DRAFT

Water Crisis in the Coal River Valley

Preliminary Business Case

Prepared for

Coal River Products Association Inc.

by

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agricultural & resource management consulting

Contents

Authority

SEIS Business Case Draft 2 Issued To	Transmission Method	Date	Copies	Authorised By
Coal River Products Association	Email	3/12/2008	1	

Acknowledgements

The assistance of the following persons and organisations in the preparation of this report is greatfully acknowledged.

Coal River Products Association

Tasmanian Irrigation Schemes Pty Ltd

Department of Economic Development and Tourism

Chris Thompson (Agricultural Resource Management)

Hydro Tasmania Consulting

Armstrong Agricultural Services (now AK Consultants)

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Disclaimer

1. Executive Summary

The problems

1. This South-East Irrigation district of Tasmania has a reliable climate to produce a wide range of high quality, temperate fruit and vegetables. Demand for water in the district is increasing.
2. However, the Craigbourne Dam is dry. The water situation has escalated to the point where the short term outlook for irrigators is critical. The viability of many multi-million dollar and other investments is directly threatened as well as the employment security of hundreds of people.
3. This includes well known Tasmanian "iconic" businesses producing stone fruits, wine grapes and salad mix products. Large companies such as Hardys (wine grapes) and Simplot (processing peas) current rely on the district for product to achieve their procurement and processing objectives. This is now at risk.
4. Prospective investors have already turned away from the district because of the water situation.
5. Some operators are already managing vines and trees for survival rather than production. Such practices are reminiscent of those adopted by growers in the Murray-Darling basin over the past two years.
6. Over the past 80 years, the average annual rainfall in all three areas has reduced by around 30%. This has had a profound effect on runoff and natural stream flows. A recent modelling study of the Coal catchment determined that available flows down the catchment for the 10-year period 1998-2007 were on average about 48% lower than that of the 1900-2003 period.
7. As levels in the Craigbourne Dam have reduced, the system has shown an increasing inability to maintain electrical conductivities within manageable limits. Water in the Dam has been Class 3 (>800 µs/cm) for most of the past year. EC's at the Richmond Weir are much higher and have reached Class 4 levels (>2,300 µs/cm) on occasions. Class 3 water is sufficient to reduce yield of intolerant crops after prolonged use. Class 4 water can reduce yields of susceptible crops such as apricots by as much as 25%.
8. Continued usage of high EC water is non-sustainable in the district.
9. There is no "do nothing" solution to these problems.
10. There is potential to further boost the contribution of agriculture to the Tasmanian economy by developing new areas in the South-East such as Sorell-Orielton and the Broadmarsh district if sufficient water can be found.

Cont..

The solutions

11. Potential solutions to the water availability and quality crisis have been identified in the South East Irrigation Scheme, particularly Stage 1 of the Scheme.
12. A solution to provide temporary and emergency water into the Coal Valley involves an on-ground pipeline connecting into Hobart Water's existing infrastructure at Granton and routing the pipeline partly along the existing railway line to deliver water into the Coal River at Fingerpost Road. This would include a connection into the emergency pipeline constructed during the winter of 2008. The estimated cost of this pipeline is $4.5 million, including $3.4 million for the pipe. Once a more permanent solution is built, much of the pipe costs would be recoverable for use in other water projects.
13. A more permanent "river replacement" solution involves the construction of a pipeline from "Daisy Banks" Dam to "Ferniehurst" where a suitably sized dam already exists and which has scope for enlargement to hold at least 4,000 ML. A possible alternative is a dam site on "Wattle Banks". The cost of the "Ferniehurst" option is estimated at around $5.5 million. The cost of the "Wattle Banks" option is slightly cheaper at around $4.5 million but the site has capacity to store only 1,500 ML.
14. For this option to be effective, Hobart Water would need to upgrade its infrastructure to enable the line to deliver a sufficient volume of water.
15. Another possible "river replacement" option would be to upgrade the Granton pipeline into a permanent system and deliver the water directly to "Ferniehurst". No capital costs have been estimated for this option at this stage.
16. It is recommended that Tasmanian Irrigation Schemes Pty Ltd applies to the State Government to make available sufficient funding to enable an immediate start on the laying of the temporary pipeline. It is expected that this pipeline would stay in place for two seasons during which time a more permanent solution to the water supply problem in the South-East is found. Funds could possibly be sourced from the Water Infrastructure Fund. Alternatively, Commonwealth sources could be pursued on the basis that the project will deliver water of superior quality and produce better environmental outcomes.
17. It is also recommended that work begins immediately on a "river replacement" strategy by confirming the feasibility of installing a pipeline from "Daisy Banks" to a dam site identified on "Ferniehurst" or possibly "Wattle Banks". Funding for this project could also be sourced from the State Water Infrastructure Fund.
18. To facilitate the "Daisy Banks" to Ferniehurst" or "Wattle Banks" development and the possible alternative route from Granton, it is recommended that the project be added to the Tasmanian Irrigation Development Board's priority list.
19. It is further recommended that the Government be made aware of the urgency of making an immediate start on both the temporary and permanent projects described in this report and outlined in more detail in reports recently completed by Agricultural Resource Management et al.

