Western Australia

Economic Regulation Authority

Inquiry into the Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder

Draft Report

30 June 2005

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HOW TO MAKE A SUBMISSION

The Economic Regulation Authority (Authority) invites interested parties to consider the issues discussed in this Draft Report and make a submission to the Inquiry.

Submissions on any matters raised in this Draft Report should be in written form and electronic form (where possible) and addressed to:

Inquiry into the Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder
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PERTH WA 6000

Email: watersubmissions@era.wa.gov.au
Fax: (08) 9213 1999

Submissions must be received by 29 July 2005.

In general, submissions from interested parties will be treated as in the public domain and placed on the Authority's website. Where an interested party wishes to make a confidential submission, it should clearly indicate the parts of the submission that are confidential.

The receipt and publication of a submission lodged by a person with the Authority shall not be taken as indicating that the Authority has knowledge either actual or constructive of the contents of a particular submission and, in particular, whether the submission in whole or in part contains information of a confidential nature. No duty of confidence will arise for the Authority in these circumstances.

Further information regarding this Inquiry can be obtained from:

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EXECUTIVE SUMMARY

This Draft Report is in response to an inquiry referred to the Economic Regulation Authority (Authority) on 13 January 2005 by the Government of Western Australia on the cost of supplying bulk potable water to Kalgoorlie-Boulder and surrounding regions.

The Terms of Reference for the inquiry require the Authority to compare the costs and benefits of two options for supplying bulk potable water to Kalgoorlie-Boulder. The options are: the expansion of existing supplies by the Water Corporation along the main conduit of the Goldfields and Agricultural Water Supply scheme (GAWS); and an alternative proposal by United Utilities Australia (UUA) to desalinate seawater in Esperance and pipe the potable water to Kalgoorlie-Boulder.

The Treasurer's reference to the Authority arises because UUA formed a very different view to the Corporation on the likely new demand for water in the Goldfields region and the ability to supply that potential new demand.

The estimates of future demand must be regarded as uncertain. For the purposes of the Draft Report, the Authority's approach has been to evaluate benefits and costs under the simplifying assumption that the demand will eventuate. This leaves the issues of demand risk and uncertainty to be separately considered. The prime scenario for the EKP is for demand to rise from 60 to 100 ML/day. The use of this scenario does not imply the Authority's endorsement of these demand projections.

The Authority's draft findings in response to each of the questions raised in the terms of reference are summarised below.

Current cost to the Corporation

The current costs of supplying water to the Goldfields are high because of the substantial infrastructure involved and the need to pump water large distances. If the existing GAWS main conduit were to be duplicated this would entail a capital cost of almost $1 billion. In addition, operating and maintenance costs over the next fifty years will substantially exceed $150 million in present value terms.

These current costs reflect substantial sunk costs which are not relevant to the consideration of alternative options for future supply. Rather, as noted, the comparative merits of different options for future supply should be assessed on the basis of avoided costs and benefits. The Authority's methodology therefore focuses on avoided costs and benefits using the familiar framework of benefit cost analysis. The forward looking costs and benefits are expressed in present value terms using a 6% pre-tax real discount rate as the base assumption.

From a public policy perspective, the key question is whether the:

Avoided costs to the Water Corporation from the EKP proposal

Plus

Benefits to mines from switching to potable supply

Exceeds

Costs of the EKP proposal.

These costs and benefits are largely quantifiable although there are intangible benefits and costs which are not easily measured.

The cost saving to the Corporation if UUA were to supply

Two sharply different views on the cost saving to the Corporation were put to the Authority by UUA and the Corporation. UUA's estimates of the cost to the Corporation were based on the assumption that beyond the throughput level of 45 ML/day the GAWS system could not be further extended without completely duplicating the system. In contrast, the Corporation's capital program is based on the presumption that the GAWS system can be incrementally extended without cost penalty up to a level of at least 77 ML/day.

UUA provided no independent evidence for their assumption. While the Corporation provided no independent verification as such, the Authority notes that the GAWS has been progressively extended incrementally in the past; that this is the basis of the Corporation's notional cost model; that the notional cost model closely aligns with the current capital programme; that the capital programme is reviewed by the Board and management; and that the presumption of the ability to make incremental extensions without significant cost penalties is also observed in other pipelines, including gas pipelines. For the purposes of this draft assessment the Authority has accepted the Corporation's view that the GAWS system can be incrementally extended at no significant cost penalty. This is an issue on which further submissions may be usefully made.

The Authority estimates that the avoided costs to the Corporation if UUA were to supply the Goldfields and Esperance are estimated to be almost $600 million in present value terms. Within this total, savings in capital expenditure to meet future Goldfields growth along the existing GAWS system ($255 million) and savings in source water costs ($156 million) are the two largest sources of avoided costs.

The cost that UUA could provide bulk potable water

Based on UUA's cost models, the Authority estimates that the capital and operating costs of the EKP proposal to supply the Goldfields and Esperance are around $916 million in present value terms with capital costs comprising half of this total. Energy costs comprise around three quarters of total operating costs.

Because the direct costs of the EKP proposal are estimated to be greater than the avoided costs to the Corporation, the Authority's assessments indicate that the EKP proposal will not provide net benefits unless the benefits arising from the mines switching from super-saline to potable water exceed the difference in the costs of the two options. The magnitude of the benefits to the mines is therefore a material issue.

Benefits to mines

The Authority has already noted the uncertainties relating to the magnitude of new demand from the mines. Based on UUA's assumptions regarding new demand from the mines, and the UUA assumption that the cost of using super-saline water is $3.33/kL, the Authority estimates that the avoided costs to mines of substituting potable water for super-saline water is $263 million in present value terms.

The impact on the State Government's finances

The EKP proposal would result in a reduction of state borrowings since it would be financed by UUA rather than the Water Corporation/State Government. The available evidence is unclear as to how this would impact on the State's credit rating.

In terms of impacts on net payments to government from the Corporation (the net amount of Community Service Obligation payments, tax equivalent payments and dividends), the EKP proposal could have a significant impact if the price negotiated between the Corporation and UUA resulted in an increase in costs to the Corporation.

Gross receipts to government from royalties from existing mines would be unchanged since they are related to the value of throughput rather than to mine profits. New mining ventures may emerge but the impact of lower direct and indirect costs of water appears unlikely to be a major factor in its own right.

The overall costs and benefits of each option

The assessment of the benefits and costs of the competing proposals for future water supply of the Goldfields region indicates that:

- net costs would be incurred if the EKP proposal were implemented under current UUA assumptions on demand for potable water and on the magnitude of costs avoided by switching to potable water. In present value terms the net costs are estimated to be around $56 million (see Figure A);

Figure A: Benefits and costs of EKP vs GAWS Extension,
Assumed demand : 60 – 100 ML/day
Discount rate : 6.0%

	$M	$M
Avoided costs (benefits) of UUA proposal		
Savings in Corporation growth expenditure		
Capital costs	254.6	
Operational costs	89.1	
Source water costs	56.3	
		399.9
Savings in Existing Water Corporation Supply Costs		
Source water costs	100.0	
Maintenance costs	16.1	
Pumping costs	50.5	
		166.7
Savings in Esperance expenditure		
Capital costs	6.6	
Operational costs	7.0	
Water quality upgrade	16.7	
		30.3
Benefits to mines		**262.8**
Total avoided costs (A +B)		**859.8**
Costs of UUA proposal		
Capital costs	-446.9	
Operational costs	-454.3	
Water quality – GAWS	-14.5	
		-915.7
Net benefit/(cost) (A+B-C)		**-55.9**

Sources: UUA CostBen Model and UUA 050411 Goldfields WSP 60-100ML Direct Cost Model

- the assessment that there are net costs from the EKP proposal is relatively insensitive to the choice of discount rate;
- however, the net costs are sensitive to the assumed level of demand. For example, if the initial level of demand was 45ML/day then the net cost is $143 million rather than $56 million;
- the net costs are also sensitive to the magnitude of the costs avoided by the mines currently using super-saline water switching to potable water. The magnitude of these benefits remains a major uncertainty;
- the benefits and costs of the EKP proposal are assessed to be essentially private: there appears to be little divergence between the public and private benefits and costs. Thus, failure of the proposal to demonstrate net benefits from a public perspective suggests that the EKP proposal would also do so from the perspective of private investors. However, the converse also applies;

- from a commercial perspective, the Corporation should be willing to commit as a foundation customer assuming its assessment of the risks are no greater than an expansion of the GAWS and payments to UUA are less than avoidable costs. Since the Corporation's avoidable costs are less than the costs of the UUA proposal, new customers are required to close the gap in revenue before the Corporation would be willing to commit to any such project;

- there may be value in UUA reducing uncertainty in the demand estimates. On the basis of the existing sketches of likely demand, it is difficult to envisage any parties committing to the project. On the other hand, this should not be a surprise at this developmental stage of the EKP proposal. In any event, UUA needs to prove up the demand to a level to satisfy their own investment criteria and the funding criteria of banks and potential investors;

- there is unlikely to be any impact on existing residential consumers under either option as the price they pay is subsidised through the Government's Uniform Tariff Policy; and

- there is a possibility that the EKP proposal would enhance regional economic development in Kalgoorlie-Boulder and the State in general but the extent of this is unclear.

In summary, the Authority considers that on the basis of the evidence currently before it the costs of the EKP proposal exceed the avoided costs to the Water Corporation. Further, the estimated magnitude of the benefits to mines at this time is not sufficient to overcome this gap. Finally, since the benefits and costs are largely private, then the decision to proceed with an alternative supply is largely a commercial one. A proponent would need to supply the foundation customer (Water Corporation) at a price equal to or less than the Water Corporation's avoidable cost and be willing to take the commercial risk with respect to any new demand and the price potential new customers may be willing to pay.

1 INTRODUCTION

On 13 January 2005, the State Government of Western Australia gave written notice to the Economic Regulation Authority (Authority) for it to undertake an inquiry into the cost of supplying bulk potable water to Kalgoorlie-Boulder and surrounding regions. The request is in accordance with section 32(1) of the *Economic Regulation Act 2003*.

The inquiry is to compare the costs and benefits of two options for the future supply of bulk potable water to Kalgoorlie-Boulder. These are: the expansion of existing supplies along the Water Corporation of Western Australia's (Corporation) Goldfields and Agricultural Water Supply Scheme (GAWS); and an alternative proposal by United Utilities Australia (UUA) to desalinate seawater in Esperance and pipe the potable water to Kalgoorlie-Boulder.

1.1 Terms of Reference

Under the Terms of Reference for the inquiry (see Appendix 1), the Authority is required to report on:

- the current cost to the Corporation of providing bulk potable water to Kalgoorlie-Boulder, including the cost to the State Government of associated Community Service Obligation (CSO) payments to the Corporation;
- the cost that UUA could provide bulk potable water to Kalgoorlie-Boulder over the next 25 years;
- the cost saving to the Corporation if UUA were to supply bulk potable water to Kalgoorlie-Boulder;
- the impact of each option on the State Government's finances, including borrowings, capital expenditure, tax equivalent and dividend revenue and CSO payments; and
- the overall costs and benefits of each option, including the impact on the end consumer and the potential to enhance regional economic development in Kalgoorlie-Boulder and the State in general.

1.2 Background to the Inquiry

The future provision of sustainable water supplies to the Goldfields has been a matter of study and debate over the past decade. Issues of concern include the need to meet growing residential water demand in future decades, the availability of groundwater resources, the costs to the mining industry of using super-saline ground water, and the restrictions to industrial expansion due to the high costs of supply and therefore the high headworks charges.

This focus on future provision of sustainable water supplies to the Goldfields mirrors similar attention devoted to the future demand/supply balance for water in the Perth metropolitan area and development of a State water strategy. An important link between the metropolitan and Goldfields strategies, at least currently, is that the source cost of water to the Goldfields is determined by the source cost of water to the metropolitan area.

The current costs of supplying water to the Goldfields are high. If the existing GAWS Main Conduit were to be duplicated this would entail a capital cost of around $1 billion. In addition, operating and maintenance costs over the next fifty years will substantially exceed $150 million in present value terms.

The current costs of the existing system are not relevant to the choice between competing options for future supply: a sunk cost and alternative options for future supply offer the prospect of lower future costs. Thus, the decision rules regarding future supply should focus on avoidable costs and benefits.

In February 2001, the Government called for expressions of interest on the sustainable supply of water to the Goldfields/Esperance region. This led to the development of an interdepartmental water supply strategy for the Goldfields Esperance region, with the final report published in January 2003.[1] The strategy examined a range of options for supplying bulk water to the region, including:

- continuing to use the GAWS;
- piping seawater from Esperance and desalinating at Kalgoorlie;
- piping desalinated water from Esperance to Kalgoorlie; and
- developing the Eucla or Officer Basin groundwater aquifers.

