination recommended a 5-year rolling carryover (gains maintenance) mechanism, but noted that it 'is more invasive than may be desirable in the longer

term', and that during the first pricing period (ending June 2005) the Authority 'will investigate approaches to achieve the same objective'.

Stakeholder Comment

GAWB argues that incentives to make efficiency gains are most noticeably dependent on the duration of the regulatory period and the benefit sharing mechanism. GAWB did not propose a specific benefit sharing mechanism, but submitted that during the upcoming regulatory period:

- no efficiency gains be claimed for the current period;
- efficiency gains should not be differentiated from windfall gains, as this adds too much complexity;
- both operating and capital savings be treated equally, to ensure that incentives are not biased; and
- that 'thresholds or a scale factor' be considered, to ensure that GAWB is not rewarded for cost savings that are achieved at the expense of reduced reliability.

In a submission in response to the Authority's Issues Paper *Efficiency Carryover Mechanism*, (QCA, 2004c) GAWB supported deferral of the introduction of an efficiency carryover mechanism for water businesses until the regulatory regime is stable and inherent incentives better understood. GAWB submitted that if an ECM is introduced, attention should be paid to the cost of administering the mechanism and the effect on incentives for maintaining service levels. GAWB preferred a simple mechanism with no attempt to distinguish between management induced savings and windfall events, and including both operational and capital efficiencies. GAWB proposed a rolling annual assessment of efficiencies with a 5-year retention period for operating efficiencies and 10 years for capital efficiencies.

QCA Analysis

The potential for an ECM was not considered for GAWB in the previous investigation. However, it was recommended that 'whether an improved means of ensuring efficiency gains can be established should be considered prior to the next review'.

A general consensus appears to be emerging amongst regulators that of the alternative forms of ECM, a rolling ECM has the least distortions, minimises the potential for gaming and is most consistent with competitive markets.

Under the rolling carryover mechanism, efficiency gains (losses) are calculated annually as the difference between actual expenditures and projected expenditures for each year of the pricing period. Annual efficiency gains (losses) are retained for a pre-determined number of years, at least equal to the term of a pricing period. This is consistent with GAWB's preferred approach.

In response to issues raised by GAWB, the ECM should incorporate only efficiency gains achieved through effort, and exclude windfall gains, on the basis of consistency with properly functioning competitive markets. However, the Authority concurs with GAWB that it may at times be complex to separate efficiency from windfall gains, and that in competitive markets, the service provider may retain windfall gains for a time. Adding to this complexity, as noted by GAWB, is that an ECM could be applied to both operating and capital costs, and may need to be assessed in regard to impacts on service quality and reliability.

At this stage, however, the Authority agrees with GAWB that adoption of an ECM is not appropriate for GAWB at this time due to the relative immaturity of the water industry regulatory framework. Other issues are:

- the complexity of implementing and monitoring an ECM, especially given that operational costs form a relatively small portion of GAWB's revenue requirement and that there are no significant capital expenditures planned;
- the potential impact on GAWB's administrative capacity; and
- related uncertainty over cost effectiveness, given that further efficiency gains achievable by GAWB are likely to be only marginal.

However, should GAWB's circumstances change, the Authority's preferred approach to an ECM would be for a rolling carry-over mechanism to be applied.

The Authority considers that, while an ECM may provide incentives for GAWB to innovate, it is not considered appropriate at this time.

10. ONGOING REGULATORY ARRANGEMENTS

Summary

The Authority considers that material changes in circumstances from those originally anticipated at the time of a price reset should be dealt with in cost pass-through arrangements or review triggers where these are beyond the capacity of GAWB to manage or avoid.

The Authority considers that material exogenous changes in expected costs may be passed through to customers, subject to approval by the Authority. Eligible costs include changes in taxation; changes in government charges such as resource management charges; changes in compliance requirements; changes in law; or changes in government policy. A price review should be triggered if there is, or expected to be, a sustained variation in aggregate revenues of at least 15%.

Annual pricing adjustments are proposed to reflect actual inflation within the regulatory period. It is proposed these be based upon the Brisbane All Groups CPI.

The Authority proposes that it monitor GAWB's implementation contracts for consistency with recommended pricing practices. Given the nexus between prices and service quality, there is a need for ongoing monitoring of proposed service standards. It is recommended that GAWB annually report service quality against the standard adopted for contractual purposes.

10.1 Introduction

The key issues in relation to ongoing regulation are:

- the potential for competitive pressures to emerge for certain of GAWB's services (that is, the loss of monopoly status);
- the appropriate framework for responding to changes in circumstances not otherwise contemplated in establishing prices and the regulatory framework for the forthcoming period;
- processes for adjusting prices to account for inflation and inter-period cash flow adjustments; and
- the monitoring of pricing practices (including prices and contractual arrangements).

10.2 Loss of Monopoly Status

GAWB has submitted that while most of its business activities have monopoly supply characteristics, technological change (in particular related to sea water technologies) will increasingly impose competitive pressure. GAWB foresees that it may face true competition across its products and services, within the life-cycle of current assets.