2. Background

The South-East Irrigation District is located within the Coal River Valley just east of Hobart. The area has a very favourable climate for the production of cool temperate crops, is close to population centres for sourcing labour and is adjacent to air, sea, road and rail transport infrastructure. Another important advantage is that the district is centred around the historic tourist town of Richmond.

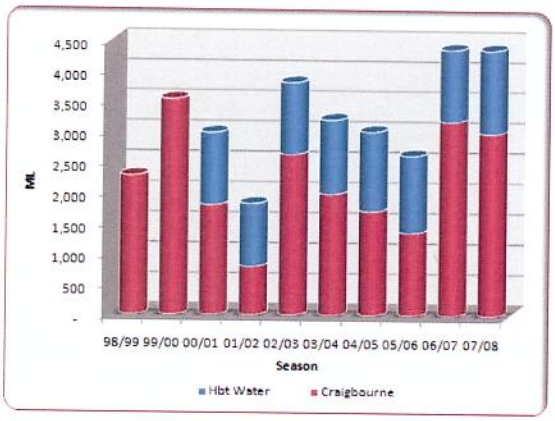
The Craigbourne Dam was constructed in 1985-86 to provide water to the Valley. Originally built to hold 12,500 ML of water, the Dam was designed to release 5,400 ML per annum which, at 65% efficiency, would make available 3,500 ML of water to be pumped onto farms in the district.

Stage 2 of the Scheme was completed 1991. This extended the Scheme by pumping water from Richmond to Cambridge through underground pipes. The Scheme was supplemented in 2000-01 following the construction of the "Daisy Banks" Dam which enabled water provided by Hobart Water to be linked into Stage 2 under gravity.

Initial take-up of water was relatively slow. In 1992, the Coal River Products Association (CRPA) commissioned Davey & Maynard to investigate the opportunities available to farmers in the South-East Irrigation district. The nine-volume Blundstone Study report highlighted the climatic advantages and market opportunities of the area and recommended a switch away from the more traditional dryland enterprises to more intensive horticultural enterprises, such as stone fruits, wine grapes, fresh vegetables, selected seed crops and others. Since then, the district has experienced a rapid development of these and other crops, all of which heavily rely on water from the Dam. Demand for water has increased over the past 10 years[1] (Figure 1) and at the same time, the district has developed a reputation for quality, seasonality and reliability.

Figure 1: Water Delivered

Season	Craigbourne (ML)	Hobart Water (ML)	Total Delivered (ML)
98/99	2,280	-	2,280
99/00	3,536	-	3,536
00/01	1,807	1,188	2,995
01/02	796	1,035	1,831
02/03	2,640	1,182	3,822
03/04	1,991	1,220	3,211
04/05	1,710	1,310	3,020
05/06	1,361	1,266	2,627
06/07	3,189	1,190	4,379
07/08	2,995	1,380	4,375



Developments within the SEIS have been so dynamic that the area has been chosen by researchers at the Australian Innovation Research Centre at the University of Tasmania to identify factors and activities that have shaped the economic development of the region[2]. The study aims to determine factors and activities that create a basis for innovation and sustainable regional development, and to identify circumstances in which government-provided infrastructure (Craigbourne Dam) can promote a dynamic response from businesses and industry.

The problem is that Craigbourne Dam has only occasionally been full and is now effectively dry, just on the verge of a summer season. Stage 1 irrigators will shortly be reduced to 0% of their licence allocations. What little water there is has questionable quality and is unsuitable for prolonged application to many crops. In the

[1] Source: Tasmanian Irrigation Schemes Pty Ltd
[2] Coal River Innovation Study – Development of a Regional Innovation Capacity. Prepared for CRPA by Alexandra Ledja at the Australian Innovation Research Centre, University of Tasmania

past, occasional flushing flows and higher levels in the Dam have enabled water quality to be maintained at manageable levels.