The water supply strategy drew upon several background studies on the sustainability of palaeochannel reserves in the region, the costs and benefits of alternative supply options, and the true cost of water delivery to the Goldfields through the GAWS. One of the recommendations in the final report was that the various options, including the piping of desalinated water from Esperance and continued use of the GAWS, should be evaluated in more detail to identify the preferred option to progress to the detailed feasibility stage.

The Government sought further advice in 2003 on the proposal to pipe desalinated seawater from Esperance to the Goldfields from a steering committee comprising the Managing Director of the Corporation, Coordinator of Water Services, and Managing Director of United Utilities Australia.[2] The study concluded that:

[1] Department of Mineral and Petroleum Resources, Water and Rivers Commission, Office of Water Regulation, Department of Planning and Infrastructure, Goldfields Esperance Development Commission (January 2003), *Goldfields Esperance Water Supply: Water Supply Strategy, Final Report.*

[2] Water Corporation of Western Australia, United Utilities Australia and the Office of Water Regulation (August 2003), *A New Water Supply to the Goldfields: Review of the Viability of a*

> A project to pipe desalinated seawater from Esperance and pipe it to the Goldfields is not viable as a completely stand-alone project at the currently-identified demands and prices. However, the project becomes viable as a commercial project if:
>
> - government is prepared to consider an annual subsidy in the region of $10 million to $32 million, taking into consideration strategic factors beyond the remit of this review; and
>
> - the mining industry is prepared to make a commitment to water volumes and prices. (p8)

During 2003/04 UUA continued to investigate potential demand from mining operations primarily between Kalgoorlie and Norseman. Based on its investigations into the feasibility of the project, UUA believes it has a sound understanding of the technical and economic fundamentals.

On 8 September 2004, the Minister for Government Enterprises issued a press release indicating that UUA had received 'substantial commitments' from a 'number' of Goldfields companies to purchase water. The Minister also indicated that the Government, on the request of UUA, had referred this matter to the Authority for review.

1.3 Review Process

Following the request by the State Government, the Authority appointed consultants, through a public tender process, to assist it in the analysis of technical and economic issues covered by the inquiry. The selected tenderer, Marsden Jacob Associates (MJA), was appointed on 2 March 2005.

Reflecting the commercial nature of the UUA proposal, MJA worked closely with UAA and the Corporation on their respective assessments and costings and convened a workshop between the parties on 20 April 2005.

On 3 May 2005, the Treasurer amended the Terms of Reference for the inquiry to extend the timetable to provide additional time for the receipt of technical information from the parties. Under the revised Terms of Reference, the Draft Report is to be made available by 30 June 2005 and the Final Report is to be completed no later than 16 September 2005.

Members of the public are invited to make written submissions to the Authority on any matter that is dealt with in this Draft Report. The closing date for submissions is 29 July 2005.

The Authority will consider the submissions received and the analysis of its consultants, and will deliver a Final Report, including recommendations, to the Treasurer by 16 September 2005, who will then have 28 days to table the report in Parliament.

Desalinated Seawater Pipeline from Esperance to Kalgoorlie/Boulder. Final Report for the Western Australian Government's Water Taskforce.

1.4 Volumes and Terminology

Volumes relating to the GAWS and Esperance Kalgoorlie Pipeline (EKP) are measured on two bases:

- GL/annum, which are most relevant when referring to the total demand and supply of water resources for the Goldfields; and
- ML/day which are most relevant when referring to average or maximum daily flow rates. When expressed as an average, there is clearly an annual equivalent.

Figure 1.1 shows volumes and flows for the GAWS scheme in 2004-05.

Figure 1.1: Volumes and flows in GAWS

	Total GL/annum	Average Flow ML/day
Volume into GAWS at Mundaring Weir	26.8	73.3
Volume to agricultural areas	15.0	33.7
Volume to Goldfields	11.8	32.3

Note: The Corporation advises that the current maximum sustainable inflow rate into Kalgoorlie during summer is 34 ML/day. After the construction of the 400 ML Binuli storage this is expected to increase to around 40.8 ML/day. The Corporation expects this to satisfy requirements until 2010. The required sustainable inflow rate by 2015 is projected by the Corporation to be 45 ML/day and by 2020 50 ML/day. The extended summer capacity is 34 ML/day.

As noted, interest in the EKP has been revitalised by UUA's investigations into future demand.

2 OVERVIEW OF PROJECTS

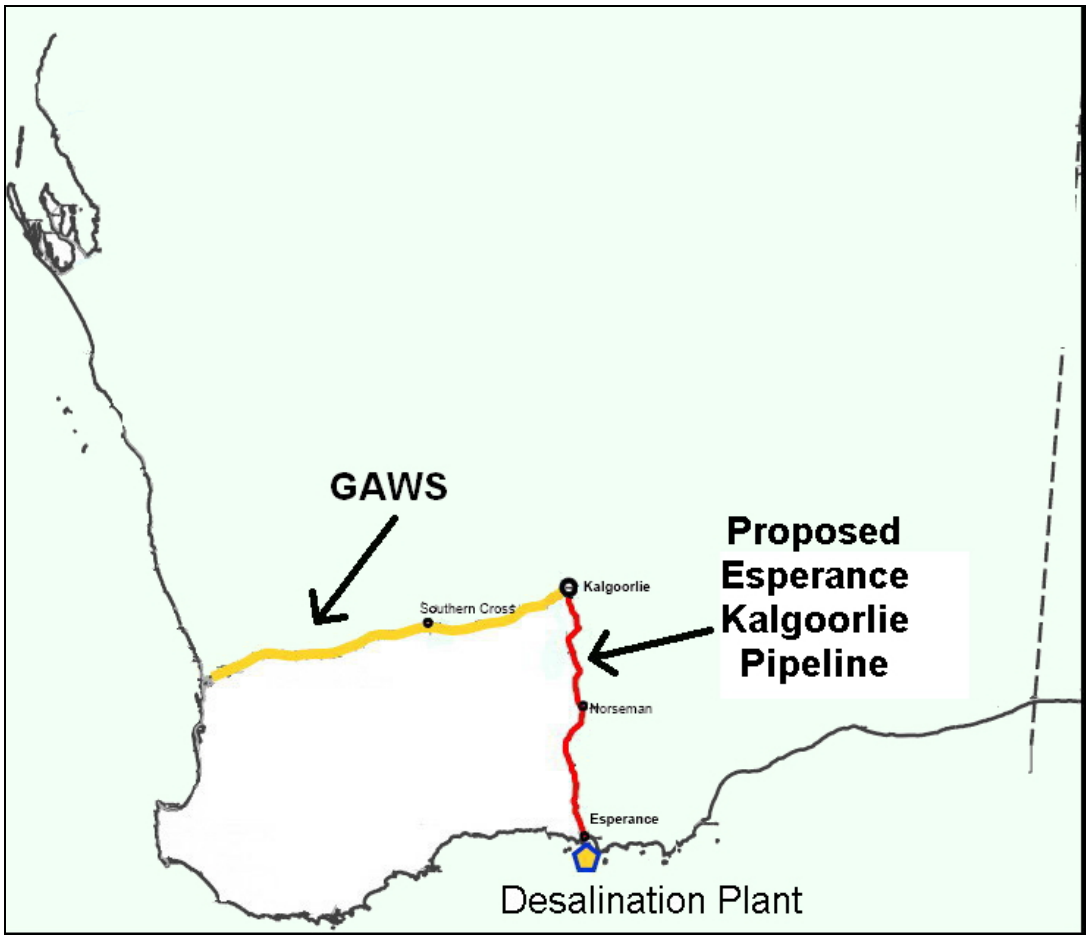
The Kalgoorlie-Boulder region and the area southward to Norseman is an area of very low rainfall and very high mineral worth. Since 1903 the area has been supplied by the GAWS scheme which pipes water from Mundaring Weir through the agricultural areas to the Goldfields. According to the Corporation, this scheme could be incrementally expanded to supply much of the growth expected in coming decades.

Alternatively, a desalination plant could be built at Esperance and potable water piped to Kalgoorlie-Boulder to supply both existing and new demand.

Currently, mining operations in the Goldfields region use large quantities of groundwater in their operations. Increased realisation of the hidden costs of using super-saline groundwater and the potential to substitute potable water for this super-saline water suggests, depending on the price of that water, the possibility of a step increase in demand for potable water in the region. Most of the expected new demand lies between Kalgoorlie-Boulder and Norseman.

Figure 2.1 provides a schematic of existing and proposed water supply option for the Goldfields region.

Figure 2.1: Existing and proposed water supply option for the Goldfields region



2.1 Goldfields and Agricultural Water Scheme (GAWS)

Kalgoorlie-Boulder's bulk water is currently supplied by the Corporation by means of the Main Conduit of the GAWS, which transports treated potable water 549 km from Mundaring Weir (part of the Perth Integrated Water Supply System) to Kalgoorlie-Boulder. The original pipeline, designed by C.Y. O'Connor, commenced supply to Kalgoorlie in 1903, and has been progressively upgraded and replaced. Thus, while the system is old, it mainly comprises new pipes and new pumps. In its current format, the pipeline can supply an average 34 ML/day and 45 ML/day for short-term peaks.

In 2003-04, water consumption in the Goldfields supplied by the GAWS scheme totalled 11.8 GL comprising:

Kalgoorlie	9.2 GL
Kambalda	2.0 GL
Norseman extension	0.4 GL
Other	0.3 GL
Total	**11.8 GL**

The Main Conduit also supplies parts of the metropolitan area and agricultural regions: 50% of the water on the GAWS goes to agricultural areas between Mundaring Weir and Southern Cross.

At Kalgoorlie, there are several reservoirs. The GAWS spurs off to Norseman, with another spur to Kambalda West and Kambalda East.

Beyond the GAWS, between Norseman and Esperance, is Salmon Gums, which is supplied from two surface water catchments, and Esperance itself, which is supplied by borefield water. Current supply to Esperance is around 5.5 ML/day or 2 GL/annum. Although 3% per annum growth was assumed in the Corporation's planning report (and by UUA), actual demand has not grown over the last 5 years.

2.2 UUA Proposal

The UUA proposed scheme[3] has the following features:

- a desalination plant in Esperance which would draw water from the Bay of Isles via a 200m inlet pipe and desalinate it using a reverse osmosis process, producing up to 100 ML/day of potable water. The brine by-product of the process would be returned to the bay via a 1.6 km outlet pipe with the contingency for this to extend to a maximum 2.5 km depending upon the outcome of environmental studies. The desalination plant would operate on power from the adjacent Burns Roe Worley gas-fired power station, with tree planting programmes proposed to offset associated carbon emissions;

- potable water would be stored in a new balancing reservoir near Esperance and piped through Esperance and then north towards Kalgoorlie-Boulder. Since the desalination plant is most efficiently operated at a stable flow, additional storages at major supply points along the pipeline would be necessary to meet seasonal peaks;

- the envisaged pipeline under the base case scenario is a 957 mm steel cement-lined pipeline with initially three rising to five pump stations as throughput increases. The pipeline would operate satisfactorily at 60 ML/day, with a practical capacity of 100 ML/day;

- the desalinated potable water would be delivered to existing storage reservoirs in Kalgoorlie (including the Corporation's proposed new 400 ML storage);

- the controls for the pipeline would be at Esperance, with shadow controls at Kalgoorlie-Boulder for security of supply purposes. Staffing would include approximately 10 of UUA's own staff, and other local contractors;

- UUA estimate that the desalination plant and pipeline would take 12-18 months to build following financial closure and EPA approval. The earliest estimate for the start of the scheme is therefore late 2007-08; and

- based on UUA's cost modelling, the initial capital cost of the scheme is estimated at $436.7 million, including $50 million in contingency, commissioning and other preliminary costs. An additional $154.2 million in capital is planned to be spent over the 30 year period to cater for scheme augmentation, asset replacement and replacement of the membranes in the reverse osmosis plant. Annual operating costs are estimated at around $24 million in the initial years increasing to around $41 million once the ultimate scheme demand of 100 ML/day is reached in year 30. Energy costs account for around 75% of total operating costs.

[3] United Utilities Australia (2005) *Goldfields Water Supply Esperance-Kalgoorlie Pipeline, Technical Description, 60 ML/day Winter Capacity*, 11 March.

2.3 Interface Issues

The base proposal advanced by UUA envisages closure of the GAWS pipeline at Southern Cross. This envisaged closure would raise issues relating to water quality in the pipeline since the prime determinant of the quality of water is the number of days since chloramination (a disinfection process involving the addition of chlorine and ammonia) and therefore the speed of movement.

