Productivity Commission Inquiry

INTO

Productivity Commission

Australia's Urban Water Sector

Submission

By

Agritech Smartwater

Perth WA.

18 MAY 2011

Submission Index

Introduction

The purpose of this submission is to demonstrate the flawed logic being used by State Governments and their Water Utilities in dealing with water shortages in Australia.

They insist the water shortages are a direct result of Climate Change/Global Warming, as a result of high CO2 emissions and not their own water management practices, such as forward planning.

There is an inherent belief in their culture that effective planning in dealing with water and water issues, remains exclusively in their domain, and if this is the case why do we have these critical water shortages in this State and why has the Economic Regulatory Authority been calling on successive State Governments to allow the private sector to supply bulk water to the Water Corporation. Their view is this would provide a cheaper and more plentiful supply of water.

Agritech Smartwater has been trying for 6 years to gain acceptance from the Water Corporation and successive State Governments to endorse and support a plan for the provision of an additional 45GL of water to domestic and industrial users in the State.

This submission outlines the project and details the misleading and deceptive conduct carried out by both the Water Corporation and the Government in rejecting the proposal to the financial, social and environmental detriment of all West Australians.

Agritech Smartwater strongly believes the rejection of this project is the result of the Water Corporation protecting its monopoly position in this State, and is being supported by the Government, on the basis that it is the largest dividend provider to the State coffers.

The Agritech Smartwater Proposal

Wellington Dam is the largest and safest dam (in terms of rainfall) in the States South West. The dam was originally built to supply water to towns in the Great Southern and to supply irrigation water to dairy farmers and irrigators in the southern region.

The dam has been going saline for more than 30 years and attempts by various government agencies to correct salinity in the dam have failed, to the extent the poor quality water resulted in another dam being built to take over the supply of the Great Southern towns. This left the dam to supply low quality water to the irrigators which caused serious salinity damage to their farms.

In their attempts to lessen the salinity in the dam the government agencies decided to flush the more saline water from the bottom of the dam, a process that has occurred over the past 30 years. This "scouring" occurs from June until November and involves discharging (wasting to the sea) up to 40Gl of slightly saline water annually. On days when scouring occurs, up to 450 million litres is discharge to the ocean which is equivalent to 66% of Perth's entire daily water usage. (see Attachment 1 Wastewater at Wellington.)

Agritech Smartwater designed and proved a concept that involved redirecting this water down the Darling Scarp to a Reverse Osmosis plant located at Brunswick Junction. The elevation difference of 150 metres was more than sufficient to treat this water using gravity produce pressure without the need for an addition energy source. This concept meant a substantial reduction in the cost of the infrastructure and operating and maintenance costs, providing large savings to the State's water users.

The project has been assessed and costed by the largest engineering, wastewater treatment and reverse osmosis groups in the world, who have described it as a "no brainer".

This assessment resulted in Agritech Smartwater putting forward a proposition to the Government in 2005 whereby it would build own and operate the infrastructure and deliver the water to the Water Corporations IWSS main at Harvey. This required the Water Corporation to enter into a long term take or pay contract indexed to CPI. The benefits to the State and water using taxpayers meant there was no technical, engineering or financial risk under this proposal. When compared to the Governments preferred option of proceeding with the Binningup seawater desalination

plant the saving to the Government would have been $1B would have resulted in a cost benefit to water users of in excess of $3B over a 25 year life of project.(see attachment 2. Pre-feasibility Study Wellington Dam 2008)

Despite the fact of the Agritech Smartwater proposal obvious benefits and acceptance and support from water users, environmental groups, Councils and ratepayers together with technical and engineering support the Government and Water Corporation continued to reject the proposal.

Concerned by this continual rejection, Agritech Smartwater ran advertisements in a Perth TV Guide to test the greater public's response to the proposal. These ads, run over 5 consecutive weeks, directly compared the Wellington Dam proposal over the Governments stated options. We invited the public to respond with their views. Over 30,000 letters, emails and faxes were received, every one of which totally supported our proposals. (See attachment 3 Copy TV Guide Ad and attachment 4. Samples of Public Responses to the ad) After the publication of the ads and following press articles on the project, the West Australian newspaper conducted a poll on what option the public would support between Seawater Desalination, ground water from the Yarragadee Aquifer or treatment of the Wellington Dam water. Seventy five percent supported the Wellington Dam option further endorsing the proposition and rejecting the government proposals.

The above seems to support the basis of this inquiry, in that the Productivity Commission is concerned that State owned seawater desalination plants are being used to increase the cost of water to consumers across the board.
Agritech Smartwater concurs with that proposition and uses the Wellington Dam Project as an unarguable example of that claim.

Misleading and Deceptive Conduct.

Agritech Smartwater has a major issue of concern over the handling by both the Water Corporation and the Government, which again brings into question , or at least supports an ulterior motive by them by interfering with due process for their political gain.

Public pressure forced the Government to conduct inquiries into Wellington Dam and the Collie Catchment. The first of these so called "independent" inquiries was held in late 2006 and headed by Mr Ross Kelly and also included two high ranking public servants one of which was Mr Paul Frewer the acting Director General of the Department of Water. Mr Frewer was subsequently disgraced and removed from this position following an inquiry into Burke and Grill regarding the Smiths Beach Project.

The Kelly Committee was supposed to hand down its findings in relation to Wellington Dam before Christmas 2006. Their report was handed to the Minister for Water John Kobelke in early 2007. Despite many attempts by myself and the press Mr Kobelke sat on the report until April 2007. During that time the Government made a decision to build a second seawater desalination plant at Binningup.

Shortly afterwards the Government announced that Wellington Dam had been ruled out as a water source following release of the Kelly Report, which concluded it was too expensive, too difficult and not sustained by the amount of available water. The cost of fixing the dam was given as $850m.

Agritech Smartwater appeared before that Committee as the proponent for two proposals. One to utilize the water wasted from the dam, the second in fixing salinity in the East Collie Catchment which would correct salinity in the Collie River and Wellington Dam.

The report findings were outrageous, as the Agritech proposal for utilizing the water from the dam had no cost or risk to the government. In relation to the costing's we submitted an estimate of $100M for the correction of the catchment. On a later reading of the report the Committee included $450m to build a 130km pipeline to a Perth Dam as a cost of "fixing" it. Our submission included in our no cost offer was an 18km pipeline to an existing Perth supply main.

Further deception and written confirmation of political interference occurred when a member of the public, with considerable knowledge of the dam, wrote to the Premier (see attachment 5) complaining about his response to a question in Parliament and recorded in Hansard, regarding the Agritech Smartwater Proposal.(see attachment 10). The Premier responded by letter on the 15th June 2007 (see attachment 6). Shortly after the Minister for Water responded to another letter from the public complaining about the same issue (see attachment 7).

In their responses both the Premier and the Minister for Water both seriously downplay the Wellington Dam project and effectively describe it as a "lemon". They use the basis for that claim on the Committee's findings. They go further and suggest it doesn't resolve any salinity issues. They are suggesting, these are not our views, but the views of the Committee. The Committee had other views (see attachment 8, extract from Water Source Options Committee May 2007) (see also attachment 9 Press Release Minister for Water 18 October 2006, and attachment 10 extract from Hansard)

Prior to the last election the current State Government released a press statement promising another Independent Review of Wellington Dam and the Upper Collie River Basin if elected. Once again this $250k investigation was contaminated and prejudiced from the beginning.

The Department of Water was given the task of writing, advertising and administering the tender process on behalf of the Government . They duly awarded the tender to KPMG and Worley Parsons. The Department of Water briefed the tenderers and ultimately received their report. Submissions closed on the 28th of April 2009 after allowing proponents only two weeks to prepare and submit their proposals.

In May 2010 the Government instructed KPMG to produce a confidential report summarizing the findings of their review. In October 2010 the WA Government instructed KPMG to produce a summary report of the review which would be suitable for public release.

This process poses the obvious question as to why the government who called for this "Independent Review" would not allow the public release of the review in the first instance and why it took 6 months to publish a summarized version. None of the proponents had claimed confidentiality.

Initially 18 submissions were received this was reduced to four short listed options. Prior to consideration the fourth proponent withdrew their proposal leaving three proposals for review.
The final proponents were Agritech, Department of Water, and WA Forest Products.

As part of its election strategy the Government promised open and transparent government which, was totally compromised by allowing a proponent to review, run and administer the tender process. More concerning is before the review process commenced the government announced funding for a pilot reverse osmosis plant and pipework for a diversion scheme on the East branch of the Collie River which was in fact the Department of Water proposal. Once again, why go ahead with the expenditure of $250k of public monies on a review, which was contaminated and compromised by a decision in favour of Department of Water's proposal.

The KPMG report on page 17 stated

> " *Desalinating Wellington Reservoir and delivering it into the potable system represents a more cost effective approach to meeting potable water demands than the alternative options*".

The next dot point suggests

> "*investing in the Blackwood and Upper Collie River Basin deep drainage network is a cost effective way of reducing salinity in the Upper Collie River Basin and improving the productive use of the land area and investing in a hydropower plant is cost effective, given you have already invested in the salinity channel diversion network".*

The Agritech Wellington Dam project could deliver 45GL pa of potable water into the domestic network at no up front cost to the Government or taxpayers of this State and at a production cost of less than a third of seawater desal plants. Secondly the larger Agritech Salinity and Hydro Project for the Blackwood Catchment (including the Collie catchment) could supply 20 mw of hydro power and 80GL pa of potable water. Implementation of that scheme also corrects the East Collie Catchment, the Collie River and Wellington Dam which will release a further 50GL pa for potable supply.

The Collie Catchment financial component of that scheme is approx $100m which is a small price to pay for recovery of the Dam and the additional 50Gl pa of water, especially when compared with the cost of

the Binningup seawater desalination plant at $1B for a similar amount of water.
As outlined in the attached Pre-feasibility Study 2008 these projects either separately or combined are the epitome of best environmental and financial practice. They are the only water projects that meet the criteria as set out by Infrastructure Australia Water Division.

The Department of Water proposal involves diverting only 4.5 GL pa of saline water from the east branch of the Collie River and treating the water by a conventional powered Reverse Osmosis plant producing 3.7GL pa potable water at an approximate cost of $2.00 per kl.
Removing 4.5 GL pa of saline water from inflow into the Dam and expect a marked reduction in its salinity level is pure folly. On Department of Waters published figures, the average inflow into the dam over the last 10 years is 133 GL .The 4.5 GL pa removal represents about 3.5% of that inflow. These wild claims have been made before and none have resulted in any significant reduction in the salinity levels of the river or the dam. The proposal is akin to putting band aids on severed arteries.

As stated in the introduction, the water crisis is blamed on climate change/global warning which in turn is caused by high C02 emissions. The government's response is to put all West Australians on strict water restrictions and asks them to reduce their carbon footprint. The Government on the other hand build these hugely expensive power guzzling, polluting monstrosities. The Department of Water proposal is worse, given the fact that Agritech offered to take this water and run it down the Darling Scarp and treat it through our RO plant. It makes no sense that if this water is on top of the Scarp it is being treated by coal fired electricity, instead of using the free energy provide by natural gravity

Conclusion

The investigation into Australia's Urban Water Sector by the Productivity Commission is warranted and overdue but my experiences tell me that it could all count for nought if certain measures are not taken.

I felt very aggrieved by what happened to me and Agritech Smartwater in pursuing the Wellington Dam project. As a consequence I took my grievances to the National Water Commission, The State and Federal Ombudsmen, Consumer Affairs, Federal Members of Parliament and Federal Corporate Regulators. Their general response was that my complaints were out of their jurisdiction and were a State matter. Although very sympathetic the National Water Commission said they had no power to effect what individual State Governments or their Water Utilities did. This poses the question, why have a National Water Commission or a Productivity Commission if they have no power to effect the reforms they are seeking?

Some years ago the Federal Government had the ability to reduce grants given to the States for lack of efficiency, I'm now told that doesn't happen.
Our projects and experiences in dealing with our most precious resource lead me to the conclusion that government's both State and Federal are not sincere in dealing with issues such as climate change/global warming, reuse, recycling, CO2 reduction and protecting the environment.

The proposed carbon tax penalizes the innocent consumers but rewards inefficient polluters and comparing the Wellington Dam project, which saves 200,000 tonnes of going into the atmosphere with the Binningup seawater desalination plant which put the same amount into the atmosphere. They claim it will be powered by renewable energy. They said the same about the Kwinana Seawater desalination plant, but that was proved to be incorrect. We need to reduce CO2 emissions, not increase or maintain the status quo.

Agritech Smartwater and Agritech Hydropower have developed plans to produce 250GL of water pa and up to 60 mw pa of cold green renewable energy via its hydroelectric power stations, plus recover saline land in the SW wheatbelt, and also recovering our rivers, streams and lakes and yet we can't get a look in.

Supporting Attachments

Reference Guide

Attachment 1.

Waste Water at Wellington

WESTERN AUSTRALIAN Business News

June 21, 2007 wabusinessnews.com.au

Water waste at Wellington

STATE SCENE
Joe Poprzeczny

STATE Scene remains bamboozled by the failure of successive state governments to tap the Wellington Dam's huge stock of water.

Wellington Dam, near Collie, holds 186 gigalitres (GL) – nearly two-thirds of Perth's annual consumption.

And it is relatively close to Perth, much closer than, say, the Kimberley which former Liberal leader Colin Barnett highlighted during last election campaign in his desperate bid to become premier.

Wellington Dam was built in the early 1930s to supply water to Great Southern consumers, who then made up a sizeable portion of Western Australia's population.

Although bankrolled by federal tax dollars – then pounds – the huge dam was subsequently transferred gratis to the state government.

Its next milestone came in the late 1940s, when its capacity was boosted to meet the needs of nearby irrigation farmers.

Now for the really bad news.

By the 1960s, its salinity level had begun rising due to over-clearing of its once timbered eastern hinterlands. All efforts to combat this have failed to return its water to the initial potable levels.

In the late 1980s, the Harris Dam was built nearby. Situated in woodlands, it remains untainted by salinity and is the source that meets Great Southern requirements.

Another outcome is the need to annually scour the denser saline water at the dam's lower levels, which involves opening a large gate valve at the base of the dam's wall to discharge up to 40GL annually into the sea via the Collie River.

Millions of dollars spent over 30 years by several government agencies to counter salinity biologically – land acquisition and tree growing – have failed to make its water potable.

WA's tragic Wellington Dam story is made more so because at any time it is holding 70 per cent of the total water in Perth's 13 metropolitan dams.

So here's this magnificent man-made structure near Perth that's unusable for drinking purposes.

Let's, however, continue with this tragic story.

In October 2002, then premier, Geoff Gallop, said: "An extra 15GL of water could be available to Perth and Goldfields residents under an innovative proposal to mix water supplies from two South West dams.

...magnificent man-made structure that's unusable for drinking purposes.

"Under the proposal, up to 15GL of water from Wellington Dam currently affected by salinity would be 'shandied' with fresh water from Stirling Dam to produce water of drinkable quality.

"Under the proposal – which is still to receive approval from the Environmental Protection Authority – three parts of Stirling water would be mixed with one part of Wellington water."

This claim was undoubtedly prompted by WA's low 2001 and 2002 winter rainfalls.

However, that idea has vanished, just like some of the dam's water that evaporates each day.

Nearly a year later – September 2003 – Water Corporation chief, Jim Gill, raised desalination, highlighting Australia's strong dollar, economies of scale, and several other factors that were making the reverse osmosis (RO) desalination method a real option.

But he wasn't gung-ho.

"Dr Gill said it was unlikely WA would build a desalination plant soon because the estimated lower annual cost of drawing water from the South West Yarragadee aquifer compared to desalination – $10 million opposed to $24 million – made the underground water source more attractive," one press report said.

"If you look at the trend, RO has been getting cheaper.

"But there is no prize for being the first mover of this technology on this scale.

"Under normal circumstances, it could be a decade, or two or three before we have a RO plant.

"Drawing water from Yarragadee is still the preferred option."

Well, as at June 2007, we know all that was pie-in-the-sky. Wellington Dam is still untapped and continues to be annually scoured from June to late October, with 40GL of slightly saline water (1,500 parts per million) flowing into the sea.