The 2008-09 State budget allocated $80 million towards a Water Infrastructure Fund (WIF) for Tasmania. This was boosted to a total of $220 million following the provision of Commonwealth funds. The WIF is targeted towards new irrigation works to assist agricultural industries in Tasmanian achieve its 10-year growth forecasts to the year 2015.

In March 2008, the State Government established the Tasmanian Irrigation Development Board (TIDB) to provide the high level drive and governance needed to deliver eleven water infrastructure projects in different locations throughout Tasmania (pictured). These projects are concentrated in the North-West, North-East and Midlands areas of Tasmania.

However, surprisingly, the TIDB does not have the water crisis in the South-East on its list of priority projects.

During the winter of 2008 and in response to the critically low water levels in the Dam, the Rivers and Water Supply Commission funded above-ground works to provide emergency water to part of the Coal Valley. Bridging pipelines were installed to join existing pipelines to supply off-peak water from Daisy Bank Dam to near Campania. Whilst this assisted a number of irrigators, it still left many operations short of water for the 2008-09 growing season.

This situation has now progressed to the point where the immediate and short term outlook for the South-East is critical. The viability of many multi-million dollar and other investments is directly threatened as well as the employment security of hundreds of people. This includes well known Tasmanian "icons" producing stone fruits, wine grapes and salad mix products. Companies such as Hardys (wine grapes) and Simplot (processing peas) current rely on product from the district to achieve their procurement and strategic plans. This is now at risk. New investors will be discouraged from committing to the region. Already, prospective investors have turned away from the district because of the water situation.

The risk profile of new developments has changed from older more traditional activities and now irrigators are reliant on a regular supply of good quality water. Due to the water outlook for the coming summer, some operators are already managing vines and trees for survival rather than production. Such practices are reminiscent of those adopted by growers in the Murray-Darling basin over the past two years. The CRPA has estimated that the value of the "lost" production at around $9 million in 2008-09 alone.

The medium and longer term outlook may indeed be much worse if climate change predictions of reduced rainfall, higher temperatures and increased evapotranspiration are realised.

In response to this situation, the CRPA has commissioned Davey & Maynard to prepare a preliminary Business Case to;

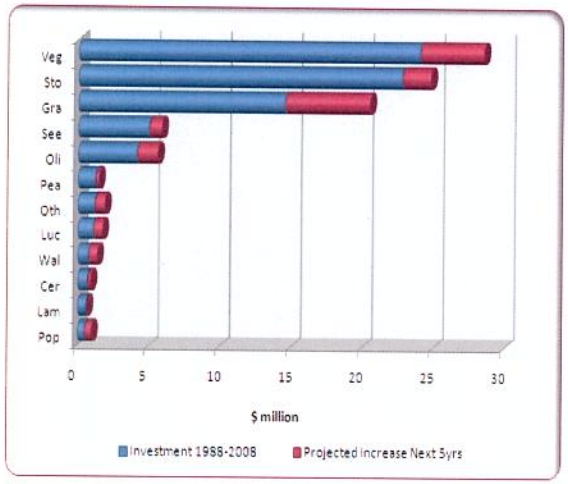
1. Highlight the immediate crisis facing established businesses in the South-East,
2. Build a case to support an application to the WIF and other funds for works to enhance the supply and quality of irrigation water to users in the South-East Irrigation district in line with studies recently completed by Agricultural Resource Management et al.

2.1 Investment in the South-East

A survey undertaken by the CRPA in November 2008 highlighted the significant contribution of intensive agricultural activity in the South-East to the Tasmanian economy. Full details are included in Attachment 11.2. Figure 2 illustrates that around $76 million has been invested in the area over the past 20 years. Stone fruit and fresh vegetables together comprise over 60% of the total. Wine grapes represent another 19%. Over the next five years, existing investors are projected to pump an additional $18 million with wine grapes and fresh vegetables accounting for nearly 60% of the increase.