The base proposal advanced by UUA also envisages the closure of the Corporation's borefield supply at Esperance. This appears to raise minimal interface issues but would offer prospective benefits in terms of improved water quality since the borefield water does not meet aesthetic criteria in the Australian Drinking Water Guidelines (1996) relating to hardness and Total Dissolved Solids (TDS).

3 ASSESSMENT METHODOLOGY

As set out in the Terms of Reference, one of the purposes of this review is to compare the overall benefits and costs of the two proposals. The Authority has therefore employed the familiar framework of benefit cost analysis. This is a forward looking approach which ignores sunk costs and focuses exclusively on avoidable and incremental costs and benefits.[4]

3.1 Choice of Methodology

A benefit cost framework is preferred over a simple comparison of costs because:

- although supplying the same area, the GAWS and EKP options are not alike. Not only are the technologies and costs different, but the benefits are also different. Indeed, a key question is whether – at different levels of demand – the additional benefits potentially associated with the EKP are sufficient to offset the higher costs of the EKP option; and

- an evaluation based on comparative costs only would provide limited information on the broader question of whether the benefits of the project exceed costs. To take the current example, there is likely to be little dispute that the EKP proposal would be cheaper in terms of costs in order to supply very high levels of demand, say, 100 ML/day of demand. Such a finding on the basis of least cost would not, however, provide adequate justification for the project to go ahead if demand were uncertain and prospective customers were unlikely to pay the price to cover the costs involved.

  This illustrates the importance of considering both the benefits and the costs.

3.2 The Benefit Cost Framework

Benefit cost analysis involves comparison of the benefits and costs arising from one fully specified case or option against the benefits and costs arising from an alternative.[5] Alternatively, the net benefits and net costs for the new proposal can be

[4] The cost of supply of any service can be measured from (at least) two perspectives:

- What would be the cost of supplying the existing service if a new entrant had to duplicate or replace the service and therefore the (modern equivalent of) the assets? and/or
- Given that all existing assets are sunk costs, what are the forward looking costs that must be incurred in order to continue the supply service at the levels and qualities required?

The former concept is familiar in economic regulatory contexts since it forms the basis of determining the maximum price that a monopoly utility should be allowed to charge.

However, the choice between an established project and a potential new project must involve comparison of the costs that will be incurred in the future − past costs are not relevant.

[5] A recent text on benefit-cost analysis is Campbell, H and Brown, R, 2003, *Benefit Cost Analysis; Financial and Economic Appraisal using Spreadsheets*, Cambridge University Press. An earlier and similarly comprehensive text is Perkins, Francis (1994) *Practical Cost Benefit Analysis: Basic Concepts and Applications*, Macmillan Educational Australia.

assessed against the benchmark/base case. In terms of outcomes, these two approaches ought to be identical, although in practice, the former is less prone to error, since errors of logic more easily arise when having to consider differences rather than two fully specified cases.

Comparison of cases

A comparison of cases involves comparing the fully specified costs and benefits of the EKP against the similarly well specified costs and benefits of expanding the GAWS. Since the EKP is intended to supply a somewhat different market to the GAWS, the benefits to customers are likely to be an important difference between the two cases. The potential benefits and costs for the two cases are set out in Figure 3.1.

Evaluation of net benefits and costs

The conceptually equivalent method of evaluating benefits and costs of the EKP is to assess the changes in the benefits and the changes in the costs compared with the base case of extending the GAWS.

This approach closely aligns with the commercial realities of the situation whereby:

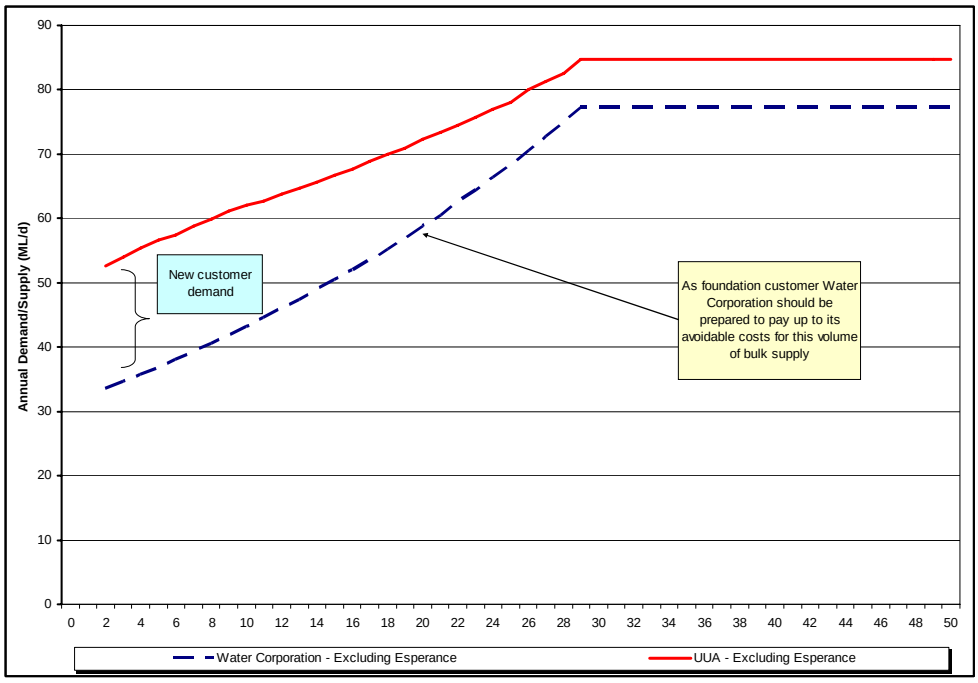
- the Corporation is the potential foundation customer for the UUA project;
- the Corporation is prepared to pay to UUA a price up to its avoidable cost for the receipt of water from UUA (existing supply and growth);
- UUA deals directly with new mining and industrial customers to supply them potable water; and
- new mining and industrial customers achieve a benefit from substituting potable water for the super-saline groundwater.

Figure 3.1: Comparison of cases - GAWS extension vs EKP

EKP	GAWS
Potential Costs Desalination plant Pipeline, pump stations and storages Connection to Esperance supply Water quality costs associated with truncation of supply at Southern Cross Exposure to higher energy prices	**Potential Costs** Capital expenditure, including storages for growth Operational and maintenance costs for growth Maintenance of existing supply infrastructure between Southern Cross and Kalgoorlie Pumping of water to Kalgoorlie Existing supply costs Water quality at Esperance
Potential Benefits Substitution against super-saline water by mining companies (avoided cost to industry)	**Potential Benefits** Not applicable
Intangible Benefits Potential risk diversification Potential for further increases in demand	**Intangible Benefits** Not applicable

Figure 3.2 shows the Corporation's estimates of future demand over the next 50 years and additional demand from new customers suggested by UUA. Thus, the solid line shows the total volume that could be supplied by UUA.

Figure 3.2: EKP and GAWS Demands/Supplies, Years 2 – 50, excluding Esperance



Source: MJA analysis of UUA's and the Corporation's models and data.

Note: This chart ignores divergences in UUA's and the Corporation's estimates of water demand levels and growth at Esperance. (UUA estimates demand at Esperance at significantly higher levels than the estimates by the Water Corporation.) If the levels assumed by UUA were taken into account total demand would start at 60 ML/day rising to 100 ML/day.

Figure 3.3 describes the derivation of the net benefits and costs. Note that the component elements do not differ from Figure 3.1 which describes the comparison of the two fully specified cases (with the exception of the risk of higher energy costs which has been ignored in this analysis).

Under this view, there are net benefits from the EKP project compared with extending the GAWS if:

Avoided costs to the Corporation

Plus

Benefits to new mining customers and intangible benefits

Together exceed

Costs of the EKP proposal, including necessary interface costs.

That is, if **A + B > C**

This decision rule is relevant to public policy decisions.[6]

[6] If the Corporation's avoided costs exceed the costs of the EKP proposal, then there are net benefits from the EKP proposal even if the benefits to new customers are zero.

However, the same decision rule (A + B > C) does not apply from the Corporation's perspective since the benefits to mining companies and any intangible benefits cannot be captured by the Corporation. From a commercial perspective, the Corporation is the potential foundation customer which – other things equal – should be willing to buy water from UUA at the Corporation's avoided costs.

Essentially the same decision rule (A + B > C) applies for a potential private investor such as UUA, so long as externalities and other intangible impacts are small. In that case, the public benefits and public costs are closely aligned with (or are the same as) the corresponding private benefits and private costs. (Issues relating to risk, externalities and other intangible impacts are discussed in Section 9).

To cover the full costs of the EKP, however, UUA is likely to need to have both revenue from the Corporation (the foundation customer) and revenue from new customers. The need to rely on revenue from new customers will depend on the size of the avoidable costs to the Corporation and therefore the revenue that UUA could obtain from the Corporation. This likely requires that the benefits to mines and other new customers are significant and that UUA is able to capture a sufficient share of these (new customer) benefits to cover any shortfall between project costs and the amount the Corporation would be willing to pay based on its avoided costs.

Alternatively, if the Corporation's avoided costs are less than the costs of the EKP proposal, then the magnitude of potential benefits to new customers becomes material in determining whether or not there are net benefits from the EKP proposal.

Figure 3.3: Elements of Net Benefit Comparison of EKP against GAWS extension

EKP
A. Avoided Costs to the Corporation Capital expenditure, including storages for growth Operational and maintenance costs for growth Maintenance of existing supply infrastructure between Southern Cross and Kalgoorlie Pumping of water to Kalgoorlie Existing supply costs Water quality at Esperance **Plus** **B. Benefits to mines** Substitution against super-saline water by mining companies (avoided cost to industry) **Plus** **Intangible benefits** Potential risk diversification Potential for further increases in demand **Compared with** **C. Costs of UUA Proposal (capital and operating)** Desalination plant Pipeline, pump stations and storages Connection to Esperance supply Water quality costs associated with truncation of supply at Southern Cross

3.3 Treatment of Risk

This review arises because UUA formed a very different view to the Corporation on the likely new demand for water in the Goldfields region and the ability to supply part of that potential new demand. Nonetheless, the estimates of future demand must be regarded as uncertain. The Authority's approach for treatment of risk is therefore as follows:

- first, benefits and costs of the respective proposals are evaluated assuming that the demand is firmly in place. The prime scenario for the EKP is for demand to rise from 60 to 100 ML/day. As noted, the working assumption in this component of the analysis is that demand is in place and that demand risk and uncertainty are issues to be considered separately; and

- second, demand risk and uncertainty needs to be taken explicitly into account. There are two main methods for doing so. One is to incorporate the risks into the cash flows, i.e. to compare probability weighted benefits with probability weighted costs. The assignment of such probabilities involves the use of judgement and such judgements are arbitrary and cannot be soundly based in an early stage proposal. The other method is to recognise that many of the uncertainties relating to levels of demand or the costs of the project can be clarified with the passing of time and the investment of resources to gain new and better information.[7]

3.4 Evaluation Parameters

Discount rates

For the purposes of the benefit cost analyses, the benefits and costs need to be brought to present value terms using the social discount rate. This minimum rate is assumed to be 4% (pre-tax real) per annum. For the purposes of sensitivity analysis, higher rates are also relevant for the benefit cost analysis. In particular, the Authority is employing a pre-tax real discount rate of 6% when evaluating the long run marginal cost (LRMC) of water for the metropolitan system.[8] UUA in its submissions has preferred to adopt an 8% pre-tax real discount rate. The main evaluations have therefore been undertaken at a pre-tax real discount rate of 6% with sensitivity analyses using 4% and 8%.

Evaluation period

All analyses have been undertaken over a 50 year period. This period is longer than that specified in the Terms of Reference. However, it removes the need to make arbitrary choices over the value of assets remaining at the end of the evaluation period; and more appropriately reflects the long term nature of the project. Moreover, the costs provided by UUA in its cost models were for a 50 year period and included the cost of replacing assets over that period.

For internal consistency with these timeframes, the Authority has also used a 50 year time frame when assessing the LRMC for source supply for Perth.

[7] A third method is to apply a higher discount rate. This method is rejected here because it implies that future benefits and costs should be more heavily discounted than benefits and costs in the immediate period. However, where the prime source of risk is demand risk and that source of risk is likely to be clarified in the short-term, then such an approach is clearly inappropriate.