QCA Analysis

The Authority notes that its jurisdiction to investigate activities of government monopoly business activities ceases if the activities become subject to competitive pressures (s.28 of the *QCA Act*).

10.3 Responses to Changes in Circumstances

Cost Pass-Through Arrangements

In its previous GAWB investigation (2002), the Authority recommended that material variations in exogenous costs due to the following factors may be passed through to the customer – taxation and regulatory compliance, law, water allocations and operating requirements, estimated yield resulting from a review of hydrology or climate change, and government policy.

The issue of cost pass-through is generally resolved by deciding:

- whether the change in costs could have been anticipated and thus managed or avoided by the service provider, and
- whether the impact of the change in costs on either the service provider or the customer is material.

Other Jurisdictions

The ESC's first regulatory period for water regulation is three years, and has signalled a preference for dealing with unforeseen events by adjusting prices at the start of the next pricing period. However, for future periods it has provided for within-period adjustments in response to changes in legislative obligations not foreseen at the time the Water Plan was approved and which had a material impact on expenditure. Materiality is measured as 5% of the business' revenue over a regulatory period less any offset such as insurance.

Stakeholder Comment

GAWB has proposed an additional cost pass-through category to those already provided for by the Authority in its previous investigation, namely where 'reasonable costs are incurred as a consequence of a government-declared emergency, disaster or extraordinary circumstance'.

CS Energy and DNRME submitted that pass-through pricing is just a cost-plus arrangement which does not by itself provide desirable incentives for GAWB and that unanticipated gains (or losses) should not be part of regular price adjustment arrangements.

CSC submitted that the investigation consider cost pass-through arrangements, in particular the impact of significant changes in hydrology on the timing of projected augmentation.

QCA Analysis

The Authority considers that within-period adjustments should only be made where significant exogenous and unforeseen events (that is, events outside the control and influence of the regulated service provider) impact significantly, either up or down, upon the returns of the regulated business. These adjustments should be limited to those which do not require a major review. Such events may include:

- changes in taxation;
- changes in government charges, for example, water resource charges;
- changes in the regulatory compliance requirements - for example, those related to health, water quality, dam safety, and environmental standards;

- changes in law or pursuant to a law; and

- other major changes in government policy.

Changes in GAWB's water allocation or changes in estimated yield resulting from reviews of river hydrology or climate change which could bring forward storage augmentations would generally require a review of the pricing model and could not be considered to be simple cost pass-through events.

It is recommended that any pass-through of costs in proposed prices should be subject to an assessment of their materiality and be subject to approval by the Authority.

In response to issues raised by GAWB, the Authority considers that costs incurred as a consequence of government-declared emergency, disaster or extraordinary circumstance should not automatically pass-through to customers, as:

- the impact of these events is often severe and the response proposed by GAWB may be contentious and unacceptable to users without some form of regulatory scrutiny, at least over the attribution of costs and the form of response; and

- the extent of prior action by GAWB to mitigate the impact of such events will often be a key consideration in efficient pricing.

The Authority's recommended pricing practices related to managing the risks of such events were dealt with in chapter 3.

Approved pass-through of costs is typically implemented in revised prices for the next financial year, with the full NPV effect recovered. In order to ensure a timely cost pass-through into revised prices, sufficient information for these events would be required by the Authority as soon as is reasonably possible after their occurrence. Should the Authority consider an unreasonable delay has occurred, it may disallow the recovery of any additional costs incurred prior to the receipt of sufficient information. Although depending on the event and relevant circumstances, the Authority considers an unreasonable delay to be at least 3 months.

The Authority considers that material exogenous changes in expected costs may be passed through to customers, subject to approval by the Authority. Eligible costs include changes in taxation; changes in government charges such as resource management charges; changes in compliance requirements; changes in law; or changes in government policy.

Review Triggers

Review triggers prompt an unscheduled review. They are generally defined in terms of an impact on a provider's revenues or costs, arising from events that diverge significantly from initially forecast.

In its previous investigation of GAWB (2002), the Authority recommended that reviews within a regulatory period could be triggered if demand changes have a significant impact on aggregate revenue. Based on other regulated industries, the variance in aggregate revenue was to exceed 15% for a review to be triggered.

Other Jurisdictions

IPART has not established review triggers for water pricing, nor does it carry forward revenue deviations between forecast and actual revenue performance for the purposes of setting future prices.

Ofwat makes provision for reviews during the regulatory period by way of interim determinations.[6] To qualify for an immediate review, the change must satisfy a materiality condition of a 10% change in revenue, otherwise it is carried forward until the end of the regulatory period before being considered.

The ICRC has defined various review triggers relating to its retail price direction for non-contestable electricity customers including: changes in regulations or codes; significant and fundamental wholesale market adjustments affecting price; demand forecast errors; insolvency of a counter-party; and significant changes to the obligations or costs associated with the ACT retailer of last resort arrangements or metrology procedures or policy (ICRC 2003).

Under approved gas distribution access arrangements in Queensland, triggers allow for a review of the access arrangements in any financial year during access arrangement period where total gas delivery varies from forecast by more than 15%, or gas delivery for any customer class varies from forecast by more than 10%.