Figure 2: Investment

Activity	Investment 1988-2008 ($ million)	Increase Next 5 Yrs ($ million)	Increase (%)
Fresh Veg	22.75	4.50	19%
Stone Fruit	24.00	2.03	9%
Grapes	14.50	6.00	41%
Seed Crops	5.00	0.90	18%
Olives	4.15	1.48	36%
Peas	1.25	0.25	20%
Other	1.21	0.71	59%
Lucerne	1.09	0.66	60%
Walnuts	0.76	0.64	84%
Cereals	0.70	0.25	36%
Fat Lambs	0.61	0.07	12%
Poppies	0.50	0.50	100%
TOTAL	76.52	17.98	23%

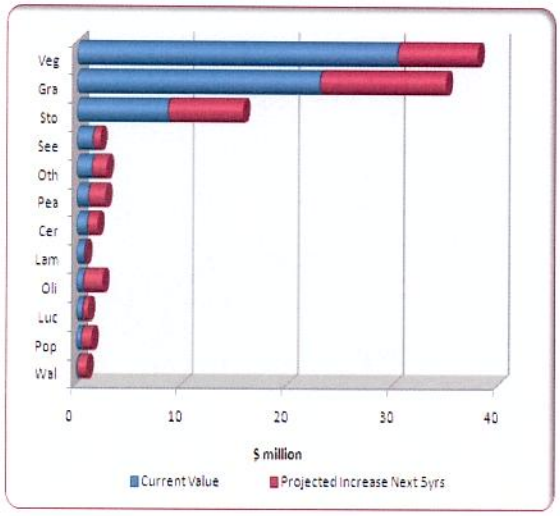


2.2 Value of production

The current value of production is estimated at nearly $70 million. As existing ventures reach harvestable stage, the value is expected to increase by over 50% in five years time (Figure 3). Fresh vegetables, wine grapes and stone fruit are the most highly valued crops representing 90% of the total. Over the next five years, the increase in the value of production from wine grapes is projected to be very significant.

Figure 3: Value of Production

Activity	Value Production ($ million)	Increase Next 5 Yrs ($ million)	Increase (%)
Fresh Veg	30.35	7.65	25%
Grapes	23.00	12.00	52%
Stone Fruit	8.62	7.16	83%
Seed Crops	1.51	0.75	50%
Other	1.42	1.45	102%
Peas	1.10	1.65	150%
Cereals	1.00	1.00	100%
Fat Lambs	0.73	0.15	21%
Olives	0.67	1.54	274%
Lucerne	0.62	0.54	88%
Poppies	0.45	1.05	233%
Walnuts	0.07	0.96	1,373%
TOTAL	69.52	36.19	52%

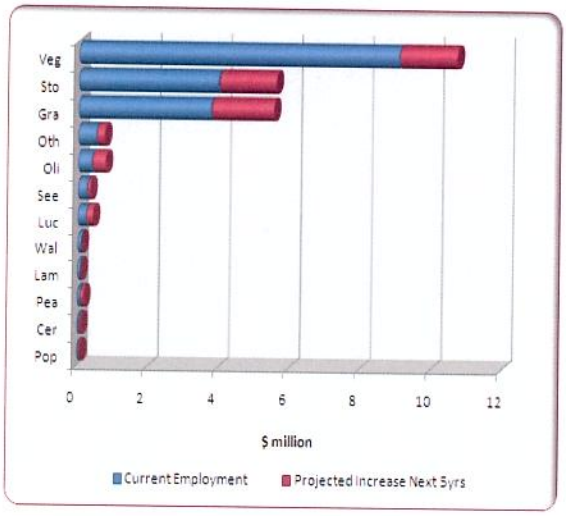


2.3 Value of employment

$18.55 million annually is currently pumped into the local economy from wages paid in the district (469 FTE's). Fresh vegetables, stone fruit, and wine grapes collectively account for $17 million or 90% of the total. Over the next years, the total value of wages is projected to increase by 34% to $35 million (628 FTE's, Figure 4). Increases in fresh vegetables, stone fruit and wine grapes account for 81% of the increase.

Figure 4: Current & projected value of wages

Activity	Wages 2008 ($ million)	Increase Next 5 Yrs ($ million)	Increase (%)
Fresh Veg	9.05	1.65	18%
Stone Fruit	3.97	1.63	41%
Grapes	3.75	1.79	48%
Other	0.51	0.25	49%
Olives	0.40	0.40	100%
Seed Crops	0.26	0.10	38%
Lucerne	0.24	0.20	85%
Walnuts	0.11	0.02	18%
Fat Lambs	0.09	0.02	17%
Peas	0.08	0.11	150%
Cereals	0.06	0.06	100%
Poppies	0.04	0.06	150%
TOTAL	18.55	6.28	34%