And now the government plans spending nearly $1 billion to treat seawater (36,000ppm) with an RO desalination plant at Binningup, just 30 kilometres from Wellington Dam.

The more saline the water, the more it costs to desalinate.

The $1 billion Binningup decision comes hard on the heels of the $440 million already spent on a similar RO desalination plant at Kwinana now in operation.

Wellington Dam's water was to be 'shandied', but that never happened. The South West Yarragadee was to be tapped, but that's not going to happen.

RO desalination plants were said to be up to 30 years away. We now have one at Kwinana and another to follow at Binningup, together costing a cool $1.4 billion. So, backflips galore.

And among all these twists and expensive turns, about a quarter of Wellington Dam's slightly saline water (up to 40GL) continues to wasted out to sea each year, something that's been happening for 30 years.

What makes this tragic saga even worse is the fact that a Perth company has proposed what seems a reasonable and farsighted fix.

Rather than wasting this slightly saline 40GL each year, it says, this water could be treated by a RO plant below the dam near Brunswick, using the hydraulic head (pressure) of the water falling 150 meters to sea level.

This downward pressure would replace the need to outlay $20 million for power.

The cost of operating Kwinana's RO desalination plant will be at least $24 million annually, while the coming Binningup RO plant will cost at least that much.

Agritech Smartwater is the company proposing to tap Wellington Dam's slightly saline water.

It's principal, Peter Coyne, has also proposed tapping saline water from across WA's southern Wheatbelt for desalination and generation of hydo-power. He proposes to do this by construction of a regional de-watering canal network (see State Scene, 'Visionary Coyne worth his salt', March 1 2007) and, in the process, removing salt from the agricultural belt.

Mr Coyne put his Wellington Dam engineering, as opposed to biological, proposal to the government soon after Dr Gallop's September 2002 never-implemented 'shandying' idea was announced. He continues to promote it.

Since then, the government has moved to tap the South West Yarragadee aquifer but has done a U-turn on that idea.

It has also outlaid $440 million on the 45GL, energy guzzling Kwinana RO desalination plant, and intends building another RO energy guzzler at Binningup for nearly $1 billion.

Understandably, opting for both these expensive-to-build and expensive-to-run options baffles Mr Coyne.

"The government's continued refusal to entertain my Wellington Dam proposal is an affront to the water-using taxpayers of WA for several reasons," he told State Scene.

"Firstly, the combined expenditure for Kwinana and Binningup ROs is almost $1.5 billion to supply Perth with just 90GL of water annually.

"Secondly, the current cost of Kwinana water to consumers is around $1.30/kilolitre and the forecast cost for Binningup water is $1.80/kilolitre.

"Agritech's Wellington Dam proposal offered to build, own and operate all infrastructures – so no cost to taxpayers – and deliver annually 45GL of purified water at 65cents/kilolitre."

"Thirdly, government refuses to produce any meaningful plan for fixing Wellington Dam and its entire eastern hinterland catchment."

State Scene is surprised Mr Coyne's plan has not been welcomed.

In parliament on May 17, when opposition leader Paul Omodei highlighted Agritech, the premier, Alan Carpenter, interjected, saying: "In relation to the Wellington Dam option, the Water Corporation will continue to have discussions and investigate with possible proponents.

"I hope the leader of the opposition is not pushing a private business venture here; is he?"

So what if Mr Omodei is attracted to the Coyne plan? Surely one is entitled to back an option that's far cheaper than the $440 million Kwinana and $1 billion Binningup RO plants.

Had Agritech's option been adopted three or so years ago, the $440 million Kwinana RO plant wouldn't have been needed.

However, now that it's up and running let's leave that be.

But letting things be shouldn't mean repeating that move to desalinate seawater at Binningup for more than twice the cost of the previous mistake.

Given WA's many public needs, including release of more urban land to reverse escalating residential affordability, State Scene needs convincing that this $1 billion couldn't be better used and Wellington Dam's slightly saline water purified via the private option.

After all, it's far cheaper to taxpayers in terms of infrastructure as well as the cost of water.

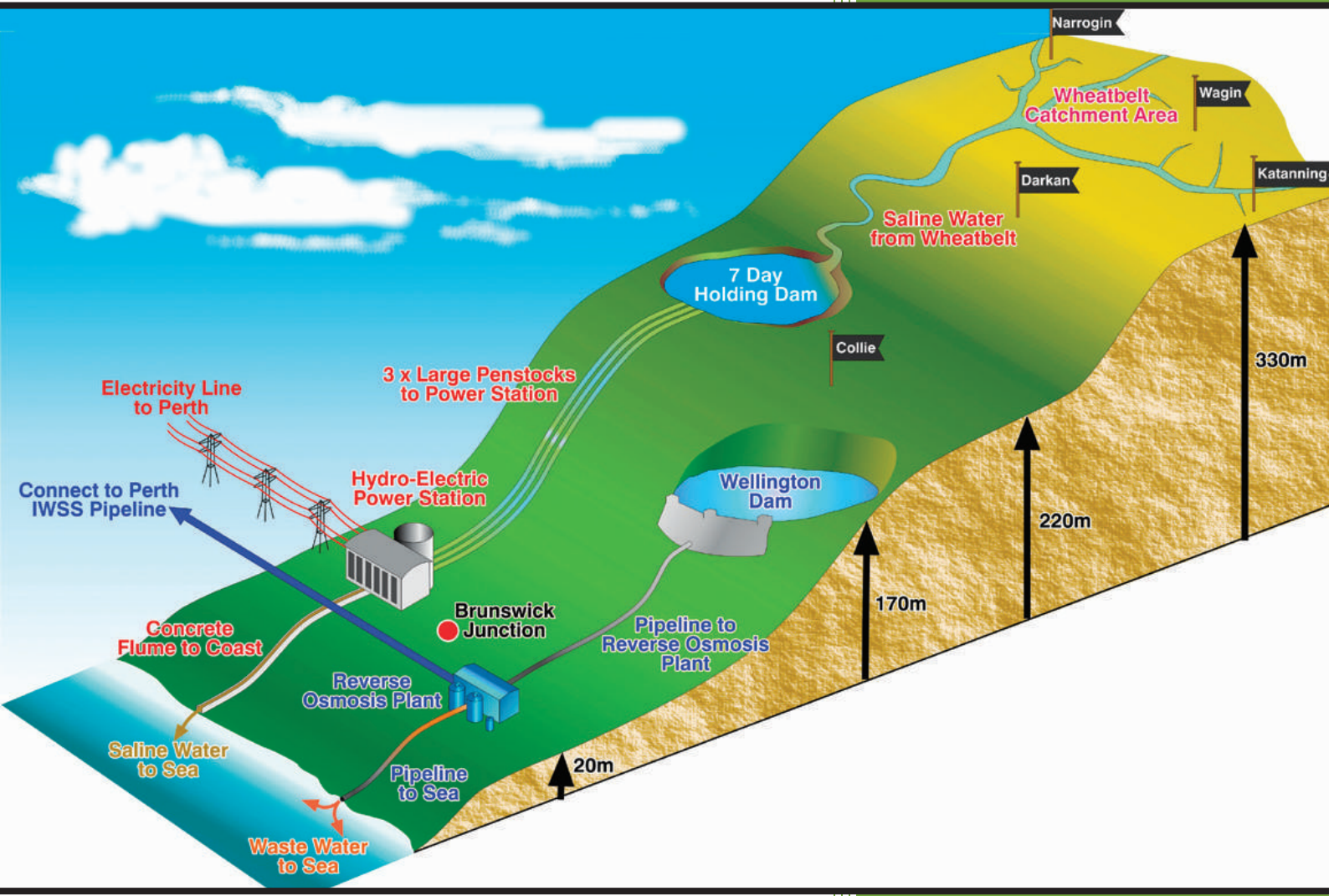
Attachment 2.

Prefeasibility Study – Wellington Dam

Agritech Smartwater

2008

Pre-Feasibility Study Gravity-Powered Desalination Plant Wellington Dam, Collie WA.



Sea Water Desalination Plants Compared

By Jonathan F. Thomas

***R**esource **E**conomics **U**nit*

Disclaimer

This Pre-Feasibility Study Report has been prepared in accordance with the scope of services agreed between Resource Economics Unit and Agritech Smartwater, November 2008. The report aims to provide an objective assessment of the likely scale of economic benefits obtainable from the use of slightly saline or brackish water desalination as proposed in the Wellington Dam Water Recovery Project, but its findings could be changed following detailed engineering and economic assessment.

Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by AgritechSmartwater or its agents.

The views expressed are not necessarily the views of AgritechSmartwater.

Resource Economics Unit accepts no responsibility for use by other parties.

Before relying on material in this publication, users should independently verify the accuracy, currency, completeness and relevance of the information for their purposes and obtain appropriate professional advice.

CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

- ***Report Objectives:*** This report presents a pre-feasibility assessment of Agritech Smartwater's Gravity-Powered Reverse-Osmosis Water Production Scheme (GPROS) at the Wellington Dam, Western Australia. (Agritech Smartwater 2006). The project is an example of how public-private partnership arrangements can deliver effective, efficient and environmentally responsible water infrastructure investment, in line with the recent recommendation of the Economic Regulation Authority to establish a new Procurement Authority for water infrastructure in Western Australia.

  The project stands separately from, but could eventually be combined with, AgritechSmartwater's separate "Salinity and Hydro" project. This proposal is to desalt 250 GL of brackish water originating in the wheat belt within 170km of Perth for supply to the IWSS.

- ***Methodology:*** The study has followed the Guidelines recently issued by Infrastructure Australia for assessment and prioritisation of water infrastructure projects.

- ***Gravity Powered Reverse Osmosis Scheme***: The proposed GPROC will use a reverse osmosis process to desalinate the slightly saline water from Wellington dam into high grade potable water for domestic supply to Perth. will use the pressure (hydraulic head) produced from the elevation difference (150m) between Wellington dam and a reverse osmosis desalination plant located at the foot of the Darling escarpment.

  The slightly saline water would be delivered from the Wellington Dam to the R-O plant by a large diameter (1.5m) pipeline some 21 km in length, delivering some 56 GL annually. 80% of the feed water is converted to potable standard, yielding 45GL of product water. This will be accumulated in buffer storage and then be delivered to the IWSS pipeline at Harvey through a 20km pipeline.

  It should be noted that this is a unique opportunity due to the topography of the location to be able to directly use the available potential energy of the stored water to treat the water. Further expansion using this same concept can be achieved by utilising saline water drained from the salinity-affected areas of the WA wheatbelt.

  The proposed feed water for the scheme comprises (i) saline scour water currently discharged to combat rising salinity, (ii) a currently unused (and unusable) licensed allocation to the Water Corporation and (iii) supplementary piped sources originating in the mining and power industries, and within the catchment. A simulation model has been used to assess feasible levels of water use taking account of the history of inflows to the Wellington reservoir and the reservoir's storage capacity. The model suggests that the scheme could withdraw up to 50 GL/yr while maintaining (i) agricultural irrigation use at recent levels of approximately 50 GL/yr, and (ii) environmental flows to the Collie River of 9 GL/yr.

- The concentrate stream (waste discharge) from the R.O. plant, with salinity of 7,800 MgL^{-1} will be much less salty than a seawater desalination plant such as Kwinana discharging at 70,000 $MgL^{-1;}$ and would be discharged under gravity from the desalination plant to the ocean. The wastewater could alternatively be used as a beneficial method of flushing the stressed Leschenault Inlet.

- ***Comparison with seawater desalination:*** A literature review and preliminary assessments suggest that gravity-powered reverse osmosis would have a considerable competitive advantage over seawater desalination due to (i) lower capital costs due to different reverse-osmosis process specifications; (ii) the use of hydraulic head to drive the reverse osmosis plant, thus avoiding electricity generation: the GPROS is a net generator of energy; and (iii) savings in membrane maintenance due to the superior physical and chemical characteristics of Wellington Dam water as compared to sea water, notably the absence of carbonates, which build up in seawater reverse-osmosis plants and require chemical dosing using sulphuric acid which is returned with the waste stream to the receiving water.

- ***Economic Assessment:*** Comparison of the relative costs, with total water production kept at the same level, suggests that slightly saline and brackish water desalination is highly attractive as compared with seawater desalination.

	Kwinana	Binningup	Wellington
Capital Cost (2008 Values)			
reverse-osmosis Plant	400.00	640.00	160.00
Trunk Pipelines	24.00	40.00	82.00
Total capital cost	424.00	680.00	242.00
Annual Operating Cost (2008 Values)			
Power (25c/kl times 45 GL)	28.02[(1)]	28.02	0.00
Other	17.00	17.00	6.80
Total per Year	45.02	45.02	6.80
Present Value (6%/yr over 20 years	575.54	575.54	86.92
Present Value of CAPEX + OPEX	999.54	1,255.54	328.92
Annualised Value	78.19	98.22	25.73
Production Volume (m3 * 10^6)	45.00	45.00	45.00
Cost/kL	1.74	2.18	0.57

Note (i) this excludes the costs of the current practice of pumping water from Kwinana to Canning Dam.

Total capital costs for the Wellington Dam project, including reverse-osmosis and all ancillary plant plus trunk pipelines for feedwater and product water delivery to the

IWSS, are estimated to be of the order of $242 million at 2008 prices. This compares with an estimated $424 million for the Kwinana plant and $680 million for the proposed Binningup plant. The figure quoted here for Binningup excludes a large part of the $300 million flagged for IWSS distribution upgrades.Operating costs are considerably reduced for slightly saline and brackish water desalination. Compared with seawater desalination, the Wellington project can expect operating costs of the order of $6.8 million/year, compared with $45 million/year for Binningup. To make these operating costs additive with capital costs they have been expressed as a present value taken over 20 years discounted at 6%. The comparison is a present value of $86.9 million for Wellington against a massive $576 million for Binningup.

- ***Environmental Implications:*** an environmental scorecard for the project was developed using Infrastructure Australia's rating categories. This suggests that slightly saline and brackish water desalination would have superior outcomes against:

    - potable water quality,
    - carbon emissions,
    - noise,
    - waste discharges, and
    - reservoir management; and

  it would make no difference with respect to:

    - recreational activities on Wellington reservoir.

- ***Conclusion:*** the very large advantage in economic efficiency of slightly saline and brackish water desalination suggests that it merits urgent consideration in source development planning for the IWSS. The Wellington Dam Water Recovery Project is the prime example of such an approach and deserves Government support in moving forward to a detailed design and bankable feasibility study.

  The superior environmental outcomes of brackish water desalination, particularly in relation to State and Commonwealth greenhouse objectives reinforce this conclusion. Brackish water desalination is superior to seawater desalination on all other environmental criteria.

1. Background

1.1 Water Demand for the Integrated Water Supply Scheme

The Water Corporation's Source development Plan for the IWSS is based on two demand projections, (i) "155" scenario (meaning that per capita demand is contained at the level of 155kl/capita), and (ii) a corresponding "170" scenario.

'155' Demand Scenario

This demand scenario assumes that per capita water-use targets proposed in accordance with the State Water Strategy are achieved by 2012. The target for Perth is 155kL/capita/year (a 10% reduction on 2001/2 consumption), hence this scenario is notionally referred to as the '155' demand scenario. Similar demand patterns were assumed for other areas serviced by the IWSS, i.e. Mandurah, selected South West towns, and towns supplied from the Goldfields and Agricultural Water Supply Scheme. The Water Corporation is progressing a wide range of water use efficiency initiatives to support achievement of the '155' demand scenario, including sprinkler restrictions, "Waterwise" rebates, conservation advertising, labelling systems, and wastewater re-cycling.

'170' Unrestricted Demand Scenario

Notwithstanding its investment in a wide range of water use efficiency initiatives, the Corporation believes that achieving the 155 kL/capita/year demand target may prove to be a greater challenge than initially anticipated. With a moderate level of community care, and continued media campaigns, it is believed that Perth's per capita demand can be held at 170kL/year. The Corporation considers the '170' demand scenario to be the upper limit of future demand for which it must be prepared. This demand scenario has thus been included in the Source Plan as a basis for assessing the implications of higher demand on future source development needs.