Stakeholder Comment

GAWB submits that current arrangements for review triggers are adequate for most but not all contingencies. GAWB's submission proposes an additional 'limited review' trigger where 'significant unanticipated investment' in excess of $5 million is required, which was not contemplated at the previous regulatory review.

CS Energy argued that unscheduled price reviews should only apply when there is a significant change in GAWB's asset base or customer base.

Queensland Treasury suggested it may be appropriate to review whether 15% is the correct level for the trigger given the relatively low beta and that as information is examined on a historical basis, there could be a large lag between a breach and a review. Queensland Treasury also requested that the Authority include a review trigger based on hydrology and demand such that, in the event of unforeseen circumstances, augmentation requirements and the revenue cap could be re-examined prior to the next regulatory period.

QCA Analysis

In the interests of maintaining price certainty, minimising the costs associated with price reviews, and providing incentives for robust estimates of costs and demand, regulators generally limit within period reviews to those situations involving a significant change in anticipated revenues or costs. In relation to GAWB's proposal, the Authority considers that an unanticipated investment of $5 million is insufficient to warrant a review. Pricing impacts of such investments may be incorporated in the next scheduled review.

The Authority notes the Treasury submission that, because of time lags in information, there could be a lag between a breach and a review. In this regard, the Authority considers that review triggers should also be forward-looking to the extent possible.

[6] Ofwat correspondence to all managing directors of water and sewerage companies and water only companies, 1 May 2003.

The Authority proposes that a review should be triggered if there is, or there is expected to be, a sustained variation of 15% or more in GAWB's aggregate revenue.

The Authority considers that a price review should be triggered if there is, or expected to be, a sustained variation in aggregate revenues of at least 15%.

10.4 Pricing Adjustments

Annual Indexation of Prices

Under the nominal cash flow approach adopted by the Authority, a forward looking estimate of inflation is incorporated into the estimated prices to apply in each year of the regulatory period. This inflation rate is based on the difference between the nominal bond rate and capital indexed bond rate over the same maturity period (Chapter 7). However, the estimated rate may diverge from the inflation rate that is actually observed during the regulatory period, and an appropriate index is required to allow GAWB to establish nominal prices each year.

The previous investigation recommended that GAWB's initial price caps (and corresponding elements of the two-part tariff) be adjusted by the consumer price index (CPI) each year of the regulatory period.

The Authority was not explicit about whether GAWB should apply the national CPI (based on eight capital cities), or the CPI for Brisbane (as a proxy of price movements in Queensland) for the purpose of indexing prices.

Other Jurisdictions

IPART has adopted the national CPI for price indexation of water businesses in NSW.

The ICRC (2004) has adopted the national CPI for ACTEW's price indexation, noting consistency with the rate of inflation assumption used for WACC and that many of the inputs required for service delivery are soured from a national market. ACTEW indicated a preference for the Canberra CPI claiming that the use of the weighted average of eight capital cities had 'little or no bearing on its costs'.

Stakeholder Comments

GAWB's submission did not support 'a price path with annual CPI increases' because of its preference for a revenue cap. However, GAWB noted a preference, where indexation is required, for the Brisbane All Groups March Quarter CPI, as it allows price changes to be communicated to customers before becoming effective on 1 July each year.

QCA Analysis

CPI price indexation is intended to allow GAWB to manage general inflationary risks which are beyond its control.

There is no *a priori* requirement that the CPI be used, only that the prices are consistent with the real movement in costs of service over time. In its previous investigation, the Authority noted that there was not a reliable water industry index that could be used in place of CPI. However, the CPI is readily available, timely and not subject to revision and is commonly used in commercial contracts for the purpose of price escalation. It is considered that the Brisbane All Groups CPI provides the most suitable available and relevant measure of inflation for GAWB.

The Authority considers that a CPI measure based on the Brisbane All Groups classification should be used for the purpose of annual price adjustments between price reviews.

Pricing Adjustments over Time

In its Final Report, the Authority noted that *'as a general principle, any future review should take into account the basis used for the current pricing recommendations, so that GAWB is able to achieve a commercial return on its assets over the life of its assets. Regulatory consistency in approach for subsequent reviews is a desirable objective. However, as regulatory principles and methods are still evolving, it is recommended that no specific constraints be placed on the basis for future investigations.'*

The Authority did not specify pricing principles detailing how a rate of return on assets below WACC in the initial years should be recognised in subsequent pricing periods. However, the adjustment is not intended to replicate an 'unders and overs' account.

Other Jurisdictions

The Authority's final determination for electricity distribution (2001) recommended that any unders or overs (associated with the revenue cap) be indexed by the WACC to maintain their value in NPV terms.

IPART for electricity distribution (2004b) recommended that, in moving from a revenue cap to a weighted average price cap, any outstanding balances on unders and overs accounts attract the nominal rate of return to compensate for the time value of money.

Stakeholder Comment

GAWB's submission proposes that adopting a fixed revenue cap with an unders and overs account that is rolled forward across regulatory periods (earning or paying interest at the regulated WACC rate) would provide a simple and effective mechanism.