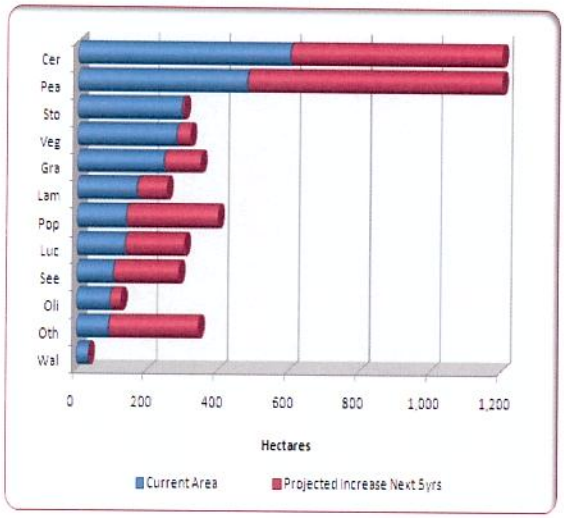


2.4 Area of production

The survey estimates the current area of intensive agricultural activity at 2,670 hectares. Cereals and peas (processing) occupy 1,080 hectares or 40% of the total (Figure 5). Stone fruit, wine grapes and fresh vegetables (mainly Houstons Farm) collectively occupy 820 hectares or 31% of the total. Over the next five years, the area of intensive crops is projected to increase by 92% to 5,030 hectares, the main increases in terms of absolute area being peas, cereals, poppies and other.

Figure 5: Area

Activity	Area 2008 (Ha)	Increase Next 5 Yrs (Ha)	Increase (%)
Cereals	600	600	100%
Peas	479	721	151%
Stone Fruit	294	8	3%
Fresh Veg	280	40	40%
Grapes	245	105	14%
Fat Lambs	170	85	50%
Poppies	140	260	186%
Lucerne	137	168	123%
Seed Crops	104	186	179%
Olives	95	32	34%
Other	91	255	280%
Walnuts	36	-	0%
TOTAL	2,671	2,460	92%



2.5 Climate change

Climate change in the South-East Tasmania and future climate predictions will put increased pressure on the ability of the Craigbourne Dam and Hobart Water to supply irrigators. Some of this pressure will be mitigated by the increasing availability of re-use water from the Clarence City Council. Whilst in recent years, re-use water was mainly used on pastures and non-food crops, there has been an increased use in the last two seasons on wine grapes and processed vegetables. However, re-use water is not an option for many operators due to its nutrient content (hence a reduced ability to control vegetative growth) and restrictions imposed by quality assurance systems.

Figure 6: Rainfall - Tasmania

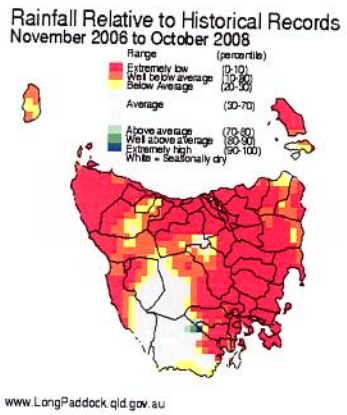


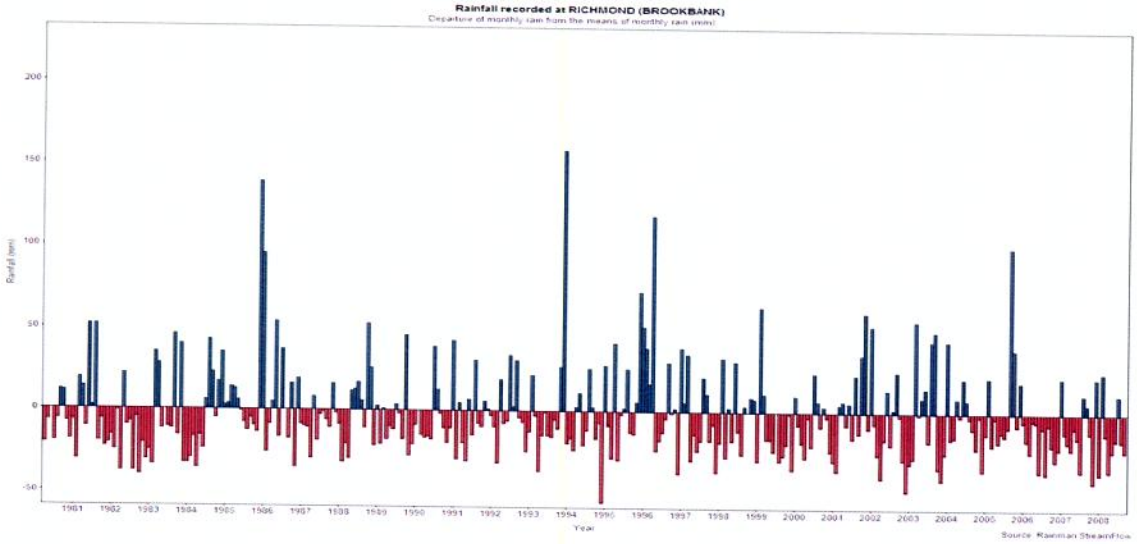
Figure 6 shows that rainfall over most of Tasmania has been extremely low over the past two years compared to historical records.