The revised (2005) projections of IWSS water demand are summarised in Table 1.

Table 1: Future water demand on the IWSS (GL)

Time Horizon	"155" with Medium population growth	"170" with Medium population growth	"155" with High population growth
2004-05	289	289	289
2008 (Actual)	280	280	280
2015	315	343	333
2025	360	390	393
2050	455	495	536

Source: Water Corporation of Western Australia IWSS Source Development Plan (2005)

Annual demands are projected to reach 360 GL by 2025, and 455 GL by 2050, under the '155' demand scenario. In the event of the higher '170' demand outcome, an additional 30GL/yr of demand will be realised by 2025, and 40 GL by 2050.

In summary, it is anticipated and widely agreed that the IWSS will need to source an additional 256 GL of capacity over the next 30 years or so, and an additional 53 GL by 2015. An indicative order of the capital investment required using seawater desalination alone, and using Kwinana costs (as quoted by the Water Corporation) would be $1.13 billion in 2008 prices before 2025 and $2.56 billion in 2008 prices before 2050. However, these figures are likely to be minima as they do not take account of likely increases in costs for seawater desalination plants. These are discussed in Section ?.

1.2 Current Planning Approaches

The Water Corporation has proposed a strategy for balancing water demand and supply titled "*Security through Diversity*". This strategy emphasises that a multi-pronged approach will be needed in future. The Water Corporation particularly emphasises the need to find new ways for counteracting an expected decline in the yields of Darling Range reservoirs, and increasingly tight environmental limits on the use of groundwater. Seawater desalination plants are a major element in the Corporation's strategy. The first such plant was constructed at Kwinana and came on line in 2006. A second is proposed to be constructed imminently near the coast at Binningup.

1.3 The Need for Efficient Infrastructure Planning

Australian Governments are committed to investing in infrastructure and delivering improved services to the community. Governments across jurisdictions are currently seeking the participation of the private sector in the delivery of infrastructure and related services to the public. Public Private Partnership arrangements are one way of delivering infrastructure investment. National Guidelines have been prepared and endorsed by Infrastructure Australia and the State, Territory and Commonwealth Governments as an agreed framework for the delivery of PPP projects. The guidelines, which provide a framework that enables both the public and private sectors to work together to improve public service delivery through private sector provision of infrastructure and related non-core services, have been in developing this report.

1.4 Environmental Responsibilities

The study identifies a number of key environmental issues for desalination plants and provides a preliminary evaluation of the relative impacts of the two projects being compared. The potential environmental issues identified are:

- Quality of the water to be supplied
- Carbon emissions
- Noise
- Discharge Water
- Reservoir Operation
- Recreation

1.5 Purpose of the Pre-Feasibility Study

This report examines the proposition that the "diversity" advocated by the Water Corporation could be considerably increased by taking advantage of a unique combination of circumstances in the south west of the State, notably:

- The existence of a large volume of "problematic" brackish water sources flowing from salt-affected agricultural land. These waters have typically one tenth to one twentieth of the salinity of seawater; they would cost much less to desalinate; and would be highly efficient in terms of the percentage of input water that could be recovered and passed into the IWSS as compared to a seawater desalination plant.

- The availability of a 150m hydraulic head between the dams of the Darling Range and the Swan Coastal Plain offers a currently un-exploited source of energy, which is the largest cost element for reverse-osmosis plants.

2. Methodology and Report Layout

2.1 Methodology

The methodology followed in this report follows the Guidelines published by Infrastructure Australia, which is currently calling for proposals for infrastructure projects around Australia, including water infrastructure. *Infrastructure Australia* considers that the broadest possible range of initiatives presents the best prospect for an effective response to addressing issues of national productivity.

The Guidelines identify two critical stages in assessment of prospective projects:

- Audit of needs

- Prioritisation of projects addressing the needs

The ***Audit Framework*** consists of 7 steps:

- Goal definition: in the case of this study the goal is to achieve an economically efficient and environmentally superior form of infrastructure development to meet the growing water demands of the IWSS.
- Problem identification: at its broadest level the problem is how the Government of Western Australia can meet its commitments and the community's expectations for infrastructure, including water infrastructure, and regional development with limited resources.
- Problem assessment: this study assesses the scale of the water demand-supply imbalance that gives rise for the need for major new investments.
- Problem analysis; there has been continuous work within the WA Water Corporation and also in the private sector on the size of the emerging gap between water availability and water demand in the south west of Western Australia. Methods of ensuring an

adequate water supply to Australia's cities have been the focus of recent Commonwealth Government attention.

- Option generation; this study widens the range of options available for supplying future water demands through the IWSS by demonstrating a way to productively utilise the large quantity of slightly saline and brackish water that runs off the Darling Range catchments.
- Solution assessment; this pre-feasibility study presents an indicative cost-benefit analysis of investment in slightly saline and brackish water desalination as compared with seawater desalination.
- Solution prioritisation: the study suggests that slightly saline and brackish water desalination should be given a much higher priority in source development planning for the IWSS.

The ***Project Prioritisation Framework*** will contain three stages:

- ***Profiling***: this considers how the strategic priorities of Infrastructure Australia are to be addressed by the initiative, and how the initiative relates to policy, regulatory, demand and pricing solutions, enhancement and capital investment solutions. The project examined in this report answers directly to Infrastructure Australia's criteria for efficient infrastructure development.

- ***Appraisal:*** monetised cost-benefit analysis (through the benefit cost ratio) will be used as the primary driver of decision making; social, equity and environmental effects as well as economic outcomes are to be considered. The study employs each of these assessment methods.

- ***Selection:*** this final stage, involving a comparison of competing proposals will be internal to Infrastructure Australia

2.2 Report Layout

The following report is in five parts:

- Section describes the Wellington Dam Water Recovery Project (Gravity-Powered Reverse Osmosis Scheme)
- Section 0 is a discussion of differences between (i) seawater and (ii) slightly saline and brackish water desalination plants drawing on international literature and experience in Western Australia
- Section presents results of a preliminary benefit-cost study comparing economics of the proposed desalination plant at Binningup with those of the Wellington Dam Water Recovery Project

- Section identifies environmental factors that should be considered and rates their importance using the Guidelines issued by Infrastructure Australia for the proposed desalination plant at Binningup with those of the Wellington Dam Water Recovery Project

- Section supplies key references.

3. Gravity Powered Reverse Osmosis Scheme

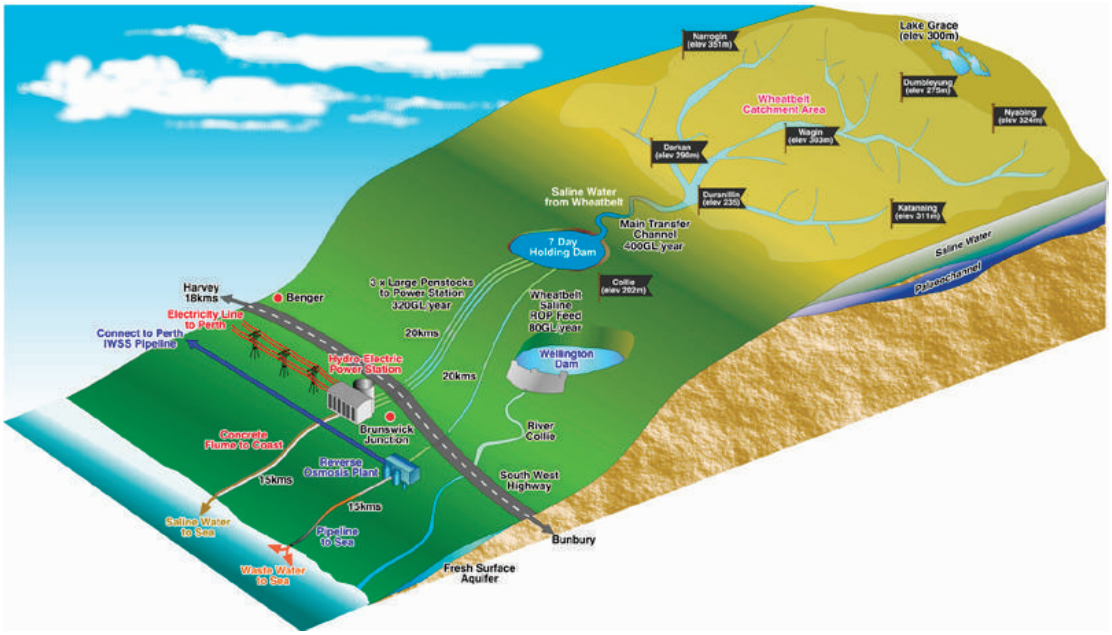
3.1 General Description

The proposed scheme, illustrated in Figure 1, will use a Reverse Osmosis (reverse-osmosis) process to desalinate the slightly saline water from Wellington dam into high grade potable water for domestic supply to Perth.

It will use the pressure (hydraulic head) produced from the elevation difference (150m) between Wellington dam and a reverse osmosis desalination plant located at the foot of the Darling escarpment.

Slightly saline water would be delivered from the Wellington Dam to the R-O plant by a large diameter (1.5m) pipeline some 21 km in length, delivering some 56 GL of feed water annually. 80% of the feed water is converted to potable standard, yielding 45GL of product water: the same output as the rated yield of each of the Kwinana and Binningup seawater desalination plants. This will be accumulated in a buffer storage and then delivered to the IWSS pipeline at Harvey through a 20km pipeline.

Figure 1: Schematic of the Project



The concentrate stream (waste discharge) from the R.O. plant, with salinity of 7,800 MgL^{-1} will be much less salty than a seawater desalination plant such as Kwinana discharging at 70,000 $MgL^{-1;}$ and would be discharged under gravity from the desalination plant to the ocean. The wastewater could alternatively be used as a beneficial method of flushing the stressed Leschenault Inlet.

3.2 Pressure Requirement

Natural osmotic process causes a dilute solution to pass through a semi permeable membrane into a more concentrated solution. To ***reverse*** this process a pressure must be applied to the concentrated solution to (i) negate the natural osmotic pressure of the concentrated solution – the osmotic pressure; and (ii) create a flow from the concentrated solution side of the semi permeable membrane to the dilute side – the "additional" pressure. This is illustrated in Figure 1. The greater the driving pressure the greater the flow rate of product (permeate) from the membrane. The driving pressure required for reverse osmosis desalination of brackish or saline water is roughly proportional to the level of salinity of the feed water. Therefore very much higher pressure and thus energy is required to desalinate seawater than low salinity brackish water. Pressure requirements for different salinity levels are given in Table 2.

Figure 2: Reverse osmosis system operating pressure

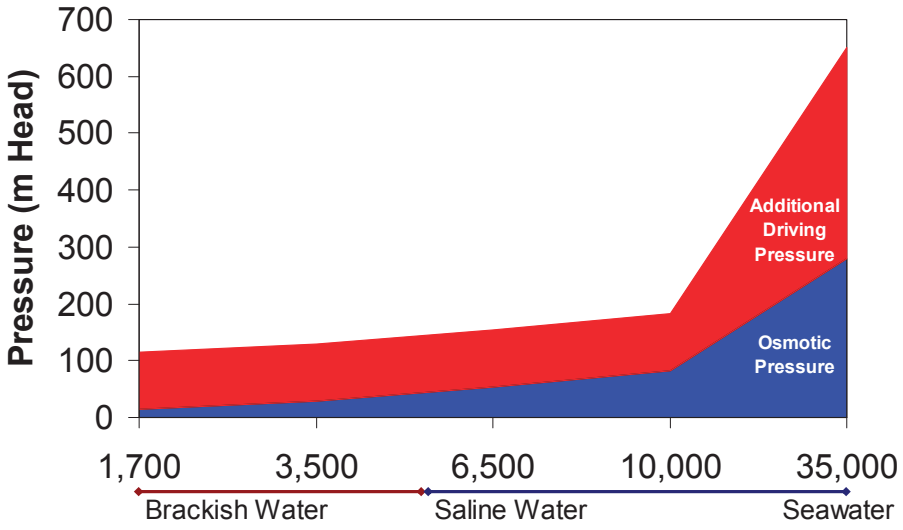


Table 2: Pressure requirements as a function of feedwater salinity

Water Salinity TDS (mg/l)	Osmotic Pressure (Bar)	Typical Additional Driving Pressure (Bar)	Typical Total Operating Pressure (Bar)
1,700	1.4	9 - 12	**10 - 14**
3,500	2.9	9 - 12	12 - 15
6,500	5.3	9 - 12	15 - 18
10,000	8.2	9 - 12	17 - 20
35,000	27 - 29	25 - 40	**50 - 70**

Source: Agritech Smartwater (2006)

Note: The Osmotic pressure above is calculated for a NaCl solution and will vary marginally depending on the actual makeup of different salts in the water

The pressure required for a reverse osmosis plant to work is the sum of the osmotic pressure and an additional driving pressure to provide the flow of water through the membrane. In the case of the Wellington dam feedwater water at say 1,700 ppm the osmotic pressure is approximately 140 kPa. With a typical driving pressure above this –of 1000 kPa this leaves approx 200 kPa pressure available for the pre-treatment stage.

There are now many improved types of R.O membranes that have good salt rejection rates whilst requiring a lower driving pressure. From system simulations using a membrane manufacturer's software the proposed reverse osmosis option is easily technically achievable. The simulations assumed a conservative feedwater at 1,700MgL^{-1}.

3.3 Energy requirement

International Experience

The desalting of low salinity water by reverse osmosis requires much less energy than the desalting of seawater. International research has suggested that desalination of brackish water can use as little as 20% of the energy required for seawater desalination: see for example Table 3.

Table 3: Comparative energy requirements for reverse osmosis of brackish versus seawater (from Glueckstern, 1999, quoted in Barron, 2006)

	Late 199's Efficiencies		Expected Efficiencies with Technological Change	
	Brackish Water	Sea Water	Brackish Water	Sea Water
Energy Requirement (kWh/m3)	1.0 to 2.0	4.5 to 6.0	0.8 to 1.5	3.5 to 5.0

Source of Power for the GPROS

The GPROS deals with a low salinity feedwater, and so has much lower energy requirement than a comparable seawater desalination plant. IF the reverse-osmosis plant were to be powered with electricity it would require approximately 23 GWh, as against 225 GWh for a comparable seawater desalination plant.

However, no electricity generation is required because the available hydraulic head between Wellington Dam and the reverse-osmosis plant at Brunswick Junction is sufficient to supply all pressurised water requirements for likely configurations of the plant and choice of membranes (B. Barnes pers comm.)

A small amount of electricity will be used for facilities outside of the reverse osmosis plant itself. It is expected that the scheme will be a net generator of electrical power, but the choice of a supply source for these ancillary requirements will await the detailed feasibility study.

3.4 Current and Future Wellington Dam Utilisation

Collie Basin as a Whole

The Australian Water Resources Assessment (2000) reported the following data for the Collie River system as a whole:

	GL
➢ Sustainable Yield	169.67
➢ Developed Yield	88.17
➢ Diversion	59.28
➢ Water Use	61.89

Wellington Reservoir Inflows

The annual average flow into the Wellington Reservoir has been reported by the Water and Rivers Commission (2002) to be 144.8 GL, as shown in Table 4. Using inflow records since 1973, shown in Figure 3 the annual average inflow was 131 GL. In the last two decades the average annual inflow was 133 GL.