QCA Analysis

The Authority recognises that by setting prices smoothed over a planning period in excess of a regulatory period, prices in the current regulatory period may generate revenues higher or lower than that required to achieve a the rate of return to maintain investment within the regulatory period – that is, as would be achieved using the building blocks method.

To ensure appropriate incentives to invest are in place, the smoothed price in future regulatory periods should incorporate an adjustment to reflect the effects of price smoothing. This can be achieved, for example, in the future by a carry-over adjustment for any over or under provision of revenues which may be identified in the subsequent period.

The adjustment should be based on the difference between the smoothed price revenue and the annual building block revenue requirement, with annual differences capitalised to the commencement of the next pricing period using the WACC applicable for the previous assessment. The sum of the capitalised amounts carried forward from the previous assessment should be subject to price smoothing on a forward looking basis, in a similar manner to the other elements of the revenue requirement.

This needs to be distinguished from unders and or overs accounts typically used under revenue caps. The proposed adjustment does not reflect changes in revenue resulting from a difference between actual and expected revenues. These are addressed under the proposed price cap method through cost pass-throughs and review triggers. Rather the proposed adjustment addresses a known methodological issue.

As previous pricing recommendations were not accepted by Ministers until August 2003 and have not yet been negotiated with customers, the above arrangements may only be required from the commencement of the next period.

The Authority proposes that where prices are smoothed over a planning period greater than the regulatory period, prices in the next regulatory period incorporate an adjustment to account for the effects of price smoothing.

10.5 Monitoring Framework

The Ministerial Direction requires the Authority to investigate an appropriate framework for monitoring pricing practices (including prices and contractual arrangements) relating to GAWB's declared business activities.

Under the Ministerial Direction relating to its previous investigation, the Authority was required to monitor prices included in contractual arrangements entered into, during and after, the period of the initial investigation.

In its previous investigation, the Authority recommended that any monitoring by the Authority be limited to assessment of cost pass-throughs and review triggers.

Pricing Practices (including prices and contractual arrangements)

Under the proposed regulatory framework, GAWB's pricing practices would be subject to regulatory reset every five years, and earlier if a review were triggered.

Other Jurisdictions

Ofwat (2002b) monitors compliance with its price determinations to check that customers are receiving the appropriate level of service and that companies are making satisfactory progress in the improvement programs. Ofwat requires regulated water businesses to lodge annual returns with Ofwat detailing regulated activities, service, expenditure and performance levels; and to publish regulatory accounts in accordance with Regulatory Accounting Guidelines issued by Ofwat.

Ofwat relies on Reporters to verify the various information returns of service providers. Reporters are professional certifiers of the regulated activities of the businesses. They ensure that regulatory information is consistent, comparable, reliable and accurate.

Stakeholder Comment

GAWB proposed that as part of its proposed revenue cap approach, the Authority should have an opportunity to ensure appropriate application of the Ministerially directed pricing principles through the annual reference tariff approval process.

However, GAWB submitted that the scope of any power to intervene in individual contract disputes by the Authority must be carefully defined to:

- avoid vexatious appeals;
- prevent the Authority from becoming the de facto price setting body; and
- facilitate general resolution of disputes where interpretation errors affect several customers.

GAWB also submitted that the Authority should have the power to:

- consider appeals from customers where the QCA considers that there is a prima facia case that GAWB has manifestly erred in its interpretation of Ministerially directed pricing principles; and
- issue a clarification decision or recommendation binding on all parties subject to the dispute.

QCA Analysis

Proposed contractual arrangements, the drought management plan and contracts for differences have yet to be established and may be applied and customised on an individual basis. Accordingly, there may be considerable opportunity for disputes to arise in relation to the interpretation and application of Ministerially approved principles.

The Authority therefore concurs with GAWB's proposal that the Authority should have an opportunity to ensure the appropriate application of the Ministerially approved pricing principles. This should be achieved by reviewing proposed prices and contracts prior to their final completion, or by reference from aggrieved customers. Any matters would need to be material in impact and not vexatious for the Authority to become involved.

However, under the *QCA Act 1997*, there is presently no provision for the Authority to mediate or arbitrate on disputes arising from contractual negotiations between GAWB and customers. Dispute resolution roles only relate to private sector water suppliers and SEQWater.

As a result, the Authority will only be able to advise Ministers of the issues and will require a Ministerial Direction to assist in the resolution of the matters raised.

To expedite resolution of any matters, the Authority recommends that consideration be given to amending the *QCA Act* to enable the Authority to resolve such matters where both parties agree for the Authority to become involved.

A more thorough review of the Act and substantial amendments could also be considered to give the Authority a role in resolving disputes where there is a unilateral request.

The Authority has received submissions that the Authority should establish reference tariffs and provide price floors and caps to guide future contractual negotiations. This is a matter for Government. Under the *QCA Act*, the Authority is only able to investigate pricing practices.

The Authority proposes to monitor the application of Ministerially approved pricing practices by reviewing prices and arrangements in contracts prior to their completion.