[8] In the Draft Report for the Inquiry on Urban Water and Wastewater Pricing, the Authority used a pre-tax real discount rate of 6.5% for the purposes of estimating regulatory asset values and LRMC. However, the mid-range discount rate used in this inquiry has been assumed to be 6.0% which is consistent with the Weighted Average Cost of Capital for the Water Corporation that is calculated using an updated risk free rate.

4 ANALYSIS OF COSTS: GAWS OPTION

The cost of continued and expanded supply to Kalgoorlie-Boulder and beyond should be assessed on a forward-looking basis. This requires:

- the separation of costs relating to GAWS supply to the agricultural districts from those attributable to GAWS supply beyond Southern Cross;
- the exclusion of costs which have already been expended or 'sunk';
- the inclusion of expansion costs at the incremental cost of expansion; and
- recognition of only those costs which would be avoided if GAWS supply to Kalgoorlie-Boulder and beyond were to cease.

During the course of the review several different analyses of the costs of the GAWS option were put forward. These included the:

- Notional Cost Model employed by the Corporation to set charges for new industrial customers. This model develops engineering solutions and cost estimates for designated changes in average flow capacity of the GAWS pipeline (say 15 or 30 ML/day increments). The resulting unit costs are then applied by the Corporation to set headworks charges for mines and other industrial users. The last full scale evaluation of this costing model was 1994: current unit costings are based on CPI indexation of those earlier costs;
- Corporation's capital program for GAWS to 2023-24 plus extrapolation to 2035. This program and the associated costings have been developed by Corporation management, approved by the Board and form part of the Corporation's submissions to the Authority for the purposes of the Inquiry on Urban Water and Wastewater Pricing; and
- 'comparator' costing of 'super' GAWS developed by UUA and its consultants under the assumption that it is not possible to extend the existing GAWS beyond the 45 ML/day capacity without completely duplicating the pipeline.

4.1 Water Corporation Costings

As detailed below, the Corporation's costings of extensions to the GAWS scheme are stable with no significant difference between the estimates from the Notional Cost Model and the estimates based on the more recent capital expenditure program. Since the capital program is based on more recent engineering concepts and data the Corporation has suggested that this information should replace the earlier cost estimates based on the Notional Cost Model. The Authority concurs with this assessment.

Comparison of the Corporation's notional cost and capital expenditure program estimates

The Corporation initially proposed using the Notional Cost Model to assess the cost of providing for future growth in supply to Kalgoorlie, Norseman and Kambalda. During the course of the review this was modified to assessing the costs based on projected capital expenditures as per the Corporation's Capital Works Program with extrapolation thereafter using average capital cost per kL of growth over the period covered by the program.

In order to understand the impact that this change in costing methodology may have had on the results, a comparison of the two methodologies was undertaken with the results summarised in Figure 4.1.[9]

Figure 4.1: Comparison of the Corporation Costing Methodologies

Cost Methodology	Present Value Cost of Augmenting Supply ($ million)		
	4%	6%	8%
Projected Capital Expenditure	315.6	254.6	211.8
Notional Cost Model	356.1	266.6	205.1

The results of the analysis show that there is relatively little difference in levels of capital expenditure between the two methodologies.

Avoidable costs for GAWS

Based on the Corporation's engineering and costings, the main items in the avoidable costs of GAWS supply to Kalgoorlie-Boulder are described below.

- **Capital expenditure to service growth**. These costs are based directly on the Corporation's capital expenditure program for the period 2006-7 to 2023-24. Corporation engineers and analysts sought to identify those costs which would be avoided and those costs which, although still incurred, would be delayed, if the GAWS pipeline were not to supply Kalgoorlie-Boulder.

  These estimates for the period to 2023-24 were then extrapolated out until 2034-35 by which time demand supplied by the Corporation is expected to have increased from the current 30 ML/day to around 77 ML/day.

[9] The Notional Cost Model calculates the cost of instantly creating a large increment (15 or 30 ML/day) to the capacity of the GAWS pipeline. Under the implicit assumption that this additional capacity is immediately taken up, the unit cost of this capacity is then derived. The fact that the Notional Cost Model assumes a single large capacity increment is instantly created does not imply that it must be, or that there is a substantial cost penalty in creating that capacity incrementally over a period of years. Indeed, the comparison of the notional cost estimates with the projected capital expenditure suggests that there is no penalty.

- **The cost of source water for growth**. Under the GAWS option, the scheme would be incrementally expanded to deal with demand growth as it occurs. Under the GAWS option, this growth water would continue to be drawn from the metropolitan supply via Mundaring Weir. The source cost of this water for Kalgoorlie-Boulder is estimated from the LRMC cost models recently developed by the Authority at 92 cents/kL at a discount rate of 6% over the 50 year period.

  This estimate is overstated somewhat since the LRMC modelling incorporates high loss rates associated with the metropolitan reticulation system and these are well above those encountered in bulk pipeline systems such as GAWS or the proposed EKP.

- **Source costs of water for existing demand**. Currently, approximately 11.8 GL/annum of water is supplied to Kalgoorlie-Boulder and other supply points beyond to Norseman. The source cost of this water is valued at its opportunity cost, i.e. the estimated LRMC if that volume of water were no longer required to be supplied from the metropolitan system. This in fact would be the case if the UUA proposal were to proceed.

  The opportunity cost of this 11.8 GL/annum of water is estimated by the Authority as a variant of the LRMC models recently developed for the Authority by The Allen Consulting Group and the Corporation. Consistent with all modelling undertaken for this current review the estimates are based on a 50 year time period.

  The Authority estimates that the unit cost per kL of this water to be 75 cents/kL at a discount rate of 6%.

  Since the source costs are an important component of the costs avoided as a result of the EKP proposal these are explored in more detail in Figure 4.2.

Figure 4.2: Definition and exploration of source costs for GAWS

GAWS draws its water from Mundaring Weir and is therefore part of the Perth metropolitan system. The LRMC of water into this system was recently examined for the Authority using the Hanke-Turvey method, sometimes described as the incremental long run marginal cost. The Authority has applied these models to examine two questions:

- What is the LRMC incurred by supplying the additional demand envisaged in the GAWS extension, i.e. the increase from the current level of approximately 11 GL/annum to around a total of 22 GL/annum?
- What is the LRMC that would be avoided by reducing demand on the metropolitan system by supplying Kalgoorlie's existing demand from a desalination plant at Esperance?
- As the wording of these two questions indicates, costs incurred when demand is increased differ from costs avoided when demand is reduced.

	4% ($/kL)	6% ($/kL)	8% ($/kL)
Growth water			
50 year assessment			
Capex	0.46	0.64	0.81
Opex	0.27	0.28	0.27
Total	**0.74**	**0.92**	**1.08**
100 year assessment			
Capex	0.48	0.64	0.79
Opex	0.33	0.30	0.28
Total	**0.81**	**0.93**	**1.06**
Existing water			
50 year assessment			
Capex	0.37	0.49	0.59
Opex	0.28	0.26	0.24
Total	**0.65**	**0.75**	**0.83**
100 year assessment			
Capex	0.38	0.50	0.60
Opex	0.39	0.31	0.26
Total	**0.77**	**0.81**	**0.86**

Source: MJA analysis

Note: rounding errors may occur.

- **GAWS operational expenditures to service growth.** Based on avoidable costs these were calculated at $0.92/kL. These compare with $1.23/kL incorporated in the Notional Cost Model. The lower cost estimate is due to the subtraction of unavoidable fixed costs previously incorporated in the $1.23/kL estimate.

- **Maintenance costs to service existing demand**. These costs would be avoided if the GAWS pipeline were closed at Southern Cross with the result that maintenance costs for Zones 5 and 6 would not need to be incurred. These avoided costs are estimated to be around 9.8 cents/kL.

- **GAWS pumping costs to service existing demand**. These costs would be avoided as a result of the EKP option since there would no longer be a need to pump the 11.8 GL/annum of existing demand to Kalgoorlie. These costs are estimated at 30.6 cents/kL.

Avoidable costs for Esperance supply

Based on the Corporation's engineering and costs, the main items in the avoidable costs of Esperance supply are set out below.

- **Esperance supply costs**. These costs which relate primarily to the cost of augmenting the borefield and the operation of the borefield would be avoided if the EKP option were to proceed and to supply Esperance. These costs are estimated at 25 cents/kL of Esperance supply.

  The capital costs assumed to be avoided in relation to supplying Esperance are based on:

  - a new bore and 0.5 km of collector main valued at $0.4 million for every 100 ML increase in consumption above 2.5 GL; and

  - expenditure of $0.15 million every five years for increased treatment capacity.

  Operation costs are based on a 2004-05 cost of $0.31 million which is escalated at the assumed growth rate of 3%.

  The present value cost of the avoided Esperance costs are shown in Chart 4.3.

Chart 4.3 Avoided Esperance Costs ($M)

Cost	Real Discount Rate		
	4.0%	**6.0%**	**8%**
Capital expenditure	8.2	6.6	5.4
Operating expenditure	10.6	7.0	5.0
	18.8	**13.6**	**10.4**

- **Esperance quality costs.** Potable supply at Esperance is sourced from the Corporation's borefields. This water meets the health and environmental criteria in the 1996 Australian Drinking Water Guidelines but does not meet aesthetic criteria relating to hardness and Total Dissolved Solids.

  The hardness of the water has noticeable effects and poses costs of users. For instance, one Esperance motel owner recently commented to UUA:

  > We find the water very hard and undrinkable and the guests complain about lack of lather from shampoo and soap. The water also leaves a noticeable deposit on the cups, after every mouthful of tea or coffee.
  >
  > We have problems with washers and have to reseat the taps regularly to the point where the taps are worn out.
  >
  > We have a large calcium build-up in hot water services and the calcium is impossible to remove from the bottom of the hot water heater. Subsequently, we have to heat the calcium before the water causing increased gas costs when heating water. The calcium also leaves calcium build-up on showers, hand basins and floor tiles. Unsightly white calcium marks are also left on the red bricks of the outside ….walls and garden pillars.

  To mitigate these impacts some water users in Esperance incur direct costs through water softeners, filters and chemicals. Such private costs are not unique to Esperance. At the current time there appear to be no direct estimates of the magnitude of these costs in total.

  The Corporation advises that a water quality treatment plant, possibly based on reverse osmosis, may be considered to address these issues in the future.

  Based on a reverse osmosis plant, the unit costs of treating the fresh borefield water would be approximately half the costs of desalination, say, 60 cents/kL. On this basis the Corporation's costs to immediately remove the water quality issues would be no more than $33.4 million in present value terms at 6%. The present value of such treatment would, however, be reduced if the commissioning of such a plant were not immediate and were to occur in, say, ten or twenty years. Moreover, regardless of when the plant were commissioned, these costs would be lower again if the plant were used to merely provide enough treated water to blend with non-treated bore water in order to meet the Guidelines.

  There is therefore a significant range of potential costs to the Corporation in order to deal with the water quality issues at Esperance. Nonetheless, whatever the magnitude of this cost to the Corporation it would be avoided if the EKP proposal were to proceed. For the purpose of clarity in this draft report the Authority has assumed that this avoided cost is 50% of the upper bound of $33.4 million in present value terms, i.e. $16.7 million in present value terms.

4.2 UUA Comparator

To assist in comparison of the cost of the options of a) extending the existing GAWS scheme and b) building a desalination plant in Esperance and pipeline to Kalgoorlie,

UUA developed its own concept and costing of a GAWS extension. For the benefit cost analyses submitted by UUA, this comparator constituted the base case.

The prime features of the comparator are:

- a like-for-like comparison is sought. That is, it seeks to estimate the cost of the GAWS extension required to supply precisely the same demand as would be supplied under the EKP proposal; and
- the UUA assumption that the GAWS could not be incrementally extended much beyond existing levels with the result that there would need to be complete duplication once the existing GAWS pipeline has been extended up to a 45ML/day capacity level.

  This means that a large upfront cost must be incurred well ahead of when the capacity is actually taken up. This has the effect of denying one of the principal advantages of the GAWS approach, i.e. continual incrementalisation so that capital expenditure is only incurred as the capacity becomes essential.

Both of these features are important to the Authority's evaluation. The Authority has already commented on the unnecessary problems that arise when attempting a like for like comparison. This is one reason why the Authority is inclined to reject the comparator approach.

The second feature above is more critical because the assumption that the pipeline cannot be extended has a substantial impact on the costs that can be avoided by the Corporation if the EKP were to proceed.

UUA provided no independent evidence for their assumption. While the Corporation provided no independent verification as such, the Authority notes that the GAWS has been progressively extended incrementally in the past; that this is the basis of the Corporation's notional cost model; that the notional cost model closely aligns with the current capital programme; that the capital programme is reviewed by the Board and management and that the presumption of the ability to make incremental extensions without significant cost penalties is also observed in other pipelines, including gas pipelines.