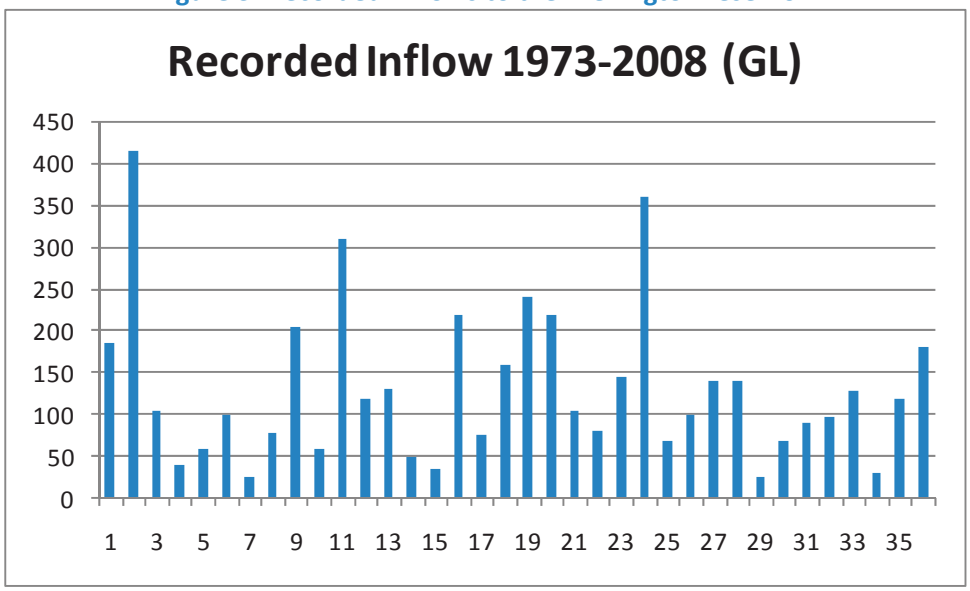
Table 4: Annual average inflows to Wellington Reservoir

Management Unit	Flow (GL/Year)
Collie River – East	14.5
Collie River -South	23.3
James Well	5.5
Bingham River	7.3
Collie River Central-East	14.3
Coillie River – Central	29.3
Harris River (after Harris dam diversion)	7.0
Wellington Reservoir	43.6
Total Inflow to Wellington Reservoir	144.8

Source: Salinity situation statement for the Collie River Catchment- a summary. (Water and Rivers Commission, 2002)

The Collie River Basin lies in a region where past and future potential climate change is regarded as having only a small impact on rainfall and runoff (Thomas and Sadler, 2008). This is in sharp contrast to expectations about the yields of hills reservoirs further north in the Darling Range. This seems to have been borne out by experience with Wellington Dam performance in the last decade. The dam overflowed in 1999, 2005, 2006 and 2007. The early years of the 21st century were characterised by low rainfall-runoff, but this is consistent with the long term variability of flows into the reservoir, which is shown in Figure 3.

Figure 3: Recorded inflows to the Wellington reservoir



Recent Usage

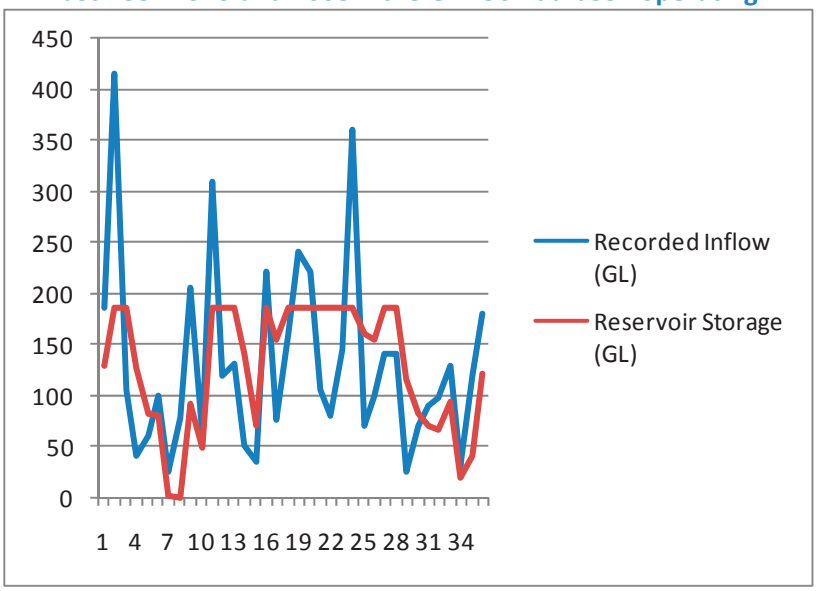
There has not been any significant change in the use of water from the Collie system for some time. The principal water use has been for irrigation in the Collie North Irrigation Area through the Harvey Water irrigation cooperative. The dam has not been used for drinking water since 1990 due to its unacceptable level of salinity. Each year the Department of Water declares what percentage of normal allocation will be made available to irrigators. Between the year 2000-01 and 2004-05 storages were low and salinity of available water was relatively high, so actual use was significantly less that allocation. Since then reservoir yields have increased. Nevertheless, the Department of Water (2007) reported that actual irrigation use from Wellington Dam was 51 GL.

Simulation Model

As a part of this study a preliminary 36-year simulation was conducted of potential usage and end-of-summer of storage in the Wellington reservoir, making assumptions for:

- Physical dam capacity of 186 GL
- A yield adjustment that allows for the capture of "overflows" by the constant daily withdrawal of the reverse-osmosis plant during years when reservoir inflow is high.
- Initial (1973) storage level
- Availability of supplementary sources of brackish water
- Recorded inflows (see Figure 3)
- Constant annual average use for irrigation
- Constant annual average environmental flow
- Constant annual average withdrawal for the reverse osmosis plant from the reservoir and supplementary sources

Figure 4: Simulated end-of-summer reservoir storage each year between 1973 and 2008 if the GPROS had been operating



It was found that results were insensitive to the assumption about 1973 storage level, because the reservoir was full after large inflows in 1973 and 1974.

From the preliminary reservoir simulation it is concluded that if (i) the GPROS had existed throughout the period simulated, (ii) agricultural use remained at recent levels (51GL), and (iii) environmental flows continued at an annual average of 9 GL (the requirement for the Lower Collie River) then there would have been only 6 out of the 36 years, when it would not have been possible to satisfy all demands. In those years reduced allocations for agriculture would be needed in order to ensure full capacity operation of the GPROS and constant annual environmental flow. This is very similar to the actual frequency of reduced irrigation allocations over the period studied. In practice, all water supply schemes (including even seawater desalination plants) experience episodes of under-capacity operation. It is also noted that environmental flows need to replicate natural variability, which means that the environmental flow does not need to be a constant annual amount. Thus, in dry spells environmental flow can be reduced to sustain other uses.

Table 5 shows the current situation regarding allocation and use of the resource, and shows an indicative allocation for the proposed project, based on the preliminary simulation model. It should be noted that not all of the available flow in the Wellington reservoir has a licensed allocation. In 2007 113 GL were licensed, of which irrigators received 68GL and the Water Corporation had an unused allocation of 17 GL. However, only 51 GL were used in irrigation, and the Water Corporation allocation was not used.

Table 5: Use of water from the Wellington reservoir in 2007 compared with indicative use with the GPROS (GL)

	Licensed Allocation (2007)	Actual Use (2007)	Indicative Annual Average Use
Irrigation	68	51	51
Environmental Flow [1]	28	9	9
Unused Allocation to Water Corporation	17	0	0
Project allocation from reservoir including saline scour	0	0	36
Supplementary Piped Sources			20
Total	113	79	116

Note (1) The "Environmental Flow" figure for 2007 includes the scour water.

In order to supply the IWSS with 45 GL with an 80% recovery rate, a feedwater supply of 56 GL would be needed. Under the proposed scheme the 17GL unused allocation to the Water Corporation would be transferred to the project, and the environmental flow would be set at EPA requirements for the Lower Collie River. Agritech Smartwater is confident that a further 20 GL of brackish water can be obtained from supplementary sources including mining and power generation plants.

The Wellington Dam Water Recovery Project proposes to use the scour water plus the current allocation to the Water Corporation plus saline flows from mining. So its production of 45 GL could be achieved without seriously affecting current uses in the irrigation area.

A decision about the exact scheme capacity for the GPROS will be made at the detailed feasibility study stage.

3.5 Water Quality and Prospects for Rehabilitation via Catchment Management

Following a study by the Water and Rivers Commission the former (Labour) Western Australian Labour Government expressed support for ongoing catchment rehabilitation so as to return the salinity of Wellington Dam water to potable standard by the year 2015, at a cost of between $750 million and $1 billion, which is similar to the cost of seawater desalination using a new plant at Binningup.

The new (Liberal) Western Australian Government has expressed interest in ways of treating the partly saline water, and has committed $250,000 to initiate an independent scientific study within the next 12 months (Minister Jacobs, reported in Murphy, 2008). The GPROS is a prime candidate to be examined by such a study.

3.6 Griffin Coal Proposal

The concept of desalinating brackish water from the Collie catchment area has also been promoted by Griffin Coal, which operates coal mines in the basin. Griffin conducted a three year trial of diverting flows from the East Branch of the Collie River. The trial began midway through 2005 and finished in October 2007.

The project involved diverting the saline first flows of the season from the Collie River East Branch into Griffin Coal's Chicken Creek mine void, to prevent the saline water from entering the nearby Wellington Dam.

A more permanent solution is now being developed based on a diversion of flow in the Collie River East Branch into a storage area and construction of a desalination plant to treat that water. It is not clear whether Griffin is proposing that the product water would be supplied to the IWSS. This desalination process would, however, require power to pressurise the water for the R.O. process, and if a nearby reservoir such as Harris reservoir is to be used thee would also be significant pumping costs.

4. Economics of Desalinating Seawater and Brackish Water

4.1 International Experience

The International Desalination Association (IDA) has designed a Seawater Desalting Costs Software Program to provide the mathematical tools necessary to estimate comparative capital and total costs of various desalination processes.

The US Army Corps of Engineers undertook comparative cost estimates for desalting of brackish waters versus sea waters, shown in Table 6. Note that the comparison uses conventional power sources in both cases.

Table 6: Comparative costs of desalting brackish vs sea water: Florida

Feedwater Type	Capital Cost per Unit of Daily Capacity ($/m^3/d)	Operation & Maintenance Cost per unit of Production (S/m3)
Brackish water	380 - 562	0.28-0.41
Sea Water	1,341 – 2,379	1.02 – 1.54

Source: US Army Corps of Engineers, quoted in www.oas.org/dsd/puiblications/Unit/oea59e/ch20.htm

It is seen that both capital and operating costs were three to four times more expensive for seawater desalting than for brackish water, even when conventional power sources are used in both cases. The disparity in costs would be even greater if the energy cost were to be eliminated, as would be the case in the Agritech Smartwater project.

A recent CSIRO report (Barron, 2006) reaches a similar conclusion about the relative costs of desalting brackish water and sea water:

- *With the upgraded designs and improved energy efficiencies, desalination units can currently deliver fresh water from the sea at costs that range from US$0.46 to US$0.80/m3, whilst freshwater from brackish water can now be produced at the rate of US$0.10 to US$0.20/m3, depending on the salt content (before water delivery to the consumers). The cost levels vary with respect to the local conditions, but nevertheless there has been a significant cost reduction from the costs of 10 years ago (US$3.00 to US$5.00/m^3 for seawater desalination).*

Efforts toward reduction in the desalination cost are mainly related to energy recovery systems, higher process efficiencies, new or improved construction materials, decreases in membrane prices, high-tech ultra- or micro-filtration for pre-treatment, the use of waste energy from other processes, and the use of low-grade energy from electricity generating plants, all of which contribute to substantially decreasing external energy use and subsequently product water cost.

Quoting Gluekstern (1999) Barron gives the relative performance of desalting for brackish versus sea water under alternative scenarios for technological improvement, as shown in Table

7. Seawater desalination is two to four times less efficient than brackish water desalination under each of the four criteria quoted. Again, these comparisons assume conventional power sources for both options.

Table 7 Effect of advanced technology on the RO process by improving efficiency and lower costs, capacity of 5,000 m^3/d (Glueckstern, 1999, quoted in Barron, 2006)

	Brackish Water	Sea Water	Brackish Water	Sea Water
Energy Requirement (kWh/m3)	1.0 to 2.0	4.5 to 6.0	0.8 to 1.5	3.5 to 5.0
Capital Cost (US$/$m^3$/d)	300 to 600	1,000 to 1,400	250 to 480	900 to 1,100
Membrane replacement (US$/$m^3$)	0.015 to 0.03	0.03 to 0.06	0.01 to 0.02	0.02 to 0.03
Total unit cost (US$/$m^3$)	0.26 to 0.58	0.73 to 1.19	0.19 to 0.41	0.60 to 0.85

4.2 Desalination of Slightly Saline Water versus Seawater in Western Australia

The Wellington Dam Water Recovery project proposed by AgritechSmartwater provides an opportunity to compare the economics of slightly saline water versus seawater desalination as a viable technology for supplying future water demands on the IWSS.

The costs of providing an additional 45 GL of water to the IWSS have been estimated for two alternatives: (i) the proposed Binningup Desalination plant and (ii) the Wellington Dam Water Recovery Project. Wherever possible, reputable data sources have been used to make this comparison.

Key cost factors considered in this analysis are:

CAPITAL COSTS

- The costs involved in constructing and commissioning a reverse-osmosis plant, as a function of the salinity of water to be treated (approximately 35,00 MgL^{-1} for seawater and less than 2,000 MgL^{-1} for Wellington Dam scour water)
- The costs of the trunk mains required to deliver treated water in bulk to the IWSS system
- The costs of delivering feedwater to the reverse-osmosis plant

OPERATING COSTS

- The power requirement of each type of plant, as a function of the salinity of water to be treated, and the cost of energy
- Other operating and maintenance costs, including membrane replacement

It is assumed that the 45 GL will be delivered to the IWSS by one of the two schemes being compared. Therefore, water consumers' positions will be affected by the choice only to the extent that the two schemes provide different cost levels. Water consumers would gain from any cost advantage passed to them by the Water Corporation through its tariff. Alternatively, the Western Australian Government could benefit by an increased dividend. However, for the purposes of the pre-feasibility study these benefits are approximated simply by the difference in discounted capital and operating costs of the two alternatives.

Comparisons are made for a "Base Case" in which best estimates of current (2008) costs are made. Then the sensitivity of the comparison is assessed by examining the implications of alternative assumptions for energy cost and the price of imported materials (particularly the reverse-osmosis plant components) assuming a lower rate of exchange between the Australian and US dollars.

Key assumptions are detailed in Table 8, which includes data for the Kwinana seawater desalination plant for comparison. The present value of operating costs over a twenty year period was calculated using a 6% real discount rate. The sum of capital and discounted operating costs was then amortised over a twenty-year period, and divided by the water yield (45 GL) to obtain a comparison of cost per kL under the two technologies.

Table 8: Key assumptions for cost comparisons

	General Factors	Kwinana	Wellington	Binningup
Amortisation factor (6% over 20 years)	12.783			
Reverse-Osmosis Plant Cost ($M)[1]		400	160	640
Trunk Pipeline Cost ($M/km)[2]	2.00			
Length of Feedwater Pipeline (km) [3]			21.00	
Length of Product Water Pipeline (km)[4]		10.00	20.00	20.00
Energy Cost ($M/GWh)[5]	0.13			
Energy Requirement (MW)[6]		24.10	0.00	24.10
Energy Cost Escalation Factor[7]	1.50			
Relative operating costs for Wellington (excl power but including membrane replacements) [8]	0.40	1.00	0.40	1.00
Relative devaluation of Au$ [9]	0.80			

Notes:

1. (i) Data for Kwinana were taken from the IWSS Source Development Plan and inflated to 2008 values; (ii) Binningup capital costs were obtained from the Media Statement by the Premier, Mr Alan Carpenter, May 2007; and (iii) Wellington data supplied by AgritechSmartwater based on quotations obtained from international suppliers and using Wellington Dam scour water salinities.
2. The trunk main from Kwinana to Thompson Reservoir cost $24M (Water Corporation IWSS Source Development Plan, and covered a distance of 10 km Water Corporation data quoted in Seah Ek Shen (2005). Quotations obtained by AgritechSmartwater suggest a significantly lower cost per km for a comparable diameter trunk main. Therefore a figure of $2M/km was used to compare the Wellington proposal with Binningup.