The Authority also recommends that consideration be given to amendments to the *QCA Act* to enable the Authority to resolve disputes where the parties agree without the need for a Ministerial reference for this purpose.

Monitoring Service Standards

Regulatory pricing is typically specified in relation to a certain standard of service. This is necessary as specifying pricing practices, prices or revenues means little to customers should the provider allow service standards to decline below acceptable levels in an effort to increase short term profitability. Thus, the Authority has recommended that GAWB's pricing practices reflect the efficient costs of providing a defined standard of service and that GAWB should develop a full product description incorporating operational standards of service for contractual purposes.

On the basis that detailed service standards are defined, the key issues are:

- to what extent service standards should be monitored over time; and
- the appropriate response to any increase or decrease in reported levels of service, including whether financial incentives or penalties should be applied.

Other Jurisdictions

Most domestic regulators of regulated electricity services monitor and apply financial incentive schemes in relation to service quality (ACCC, IPART, ESCOSA and ESC). In Queensland, the Authority requires regulated electricity distribution service providers to provide data on service quality on a quarterly and annual basis.

The ORG (2000) applied service quality incentives in its 2001-05 determination for electricity distributors in Victoria. The key incentive was an S factor applied to the CPI-X controls to adjust annual price caps for each distributor to reflect actual service performance outcomes relative to targets. Distributors could be rewarded with price increases reflecting the costs of the improved services where they exceeded targets, while penalties applied in years that targets were not achieved. In addition, a 'guaranteed service level (GSL)' arrangement required the distributors to financially compensate customers where reliability thresholds (time taken to restore supply and number of interruptions during the year) were exceeded. These incentives were seen as complementary to efficiency carryover mechanisms.

ORG's successor, the ESC, has an explicit function to monitor, report and audit the performance of Victoria's regulated water industry. In July 2004, the ESC released a decision paper on a performance reporting framework for metropolitan and regional water businesses. The performance indicators cover the key areas for retail businesses of baseline explanatory data, drinking water quality, water and sewerage network reliability, water consumption and reuse, environmental issues, drainage services, customer service and affordability. The ESC noted that many water businesses had already implemented GSLs voluntarily, but noted that information issues and limited consultation time may constrain the ability of regional businesses to implement GSLs in the first regulatory period. The ESC drew similar conclusions in relation to S factors, indicating that insufficient reliable data on service performance was available for the first period, but that further consideration would be given to S factors in the next review period.

The ERA's water licensing framework requires service providers to establish customer service charters to safeguard quality and service standards.

Under the *Water Supply and Sewerage Services Act 2000,* the NT Utilities Commission requires service providers to establish and publish customer contracts. The contracts must set out the rights and responsibilities of customers. Licensees are also obliged to lodge an annual report with the Commission on their performance against key indicators specified under their licence and any other information requested in writing by the Commission.

Ofwat assesses each service provider's overall performance and makes price adjustments for those with the best and worst service. The scale of price adjustment ranges between a 0.5% increase for the top performers and a 1.0% decrease for the worst performance.

Stakeholder Comment

GAWB and customers did not specifically comment on monitoring of service standards.

QCA Analysis

Given the nexus between price and service quality, the Authority considers that an appropriate framework for monitoring pricing practices, including prices, must also provide for the monitoring of service quality. Under current arrangements, the Authority does not have a specific role to monitor GAWB's performance against a range of service indicators. The only monitoring of performance is undertaken by DNRME as the technical regulator for the industry.

At this stage, the Authority considers that there is insufficient information for the application of service quality incentive mechanisms such as S factors and GSLs to GAWB and its customers. Indeed, the costs of such an approach may exceed the benefits.

GAWB's customers should be well placed to directly negotiate different level of service quality, associated thresholds, guaranteed service levels and corresponding prices should this be considered desirable.

To support customers, the Authority considers that GAWB should annually report on service quality against the standard adopted for determining maximum allowable prices which is reflected in product descriptions provided in customer contractual arrangements.

It is not proposed that the Authority undertake a specific role in monitoring quality of service at this stage, although it recognises that it could become an issue in the event of disputation over prices.

The Authority considers that an appropriate framework for monitoring pricing practices must also involve the monitoring of service standards.

It is proposed that GAWB annually report service quality against the standard adopted for contractual purposes. Specific S factors and guaranteed service level thresholds are not proposed to be included in the regulatory monitoring arrangements for the current review period.

11. IMPLICATIONS OF PROPOSED REGULATORY AND PRICING ARRANGEMENTS

Summary

Compared to the previous investigation, GAWB's aggregate revenue requirement is significantly lower, as lower demand has resulted in lower operating costs, a lower return on capital, and a slightly lower regulatory asset base. Some assets previously anticipated in the future are now not considered necessary.

All segments will require a two-part tariff to achieve revenue adequacy.

The Authority proposes that prices be implemented without a transition period, as customers could reasonably have expected increases to occur given the changes in GAWB's circumstances.

GAWB's operating profit remains negative until 2009-10, while its cash balance continues to trend upwards from current levels.