For the purposes of this draft assessment the Authority has accepted the Corporation's view that the GAWS system can be incrementally extended at no significant cost penalty. This is an issue on which further submissions may be usefully made.

5 ANALYSIS OF COSTS: UNITED UTILITIES AUSTRALIA PROPOSAL

The costs of UUA's proposal for the EKP are based on the detailed technical specifications described in UUA (2005). These specifications were reviewed by the Authority's engineering associates, IBL Solutions. The advice is provided in Appendix 2.

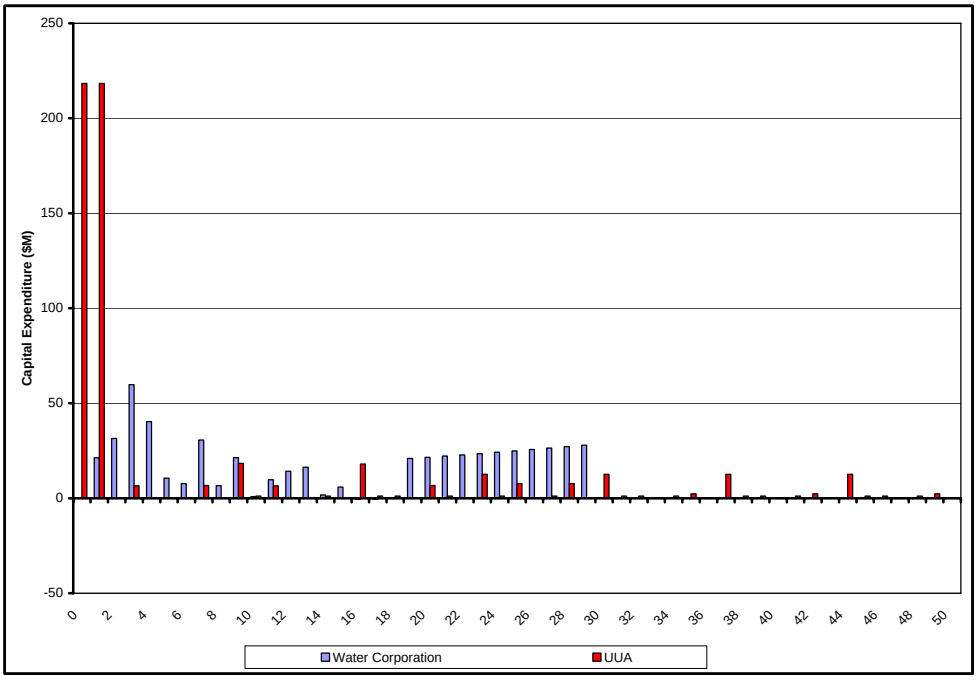
Costings showing cash outlays over a 50 year period were developed by UUA for a plant and pipeline delivering initially 60 ML/day rising to 100 ML/day. UUA described these costings as "*conservative, leaving room for profit*".

Main features

The capital expenditure required for the EKP is front-loaded with more than 90% occurring in the first two years. This contrasts with the extensions of the GAWS which are incremental and spread over time (Figure 5.1).

Reflecting the energy intensity of the desalination processes and the need to pump water along the 392 km pipeline, operating costs including administration are significant at $1.14/kL (including administration) with energy costs comprising around 75% of the total operating cost, i.e. $0.85/kL.

Figure 5.1: Capital Expenditure on EKP and GAWS compared with Corporation Expenditure

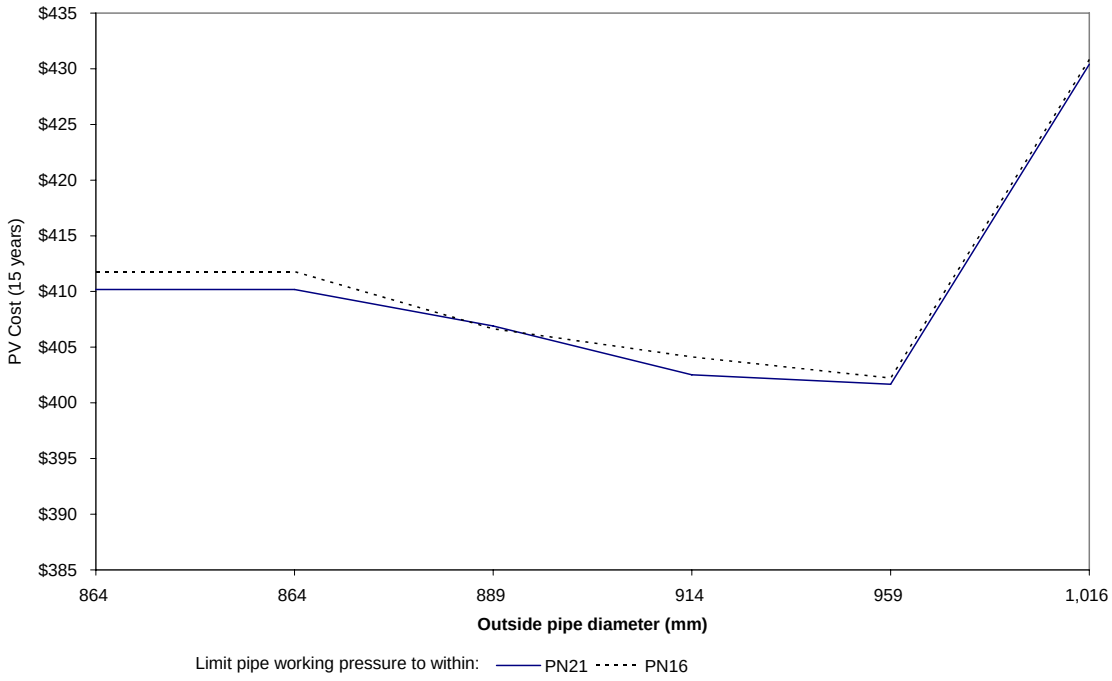


Source: UUA costing model for 60-100 ML/day demand, and Corporation advice.

An important design question is the trade-off between operating and capital costs in the pipeline itself. UUA reported that their investigations of the trade-off between pipe size (diameter) and pumping costs showed a relatively flat impact on costs.[10] Figure 5.2 illustrates the results of the UUA analysis.

UUA has stressed that the project is at the pre-feasibility stage and that its costs are conservatively estimated, based upon a robust engineering and operational design.

Figure 5.2: Trade off between pipe diameter, pipe costs and pumping costs

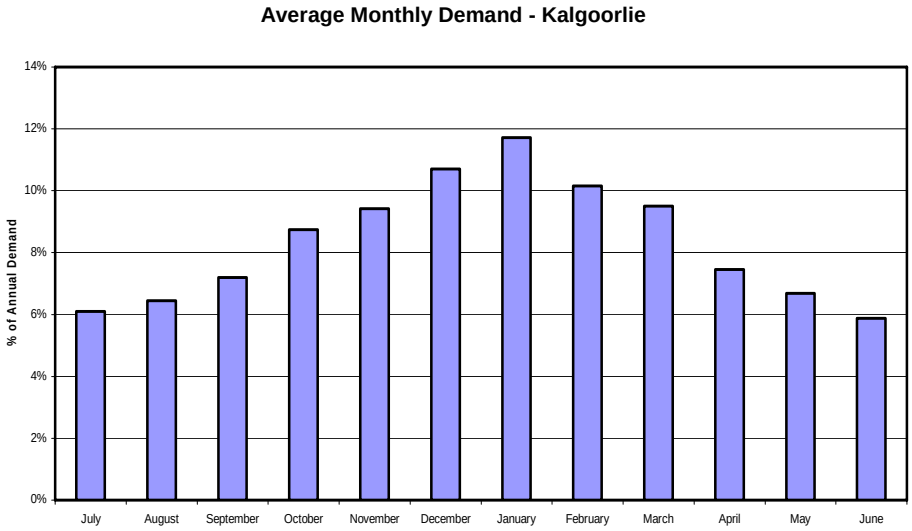


Peaking storage requirements

A desalination plant utilising reverse osmosis technology, such as envisaged at Esperance, operates at maximum efficiency and lowest cost when operating at full and stable production. However, demand for water in the Goldfields exhibits a strong seasonal swing (Figure 5.3).

[10] UUA investigated pipe sizes ranging from 864 to 1,016 mm outer diameter (OD) and the number of pump stations from 4 to 8. The analysis of total costs over both 15 and 50 year periods, indicated a relatively little change for pipe sizes from 959 mm OD to 864 mm OD. In the interests of long-term flexibility, the 959 mm OD sizing has, at this stage, been selected.

Figure 5.3: Seasonal swing in Goldfields demand for water



A *prima facie* concern has been that the UUA proposal would need to incorporate substantial additional peaking storage. Detailed investigations of this issue by the Authority, the Corporation and UUA were undertaken. Following face-to-face discussions between the respective engineers, it was concluded that the combination of existing Esperance and Kalgoorlie storages and demand management may be sufficient for UUA to accept the risk of meeting peaking requirements and that no immediate addition to peaking storage may be required.

Interface issues

In its simplest form the EKP proposal envisages the closure of the GAWS pipeline at Southern Cross.

It also envisages replacing the Corporation borefield supplies to Esperance with water from the desalination plant.

These interfaces raise several issues including:

- the need to maintain water quality and the GAWS disinfection strategy;
- the ability to improve reliability and security of supply beyond existing levels by retaining the GAWS pipeline as backup to the EKP in the event that the EKP proceeds; and
- the improvement in water quality at Esperance which (because of the levels of hardness and Total Dissolved Solids) currently does not meet the non-mandatory aesthetic criteria of the Australian Drinking Water Guidelines.

The first issue is discussed below; the second issue is discussed in Section 9; and the third issue has already been discussed under Water Corporation Costs (Section 4.1).

Water quality and GAWS disinfection strategy

The GAWS Main Conduit and its extensions are among the most geographically expansive drinking water supply system in the world. The combination of geography, variable demand and high temperatures (in autumn/spring and summer) presents significant challenges in relation to maintenance of high water quality standards.

The Corporation has a comprehensive set of planning, design and operational strategies to address these challenges.

One of the strategies for maintaining an acceptable water quality along the Main Conduit involves en route chloramination, i.e. the addition of both chlorine and ammonia.

The Corporation modelling indicates that the optimum balance between dosing rate, residual decay and the control of disinfection by products is achieved by limiting water age to eight days.

Under the scenario where there is zero demand east of Southern Cross (the UUA proposal), control of water quality (i.e. limiting water age to eight days) involves:

- isolating all parallel mains;
- constructing new disinfection facilities at Cunderdin and Nulla Nulla. These are costed at $2 million and $1.5 million respectively; and
- replacing existing pipeline between Yerbillion Pump Station and Ghoolie Pump Station (i.e. Southern Cross) with 72.5 km of smaller diameter pipe to achieve required velocities under conditions where flows are significantly reduced. This is costed at around $12 million.

Detailed discussions between the Corporation and UUA engineers are understood to have agreed that these costs would be warranted.

6 BENEFITS TO MINES AND OTHER NEW CUSTOMERS

A key feature distinguishing the EKP proposal from the GAWS option is the view that there is a block of industrial demand for water that is currently unsatisfied by GAWS and which could be satisfied by the EKP proposal.

This industrial demand may arise from two sources:

- substitution demand as existing mines switch to potable water from current super-saline groundwater; and
- new demand from as yet unidentified customers, and still to emerge customers.

Mines in the Goldfields currently use very substantial volumes of groundwater. Overwhelmingly this groundwater is super-saline, with parts per million of 50,000 or more, i.e. multiples of the salinity of seawater.

For the mines this water can be obtained at low direct costs since these costs are limited to pumping and pipework. However, the super salinity of the water imposes indirect costs on the mines in their operations and processing in the form of reagent costs, rust and deterioration of mining and processing equipment and from reductions in processing efficiencies and yield. Potentially, the benefits to the mines arise from the cost avoided by substituting potable water for the super-saline groundwater currently used and the resulting reduced use of reagents, increased processing efficiency and increased capital lives of equipment. Profitability would increase if the price paid for potable water was less than the avoidable costs.

As noted, following the joint investigations undertaken by the Corporation and UUA during 2002-03, UUA has continued to explore the extent of potential new demand. The result has been a firming of interest among mining companies resulting in letters during 2003-2005 confirming interest and support and in one significant case participation with UUA in meetings with the Western Australian Government.

The Authority has seen these letters and MJA has discussed them with UUA.