Figure 7 below shows the departure of rainfall at Richmond since 1980 from the monthly average. The graph demonstrates a clear pattern of lower than average rainfall over this period.

Figure 8 below confirms the reducing rainfall trend for Colebrook, Campania and Richmond. Over the past 80 years, the average annual rainfall in all three areas has reduced by around 30%. The trend line for Colebrook shows that annual rainfall has reduced from around 650 mm per year in the decade to 1938 to around 450 in the decade to 2008. The trend for Campania has been from 600 mm to 400 mm and for Richmond it has been from 550 mm to 400 mm.

The reducing rainfall has had a profound effect on runoff and natural stream flows. A recent modelling study of the Coal catchment by Hydro Consulting[3] examined the available flows in each of 23 sub-catchments of the system. It determined that that flows available down the catchment for the 10-year period 1998-2007 were on average about 48% lower than that of the 1900-2003 period.

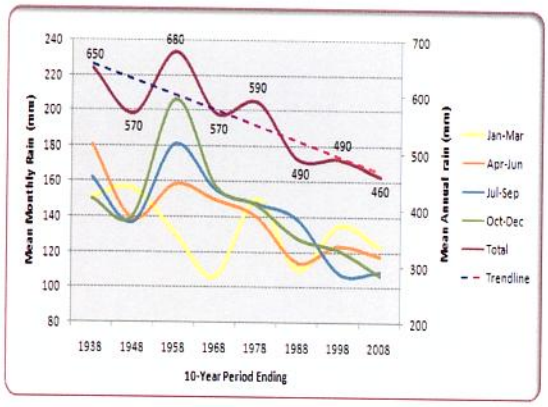
Figure 7: Monthly Rainfall at Richmond (Brookbank) since 1980



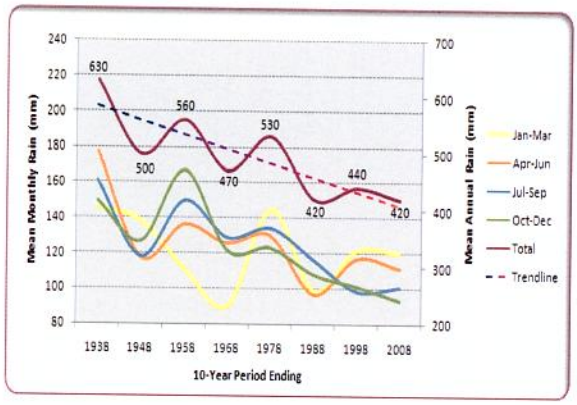
[3] Hydro Tasmania Consulting (2008). Review of River Flows in the Coal Catchment

Figure 8: Rainfall Trend Over the Past Eight Decades

Colebrook



Campania



Richmond

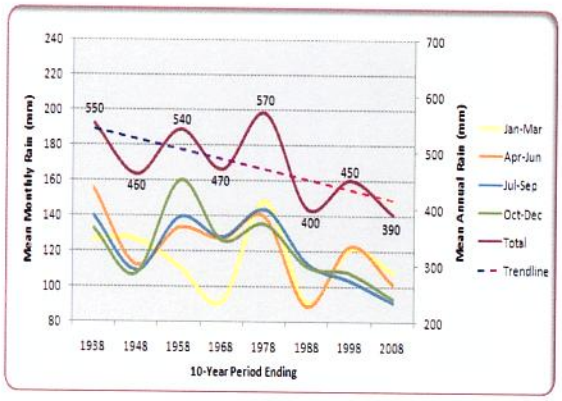


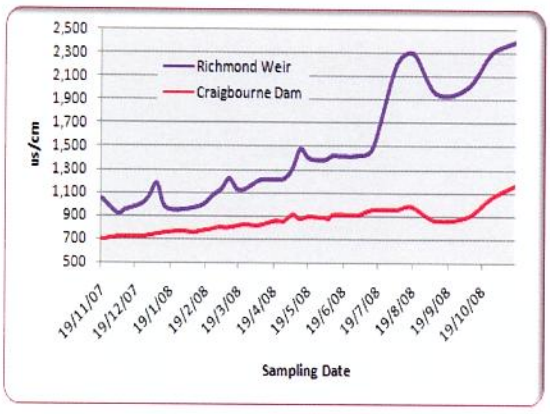
Figure 9: EC Levels in Coal River

2.6 Water quality

Figure 9 shows the electrical conductivity (EC) of water in the Coal River sampled at the Dam and at the Richmond Weir, over the past 12 months[3].