3. Data supplied by AgritechSmartwater.
4. Data for Wellington supplied by AgritechSmartwater. Data for Binningup obtained from the distance (km) between Binningup and Harvey. Note that the total cost of distribution infrastructure included in the Media Statement by the Premier, Mr Alan Carpenter, May 2007 was $300M, which included upgrades of distribution system capacity that would be needed whatever the source of bulk water.
5. Energy cost was obtained by adding the revenues of Verve Energy (primarily for power generation) and Western Power (for the electricity distribution system), dividing by system capacity of approximately 3,000 MW, and converting to an equivalent GWh basis)., to obtain a representative average cost of power.
6. Data from Water Corporation quoted in Seah Ek Shen (2005).
7. Energy cost escalation used for sensitivity testing.
8. Non-power costs are lower for Wellington because of less frequent and cheaper membrane replacement and lower chemical costs for scaling control.
9. The Australian dollar has recently devalued by some 20% in terms of US$

The results of the assumptions given in Table 8 are given in Table 9. It is seen that the capital costs for Binningup are considerably higher than both Kwinana and Wellington.

Table 9: Capital and operating costs without change in the price of energy or imports ($M at 2008 prices)

	Kwinana	Binningup	Wellington
Capital Cost (2008 Values)			
reverse-osmosis Plant	400.00	640.00	160.00
Trunk Pipelines	24.00	40.00	82.00
Total capital cost	424.00	680.00	242.00
Annual Operating Cost (2008 Values)			
Power (25c/kl times 45GL)	28.02	28.02	0.00
Other	17.00	17.00	6.80
Total per Year	45.02	45.02	6.80
Present Value at 6%/yr over 20 years	575.54	575.54	86.92
Present Value of CAPEX + OPEX	999.54	1,255.54	328.92
Annualised Value	78.19	98.22	25.73
Production Volume (m3 * 10^6)	45.00	45.00	45.00
Cost/kL	1.74	2.18	0.57

It should be noted that press statements generally refer to Binningup as a "$1 billion project" However, $300M of this is for distribution system upgrades including an unpublished amount for general capacity upgrades of the IWSS that would be needed irrespective of which source

development option was selected. In order to make a fair comparison, this report uses the published data for the cost of the reverse-osmosis plant at Binningup ($640M), and applies the same cost per kilometre for the trunk main between Binningup and Harvey as is used for the Wellington costing.

Power costs for the Wellington project are set to zero reflecting the fact that all power is obtained from the hydraulic head available. Wellington also has a cost advantage over both Kwinana and Binningup for other operating costs, as seawater desalination involves more chemical usage for descaling of membranes and more frequent membrane replacement than does desalination of brackish water.

The present value of capital and operating costs over 20 years for Wellington is $329M compared with $1,256M for Binningup, a saving of $927M.

As can be seen from Table 10 and Table 11 the Wellington project is less sensitive than Binninup to assumptions about (i) the value of the Australian dollar relative to the US dollar, or (ii) the price of electricity.

Table 10: Capital and operating costs subject to 20% dollar devaluation. ($M at 2008 prices)

	Kwinana	Binningup	Wellington
Capital Cost (2008 Values)			
reverse-osmosis Plant	**500.00**	**800.00**	**192.50**
Trunk Pipelines	**24.00**	**40.00**	**82.00**
Total capital cost	**524.00**	**840.00**	**274.50**
Annual Operating Cost (2008 Values)			
Power (25c/kl times 45GL)	**28.02**	**28.02**	**0.00**
Other	**17.00**	**17.00**	**6.80**
Total per Year	**45.02**	**45.02**	**6.80**
Present Value at 6%/yr over 20 years	**575.54**	**575.54**	**86.92**
Present Value of CAPEX + OPEX	**1,099.54**	**1,415.54**	**361.42**
Annualised Value	**78.19**	**110.74**	**28.27**
Production Volume (m3 * 10^6)	**45.00**	**45.00**	**45.00**
Cost/kL	**1.74**	**2.46**	**0.63**

A dollar devaluation of 20% against the greenback increases the cost of the reverse osmosis plants by the same percentage, but for Binningup this would mean an increased cost of $160M,

compared with an increased cost of $33M for the Wellington project. This results from the much lower specification for the reverse-osmosis plant at Wellington Dam, given the low salinity of feedwater.

The increased capital cost assuming dollar devaluation widens the difference in Present Values for capital and operating costs, leaving a cost advantage of $1,055M for the Wellington project.

There is a similar effect from increasing energy price, with annual power cost for Binningup increasing from $28M/yr at full capacity to $42M/yr (see Table 11) for a doubling of unit energy cost. By contrast, the Wellington project would not be affected by increased energy cost. The overall effect is similar to the dollar devaluation scenario.

Table 11: Capital and operating costs assuming increased energy price ($M at 2008 prices)

	Kwinana	Binningup	Wellington
Capital Cost (2008 Values)			
reverse-osmosis Plant	400.00	640.00	160.00
Trunk Pipelines	24.00	40.00	82.00
Total capital cost	424.00	680.00	242.00
Annual Operating Cost (2008 Values)			
Power (25c/kl times 45GL)	42.04	42.04	0.00
Other	17.00	17.00	6.80
Total per Year	59.04	59.04	6.80
Present Value at 6%/yr over 20 years	754.65	754.65	86.92
Present Value of CAPEX + OPEX	1,178.65	1,434.65	328.92
Annualised Value	92.20	112.23	25.73
Production Volume (m3 * 10^6)	45.00	45.00	45.00
Cost/kL	2.05	2.49	0.57

A “worst case” but plausible scenario, involving both dollar devaluation and increased energy cost is shown in Table 12. In this case the Present Value of capital and operating costs is $1,595M for Binningup compared with $361M for Wellington, a cost advantage of $1,234M.

Table 12: Capital and operating costs assuming both dollar devaluation and increased energy cost ($M at 2008 prices)

	Kwinana	Binningup	Wellington
Capital Cost (2008 Values)			
reverse-osmosis Plant	500.00	800.00	192.50
Trunk Pipelines	24.00	40.00	82.00
Total capital cost	524.00	840.00	274.50
Annual Operating Cost (2008 Values)			
Power (25c/kl times 45GL)	42.04	42.04	0.00
Other	17.00	17.00	6.80
Total per Year	59.04	59.04	6.80
Present Value at 6%/yr over 20 years	754.65	754.65	86.92
Present Value of CAPEX + OPEX	1,278.65	1,594.65	361.42
Annualised Value	100.03	124.75	28.27
Production Volume (m3 * 10^6)	45.00	45.00	45.00
Cost/kL	2.22	2.77	0.63

Table 13 compares the projects in terms of the cost per kilolitre of product water. It is seen that the Wellington project is relatively insensitive to both dollar devaluation and increased energy cost, producing potable water at around $0.6/m^3.

Table 13: Cost per kilolitre of product water ($/m^3)

Scenario	Kwinana	Binningup	Wellington
No change in input prices	1.74	2.18	0.57
Dollar Devaluation	1.74	2.46	0.63
Increased Energy Price	2.05	2.49	0.57
Worst Case	2.22	2.77	0.63

By comparison the Binningup project produces water at a minimum of $2.18/m^3, with the possibility of cost increases to $2.77/m^3.

5. Comparative Environmental Impacts

5.1 Appraisal methodology

This report has adopted the rating scales issued by Infrastructure Australia (Infrastructure Australia, 2008) in assessing the potential comparative environmental impacts of the Wellington project versus the alternative of a conventional seawater desalination plant.

Table 14: Infrastructure Australia's rating scale for assessing "non-monetised" benefits and costs.

Rating	Level Description
Highly beneficial	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.
Moderately beneficial	Moderate positive impact, possibly of short-, medium- or longer-term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.
Slightly beneficial	Minimal positive impact, possibly only lasting over the short-term. May be confined to a limited area.
Neutral	No discernible or predicted positive or negative impact.
Slightly detrimental	Minimal negative impact, probably short-term, able to be managed or mitigated, and will not cause substantial detrimental effects. May be confined to a small area.
Moderately detrimental	Moderate negative impact. Impacts may be short-, medium- or long term and impacts will most likely respond to management actions.
Highly detrimental	Major negative impacts with serious, long-term and possibly irreversible effects leading to serious damage, degradation or deterioration of the physical, economic or social environment. Requires a major re-scope of concept, design, location, justification, or requires major commitment to extensive management strategies to mitigate the effect.

5.2 Product water quality

It is reasonable to expect that the quality of water produced by the Wellington project will be much better than with seawater desalination. Any deterioration in membrane performance (as

is normal in the run up to routine maintenance operations) is more likely to cause a greater loss of water quality for a seawater desalination plant than a brackish water plant.

5.3 Carbon Emissions

There is a very large difference between the GPROS and a conventional seawater desalination plant with respect to carbon emissions.

To clarify this, it is important to rebut the claim that wind farms (or other alternative energy sources) provide a carbon-neutral solution for seawater desalination. Non-fossil based energy technologies are a part of the development plans of Verve Energy. At present wind farms provide a small proportion of Verve Energy's power generation capacity. Such technologies must be considered as one element in the production function, and should not be "earmarked" for any particular consumer. In the absence of a demand from the Water Corporation wind farms could be used for other consumers, and therefore the benefits of wind farms in terms of reduced carbon emissions are not exclusively attributable to one customer. There is nothing special about a seawater desalination plant that makes it more carbon efficient than any other cause of growth in the demand for energy.

The power requirement of the Binningup plant is of the order of 211GWh/year (24.1MWh/d). This would account for about 25% of the total growth in energy requirement in Western Australia in a year. A number of different calculators is available to estimate carbon emissions and abatement needs for particular levels of energy demand. It is calculated that the power generation required by the Binningup plant would produce approximately 207,000 tonnes of CO2 annually if supplied by conventional electricity generating capacity. This would require of the order of 1.2 million trees as an offset.

In the case of the Wellington plant all necessary energy is provided hydraulically, with no intermediate electricity generation. Therefore there is no additional electricity generation capacity required, nor to carbon emissions.

5.4 Noise

The Wellington plant would have a much superior noise performance to the seawater desalination plant. In seawater desalination plants noise is generated by the pumps required to pressurise the feedwater, whereas in the case of Wellington the pressure is obtained naturally through hydraulic head.

5.5 Wastewater Discharges

It is proposed to discharge wastewater from the reverse-osmosis plant to the ocean via an existing disposal pipeline, which enters the ocean near Binningup. It is expected that the salinity of discharge water would be of the order of 7,800 mgL^{-1}. (With recovery rate of 80%, feedwater of 1,700 mgL^{-1}, and product water of 100 mgL^{-1}, leaving 20% wastewater at 7,800). This compares with current winter discharges from reservoir scouring of 2,000 mgL^{-1} approximately.

By comparison, a new seawater desalination plant would have significant issues for ocean water quality, as have been widely discussed for the Kwinana plant. These include oxygen levels,

raised salinity, sulphuric acid discharge and sea water temperature in the vicinity of the wastewater outfall. None of these issues would arise in the case of a brackish water desalination plant.

5.6 Wellington Dam Recreation

The use of reverse-osmosis treatment technology provides water of high quality. It is not anticipated that recreational activity on the Wellington reservoir would need to be restricted. To quote one example, there are hundreds of potable water supply reservoirs in California where recreation is unrestricted, because of the level of water treatment offered.

5.7 Wellington Reservoir Management

There would need to be some adaptation of reservoir operating rules to allow a near-constant flow of saline water from the dam to the reverse-osmosis plant. This is likely to make reservoir management simpler because, at present, there is a need to adjust discharge rates in the winter periods to take account of available fresh water flows.

Once the Wellington project was in operation and supplying the IWSS it would receive first priority in terms of annual reservoir allocations. Reservoir simulations described in Section 3.4 suggest that reservoir operating rules would not need to change radically, while the level of environmental allocations would not be affected. The establishment of a constant daily drawdown would assist in avoiding situations where fresher water is mixed with saline water in the reservoir as a result of too rapid a rate of scouring.

5.8 Lower Collie River

The project would change the salinity of winter flows in the lower Collie River because there would no longer be a scouring component. In summer the usual flow to the irrigation area would occur at recent levels. This is noted, but not scored in Table 15.

5.9 Summary

Table 15 presents an environmental scorecard for the project using Infrastructure Australia's rating categories.

Scores ranging from +3 (Highly Beneficial) to -3 (Highly Detrimental) have been attributed across these categories. Firstly, each project is rated in absolute terms. For example, on carbon emissions the Wellington project is rated as "Neutral", because it has no impact. The Binningup project is rated as -3 (Highly Detrimental) against carbon emissions because it makes a large contribution to electricity demand. The column at the right gives the difference in score between the Wellington project and the seawater desalination project.

Table 15: Environmental scorecard of the project

	Highly Beneficial	Moderately Beneficial	Slightly beneficial	Neutral	Slightly Detrimental	Moderately Detrimental	Highly detrimental	Total	*Wellington minus Seawater Desalination*
Wellington Project:									
Product water quality	3							3	**1**
Carbon Emissions				0				0	**3**
Noise				0				0	**2**
Wastewater Discharges				0				0	**1**
Reservoir Management			1					1	**1**
Recreation				0				0	**0**
Total	3		1	***0***				***4***	**10**
Seawater desalination Project:									
Product water quality		2						2	
Carbon Emissions							-3	-3	
Noise						-2		-2	
Wastewater Discharges					-1			-1	
Reservoir Management				0				0	
Recreation				0				0	
Total	3	***2***		***0***	***-1***	***-2***	***-3***	***-6***	

It is seen that the Wellington project has superior outcomes against potable water quality, carbon emissions, noise, waste discharges and reservoir management, and makes no difference with respect to or recreational activities.

6. References

Agritech Smartwater (2006) *Collie-Wellington Basin Water Source Options. Supplementary Submission* 11th December.

Barron, O. (2006). *Desalination Options and their possible implementation in Western Australia: Potential Role for CSIRO Land and Water*. CSIRO: Water for a Healthy Country National Research Flagship, Canberra.

Department of Primary Industries and Energy (1987) Review of Australia's Water Resources and Water Use, 1985, Table S4 Pp 42. Department of Primary Industries and Energy, Canberra.

Department of Water (2007). *Water source options in the Collie-WSellington Basin – Final report to the Minister for water ResourcesCollie-WSellington Basin Source Options Steering Committee.* Department of Water, Perth.

Infrastructure Australia (2008). *Prioritisation Guidelines Vol 5: Outline of Infrastructure Australia's prioritisation methodology*. In: www.infrastructureaustralia.gov.au/files/Prioitisatin_Guidelines_v5.pdf

S. Seah Ek Shen (2005). *Comparing the functionality of the Kwinana desalination plant with the South West Yarragadee groundwater development.* Thesis supervised by Professor Jorg Imberger Environmental Engineering Project 640.406. University of Western Australia.

Water and Rivers Commission (2002) *A fresh future for water: situation statement for the Collie River Catchment – a summary.* Water and Rivers Commission, Perth

Water Corporation of Western Australia (2005). *IWSS Source Development Plan*. Available on www.watercorporation.com.au/publications.

ANNEX: THE AUTHOR

Resource Economics Unit

Tel/Fax:(08) 9388 2461

Mobile 0432 66 44 07

e-mail: rec_unit@bigond.com

Jonathan was trained as an economist and statistician at Oxford University, where he holds Batchelor and Masters degrees in Economics and Statistics. He was Assistant Chief in the CSIRO Division of Water Resources until 1997 when he became Managing Director of the Resource Economics Unit. Since then his clients have included:

- Department of Water, Western Australia
- Economic Regulation Authority, Western Australia
- Department of Agriculture, Western Australia
- Department of Industry and Resources Western Australia
- Water and Rivers Commission,
- Swan Catchment Council
- Corangamite Catchment Management Authority (Victoria)
- Commonwealth Department of Agriculture, Forestry & Fishing (DAFF)
- Commonwealth Department of Environment and Heritage (DEH)
- National Land & Water Resources Audit
- National Dryland Salinity Program
- Dairy Australia
- Australian Academy of Technological Sciences and Engineering
- Engineering Australia
- Chamber of Commerce and Industry, Western Australia
- Kwinana Industries Council

He has authored a total of 132 publications, including 3 books, 14 refereed journal papers, 30 conference papers and 85 consultancy reports. The following gives a selection.