Given the current early stage of the proposal, the level of interest and support currently expressed by Gold Fields Australia Pty Ltd, who own the St Ives mining operation, is judged by the Authority to be strong. On the other hand, there is insufficient information to determine the magnitude, timing and certainty of the potential demand and associated avoided costs. The drivers of these avoided costs include:

- the volumes of potable water which can be profitably substituted for the super-saline groundwater;
- the companies' perceptions of the indirect costs;
- the relative importance of recurrent costs such as reagents and capital costs including replacement; and

- the position in the replacement cycle for each mining operation and processing plant. For instance, to what extent are mines locked into a depreciation profile as a result of the current use of super-saline water. For instance, if rust has set in, then there may be small benefits over the remaining life from switching from super-saline to potable water. Thus, there may be large threshold effects leaving mines unwilling to pay for potable water until an appropriate stage of reinvestment in their plant and machinery.

As a result, it is not possible currently for either UUA or for the Authority to determine the shape of the demand schedule for potable water for the mines.

UUA has, however, suggested in discussion with the Authority that it is prepared to invest significant resources to prove up this demand. Such development investment would be required to ensure that its investors and financiers are willing to commit the necessary funds to allow the project to proceed.

UUA has further noted that:

- it has undertaken detailed consultation with a wide range of the mining interests in the area, in the context of market research – building on and flowing from its 2003 work with the Corporation;

- this market research has been a requirement of UUA's internal accountability and investment planning processes at least as much as it has been done to support a stronger case being presented to the WA Government;

- it is a commercial firm and is only interested in investing time and effort in testing investment opportunities with good prospects for offering commercial returns; even the resources devoted to this market research, and now to engagement with the Authority process, have had to be justified internally as commercially sound investments, given the evidence available;

- it has provided to MJA a detailed presentation setting out the nature of mine responses, inclusive of company names and UUA's understanding of the reasons driving any expressions of interest in the project. UUA has shown the Authority the letters of support for the project that it has received; and

- it recognises that some of the expressions of demand, even some of the mining statements of support, may not eventuate, or may be slow to eventuate.

UUA has therefore proposed a staged risk management process to firm up the demand and the detail of the design of the project in advance of any irreversible commitment.

In its submissions, UUA has indicated to the Authority a willingness to accept the risks of not being able to meet the bankable standard of proof on mining demand once in-principle support is granted. UUA submit that its willingness to commit substantial resources to providing such a demonstration, after the detailed probing it has already undertaken, in fact provides part of the evidence of a commercial opportunity.

UUA has suggested that it is potentially able to supply demand for potable water for mining/industrial customers facing costs of super-saline water in the range of $3 to $4/kL. As noted, UUA is not presently seeking to meet demand for potable water from mining/industrial customers whose avoided costs are less than $3.00/kL.

UUA has further suggested that the average value might be $3.33/kL and that because mines experiencing higher costs are likely to commit first, that this price, when expressed in present value terms, might be, say, $3.40/kL.

For the purpose of the benefit cost analysis developed in this report the levels of demand presented in each scenario have been taken as being in place. Similarly, the analysis has incorporated UUA's assumptions regarding the unit values of costs avoided by substituting potable water for super-saline water. The estimate of average value of $3.33/kL has been accepted for the purposes of the Authority's evaluation.

The use of these assumptions does not indicate endorsement by the Authority of either the volume assumptions or the unit value assumptions made by UUA. Rather, it provides a basis for assessing how the benefits and costs of the UUA proposal measure up when UUA's own assumptions are applied to this critical area.

Unmet demand

The Authority notes that neither of the two options being compared can meet all potential demand for potable water. Not only is there unmet demand currently from mines facing a total cost of $3 to $4/kL for super-saline groundwater but there is further unsatisfied demand from users facing a cost of $2 to $3/kL and again for those facing a cost of $1 to $2/kL.

Moreover, this demand for potable water is not limited to mines adjoining the proposed pipeline between Esperance and Kalgoorlie. There will be demand along the GAWS pipeline and in areas not served currently or prospectively by either of the pipelines.

UUA is interested in meeting unmet demand where (and only where) it is profitable to do so. Where unmet demand for potable water can be profitably supplied, then regional and state development may be stimulated.

The Authority seeks further information and views on the potential magnitude of demand for potable water by mines, the magnitude of the cost savings and therefore the unit value assumptions which should be employed in the current assessment, and particularly on the factors which affect the rate at which new demand would be taken up.

7 COMPARISON OF COSTS AND BENEFITS

The benefits and costs of the two options can be separated into tangible benefits and costs which are capable of being quantified and intangible benefits and costs which are not. The section below describes the comparison of tangible benefits and costs which have been quantified. Section 9 describes and discusses risk and intangible impacts associated with the two options for future supply.

7.1 Base Results

Compared with the option of extending the GAWS, the benefits and costs of the EKP under the scenario of total demand of initially 60 ML/day rising to 100 ML/day, are summarised in Figure 7.1 where the present values are calculated over 50 years at a discount rate of 6% p.a. (Figures 7.2 and 7.3 report the same results for discount rates of 4% and 8%.)

This present value comparison shows that:

i. the total cost of the UUA proposal is over $900 million in present value terms with operational costs accounting for slightly more than half of this amount;

ii. savings from avoiding the costs of growth in the GAWS scheme total $400 million with avoided capital costs representing around 64% of this amount;

iii. savings from costs avoided as a result of the cessation of existing GAWS and Esperance supplies together total just under $200 million in present value terms of which savings in source water costs represent over $100 million;

iv. based on UUA assumptions, the benefits from replacing super-saline groundwater with potable water (shared between the mines and UUA) are estimated at around $263 million in present value terms;

v. in total, the cost savings from avoided costs are estimated in present value terms at $860 million; and

vi. the net impact is a cost of $56 million in present value terms.

Figure 7.1: Benefits and costs of EKP vs GAWS Extension,
Assumed demand : 60 – 100 ML/day
Discount rate : 6.0%

	$M	$M
Avoided costs (benefits) of UUA proposal		
Savings in Corporation Growth Expenditure		
Capital costs	254.6	
Operational costs	89.1	
Source water costs	56.3	
		399.9
Savings in Existing Water Corporation Supply Costs		
Source water costs	100.0	
Maintenance costs	16.1	
Pumping costs	50.5	
		166.7
Savings in Esperance Expenditure		
Capital costs	6.6	
Operational costs	7.0	
Water quality upgrade	16.7	
		30.3
Benefits to mines		**262.8**
Total avoided costs (A +B)		**859.8**
Costs of UUA proposal		
Capital costs	-446.9	
Operational costs	-454.3	
Water quality – GAWS	-14.5	
		-915.7
Net benefit/(cost) (A+B-C)		**-55.9**

Sources: UUA CostBen Model and UUA 050411 Goldfields WSP 60-100ML Direct Cost Model

Figure 7.2: Benefits and costs of EKP vs GAWS Extension
Assumed demand : 60 – 100 ML/day
Discount rate : 4.0%

	$M	$M
Avoided costs (benefits) of UUA proposal		
Savings in Corporation Growth Expenditure		
Capital costs	315.6	
Operational costs	149.5	
Source water costs	45.1	
		510.2
Savings in Existing Corporation Supply Costs		
Source water costs	80.2	
Maintenance costs	22.8	
Pumping costs	71.3	
		174.3
Savings in Esperance Expenditure		
Capital costs	8.2	
Operational costs	10.6	
Water quality upgrade	24.9	
		43.7
Benefits to mines		**344.9**
Total avoided costs (A +B)		**1,073.1**
Costs of UUA proposal		
Capital costs	-477.3	
Operational costs	-668.6	
Water quality – GAWS	-15.5	
		-1,161.4
Net benefit/(cost) (A+B-C)		**-88.3**

Sources: UUA CostBen Model and UUA 050411 Goldfields WSP 60-100ML Direct Cost Model

Figure 7.3: Benefits and costs of EKP vs GAWS Extension
Assumed demand: 60 – 100 ML/day
Discount rate : 8.0%

	$M	$M
Avoided costs (benefits) of UUA proposal		
Savings in Corporation Growth Expenditure		
Capital costs	211.8	
Operational costs	56.2	
Source water costs	66.1	
		334.1
Savings in Existing Corporation Supply Costs		
Source water costs	106.4	
Maintenance costs	12.1	
Pumping costs	37.8	
		156.3
Savings in Esperance Growth Expenditure		
Capital costs	5.5	
Operational costs	5.0	
Water quality upgrade	11.9	**22.4**
Benefits to mines		**208.2**
Total avoided costs (A + B)		**721.1**
Costs of UUA proposal		
Capital costs	-424.0	
Operational costs	-327.9	
Storage		
Water quality – GAWS	-13.7	
		-765.6
Net benefit/(cost) (A+B-C)		**-44.6**

Sources: UUA CostBen Model and UUA 050411 Goldfields WSP 60-100ML Direct Cost Model

7.2 Sensitivity Analyses

The choice of the pre-tax real discount rate does not affect the conclusion that the EKP proposal results in net costs (Figure 7.4 refers).

Figure 7.4: Sensitivity of net costs of choice of discount rate

	Real Discount Rate ($M)		
	4%	**6%**	**8%**
Avoided costs Water Corporation	728.2	596.9	512.8
Plus			
Benefits to mines	344.9	262.8	208.2
Less			
Costs to UUA	1,161.4	915.7	765.6
Net Project Benefit/Cost	**-88.4**	**-55.9**	**-44.7**

The sensitivity analysis confirms, however, that the net economic benefits are sensitive to the assumed level of initial demand. Figure 7.5 compares the costs and benefits under two demand scenarios: the first rising from 45 to 100 ML/day; the second rising from 60 to 100 ML/day over the same period.

Both scenarios incorporate the same volumes of demand for the Water Corporation. Thus, the resulting difference in demand, 45 vs 60 ML/day in the first year, is assumed to reflect differences in the speed at which potable water is substituted for super-saline water by the mines. Compared with the 60-100 ML/day scenario, the lower initial level (45 rising to 100 ML/day) has the same avoided costs for the Corporation but reduced benefits to mines and reduced costs to UUA.

Figure 7.5: Sensitivity of net benefits/costs to levels of initial demand ($ million at 6% discount rate)

	Initial Demand	
	45 ML	**60 ML**
Avoided costs to Water Corporation	596.9	596.9
Plus		
Benefits to mines	132.1	262.8
Less		
Costs to UUA	871.7	915.7
Net Project Benefit/Cost	**-142.6**	**-55.9**

Note: rounding errors may occur.

Under base case assumptions the estimated net cost of proceeding with the EKP option is around $56 million in present value terms at 6%. The benefits and costs would breakeven if the costs of the EKP were 6% lower than those indicated by UUA at this early stage of consideration. Figure 7.6 shows the percentage changes required in the high level aggregates for the measured benefits and costs to breakeven.

Figure 7.6: Percentage change in benefits/costs to breakeven

	4%	**6%**	**8%**
Avoided costs to Water Corporation	+12%	+9%	+9%
Benefits to mines	+26%	+21%	+21%
Costs to UUA	-8%	-6%	-6%

Within the total costs of the EKP proposal, energy costs are around $315 million in present value terms at a 6% discount rate. In contrast, energy costs for the GAWS option are around half of this amount. As a result, the economics of the EKP proposal is much more sensitive to changes in energy prices than is the economics of the GAWS option. Thus, a 10% rise in energy costs would increase the net cost of the EKP proposal by around $15 million in present value terms (and conversely).

Alignment of timing of investment with capacity requirements

A principal advantage of the GAWS extension is that investment in new capacity can be delayed until that capacity is actually required. As noted, this is not the case with the pipeline between Esperance and Kalgoorlie-Boulder or substantial other parts of the total UUA proposal.

As a result, the small cost advantage in terms of aggregate funds expended for the GAWS option compared with EKP becomes a large cost advantage when the time value of money is recognised and all costs are expressed in terms of present values (Figure 7.7 refers).

Figure 7.7: PV Impact of Options ($M)

	Total Capital Expenditure	Present Value of Capital Expenditure		
		4.0%	6.0%	8.0%
Water Corporation	544.7	315.6	254.6	211.8
UUA 60 to 100 ML/day option	590.9	477.3	446.9	424.0
Difference	-46.2	-161.7	-192.3	-212.2

If (like the proposed EKP), the extensions to the GAWS scheme were to be constructed upfront, say mainly over a two year period, then the GAWS extension would be not much cheaper in terms of capital expenditure than the proposed EKP. However, the GAWS extensions can be incremental so that the money is spent only at the time it is needed. In present value terms, the option of extending the GAWS is much cheaper to build than the EKP.