EC's in excess of 800 µs/cm are classified as Class 3 quality water in Tasmania[4]. Class 3 water should not be used on soils with restricted drainage. Even with adequate drainage, management for salinity control will be needed at these levels.

Figure 9 shows that water in the Dam has been Class 3 for most of the past year. EC's at the Richmond Weir are much higher and reached Class 4 levels (>2,300) in



[4] http://www.dpiw.tas.gov.au/inter.nsf/webpages/jmuy-4z58s8?open

August and again more recently.

There is no doubt that the continual application of water of Class 3 quality is detrimental to many plants. For example, vegetables such as lettuce, onion and carrot will lose up 10% of yield at EC's in excess of 700 µs/cm and lose up to 25% of yield where EC's exceed around 1,800[5]. Of the fruits commonly grown in the South-East, walnuts, apricots and grapes will lose up 10% of yield at EC's in excess of around 1,000 µs/cm. Walnuts and grapes are more tolerant than apricots at higher EC levels. For instance, apricots will lose up to 25% of yield at 1,800 µs/cm but walnuts and grapes require 2,200 and 2,700 respectively before yields are reduced by this amount.

3. Overview

3.1 Objectives and scope

Tasmanian Irrigation Schemes Pty Ltd {(TIS), previously the Rivers and Water Supply Commission (RWSC)} is a Government Business Enterprise responsible for State Government owned water schemes[6], including the:

1. Prosser River Supply Scheme
2. Togari Water Supply Scheme
3. River Clyde Irrigation Scheme
4. South-East Irrigation Scheme
5. Furneaux Drainage Scheme
6. Welcome River Improvement Scheme
7. Montagu River Improvement Scheme
8. Meander Dam

It has the following functions:

1. To administer water districts in accordance with section 5(2) of the *Rivers and Water Supply Commission Act 1999*
2. To manage property of the Crown or the Commission and other property related to the administration of such districts
3. To provide project management and project development services commercial water industry and related industries
4. To undertake the necessary duties of a Government Business Enterprise
5. Such other functions related to the commercial water industry as the Minister directs.

TIS is responsible for water supplies in the South-East district. As the RWSC, it obtained funds from the Water Infrastructure Fund during 2008 to undertake works to supply emergency supplies of Hobart Water to some irrigators in the Coal Valley. It also commissioned a preliminary study on additional water supply options for the South-East district. This will be discussed late in this report.

[5] Saltpak, Tasmania.
[6] http://www.dpiw.tas.gov.au/inter.nsf/WebPages/RPIO-4YJ88E?open#FunctionsoftheRWSC

3.2 Policy context

Water Development Plan

The Water Development Plan for Tasmania (WDP) was launched in 2001 and identified strategic initiatives to manage and develop the State's water resources[7].

The initiatives included funding to investigate the feasibility of 22 potential water development projects throughout the State. In most instances, the proposals were put forward by private individuals or groups.

The projects were generally complex and had known economic, engineering or environmental issues that had discouraged the initial investigation by the private sector. Funding for these initial investigations enabled the Government to make the crucial preliminary assessment of which projects contained potential fatal flaws and which projects may be progressed to the next phase.

Of the 22 projects investigated by the WDP:

1. 7 reached the implementation stage (Meander Dam, Coles Bay water supply, Swansea water supply, Derwent River water allocations, Headquarters Road Dam, Wesley Vale irrigation scheme, Tamar Ridge vineyard expansion);
2. 2 are still in progress (Meadstone Dam and Northern Midlands Irrigation Project);
3. 1 was identified as uneconomic (Maloneys Hill Dam);
4. 3 were identified as environmentally unsustainable (Chimney Hill Dam, Waterhouse Dam, Parramatta Creek Dam);
5. 1 was identified as having insufficient water availability (Jetsonville);
6. 1 was identified as having land tenure issues (Shannon River Dam); and
7. 7 were identified as having multiple fatal flaws (environmental, engineering, economic and/or land tenure) (Jordan Dam, Iron Creek Dam, Benham Dam, Long Marsh Dam, St Patrick's Dam, Edith Creek Dam, Arthur River extractions).