11.1 Introduction

To maintain confidentiality, the Authority has reported on the implications of the pricing recommendations at the aggregate level. Consistent with the Ministerial Direction, it is proposed to provide individual customers with indicative prices consistent with the Draft Report recommendations.

11.2 Aggregate Revenue Projections

Table 11.1 provides a comparison of projected revenues for the current investigation with those of the Final Report recommendations from the previous investigation. The first comparison is on the basis that existing contract prices continue where these are in place.

Table 11.1. Summary of Aggregate Revenue Projections ($m)

	2005-06	*2006-07*	*2007-08*	*2008-09*	*2009-10*	*2014-15*	*2019-20*	*2024-25*
2002 projected revenue (existing contract prices where in place)	32.74	33.88	35.33	36.30	41.81	52.50	61.37	n/a
Current projected revenue (existing contract prices where in place)	21.28	22.22	23.20	26.05	29.85	37.20	45.40	55.34
Current projected revenue (assuming no contractual constraints)	22.52	23.55	24.60	27.70	31.15	38.90	47.39	57.67

There is a significant reduction in GAWB's aggregate revenue requirement as compared to the previous investigation. The major factors in this change are:

- significantly lower demand over the regulatory review period. In 2005-06, demand is 31% lower than previously forecast, while in 2009-10, demand is 18% lower due to permanent changes following drought;

- in line with this reduced demand, operating costs are about 11% lower in 2009-10, although they are slightly higher in the first two years of the regulatory period;

- a lower return on capital due to a lower risk-free rate and a slightly lower asset beta. The WACC applied is 8.02% compared to 8.72% previously; and

- the regulatory asset base is around 5% lower at 2009-10 than previously, due to some assets previously anticipated in the future being excluded and the adoption of market value for land.

As a result GAWB's revenues of around $32 million are now to be reached in 2009-10 rather than in 2004-05 as previously expected.

11.3 Implications for Pricing Arrangements

Tariff Structures

The Authority recommends that a two-part tariff be adopted, with the volumetric charge based on LRMC and an access charge set on a customer basis to meet the residual requirement for revenue. It is also proposed to derive separate tariffs for storage and delivery services to provide greater transparency in pricing arrangements.

However, Table 11.2 provides a summary of LRMC as a percentage of the revenue requirement for 2005-06 for the key system segments.

Table 11.2. LRMC by System Segments (2005-06)

Segment	*LRMC as a % of revenue requirement*
Awoonga Dam	8.9
Raw water delivery	50.5
Urban treated water delivery	72.0

GAWB's revenue requirement exceeds LRMC in all segments. Hence, if prices were based solely on LRMC, revenue would fall short of that required to sustain the business and provide a return on capital invested. In the storage segment, LRMC is now relatively low, as no significant augmentations are planned for the 20-year planning horizon and GAWB has only recently invested in additional storage capacity.

In the raw water delivery segments, LRMC comprises an average 50.5% of total revenue, reflecting electricity and pumping costs. GAWB has recently upgraded its major pipeline to Gladstone and installed the Mt Miller pipeline, so that augmentation costs are largely now complete. The LRMC for urban treated water incorporates electricity and chemicals costs as well as minor planned augmentations.

The fixed access charges are proposed to be established on the basis of contracted volumes or reservation amounts to be defined in new customer contracts from 1 July 2005. In some cases, customers have reservation volumes specified in existing contracts. However, the Authority found that these reservation volumes were in some cases much lower or much higher than actual consumption, and new reservation volumes need to be negotiated which better reflect current customer needs. In other cases, no reservation volumes have yet been defined.

Accordingly, in the absence of firm estimates for contracted reservation amounts, the Authority has assessed provisional tariffs based on estimated demand rather than reservation amounts.

Should a customer subsequently choose to contract for a reservation amount in excess of its estimated demand, access charges for all customers would need to be adjusted to ensure that GAWB's revenue conforms to the maximum revenue requirement.

Transitional Pricing

The Authority recommends that prices be transitioned where certain criteria are met in regard to the magnitude of the price increase, the level of expectation of price increases, potential customer impacts in terms of ability to pay and social impacts, and impacts on the viability of the service provider.

The changes in GAWB's circumstances following the drought, particularly in regard to supply and demand for water, have led to increases in prices for most customers. In many cases, these increases follow significant increases that were recommended in the Authority's previous investigation for existing customers.

The magnitude of price increases for each major segment is summarised in Table 11.3.

Table 11.3. Price Increases for Selected Segments, % change from Previous Recommendations

Segment	*% Change*
Awoonga Dam	+16.5%
Raw water delivery to Gladstone	+14.2%
Raw water delivery to northern industrial area	-1.3%
Urban treated water delivery	+23.3%

These increases are not indicative for individual customers, which include adjustments for capital contributions, spur-lines or other adjustments.