Water Demand and Allocation

- Thomas J.F et al (1999) *Water and the Australian Economy Study* on behalf of the Academy of Technological Sciences and Engineering and Engineering Australia
- Water and Rivers Commission (2002) *WA Water 2000 Study – water demand projection for 19 WA regions.*
- Department of Water (2008) *Water demand scenario modelling tool and projections.*
- Thomas J.F (2007) *Options for water trading*. Commissioned Report for the Economic Regulation Authority Inquiry into Competition in the Water and Wastewater Services Sector.

Benefit Cost Studies

- Thomas, J.F. and Williamson, D.R. (2001). *Potential benefits from rehabilitation of salt-affected land by a drainage canal scheme in the Blackwood River Catchment, Western Australia.* Resource Economics Unit, Perth
- Bolt, S., Thomas, J.F., and Lumley, S. (2001) *Options for the productive use of saline lands: report to the National Dryland Salinity Program.* PPK Environment & Infrastructure Pty Ltd., Adelaide.
- Gomboso, J., and Thomas, J.F. (1998) *Cost-benefit analysis of agricultural groundwater pollution. In:* Candela, L. and Aureli, A (eds) Agricultural threats to groundwater quality. Proc. Workshop, Zaragoza, Spain. IHP-UNESCO and IAMZ-CIHEAM, Zaragoza.
- Coelli, T., Lloyd-Smith, J., Morrison, D. and Thomas, J.F. (1991) *Application of a hedonic pricing model to a cost benefit analysis of a public water supply scheme for wheatbelt farmers in WA.* Australian Journal of Agricultural Economics Vol 35 No 1, April.
- Hajkowicz, S., Howard, B., Thomas, J.F. and Young, M. (2002) *The Economic Impact of Salinity in Australia.* Paper

presented to the Annual Conference of the Australian Economic Society.

- Thomas, J.F. (2001). *National Land and Water Resources Audit. Ex-situ costs of land and water degradation to non-agricultural industries, infrastructure and households in Australia.* Resource Economics Unit, Perth
- Macpherson, D.K. and Thomas, J.F. (2001) *Urban salinity economic analysis package. Release 1_1, June 2001.* Resource Economics Unit, Perth
- Dames & Moore NRM, The Resource Economics Unit and Agriculture Western Australia (2001). *The economics of predicted rising groundwater and salinity in rural towns.* Final Report to the Rural Towns Steering Committee and Agriculture Western Australia. Dames & Moore NRM, Perth.
- Thomas, J.F., Bennett, D. and Macpherson, D.K. (1984) *Theory and practise in catchment land use planning: the Murray Valley of Western Australia*. *In:* Proc. Conference on Conservation and the Economy, Sydney Australia. Department of Home Affairs, Canberra.
- Peck, A.J., Thomas, J.F. and Williamson, D.R. (1983*) Effects of man on salinity in Australia.* Water 2000 Study: Consultants' Report No 8 AGPS, Canberra

Regional NRM Strategies

- Thomas J. F. (2005) *Swan Region Strategy for Natural Resource Management: Investment Plan*. Swan Catchment Council, Perth.
- Thomas J.F. (2004) *Targets4Change: Guidelines for setting natural resource management targets in Australian farms*. Dairy Australia, Melbourne and the Department of Agriculture, Fisheries and Forestry, Canberra.
- Resource Economics Unit (2002) *Corangamite Regional Catchment Strategy 2003-07*. Corangamite Catchment Management Authority, Colac, Victoria
- Gomboso, J and Thomas, J.F. (2002) *A monitoring and evaluation framework for the Corangamite Regional Strategy, Victoria.* Corangamite Catchment Management Authority; Colac, Victoria.
- Thomas, J.F. and Lumley, S. (2002) *An investment framework for natural resources management in the Corangamite Region, Victoria*. Corangamite Catchment Management Authority, Colac, Victoria.
- Resource Economics Unit (2002) *Review of the 1997 Corangamite Regional Catchment Strategy.* Corangamite Catchment Management Authority, Colac, Victoria.
- Thomas, J.F., Alexandra, J, Douglas-Hill, S.D et al (1999) *Mid-Term Review of the Australian Natural Heritage Trust: Urban Environment Theme.* On behalf of Environment Australia and Agriculture, Fishing and Forestry Australia. PPK Environment and Infrastructure Pty Ltd, Adelaide
- Alexandra, J., Douglas-Hill, S.D., Thomas J.F. et al (1999) *Mid-Term Review of the Natural Heritage Trust: Inland Waterways Theme.* Study on behalf of Environment Australia and Agriculture, Fishing and Forestry Australia. PPK Environment and Infrastructure Pty Ltd, Adelaide
- Thomas, J.F. (1993). *Development of a total catchment management strategy for the Melbourne Region: research needs.* CSIRO Division of Water Resources Consultancy Report No 93/19 on behalf of Melbourne Parks and Waterways. CSIRO, Canberra.

- McFadden, J.R., Burbidge, A.A., Orr, N., Stoneman, T.C. and Thomas, J.F. (1984) *Report of the Working Party Assisting the Agricultural Land Release Review Committee.* Western Australia Department of Lands and Surveys, Perth.
- Thomas, J.F. (1978) *Economics of agroforestry at the regional level. In:* Integrating Agriculture and Forestry (Eds K M W Howes and R A Rummery), pp 106-23. CSIRO, Melbourne.

Catchment Investigations

- Thomas, J.F. (1990) *"Regional land use planning: the Murray River catchment of Western Australia". In:* Dixon, J. A., James, D. E. and Sherman, P. B. Dryland management: economic case studies. Earthscan Publications, London.
- Wilcox, D. G. and Thomas, J.F. (1990*) The Fitzroy Valley Regeneration Project in Western Australia. In:* Dixon, J.A., James, D.E. and Sherman, P.B. Dryland management: economic case studies. Earthscan Publications, London
- Thomas, J.F. (1986*) Regional land use planning: the Murray River catchment of Western Australia. In:* Proc Int. Conference on the Economics of Dryland Degradation and Rehabilitation, Canberra, 10-14 March 1986: Compendium of Case Studies. Dept. of Arts, Heritage and Environment, Canberra.
- Bennett, D. and Thomas, J.F. Eds. (1982) *On Rational Grounds: Systems Analysis in Catchment Land Use Planning*. Developments in Landscape Management and Urban Planning, Volume 4. Elsevier Scientific Publishing Company, Amsterdam. 362 pp. ISBN 0 444 420568.

Attachment 3.

Copy of TV Guide Advertisement May 27 2007

THE ULTIMATE WATER CRISIS SOLUTION...

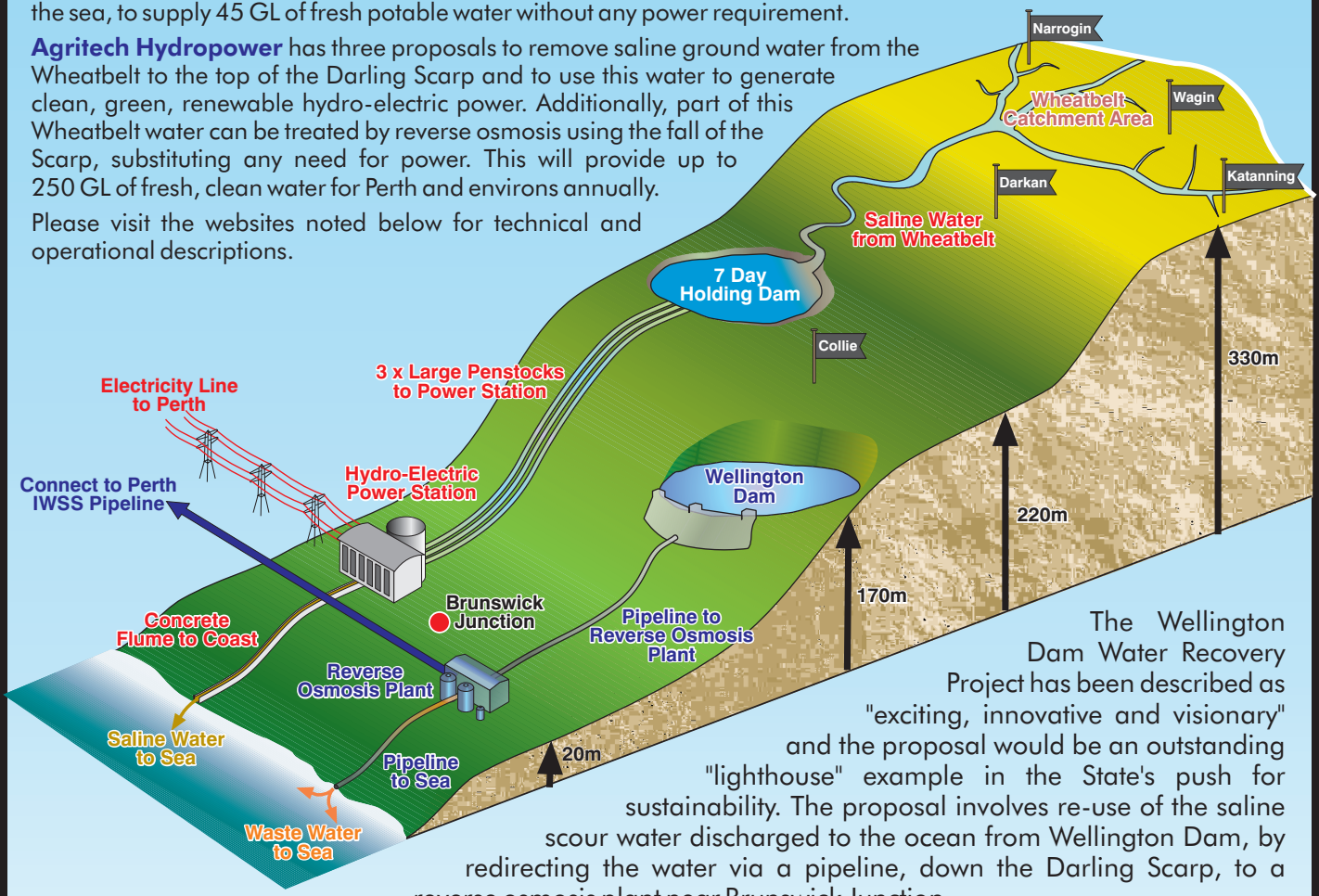
...Will save Tax Payers $1.5 billion and provide a cheap & reliable water source for our current and future water needs.

Current Government options for water include SW Yarragadee with capital cost of $700 million and cost of water $1.07/kL**?**, and a second seawater de-sal plant near Rockingham with capital cost of $535 million - $1 billion and cost of water $1.30/kL. Both projects have enormous power requirements, hence large CO^2 discharge and high operating costs.

Agritech Smartwater has a proposal to initially re-treat saline scour water from Wellington Dam, currently wasted to the sea, to supply 45 GL of fresh potable water without any power requirement.

Agritech Hydropower has three proposals to remove saline ground water from the Wheatbelt to the top of the Darling Scarp and to use this water to generate clean, green, renewable hydro-electric power. Additionally, part of this Wheatbelt water can be treated by reverse osmosis using the fall of the Scarp, substituting any need for power. This will provide up to 250 GL of fresh, clean water for Perth and environs annually.

Please visit the websites noted below for technical and operational descriptions.



The Wellington Dam Water Recovery Project has been described as "exciting, innovative and visionary" and the proposal would be an outstanding "lighthouse" example in the State's push for sustainability. The proposal involves re-use of the saline scour water discharged to the ocean from Wellington Dam, by redirecting the water via a pipeline, down the Darling Scarp, to a reverse osmosis plant near Brunswick Junction.

Agritech Smartwater cannot understand why the Government and Water Corporation continue to "stonewall" this project and we invite the people of the State to help us. We need 100,000 tax-payers to join with us and voice their disapproval at this unnecessary waste of public monies.

"APATHY WILL CAUSE HIGHER WATER CHARGES TO CONSUMERS".

For full project descriptions and details, visit

- **www.agritechsmartwater.com.au**
- **www.agritech-hydropower.com.au**

Agritech Smartwater

AGRITECH Hydropower

To register your support and comments, email us at agritechsmartwater@bigpond.com.
Written comments and support can be sent to Agritech Smartwater, Suite 6/439 Albany Hwy, Victoria Park, WA 6110

TI #5116

Attachment 4.

Copies of Emails from the Public in response to ad

Agritech Smartwater

From: "D. R. W " <
To: "'Agritech Smartwater'" <agritechsmartwater@bigpond.com>
Sent: Tuesday, 8 May 2007 11:42 PM
Attach: ATT01973.htm
Subject: RE: Agritech Smartwater Wellington Dam Initiative

Dear Peter,

To respond to the information being given yet again to the public about highly relevant sources of water for public use, it continues to both amaze and annoy me that the government sector can continue to ignore the proposals which AgriTech-Smartwater and Agritech-HydroPower have been putting forward for more than 10 years now. Promises have not been honoured, the facts have been twisted and manipulated, and any excuse to avoid the most logical, low-cost way forward with "new" water sources shows that the government is caught in the "Yes Minister" trap. Is there no one in government, from any side of politics, willing to challenge the system. Cannot someone in politics with reasonable clout take the numbers being trotted out to the public and expose them for what they are - geared to maintain the in-house, operationally biased schemes of agencies responsible for water supply for urban, industrial and agricultural needs.

I have admired for a long time the tenacity with which you are pursuing the creative options which you propose. I have confidence in the technical support that is available to confirm the feasibility of each of the schemes. No agency person has been able or willing to constructively identify errors in the data supporting the projects. There is simply no justification for ignoring the feasibility of each scheme. The classic is the operational costs of the current desalination plant using seawater as the source. Sure there is an almost infinite amount of sea water available - but the operational costs per kilolitre are 4 or 5 times the costs for the schemes proposed by the AgriTechSmartwater plan for managing waste water from Wellington dam, and saline sources further inland. Even if just the saline flows in the Blackwood upstream of Duranillan were channelled to the Darling Scarp, to add to the water available from the Collie River, the volume available would satisfy the needs which the government proposes to supply from Yarragadee, and sea-water desalination plants.

Please add my name to those who support the proposals being pursued by AgriTechSmartwater and Agritech-Hydropower.

Keep at it. There has to be a break-through soon!! Surely.

Kindest regards

D W

Agritech Smartwater

From: "R C " <
To: "'Malcolm Turnbull'" <Malcolm.Turnbull.MP@aph.gov.au>
Sent: Tuesday, 8 May 2007 8:59 PM
Attach: ATT01983.htm
Subject: RE: Climate Change after Kyoto, Major Water Projects and lots of news national and local

Dear Malcolm,

I have taken an active and financial interest in supporting water projects in Western Australia. In particular, I am supporting the Wellington Dam project. This is a self-financing, stand-alone initiative to supply Perth with an additional 45 gigalitres of potable water through a gravity fed reverse osmosis plant. This has merits above alternative projects because it removes salt from the existing Blackwater catchment and has low embodied energy as it uses gravity, rather than fossil fuel energy to drive the process. This project is part of a greater proposal for the Blackwater Catchment - formerly the most fertile land in W.A. - to provide 250 gigalitre of potable water for Perth, reclaim significant tracts of salt-affected land and provide hydro power to the W.A. grid.

At present the Water Corporation of WA is opposed to this project. Quite alarmingly, it has provided no sensible or cogent argument to support its opposition. Indeed, most politicians have shown support, but such is the equivocal position of politics in W.A., nothing vaguely intelligent appears to be happening. The alternative proposal for provision of supplementary water is the Yarragadee Aquifier and this appears to have serious and legitimate issues. In fact, there is almost universal opposition to it, except from the Water Corporation. This has raised deep and unanswered suspicions. Surely, there is a role for the Federal government to demonstrate some important leadership on the issue? The W.A. Liberals appear too focussed on internal issues to provide adequate external support for real issues and are an Opposition without confidence.

Please let know if it is possible to discuss these important matters in greater detail with you as I know you are determined meet the challenge and make a deep and lasting impact on the provision of water resources in this country.

Your's sincerely,

R C

-----Original Message-----
From: Malcolm Turnbull [mailto:Malcolm.Turnbull.MP@aph.gov.au]
Sent: Friday, 4 May 2007 6:39 AM
To:
Subject: Climate Change after Kyoto, Major Water Projects and lots of news national and local

Agritech Smartwater

From: "S J " <
To: <agritechsmartwater@bigpond.com>
Sent: Monday, 7 May 2007 3:03 PM
Attach: ATT02057.htm
Subject: water crisis solution

Hi there,

I am a Water Resources Scientist for a housing development company and I strongly agree with the concept behind the Agritech Smartwater and Agritech Hydropower solutions. I have a degree in Environmental Science with First Class Honours in wastewater recycling.