The (assumed) ability to extend major infrastructure through an incremental and progressive capital program in response to demand growth rather than lumpy up-front investment program reduces the present value costs for the GAWS option. In contrast, the EKP option requires large capital expenditure at the front end of the project.

Apart from the empirical impacts on the present values of costs, the ability to use an incremental progressive capital program has two further implications.

- First, this key difference in capital expenditure profiles greatly reduces the risk profile of the GAWS option relative to the UUA option.
- Second, new issues arise, including the potential benefits of delaying the investment decision and expenditure commitment, and the ability to choose the optimal timing for committing to an EKP proposal. These options have value and may ultimately strengthen the case for the EKP proposal which can then be developed at a point in time when there is stronger ‘new’ demand.

7.3 Hybrid Options

The EKP proposal as specified by UUA envisages closure of the GAWS pipeline at Southern Cross. It would, however, be possible to keep that section of the pipeline open. An alternative option would therefore be to keep the GAWS pipeline open between Southern Cross and Kalgoorlie-Boulder and to use occasional pulsing to ensure movement of water along the pipeline. This would have the advantage of increasing the security and reliability of supply to Kalgoorlie-Boulder above current levels, may provide an alternative method of meeting seasonal peaks and may reduce the cost of chloramination.

The issue, however, is at what cost. That is, would these potential benefits justify the premium payment that would be involved. By inspection of Figure 7.1 the cost of this premium payment appears to be high since maintenance costs would still need to be incurred as would some proportion of the estimated source and pumping costs.

A second hybrid option, identified at the workshop between the parties, could involve:

- the Corporation continuing to supply all existing demand to the Goldfields (currently 11.8 GL/annum or an average 32 ML/day), but ceding all growth in demand from existing customers to the UUA;
- UUA supplying the needs of all new customers and all growth in Kalgoorlie-Boulder and other centres;
- the Corporation avoiding all expenditures associated with growth but continuing to incur all expenditures associated with supply of existing demand; and
- the benefits of avoiding the costs of using super-saline groundwater in mining operations and processing remaining unchanged.

By inspection (of Figure 7.1) it is apparent that whatever the costs of this downscaled EKP, they would need to be lower than the sum of the:

- avoided costs of the Corporation in meeting growth expenditures;
- avoided costs of mines in using super-saline groundwater; and
- avoided costs of meeting water quality guidelines in Esperance.

The aggregate benefit arising from these avoided costs is approximately $693 million in round terms. Thus, two questions arise. First, could UUA build and operate a desalination plant and pipeline to meet the downscaled demand for less than $693 million in present value terms, and second, would the resulting unit price allow any of the currently unmet demand to be satisfied?

UUA has advised informally that they expect the answer to at least the second question is no. To answer the first question, UUA would need to develop new costings for a significantly downscaled plant and pipeline.

This hybrid option has not been pursued further in this Draft Report.

8 IMPACT ON STATE FINANCES

Information on the finances of the Water Corporation are available from State Budget papers. Figure 8.1 shows projected payments shown in the Budget papers for the 2005-06 year. The Corporation's finances directly impact the Budget.

Figure 8.1: Payments between the Budget and the Water Corporation, 2005-06

	$ million
Tax equivalent (income) payments	171.6
Tax equivalent (indirect) payments	2.9
Dividend payments	321.6
Total payments to Government	**496.1**
Less CSO payments received	-356.1
Net payments from Government to the Corporation	**140.0**

Source: Budget Paper No. 3, Appendix 7, Tables 1 and 2

The Terms of Reference for the review request an assessment of the impact of each option (GAWS or UUA scheme) on the State Government's finances, including borrowings and capital expenditure, tax equivalent and dividend revenue and CSO payments (Terms of Reference s.4). These matters are addressed below.

Compared with extension of the GAWS scheme and the current Esperance borefields scheme, the UUA proposal to develop the EKP scheme would have several differential impacts on the State's finances. These include:

- a reduction in the magnitude and cost of State borrowings. Rather than the Corporation expending several hundred million dollars on capital investment, UUA and its financiers would supply these funds. Unlike a BOO/BOOT scheme or other forms of public-private partnership, this private investment arises as a private initiative rather than a government initiative seeking private funding and participation. It therefore appears possible that it would be assessed differently by the credit ratings agencies, such as Standard & Poor's. On the other hand, the ratings agencies would also look carefully at the supply contracts and any guarantees provided or inferred by the State;

- a potential change to CSO payments from the Treasury to the Corporation. While the magnitude of this change is unclear, in terms of impact on the State Budget the final impact is small since for each dollar of CSO payment, 89.5 cents is returned to the Treasury as a Tax Equivalent Payment or as a dividend. For the Goldfields CSO payments are made in respect of residential and some existing industrial customers (Figure 8.1). It is not envisaged that they be made to existing mines intending to substitute potable for super-saline supply. However, the change in the source of supply will result in some adjustment of the CSO in direct relation to the change in costs;[11]

- for all supplies to existing customers, the Corporation's tax equivalent payments and dividend payments would change in relation to the change in CSOs since any change in the CSO is directly reflected in these. However since the Treasury would not pay new CSOs, the Treasury would not receive dividends or tax equivalent payments in respect of the new block of supply to mines substituting potable for super-saline water;

- since mining royalties are based on throughput rather than on profit, budget receipts from royalties from existing mines would be unaffected despite mining sector profit being increased (as a result of cost savings to mines due to the substitution of potable for super-saline water assuming a price that makes it viable); and

- an increase in mining profits may encourage increased exploration activity, the opening of new mines and/or increased production from existing mines. Budget receipts from royalties would therefore rise. However, net budget receipts could show a lower increase due to changes in Grants Commission payments[12].

[11] Closure of the GAWS pipeline at Southern Cross would strand relevant assets between Southern Cross and Kalgoorlie and beyond. The resulting write-down of assets would result in an accounting loss being recorded with a compensating cash payment to the Corporation in the form of an increased CSO payment. To offset this temporary increase in CSO payments, a (special) dividend and/or a return of capital may be necessary. In the longer term, the lower capital value would lead to a lower CSO payment and therefore a lower gross dividend to the Treasury.

[12] Where the royalty level in Western Australia exceeds the national average for that mineral, then an expansion of related mining activity will lead to improved results via Grants Commission payments. This appears to be the situation for nickel. On the other hand, Western Australian royalties on gold mining are understood to be less then the national average so that an expansion of gold mining as a result of lowered water prices could lead to reduced or negligible net receipts for the State Treasury. As an example, the Treasury advises that State Government currently loses around 75% of any expansion in iron ore royalties and around 90% of any expansion of royalties on petroleum activity.

Figure 8.2: Background of Corporation's CSO Payment

CSO's (Community Service Obligations) are paid to the Corporation to recover the costs of schemes or services that would not otherwise be commercially viable.

The Corporation's CSO payment for the provision of country water, sewerage, drainage and irrigation services is based on the difference between customer revenue and the cost. Costs are measured as the sum of the operating cost, replacement cost depreciation and a real rate of return on the written down value of assets.

This CSO payment is rebased every four years to the actual loss incurred. In the interim period, the payment is based on a formula that adjusts the actual loss at the last rebase for growth, changes in prices and an efficiency target. Asset write-offs, however, are included each year as a wash-up item.

An additional payment is made for any new CSO service approved by Cabinet, or any improvement to the level of existing CSO services. CSO payments for improvement in service levels are either approved by the Minister or by Cabinet if the project exceeds $5 million.

Any change in the cost of providing country services directly impacts the State Budget either via the CSO payment or the Corporation's tax equivalent and dividend payments. Changes to the cost of providing services to Kalgoorlie are reflected in the CSO payment at the time of the rebase. In the interim years they impact the Corporation's bottom line, and are reflected in the tax equivalent and dividend payments to Government.

A significant once-off change, such as the purchase of water from United Utilities, would be subject to a Cabinet decision. In this case changes would be immediately reflected in the CSO payment.

CSOs for schemes are calculated based on operating and capital costs (depreciation and a Return on Assets) less total revenue raised. The Return on Assets has been set at 4% of Written Down Replacement Cost for assets constructed prior to 1996 and 6% for assets constructed thereafter. The calculation of CSOs is rolled forward each year based on growth and inflation, and is then reduced by a factor for efficiency.

The CSO is calculated for each town based on a 'nodal' costing model, where operating and capital costs are distributed based on demand and location.

The CSO budget for Kalgoorlie-Boulder was $26.8 million in 2005/06. In addition, the Corporation received CSOs totalling $6.5 million for Kambalda, Coolgardie, Norseman and Ora Banda.

CSOs represent a recovery of operating costs and past investments and are not intended to reflect forward looking or avoidable costs.

Source: Water Corporation

9 OTHER IMPACTS

The Terms of Reference require the Authority to report on the overall costs and benefits of each option, including the impact on the end consumer and the potential to enhance regional economic development in Kalgoorlie-Boulder and the State in general.

The impact on end consumers can be dealt with briefly. Neither option will impact on the price paid for water by residential consumers in the Goldfields because in both cases the costs are higher than the price paid under the Government's Uniform Tariff Policy. Thus, these end consumers are protected from changes in the cost of supply.

Comments on the substantive matters are set out below.

9.1 Risk in Sources and Pipelines

The two options for future supply in the Goldfields have different profiles and different risks. Two issues require comment.

Source risk

As the State's experience with climatic variability has shown, there are some uncertainties over the security of future supplies based on rainfall, including the rainfall replenished aquifers such as the Gnangara Mound. In principle, other things equal, an additional rainfall independent water source is therefore to be preferred over a continued reliance on existing sources.

Does a similar benefit from risk diversification of water sources arise in practice? As proposed, the EKP would not connect to the GAWS and would operate on a standalone basis. This means that the lowering of operational risks to Goldfields customers that might occur when difference sources of supply are interchangeable is not applicable.

In terms of the comparative risks of GAWS supply and the proposed reverse osmosis plant at Esperance, GAWS supply is drawn from the multiple sources supplying the metropolitan area. However, all these sources are channelled through Mundaring.

Under the UUA proposal, the desalination plant would become the sole source of supply. Reverse osmosis (RO) is an increasingly familiar technology with the Kwinana RO plant, now contracted, and the NSW Government calling for Expressions of Interest for the design (and possible construction) of a large RO plant for Sydney.

On the other hand, the failure of the largest plant at Tampa, Florida, is highly publicised. UUA provided the Authority team with a detailed presentation and critique of the Tampa experience. This presentation suggested that the failure of the

plant may have been due to poor construction and divergences in design between the pilot and the ultimate plant.

UUA's view is that the technology planned for the Esperance seawater desalination plant is robust and well-tried, and indicated it is confident that the planned performance can be achieved, using the same technological approach installed in many successful plants around the world and as planned for the Kwinana desalination plant near Perth.

At commissioning (when the risks to the operation of the RO plant are likely to be higher than in bedded down operational mode), the GAWS pipeline would still be operational. This would reduce the consequences of any adverse operational risk in the initial start-up of the desalination plant and pipeline.

UUA has also stressed that once in operation the modular nature of the plant and a buffer of reserve modules would allow any reasonable contingency to be met especially within the 3-4 day buffer provided by storages.

In summary, the Authority's assessment of relative source risks is that, in the short to medium term, the desalination plant may involve somewhat higher risks than Mundaring Weir but that such risks appear to be manageable. In the longer term, the prospect of future climate change suggests that Mundaring Weir may face a high level of risk.

Pipeline risk

There is a simple presumption that new pipelines will be more reliable than old. The EKP proposal offers a new pipeline whereas the GAWS system dates from 1903.

The extent of any divergence in the levels of risk in the two pipelines was a major issue discussed at the workshop and in the follow-up between Corporation and UUA engineers. The Authority understands that the Corporation's detailed advice on this issue has been accepted by UUA.

The Main Conduit, like any distributed network (power, water or gas), relies on many assets in series to maintain supply to customers. Failure of any of these assets has the potential to interrupt supply downstream of the failure.

The types of possible failure events can be classified as natural, external or physical.

- Natural failure events include earthquakes storm and fire – events that the operator has little control over.
- External failure events for a water utility would include power supply failure and pre-meditated events/acts.
- Physical failure events can occur at pump stations, treatment plants, water storages and on pipelines. These events would include mechanical, electrical or structure failures.

The Corporation reports that the "Operational Risk Evaluation" for the Main Conduit indicates that, on average, it can be expected that inflow to Kalgoorlie could be interrupted for 2.3 days per year. Of these 2.3 days, only 0.9 days will be during the peak demand summer months which represent the greatest risk exposure for the Corporation.

However, whilst pipeline failures are the major cause of supply interruption, the Corporation's risk model is also reported to identify power outages and failures of pump stations and reservoirs as significant causes of supply interruption.