Key issues are that:

- the increase in price for services at Awoonga Dam primarily reflects the reduction in overall demand over the 20-year planning horizon. In addition, the value of the dam is slightly higher as the previously optimised additional dam crest is now included to meet dam safety requirements for a maximum possible flood. Further, the rolled forward value is higher in nominal terms as the rate of inflation is higher than the rate of depreciation;

- raw water delivery to Gladstone incorporates the higher cost at the dam, modified by some savings in operating costs as peak-time pumping is minimised due to lower demand and previously planned augmentations are also deferred due to lower demand;

- the price for raw water delivery to the northern industrial area incorporates the higher cost at the dam, offset by a lower capital cost for the Mt Miller pipeline and lower operating cost due to gravity feeding from Toolooa rather than pumping; and

- for urban water, the reduction in treated water demand is the key reason for the increased price, with no corresponding savings achievable in terms of optimisation of the capital investment. This results in a higher increase in price than at the dam.

While there are significant increases for some segments, these could reasonably have been expected by customers in view of the drought impacts on demand and supply. Moreover, the Authority considers these price rises to be achievable by GAWB without undue hardship being imposed on end users. Accordingly, the Authority considers that transitioning of prices to new levels from 1 July 2005 is not necessary.

The Authority proposes new prices may be implemented without any transition period from 1 July 2005. Prices corresponding to its recommended pricing practices will be provided on a confidential basis to individual customers.

11.4 Implications for GAWB's Financial Viability

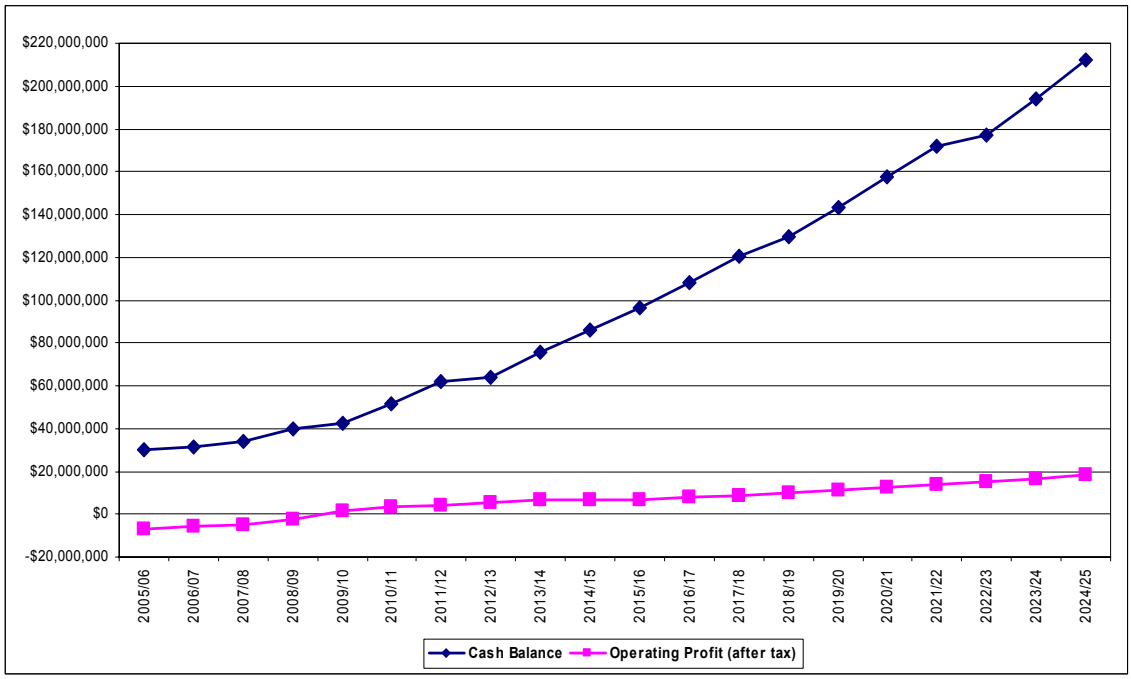
Operating Profit and Cash Balance

The Authority has assessed the financial viability of GAWB based on the projected revenues, taking into account existing contracts over the period to 2024-25.

The analysis showed that a positive operating profit is achieved in 2009-10 (Figure 11.1). GAWB's cash balance follows an upward trend over the period, given that there are no significant planned capital expenditures.

In general, under the recommended pricing practices, any reduction in revenue due to lower than projected demand and/or loss of a customer would be borne by GAWB and result in a lower operating profit until the subsequent regulatory review. However, demand projections include only contracted and relatively certain demand, with only a small component for undetermined demand. Hence, the downside risks in the near term are limited.

Figure 11.1. GAWB's Operating Profit and Cash Balance



APPENDIX 1 – ESTIMATING LONG RUN MARGINAL COST

The estimation of LRMC involves the determination of values for two elements – the SRMC or marginal operating costs and the marginal capacity cost (MCC). The two widely accepted methods used for determining LRMC include the Turvey (1976) approach, also referred to as the Present Worth of Incremental Costs or 'perturbation' method and the average incremental cost (AIC) method (Mann et al. 1980).

Turvey Method

The concept of the Turvey approach is not well defined in the literature and Turvey has himself proposed a number of variations on the estimation procedure.