I do not know the full ins and outs of the project, but to me the idea appears to make sense from an economic, environmental and social point of view. In the current climate it is clear WA should move forward in a sustainable manner. Innovative centralised projects such as this one coupled with a range of decentralised (small scale) solutions should be the way of the future.

Pumping water from far away catchments is not an ideal solution as far as I am concerned. You must first strongly consider nearby sources and those with hydraulic head are clearly preferable from an energy point of view. Based on my own calculation the energy use to supply an area of land in Baldivis (Rockingham) with scheme water is as follows (includes all energy for treatment, reticulation head loss, pressure, etc):
* From dam (50km away @ approx 200m head) = 2.27kWh/kL
* From desal plant (10km away) = 7.23kWh/kL

I will review the further information from the websites and would like to receive more detailed information regarding the two proposals if available. With more knowledge I will be able to fully endorse the projects and pass the word on to workmates and colleagues both at my company and the Environmental Technology Centre at Murdoch University.

Regards,

S J

Manning WA 6152

Agritech Smartwater

From: "b a " <
To: "Agritech Smartwater" <agritechsmartwater@bigpond.com>
Sent: Tuesday, 8 May 2007 3:20 PM
Attach: ATT02064.htm
Subject: Water Crisis.

Dear Sirs,

Having read your advertisement in the West Magazine, I applaud the initiative in designing a sensible way to improve our Electricity and Water supplies to the Greater Metropolitan area

My first question is, “Why isn’t this being written up in every newspaper and produced on every television station in WA?” The only way to get those clever people in the bureaucracy and parliament, to do something intelligent, is to shame them into actually thinking about more than their next election, or to avoid doing something which might rock the boat.

My second question is, “How can I help to push such an intelligent plan?

Being retired now, I have some spare time and can possibly be of some assistance

Looking forward to your comments,

Yours Sincerely

B A

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Tuesday, 8 May 2007 2:01 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Tuesday, May 8, 2007 at 16:01:21

Name: A G

Suburb_Town: Rockingham

Postcode: 6168

Phone:

Age: 50's

Occupation: Housewife & Non-profit Environmental group.

Proposal_Comments: I believe the Wellington Dam Water recovery Project proposed by Agritech, is definately visonary and will be a definate outstanding example in the state's push for sustainability.This is our state's chance to move forward without any damage being done to the environment & producing much needed water.The assistance Agritech Hydro-Power will give to our farmers in fighting the salinity problem speaks volumes.

General_Comments: When learning of Agritech Smartwater ,seeing thir presentation & listening to the facts and figures we believe this is a win win situation for the public of WA.We can't believe the government would place industry before the needs of the public.Hardly a day goes by that where not reminded about the water crisis,so how can the government turn their back on this brilliant project?Our farmers will also benefit with salt effected areas in the southern wheatbelt becoming arable again.
The government where elected by the people for the people,its time they acted in the peoples interests and began woking with Agritech to elevate the water problem.
To build another desalination plant or tap the Yarragadee would be irresponsible.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 6:58 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 20:58:40

Name: P R

Suburb_Town: Byford

Postcode: 6122

Phone:

Age: 44

Occupation: self employed

Proposal_Comments: the best idea ive heard and should be implemented without further delay! A great initiative that should be embraced by the politicians aswell as the people of this state!

General_Comments: if you need volunteers to distribute information pamplets or any other related materials do not hesitate to email me!!

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 3:43 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 17:43:09

Name: M M

Suburb_Town: DUNCRAIG

Postcode: 6023

Phone:

Age: 67

Occupation: Bookeeper

Proposal_Comments: Both the Smartwater and the Hydropower are wonderfull and projects,easily built.
Both will be great assets to future generations of Western Australians by putting what is now used as a waste water to good use.
We do not want to depleat the Yarragdee acquifer ant more than it has been.

General_Comments: You must realise that to-day we have no Politician with vision and foresight a Bureaucracy which will not give any support to new ideas and certainly will not advance those ideas to a Minister for fear of having to make a difficult decision of which they are incapable.
I wish you every success but you have a big battle ahead of you.
The use of underground water must be stopped.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 12:18 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 14:18:06

Name: R J

Suburb_Town: ATTADALE

Postcode: 6156

Phone:

Age: 55

Occupation: CIVIL ENGINEER

Proposal_Comments: I am appauled at the lack of political backbone displayed by WaterCorp in relation to provision of a sustainable water supply for Perth. The focus on high energy solutions such as desalination in a period when all residents and public agencies should be focusing on limiting greenhouse gas emmisions is irresponsible in the extreme. To be even considering such capital intensive stop gap measures before fully exploring efficiency measures indicates to me that WaterCorp cannot be trusted with sustainable planning for WA's most important natural resource. Perth residents still enjoy effectively no water restrictions compared to the rest of the Australia, most of whom are on level 4-6 water restrictions. Letters to the editor in the West clearly indicate to me that there is strong public support for serious water restrictions in Perth and southern regions and even industry has been asking for a review of tarrifs and allocations. The fact that WaterCorp would not be exploring these possibilities and the excellent proposal that you have been promoting for the past couple of years before risking the unique environment of the south west by tapping the SW Yarragadee, reeks of arrogance and policy by public opinion.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 11:18 AM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 13:18:07

Name: C M

Suburb_Town: Willetton

Postcode: 6155

Phone:

Age: 28

Occupation: Landscape Maintenance Supervisor

Proposal_Comments: Excellent and smart idea i hope this project gets of the ground so that my children and my grand children dont have to pay for the mistakes of this government.

General_Comments: It scares me that my hard earned money is being wasted by these morons. I cant believe that these people (The Government) have been to University and have the brain capacity of a Gnat, why wont they listen to people that have a brain and know what they are talking about.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Saturday, 5 May 2007 9:26 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Saturday, May 5, 2007 at 23:26:31

Name: A V

Suburb_Town: Collie

Postcode: 6225

Phone:

Age: 69

Occupation: Retired

Proposal_Comments:

General_Comments: This project needs our full support. I don't believe the Yaragadee Project will be vialble in the long run. As draining this source will eventually lower the water table. This has been well proven in the Perth Basin, where all the main supplies are at present.
The Wellington Dam has a very stable profile, as regards the quantity of water.
The Wellington Dam is there, and everything in this region should be fully utilised.
The fact that it is located in an elevated area, is a real bonus, as regards transportation and desalination concerned.
You have my full support.
Thank you
A V

COLLIE - W.A. - 6225

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Saturday, 5 May 2007 2:39 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Saturday, May 5, 2007 at 16:39:51

Name: G G

Suburb_Town: Meckering

Postcode: 6405

Phone:

Age: 58

Occupation: self employed upholsterer

Proposal_Comments: I would like to propose that you set up a petition on your web site for interested people to sign just as you would a paper petition.

General_Comments: This is a fantastic idea. It could be used all over Australia, not just WA. Take for instance the furore over in Maryborough at the moment. The QLD State government wants to dam the Mary River just to supply Brisbane with water.
Plus the furore over east with the farmers being denied water for irigation on the Murray / Darling scheme, again to keep the water for the city people.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Saturday, 5 May 2007 8:25 AM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Saturday, May 5, 2007 at 10:25:35

Name: J S

Suburb_Town: AUSTRALIND

Postcode: 6233

Phone:

Age: 58

Occupation: Retired Engineering Maintenance Planner

Proposal_Comments: I am impressed by both of your website Project information overviews and astonished by the "head in the sand" attitude exhibited by the Government and the Water Corporation in regard to this project and its complementary project involving the Hydropower scheme / Salinity Solution.
I was only made aware of their "secret" existence via the feature advert in the West Magazine today (5/5/2007).
What are their objections / arguments or hidden agenda's ?

Well done so far - Who and how do we lobby to assist ?

General_Comments: This is truly worthy of C.Y.O'Connors praise

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritech-hydropower.com.au>
Sent: Tuesday, 1 May 2007 6:53 AM
Subject: Agritech Hydropower Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Tuesday, May 1, 2007 at 08:53:10

Name: L N

suburb: South Fremantle

postcode: 6162

phone:

age: 31

occupation: Project Engineer

proposal_comments: I would very much like to support your action in regards to both of the schemes you have proposed for smartwater and hydropower. I am impressed by the vision, in that it is renewable, sustainable, efficient and intellegent. It will continue to create infrastrucutre and jobs for WA, and this process could then be used more commonly across Austrlalia in other areas that have similar issues.

general_comments: I would be interested in future correspondence, and if possible assist in the mobilisation of these projects.

agree: agree

Submit: Submit

Agritech Smartwater

From: "J B " <
To: <agritechsmartwater@bigpond.com>
Sent: Tuesday, 8 May 2007 10:29 AM
Attach: ATT02100.htm; image001.jpg
Subject: Water Crisis Solution

To Whom This May Concern,

I have viewed your water crisis solution and believe that it is an extremely innovative solution to greatly assisting in managing our current and also assisting in the long term water issues. Not only does it assist with utilising saline water but also contributes clean energy to both areas of the solution.

You have definitely turned my interest to this project.

You are acting very positively towards a growing issue not only to the water crisis, but also to clean electricity generation.

Our governments both state and federal seem to be dragging their feet on both of these issues.

Let's hope we can go forward with these solutions.

Keep up the good work.

Regards,

J B

Operations Manager

Welshpool

WA 6986

Ph:

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Monday, 7 May 2007 10:11 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Tuesday, May 8, 2007 at 00:11:11

Name: V H

Suburb_Town: Mundijong

Postcode: 6123

Phone:

Age: 56

Occupation: mental health nurse

General_Comments: I have a farming back ground and have seen first hand the continuing degradation, not only in W.A. but in both NSW and Victoria. Something radical needs to be done to reverse this situation.

I have studied both of your web sites and are very excited with what I have seen. I don't know much about the technical side of the project but just by listening and speaking with other people this all sounds very feasible.

I have bought your advertisement to the attention of my friends and colleagues and have encouraged them to respond positively as I have done.

All the best
V H

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritech-hydropower.com.au>
Sent: Monday, 7 May 2007 7:56 PM
Subject: Agritech Hydropower Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Monday, May 7, 2007 at 21:56:00

Name: J J

suburb: Katanning W.A.

postcode: 6317

phone:

age: 63

occupation: retired

proposal_comments: Well. I am impressed.
At long last there is some sanity being put forward.

I have spent at least one third of my life working in the country.
I have travveled from Geraldton coast to Paynes find, down to albany , Kalgoorlie, Esperance and most points in between.
Over the years, I have observed to degardation of our country. The increase in salt damaged are's has been slow but certain.
Having a break of 20 years away from the country, I am dismayed from what I now see.

I have had the privilage of befriending a well known scientist and chemist, who had been very involed in water conservation both here and overseas. he had developed a water processing method based on Ultraviolet light, electrical stimulation and non R.O. system which allowed for full flow of cleaned water at low pressure.
Unfortunately, he has passed away.
However, his son has his technology. I would love to see his invention and technology to be used in your project as it would greatly enhance it.

general_comments: As far as funding goes, have you considered hiring some experts in creating I.P.O.'s.
I can put you on to a group if you need to.

very best wishes for your success.

J

agree: agree

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Monday, 7 May 2007 2:42 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Monday, May 7, 2007 at 16:42:59

Name: i p

Suburb_Town: bedfordale

Postcode: 6112

Age: 42

Occupation: sales Manager

Proposal_Comments: I cannot believe any sane government would not give this proposal its full attention????

What do the liberals and greens think of it - Labour are obviously a waste of space but you may be able to get a change if the opposition and greenies got on side?

General_Comments: The idea looks "too good to be true" but all sounds 100% feasible given the knowledge I do have. It is hard to understand the governments misguided "push" for inferior and more costly (environmentally and financially) alternatives and their total disregard for this proposal. I can only guess that it somehow benefits some obscure union that supports them, some politicians mate or at least creating a few more useless jobs ion the public service.
I can't even get water from the metro system where I live (but can see Wungong dam from the road I live on). I have to pay $12.00 k/l but I still strongly object to my taxes being wasted on inefficeient and costly process such as desalination or worse still, tapping the yaragadee which I believe is fragile at best. You do not need to be an Einstein to see the damage alraedy done by damming every decent watercourse in Perth and sucking countless litres from the ground foran overpopulated coastal plain.

GOOD LUCK!!!!!

Regards
I

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Monday, 7 May 2007 1:43 PM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Monday, May 7, 2007 at 15:43:12

Name: D & D F

Suburb_Town: Dudley Park

Postcode: 6210

Phone:

Age: 72 & 77

Occupation: Retired

Proposal_Comments: Having read the details of the proposal to use the scour water from the Wellington Dam we are amazed that such a solution is available, practical and affordable. This proposal is the most logical answer to the very urgent and increasing need for water for our growing population.
Congratulations on your most informative website. We will do our best promote this proposal omong our friends.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: "M H " <>
To: <agritechsmartwater@bigpond.com>
Sent: Wednesday, 9 May 2007 12:16 PM
Attach: ATT02121.htm
Subject: The ultimate water crises solution

I think this is a fantastic proposal and i support it 100%.
Unfortunately for such a proposal to come to fruition requires visionary politicians.The day that you find visionary politicians anywhere in this country will be the same day that you see little green men walking up and down the Hay St Mall.
However i wish you ultimate success in this endeavour.
N H

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 10:45 AM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 12:45:34

Name: T F

Suburb_Town: Collie

Postcode: 6225

Phone:

Age: 22

Occupation: Field Officer - Dept. Environment and Conservation

General_Comments: This is an excellent proposal. With a proposal like this, and with the clear advantages compared to the Yarragadee and RO plant, there should be no other option. I totally diossaprove of the hugh waste of public monies that could be desperately spent on other ventures.

agree_to_publish: checkbox

Submit: Submit

Agritech Smartwater

From: < >
To: <survey@agritechsmartwater.com.au>
Sent: Sunday, 6 May 2007 10:44 AM
Subject: Agritech Smartwater Feedback Form

Below is the result of your feedback form. It was submitted by
( ) on Sunday, May 6, 2007 at 12:44:42

Name: A E

Suburb_Town: Geraldton

Phone:

Age: 62

Occupation: Pump & Irrigation Consultant.

Proposal_Comments: I have been hearing and reading about your propasal for some time and like the concept very much. Spotted your full page add in the West Magizine and just thought I would add my support for what its worth. It is the most sensible solution that I have seen to Perths water problem to date and the only reason you are not getting any support from the Water Athority is that the dum bastards didn,t think of it themselves. I have been in the water industry for 40 years and have picked up some knowledge about what you can and can,t economically achieve with moving water and your concept makes more sense than the alternatives. I wish you every success. A E . G N Pumps.

agree_to_publish: checkbox

Submit: Submit

Attachment 5.

Letter from Member of Public to the Premier 4 June 2007

June 4, 2007

Dear Mr Carpenter,

I have just finished reading the excerpt from Hansard detailing your frivolous replies to the Leader of the Opposition's questions regarding the Agritech Smartwater proposal to use scour water from Wellington Dam to supplement metropolitan water supplies. I am writing to say that I have been absolutely appalled by the Government's response to this proposal. I cannot for the life of me understand what we have to lose by accepting Agritech's plans – as far as I can see, they are not asking for the government to pay for their plant and the water would be much cheaper than that produced by your very expensive ocean water desalination plants. What is disappointing with regard to your attitude to this project is that you don't seem to have a clear understanding of the issues. For instance, you said to Mr Omedei that 'the presence of other chemicals in the water' is one of the reasons given by the Water Corp for regarding the project as unviable. Surely, passing the scour water through a Reverse Osmosis process (which is part of the plan) will take care of any 'other chemicals'? Again, the Water Corp has advised you that 'human and other activity *in the catchment area*' is a problem – but this project is only concerned with the outlet area. Is it possible that you are confusing this with Agritech's other project ie the one concerned with collecting saline water in the wheatbelt *catchment* area? Also, Agritech has provided us with a graph which quite clearly shows that it is the decline in catchment efficiency (apparently due to a change in management policy) rather than rainfall volume that is responsible for the low water levels in our dams. The Water Corp obviously has not shown you this graph. (I wonder why not?) I attach a copy for your education.