The Corporation has suggested that the popular belief that the 'age' of the GAWS pipeline must in some way impact system reliability is a misconception and suggest that this misconception arises because the fact is ignored that major upgrades over the last 30 years have resulted in relatively young assets being added to the asset base, and that major refurbishment initiatives have significantly increased the residual life of the pipeline system as a whole.

The Corporation also notes that the risk assessment completed for the GAWS would suggest that there would, at best, be only a marginal increase in system reliability for a new system supplying water from Esperance when compared with the GAWS.

9.2 Environmental Impacts

The EKP is intended to run through already established easements so that disturbance of flora and fauna should be minimised.

The EKP is approximately twice as energy intensive as is the GAWS option and as a result has proportionally higher gross greenhouse gas emissions. However, the EKP emissions are proposed to be fully offset by tree planting which is costed in the EKP budgets. By way of comparison, it is intended that the Kwinana reverse osmosis plant will be powered by renewable energy. The GAWS pumping costs are not powered through renewable energy, however the Water Corporation is currently implementing a number of initiatives which will result in a reduction in total emissions of over 40% compared with traditional means.

An environmental concern with any desalination plant is the disposal of the super-saline effluent stream discharged from the reverse osmosis plant. UUA advise that the ocean floor in the Bay of Isles is relatively steep which will aid dispersal.

9.3 Regional and State Development

The impact of the EKP proposal on regional and state development would be determined by:

- the magnitude of the potential benefits arising from the substitution of potable water for super-saline ground water. The benefits have been assessed on the basis of UUA assumptions but at this stage must be regarded as unproven;

- the share of these benefits which UUA would need to capture in order to make its investment viable. Preliminary analysis by the Authority suggests that the share of benefits captured would need to be high;

- the share of the benefits which are then available in increased profits to mines. Conversely the preliminary analysis suggests that the increase in mining profits may be relatively low; and

- the extent of any resulting stimulus to new exploration, expanded production and possible new mines. These linkages and stimuli are not well understood.

The magnitudes of any resulting expansion of new exploration, expanded production and possible new mines must be considered speculative. However, the Authority notes that any resulting employment and construction benefits are likely to be concentrated in the local area.

Nonetheless, flow-on benefits to the wider State economy would ensue. However, depending on the extent of capacity constraints, the net impact on State development could be smaller than the direct or local impacts since attracting labour and investment to mining developments in the Goldfields may reduce labour and investment elsewhere in the State.

As a result, the Authority considers that the EKP proposal may have a positive impact on regional development but that to the extent a judgement can be formed on its magnitude and the impact on regional development appears likely to be small. The Authority would welcome further submissions on these issues.

10 DRAFT CONCLUSIONS

The assessment of the benefits and costs of the competing proposals for future water supply of the Goldfields region indicates that:

- net costs would be incurred if the EKP proposal were implemented under current UUA assumptions on demand for potable water and on the magnitude of costs avoided by switching to potable water. In present value terms the net costs are estimated to be around $56 million (see Figure 7.1);
- the assessment that there are net costs from the EKP proposal is relatively insensitive to the choice of discount rate;
- however, the net costs are sensitive to the assumed level of demand. For example, if the initial level of demand was 45ML/day then the net cost is $143 million rather than $56 million;
- the net costs are also sensitive to the magnitude of the costs avoided by the mines currently using super-saline water switching to potable water. The magnitude of these benefits remains a major uncertainty;
- the benefits and costs of the EKP proposal are assessed to be essentially private: there appears to be little divergence between the public and private benefits and costs. Thus, failure of the proposal to demonstrate net benefits from a public perspective suggests that the EKP proposal would also do so from the perspective of private investors. However, the converse also applies;
- from a commercial perspective, the Corporation should be willing to commit as a foundation customer assuming its assessment of the risks are no greater than an expansion of the GAWS and payments to UUA are less than avoidable costs. Since the Corporation's avoidable costs are less than the costs of the UUA proposal, new customers are required to close the gap in revenue before the Corporation would be willing to commit to any such project;
- there may be value in UUA reducing uncertainty in the demand estimates. On the basis of the existing sketches of likely demand, it is difficult to envisage any parties committing to the project. On the other hand, this should not be a surprise at this developmental stage of the EKP proposal. In any event, UUA needs to prove up the demand to a level to satisfy their own investment criteria and the funding criteria of banks and potential investors;
- there is unlikely to be any impact on existing residential consumers under either option as the price they pay is subsidised through the Government's Uniform Tariff Policy; and
- there is a possibility that the EKP proposal would enhance regional economic development in Kalgoorlie-Boulder and the State in general but the extent of this is unclear.

In summary, the Authority considers that on the basis of the evidence currently before it the costs of the EKP proposal exceed the avoided costs to the Water Corporation. Further, the estimated magnitude of the benefits to mines at this time is not sufficient to overcome this gap. Finally, since the benefits and costs are largely private, then the decision to proceed with an alternative supply is largely a commercial one. A proponent would need to supply the foundation customer (Water Corporation) at a price equal to or less than the Water Corporation's avoidable cost and be willing to take the commercial risk with respect to any new demand and the price potential new customers may be willing to pay.

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APPENDIX 1: TERMS OF REFERENCE

INQUIRY ON THE COST OF SUPPLYING BULK POTABLE WATER TO KALGOORLIE-BOULDER

Terms of Reference

I, ERIC RIPPER, Treasurer, and pursuant to section 32(1) of the *Economic Regulation Authority Act 2003* (the ERA Act), request that the Economic Regulation Authority (the Authority) undertake an inquiry into the cost of supplying bulk potable water to Kalgoorlie-Boulder and surrounding regions.

In conducting its investigations the Authority is to report on the following matters:

1. The current cost to the Water Corporation of providing a bulk potable water supply to Kalgoorlie-Boulder and surrounding regions. This should clearly identify the cost to the State Government through its community service obligation (CSO) payments to the Water Corporation.

2. The cost that United Utilities Australia, through its proposed desalinated seawater pipeline from Esperance to Kalgoorlie-Boulder, could provide bulk potable water to Kalgoorlie-Boulder and surrounding regions, over the next 25 years.

3. The cost saving to the Water Corporation for the next 25 years if United Utilities Australia did provide Kalgoorlie-Boulder and the surrounding regions with bulk potable water through its proposed desalinated seawater pipeline.

4. The impact of each option (points 2 and 3) on the State Government's finances, including borrowings and capital expenditure, tax equivalent and dividend revenue and CSO payments.

5. The overall costs and benefits of each option, including the impact on the end consumer and the potential to enhance regional economic development in Kalgoorlie-Boulder and the State in general.

A draft report is to be made available by 6 May 2005. Consultation for this inquiry will be on the basis of the draft report, through invitations for written submissions from industry, government and all other stakeholder groups, including the general community.

A final report is to be completed by no later than 4 July 2005.

ERIC RIPPER MLA
DEPUTY PREMIER; TREASURER;
MINISTER FOR ENERGY

Economic Regulation Authority Act 2003

Economic Regulation Authority (Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder Reference) Notice (No.2) 2005

Given by the Economic Regulation authority under section 34(1) of the *Economic Regulation Authority Act 2003*.

1. Citation

This notice is the *Economic Regulation Authority (Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder Reference) Notice (No.2) 2005*.

2. Reference amended

(1) Under section 33 of the *Economic Regulation Authority Act 2003*, the Treasurer has amended the reference, notice of which was given in the *Economic Regulation Authority (Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder Reference) Notice 2005* published in the *Gazette* on 8 February 2005, pp.664-666.

(2) The particulars of the amendments are set out in Schedule 1.

3. Period of the inquiry

The period of the inquiry is 13 January 2005 to 16 September 2005.

4. Public submissions

(1) Members of the public may make written submissions to the Economic Regulation Authority on any matter that is dealt with in the draft report referred to in the terms of reference.

(2) The draft report will be made available by 30 June 2005.

(3) Submissions in response to the draft report may be made within 4 weeks after the draft report is made available or any longer period allowed by the Economic Regulation Authority.

(4) The address for submissions is the Economic Regulation Authority, GPO Box 8469, Perth Business Centre WA 6849.

5. Further information

Further information about matters relating to the inquiry is available on the Economic Regulation Authority's website at http://www.era.wa.gov.au.

Schedule 1 — Particulars of amendment

[cl. 2(2)]

NOTICE OF AMENDMENT TO REFERENCE FOR INQUIRY ON THE COST OF SUPPLYING BULK POTABLE WATER TO KALGOORLIE-BOULDER

I, Eric Ripper, under section 33 of the *Economic Regulation Authority Act 2003*, amend the reference for the Inquiry on the Cost of Supplying Bulk Potable Water to Kalgoorlie-Boulder, notice of which was published in the *Gazette* on 8 February 2005 at pages 664-6, as follows:

1. The draft report is to be made available by 30 June 2005 instead of 6 May 2005.

2. The final report is to be completed by no later than 16 September 2005 instead of 4 July 2005.

ERIC RIPPER MLA
DEPUTY PREMIER; TREASURER;
MINISTER FOR ENERGY

Chairman
Economic Regulation Authority

APPENDIX 2: CONSULTANT'S OPINION ON UUA'S TECHNICAL PROPOSAL

Ian B Law

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June 7, 2005

Dr John Marsden
Marsden Jacobs
Level 3, 683 Burke Road
CAMBERWELL VIC 3124

Dear John,

WA ERA Kalgoorlie-Boulder Project

Marsden Jacobs' request for me to carry out a 'high level' technical review of United Utilities Australia's (UUA's) Technical Proposal, and its Cost Model, for providing a drinking water supply to the Kalgoorlie-Boulder area in WA., refers.

I confirm that the process train developed in the Technical Proposal is technically appropriate and should be well able of producing the desired volume and quality of drinking water identified. In addition, apart from a few operational costs that are identified and further elaborated upon below, I confirm that the costs developed in the UUA Cost Model are adequate for this stage of project development.

The technical items that I considered required some clarification are:

1. Use of a relatively unknown form of ultrafiltration (UF) pre-treatment ahead of the reverse osmosis (RO) plant; supplied by Hydranautics who also supply the RO membranes and are responsible for the conceptual design of the UF/RO desalination plant;

2. Apparent lack of a balance or surge tank between the UF and RO process units;

3. Basis for the ultraviolet irradiation (UV) dose, as I would have expected it to be higher, thus possibly having implications for the magnitude of the power supply to this unit;

4. Use of 8 RO elements in each pressure vessel, in lieu of the 'normal' 6 or 7;

5. Clarification of the anti-scalant dose ahead of the RO system;

6. Membrane life in the RO system is stated as 7 years, with this value being used in generating the membrane replacement costs that appear in UUA's Cost Model. I accept 7 years fro the first pass but am concerned with 7 years for the second pass given that this latter unit will be operating with a high recovery;

7. How is variation in water demand accommodated ?

8. How is the 'supply risk' addressed – given that the product drinking water is produced in only one treatment plant ?

9. Appropriateness of basing the costs for chemically cleaning the RO membranes on a *single* annual clean, noting that this assumption has been made with only one sample of seawater having been taken and analysed ?

I confirm that the above technical and in some case, costing issues, were discussed with Neil Palmer of UUA and Keith Anders of Hydranautics on the 15th April 2005.

Satisfactory responses were provided for Items 1, 2, 4, 5, 7 and 8. However, Responses to Items 3 (basis for UV dose) and 9 (frequency of chemical cleaning of the RO membranes) were not resolved and UUA was to provide more feedback/clarification. In addition, while it is not necessary to take any further action at this stage, Item 6 (appropriate membrane life) must be addressed in more detail should the project ever move to the design stage.

I trust that the above suits your needs in compiling the report for ERA, but please do not hesitate to contact me should you require any further details or feedback.

Yours faithfully

Ian B Law

APPENDIX 3: GLOSSARY

CPI	Consumer Price Index
CSO	Community Service Obligation
EKP	Esperance-Kalgoorlie Pipeline
EPA	Environmental Protection Authority (Western Australia)
GAWS	Goldfields and Agricultural Water Supply
GL	Gigalitres, which is 1,000 ML or equivalent to 667 Olympic-sized swimming pools
kL	Kilolitres, which is 1,000 litres
LRMC	Long Run Marginal Cost, which is the forward-looking cost of supplying an additional unit of water to meet increases in projected demand, through new source development and demand management programmes
MJA	Marsden Jacob Associates
ML	Megalitres, which is 1,000 kilolitres
RO	Reverse Osmosis
TDS	Total Dissolved Solids
UUA	United Utilities Australia
The Authority	Economic Regulation Authority
The Corporation	Water Corporation