The 'Turvey method' is most commonly defined as the present worth of the increment in system costs resulting from a permanent increment in consumption at the beginning of year t, minus the present worth of the increment in system costs resulting from the same permanent increment in consumption starting in year t+1.

The central argument of the Turvey approach is that augmentations required to meet the preferred planning demand forecast are unavoidable, and that it is not the total costs of a system augmentation that require examination, but rather the consequences of a marginal change in the rate of demand growth. Turvey argues that the cost savings from deferral of augmentation are relevant to the marginal cost measure, not the cost saving from abandoning it entirely. Hence, the Turvey approach is related to an opportunity cost concept of delaying or bringing forward infrastructure augmentation.

The Turvey method was expressed in formulaic terms by Mann et al (1980), and derived from Turvey (1968), as the present worth of incremental system costs:

$$PWISC_t = \frac{(O_{t+x} - O_t) + \left(\frac{I_k}{(1+i)^{k-t}} - \frac{I_k}{(1+i)^{k+1-t}} \right)}{Q_{t+1} - Q_t}$$

where:
- O_t = Operation and maintenance costs in year t
- I_k = Capacity investment in year k
- Q_t = Water demand in year t
- i = Opportunity cost of capital

This perturbation approach is consistent with Ofwat's interpretation of the Turvey method. Another interpretation is provided in Turvey (1976), where he includes a numerical example in which he amortises the present value of the capital expenditure and divides by the demand volume increment. This approach always gives a higher estimate of LRMC than the more generally accepted interpretation noted above.

The Turvey method gives an estimate of LRMC that becomes larger as the augmentation becomes imminent. Key issues with the Turvey approach are that:

- in Turvey's research (1968) there is an implicit assumption that investments take place each year. The Turvey approach appears more relevant to smaller frequent augmentations than to larger infrequent augmentations;

- in Turvey's original research, the approach is based on taking only the first augmentation and consumption increment. As noted by Marsden Jacob Associates, this would result in instability in the estimated LRMC as successive augmentations are considered over time. However, it would be a simple matter to adapt the method to incorporate planned future augmentations over a longer planning period;

- Turvey does not specify whether a residual value should be applied. However, as the resulting estimate of LRMC is effectively an annualised estimate, residual values should not need to be considered;

- the Turvey method uses the consumption increment in the year of the augmentation as the denominator. In lumpy investments characteristic of the water industry, the volume of demand growth in the year of the augmentation could be small relative to the expanded capacity, resulting in a high LRMC estimate. Alternatives are to use expected consumption growth over the planning period or to use capacity as the denominator; and

- Marsden Jacob Associates note that there is some lack of clarity as to whether SRMC in the Turvey method is based on current operating costs or the change in operating costs arising from the augmentation, which may include one-off (or stepped) increases in the scale of operating costs, such as for example, an increase in labour costs to manage and operate the augmented facilities. A more appropriate approach may be to estimate SRMC as the difference between operating costs after the augmentation and current operating costs.

The lack of clarity in the Turvey method is an issue and the various possible adaptations of the approach effectively align it more closely to the AIC approach. The method as originally intended by Turvey provides a conceptually sound approach to estimating LRMC in examples where there are regular capacity increments to meet demand increments, and for this reason, is less suited to lumpy investments in water infrastructure where there may be lengthy periods of spare capacity.

Average Incremental Cost (AIC) Method

The Average Incremental Cost (AIC) method bases LRMC on a measure of the incremental costs of all system augmentations taken over a planning period. Mann et al (1980) note that AIC is calculated by:

> *"discounting all incremental costs which will be incurred in the future to provide for estimated additional demand over a specified period, and dividing that by the discounted value of the incremental output over the period"*

In other words, AIC is the present value of the stream of (least cost) capital expenditure needed to satisfy the projected demand divided by the present value of the stream of demand itself. In conceptual terms, the formula is:

$$AIC_t = \frac{NPV\ (Capex\ ) + NPV\ (Opex\ )}{NPV\ (demand\ )}$$

A precise formula is provided by Mann et al (1980):

$$AIC_t = \frac{\sum_{k=1}^{T}\left[\frac{I_{t+k-1} + (O_{t+k} - O_t)}{(1+i)^{k-1}}\right]}{\sum_{k=1}^{T}\left[\frac{Q_{t+k} - Q_t}{(1+i)^{k-1}}\right]}$$

where:
- O_t = Operation and maintenance costs in year t
- I_t = Capacity investment in year t
- Q_t = Water produced in year t
- i = Opportunity cost of capital
- T = Years for which expenditure and output are forecast (the planning horizon)

This formula provides an 'annualised' value for capital costs enabling consistency with annualised operating costs. It effectively generates an 'average marginal' capacity cost as part of the LRMC measure. Consistent with average cost pricing approaches, capex should be determined over the full life of the asset or, if determined over a shorter planning horizon, a residual value should be incorporated.

The AIC definition thus gives marginal cost estimates which smooth out lumps in expenditure over time while at the same time reflecting the general level and trend of future costs which will be incurred as water consumption increases.

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