As for your claim that the new desalination plants that the Water Corp wants to build would not be very costly in terms of CO2 emissions – it is a fantasy to imagine that geothermal power would be able to generate the electricity needed to run them, at least in the foreseeable future. I had some shares in Geodynamics Ltd, a company which is trying to produce electricity from the hot fractured rocks found in the Cooper Basin in South Australia. I sold my shares once it became obvious to me that the technology is in its infancy and that the project is light years away from commercial viability.

It is a great shame that the government seems to be acting in such a financially irresponsible way in this matter as your plans to upgrade the rest of the state's infrastructure appear to be sound. Perhaps the surplus funds generated by the mining boom have gone to your heads. On the other hand, I should not be surprised that you, personally, have seriously underestimated the public's interest in this proposal as you have demonstrated poor judgement on a number of occasions in the short time that you have been Premier. We haven't forgotten the way you insisted on appointing a criminal as Minister of Police, you know!

I have never voted Liberal in my life before, but I intend to at the next election. I have been telling everyone who will listen to me about this situation and I hope to convince some of them to follow my example – especially those who, like me, live in your electorate.

Yours sincerely,

Anne

Attachment 6.

Letter from Premier to Member of Public 15 June 2007

PARLIAMENT OF WESTERN AUSTRALIA
LEGISLATIVE ASSEMBLY

ALAN J. CARPENTER, M.L.A.
MEMBER FOR WILLAGEE

Shop 13,
Simms Road
Hamilton Hill WA 6163

Telephone Numbers:
Office: (08) 9331 8015
Fax: (08) 9331 8017
acarpenter@mp.wa.gov.au

Ms Anne

Dear Ms

Thank you for your letter of the 4th of June 2007 outlining your concerns regarding Agritech Smartwater and their proposal to use scour water from Wellington Dam.

The Office of the Minister for Water Resources has provided further information on this matter and based on this information I believe the Government's current position regarding this proposal is appropriate.

The State is currently assessing a number of options for the Wellington reservoir and Collie River Basin, including a submission from Agritech. A report on these options will soon be released. The independent steering committee set up to assess these options received very limited information from Agritech. The Government has been asking for more information from Agritech for many years but has not been able to obtain this.

From the information available on the Agritech website (30 April 2007), which varies from the submission to the Government and changes regularly, and from recent advertisements placed in *The West Australian*, this proposal is designed to take 45 GL of saline scour water from Wellington Dam, by pipeline, vertically down the Darling Scarp to Brunswick (approx. 20kms). At Brunswick, the water is to be treated by a reverse osmosis plant and then piped 18kms to Harvey and connected to the pipeline supplying Perth. The proposal also includes a component of saline water from a drainage concept in the Blackwood River Basin. Details on how this would be undertaken are vague.

Many of the concepts drawn by Agritech are not new to the Government and have been known and considered as options over the last thirty years. Assessment of Agritech's proposal indicate that there are doubts about the technical validity of the concepts. It is also not clear where the volume of water (45GL) outlined will be sourced from as the reservoir is fully allocated and scour volumes are projected to decrease significantly as salt water entering Wellington Dam is diverted, tree plantations lower salty groundwater entering streams and on-farm management of salt affected land improves.

As Agritech's proposal does not deliver any salinity improvement to Wellington reservoir and therefore does not provide any benefits to Collie District Irrigators, it is considered unlikely that the irrigators would be prepared to trade any of their current 68 GL licence for this option. Therefore this option must be compared with other potential water sources for the Collie that do cover the issues outlined as well as other options for the Integrated Water Supply System, such as desalination. It is this Government's estimation, pending more detailed costing from Agritech, that the current proposal cannot compete with a similar size seawater desalination plant located closer to Perth in cost or would be in a position to be implemented quicker than a second desalination unit.

Thank you for raising this matter with me.

Yours sincerely

Alan Carpenter
MEMBER FOR WILLAGEE

15 June 2007

Attachment 7.

Letter from John Kobelke to a Member of the Public 28 July 2007

Government of Western Australia

Hon John Kobelke BSc DipEd JP MLA

Minister for Police and Emergency Services; Community Safety; Water Resources; Sport and Recreation
Leader of the House in the Legislative Assembly

Our Ref: 14-17221

Dear Mr

AGRITECH SMARTWATER PROPOSAL

Thank you for your letter dated 9 July 2007 regarding Agritech's Smartwater proposal for Wellington Dam scour water to drive and supply a desalination plant.

Collie-Wellington is a realistic source of water for Perth, but more work needs to be done on salinity recovery, water treatment and water sharing. Salinity reduction is key to any improvement in irrigation, providing water to industry, or to develop drinking water. The Collie-Wellington Committee has come up with recommendations which I am endorsing the Department of Water to implement.

The Agritech proposal was reviewed by the Committee and found to have significant unresolved issues including that the:

1. Total costs are high given the need to include integration into the existing water supply scheme and saline disposal;
2. The proposal does not resolve irrigation salinity issues nor does it improve the salinity in the river at any stage; and
3. The source of water for the proposal is scour water and varies from year to year in quantity and quality, and will decrease significantly in volume as the dam becomes fresher due to the diversion of salt above the dam.

It should be noted that the recommended options by the Collie-Wellington Committee include innovative approaches, such as using the water pressure from the dam to generate electricity to power the water treatment plant.

Thank you for your inquiry.

Yours sincerely

John Kobelke

JOHN KOBELKE MLA
MINISTER FOR WATER RESOURCES

25 JUL 2007

20th Floor, 197 St Georges Terrace, Perth, Western Australia 6000 Telephone (08) 9222 9211 Facsimile (08) 9321 6003
Email: john-kobelke@dpc.wa.gov.au Internet: www.ministers.wa.gov.au/kobelke

Attachment 8.

Extract from Water Source Options Committee May 2007

10. Appendices

Appendix 1. Public Submissions

Public Submissions

Public submissions were received from:

Agritech Smartwater

Aquaculture Council of Western Australia

Bunbury Wellington Economic Alliance

Centre of Excellence for Sustainable Mine Lakes,

Curtin University of Technology

Collie Water

Griffin Coal

Harvey Water

Member for Collie-Wellington

Verve Energy

Water Corporation

Preliminary Assessment of Submissions

A preliminary proposal to treat the 14 GL of diversion water by reverse osmosis and deliver the potable output into Harris Dam was presented to the Steering Committee. The proposal indicated a capital cost of $70M would be applicable and that the delivered price of water would be 140 c/kL. On the surface, the above appears attractive compared with equivalent prices and capital costs determined by the Committee of $164M and 204 c/kL respectively. However, part of the difference could be due to the fact that the costs of diversion are included in the Committee's estimated costs.

A second proposal presented to the Steering Committee, promoting a scheme involving the desalination of saline groundwater drained from the eastern catchment and beyond, was comprehensive and involved a number of innovative elements.

This proposal included:

- Saline groundwater being collected from the eastern catchment and beyond using a network of open canals.
- Part of the water collected being channelled through a brackish water reverse osmosis plant, the remainder being piped to the ocean.
- The desalination plant was driven by hydrostatic pressure created by difference in elevation between the top of the Darling Scarp and Brunswick, where the reverse osmosis plant was located.
- While the canals are being built and until they became fully operational, the plant would use Wellington Dam water as its input.

Many elements of the scheme fall outside this investigation's Terms of Reference. Moreover, given its complexity, much more time would be needed than that available to complete this investigation, as a proper assessment of the engineering and financial feasibility of the main scheme is required. The desalinated water under this proposal is essentially a by-product of the canal drainage scheme and as such its feasibility stands or falls with the main scheme.

Attachment 9.

Press Release Minister for Water announcing Committee 18 Oct 2006

Government of Western Australia
Media Statement

Notification Service
Statements Home Page

Statement Released: 18-Oct-2006
Portfolio: Water Resources

Future of Collie-Wellington Basin under the spotlight

18/10/06

Proposed future uses of the Collie River catchment and Wellington Dam will be investigated by a steering committee

Water Resources Minister John Kobelke today named Ross Kelly, chairman of the Water Reform Implementation Committee, as the chair of the five-person committee.

"Developing the water resource in the Collie-Wellington Basin offers potentially a unique set of benefits to the community," Mr Kobelke said.

"I have set up the steering committee and asked it to take an innovative approach to the conservation and management of a substantial water source, previously deemed unsuitable for drinking water because of salinity problems."

Wellington Dam is the biggest reservoir in the South-West but its salinity has meant it is not suitable for drinking water. Along with other water sources in the Collie Basin, the dam offers a big potential water resource.

The committee will be responsible for considering a range of initiatives that could result in sustainable irrigation, regional industrial water supply and 50 billion litres of drinking water that might be used as part of the integrated water system.

Initial estimates suggest the earliest water could be delivered to Perth from this potential source is 2013.

Joining Mr Kelly will be:

- Simon Holthouse, chair of the Collie Basin Planning and Management Committee and former chair of the WA Planning Commission;
- Verity Allan, chair of the Water and Rivers Commission Board;
- Paul Frewer, director general of the Department of Water; and
- David Smith, executive director Economic Department of Treasury and Finance.

The committee will provide a report to the Minister by Christmas, giving advice on the future uses for the dam.

The committee will provide advice on the:

- best productive uses of water in the Collie Basin, taking into account all potential and existing users of the water resource at the local and State level;
- range of water source development options in the Collie Basin, the outstanding

issues and uncertainties associated with each and the timeframe required for the option to begin delivering water;
- best prioritisation of projects to deliver water to required standards. When determining the priority, the committee will consider issues including but not limited to:

- the highest value use of the water;
- the cost-effectiveness of different water use options;
- how to best integrate projects to optimise the use of the resource;
- timelines for developing each option to optimise the integration; and
- balancing the social, economic and environmental outcomes.

- preferred approach based on timing, hydrological, economic, social and environmental assessments;
- most appropriate method of assessment for private and public sector options. This does not extend to recommending a preferred supplier(s); and
- most appropriate approaches to engage proponents for developing water source options, taking into account that one proponent may not be responsible for all the different infrastructure and development aspects of a project.

The Draft State Water Strategy, released this week by Mr Kobelke, highlighted significant programs to support water conservation and reuse. It also looked to new sources and developments such as Wellington Dam.

Minister's office - 9222 9211

Comment Back to Statements list

Attachment 10.

Extract from Hansard May 2007

AGRITECH SMARTWATER AND SOUTHERN CROSS WATER AND INFRASTRUCTURE CORPORATION PTY LTD

243. Mr P.D. OMODEI to the Premier:

Given that the government has made a decision to build a second 45-gigalitre desalination plant at Binningup at a cost of $1 billion -

(1) Will the government now investigate the Agritech Smartwater project and its offer to build, own and operate a 45-gigalitre a year reverse osmosis plant using water from Wellington Dam and to sell it to the Water Corporation at 65c a kilolitre?

(2) Will the government support a proposal submitted by Southern Cross Water and Infrastructure Corporation Pty Ltd to proceed with an Environmental Protection Authority impact study on its proposal to allow construction of a dam on the Brunswick River; and, if not, why not?

Mr A.J. CARPENTER replied:

(1)-(2) I am not familiar with the second proposal, but I hesitate at the possibility of building another dam. Did the Leader of the Opposition say "build a dam on the Brunswick River"? He supports that, does he?

Mr P.D. Omodei: Not necessarily. I am asking you whether you will investigate that.

Several members interjected.

The SPEAKER: Members!

Mr A.J. CARPENTER: I thought I just heard some commentary; intrinsic in the question I thought I heard a suggestion that that was a good proposition.

Mr P.D. Omodei: No, I said, "Will you investigate it?"

Mr A.J. CARPENTER: So, it is okay to dam the Fitzroy River, according to the Leader of the Opposition, but why put a proposition to me that we should investigate the damming of the Brunswick River if he is not even prepared to say it is worth considering?

Mr P.D. Omodei: It is on one of the Water Corporation's lists.

Mr A.J. CARPENTER: The Leader of the Opposition knows that from his time -

Mr P.D. Omodei: Why is it on the Water Corporation's list?

Mr A.J. CARPENTER: I do not think there is much to be gained by damming more rivers in the south west. I think the question tends to indicate that the Leader of the Opposition has not cottoned on to what is happening. It has stopped raining in the south west of Western Australia**. The rain no longer falls from the sky in sufficient quantities to fill the dams to fill the pipes to fill the cups for people to drink. Something quite profound has happened in the south west of Western Australia. It has stopped raining to the extent that it used to rain when we got 90 per cent of our drinking water from**

the dams. There is not much point in building more dams if it does not rain. The only way we can fill them is to pump water into them from another source - groundwater or the desalination project. I think, and I might have misread the reaction, the overwhelming majority of people strongly support what we have done in announcing the desalination project. I think so; it is possible I have misread it but we will find out.

In relation to the Wellington Dam option, the Water Corporation will continue to have discussions and investigate with possible proponents. I hope the Leader of the Opposition is not pushing a private business venture here. Is he?

Mr P.D. Omodei: Are you having a feasibility study into private water or not?

Mr A.J. CARPENTER: I hope the Leader of the Opposition is not using his parliamentary position to promote a particular private venture. Is he?

Several members interjected.

Mr A.J. CARPENTER: Does the Leader of the Opposition have any relationship or connection with the proponents?

Mr P.D. Omodei: It is unbecoming of you, Premier.

Mr T. Buswell: Did you ever use your parliamentary position to do anything like that?

The SPEAKER: Order, members!

Mr A.J. CARPENTER: The analysis of the Wellington Dam option will go on. The Water Corporation's advice to me -

Mr T. Buswell interjected.

The SPEAKER: Member for Vasse!

Mr A.J. CARPENTER: The Water Corporation's advice to me was that the Wellington Dam option was a viable option, but 2015 was as early as it was likely to be before that could be brought on stream, for a variety of reasons - primarily, of course, the water quality -

Mr M.J. Birney: That is the private business option.

The SPEAKER: Order, member for Kalgoorlie!

Mr A.J. CARPENTER: - the presence of other chemicals in the water and human and other activity in the catchment area, which would make an earlier date for tapping that water unviable. It is under consideration by the Water Corporation.

AGRITECH SMARTWATER AND SOUTHERN CROSS WATER AND INFRASTRUCTURE CORPORATION PTY LTD

244. Mr P.D. OMODEI to the Premier:

I have a supplementary question. Will the government investigate both of the proposals that I mentioned?

Mr A.J. CARPENTER replied:

Let me ask this question - I think I have answered the Wellington Dam aspect: is the Leader of the Opposition suggesting that if he was in government, he would be pursuing a dam on the Brunswick River?

Mr P.D. Omodei: The person who has made the proposal has written to your minister and asked for a licence to take water from the Brunswick River and for an environmental impact study. Will you investigate it?

Mr A.J. CARPENTER: This is very interesting.

Mr P.D. Omodei: I am not saying whether I am supporting it or not; I am asking: will you investigate it?

Mr A.J. CARPENTER: I think the good citizens of the south west would be very interested to know that the Leader of the Opposition is extremely interested in damming the Brunswick River. What about the Denmark River? Is he going to dam that as well?

Mr P.D. Omodei: There is a dam site on the Denmark. There is a dam site on the Warren. There is a dam site on the Donnelly. There is a dam site on the Barlee. Will you investigate them? Your departments have been investigating a dam on the Barlee and the Warren.

Mr A.J. CARPENTER: The Leader of the Opposition is asking whether I am going to investigate it. It sounds to me as though the Leader of the Opposition is digging himself -

Several members interjected.

The SPEAKER: Order, members!

Mr A.J. CARPENTER: It is probable that this type of behaviour would not be allowed at Guildford Grammar School. I fear the Leader of the Opposition is digging himself a watery grave by promoting a series of more dams on Western Australia's rivers, including those in the south west. The days of damming rivers in the south west are, I fear, over.