The WDP provided significant funding to progress work on the viable projects, culminating in the successful completion of the Meander Dam in February 2008.

Smart Farming water initiative

In March 2006, the Government released Smart Farming, a key policy for the Tasmanian primary industry sector. Smart Farming recognised that an innovative, competitive and sustainable primary industry sector was vital to Tasmania's long-term economic development.

There were eight key initiatives in Smart Farming, one of which was the Smart Farming Water Initiative. Projects addressing these key initiatives were developed and delivered by working with industry. This process of collaboration was designed to further alignment Government and industry to build the prosperity and sustainability of Tasmania.

[7] http://www.dpiw.tas.gov.au/inter.nsf/WebPages/SSKA-7FJ855?open

The Smart Farming Water Initiative provided $7.54 million in funding for the following programs:

1. Enhancing targeted farm water development.
2. Implementing the National Water Initiative.
3. Increasing the availability and accessibility of surface water stream flow information.
4. Ensuring sustainable access to groundwater supplies.
5. Improving farmer and public confidence in the safety of farm dams.

For the enhancement of targeted farm water development the SMART Farming Water Development Project provided $3.11 million over four years from 2006-07 to 2009-10 to develop feasibility studies to progress existing and new water developments in partnership with private sector proponents. Funding was delivered under two complementary programs;

1. Farm Water Development Plan - farmers can apply for a subsidy to engage consultants to prepare Farm Water Development Plans. The plan identifies options for effective use of existing water supplies and additional irrigation water to enhance current and future farm productivity.
2. Irrigation Partnership Program - farmers can apply for a subsidy to engage consultants to prepare environmental studies that are required to support applications for dam works, permits or water licences and allocations, such as flora, fauna, aquatic ecology, hydrology, geomorphology, aboriginal and historical cultural heritage studies.

Water Infrastructure Fund

The 2008-09 Tasmanian Budget included an $80 million allocation of funds to establish the Water Infrastructure Fund (WIF) by transferring funds from the Infrastructure Tasmania Fund (ITF)[8]. The ITF was established in 2007-08 with proceeds of $312.9 million from the divestment of Government businesses.

The WIF will enable major investment in a number of significant irrigation projects with the potential to provide Tasmania with an additional 250 GL of irrigation water per annum. In 2008-09, $5 million will be expended from the WIF to commence development of this key infrastructure. This will be followed by $10 million in 2009-10 and 2010-11 and $20 million in 2011-12[8].

Irrigation Development Board

In March 2008, the Government established the Tasmanian Irrigation Development Board (TIDB) to provide the high level drive and governance needed to deliver eleven water infrastructure projects in different locations throughout Tasmania[9].

The TIDB is an expertise-based Board whose members are well-qualified and experienced in major infrastructure projects, governance, negotiation, finance and agricultural development.

The Board will progress the irrigation development projects from the feasibility assessment stage to the construction and operational stages. In undertaking this work, the Board will aim for the schemes and projects to:

1. Provide greater water security for farmers and regional communities and drought-proof susceptible areas;
2. Take account of the interests of local communities and key stakeholders;
3. Be economically viable and technically feasible;

[8] Tasmanian Government Budget Paper No. 1 2008-09 (http://www.budget.tas.gov.au/media/pdf/publications/2008-09_BP1.pdf)

[9] http://www.dpiw.tas.gov.au/inter.nsf/WebPages/SSKA-7FJ45X?open

4. Leverage appropriate investment by water users to augment public funds;
5. Be facilitated in an efficient, cost-effective and timely manner;
6. Ensure the ongoing environmental sustainability of Tasmania's water resources; and,
7. Comply with relevant State and Commonwealth legislation and policy.

The Board will use money from the $80 million WIF as well as an additional $140 million allocated by the Commonwealth Government. The projects will also leverage user contributions which could eventually take the scale of the irrigation development program to around $400 million.

The TIDB has been presented with a priority list of 11 projects to progress to the construction and operational stage (Figure 10). The location of each project is shown in more detail in Attachment 11.1.

However, the crisis situation on the South-East is not one of the TIDB's priorities.

Figure 10: Current TIDB projects

Project	Detail	Approx Project Cost ($ million)
Midlands	Pipeline to deliver 50,000 ML from Poatina Tailrace/Arthurs Lake from Macquarie Settlement to Tunbridge area	$100
North-East	7 storage dams with a potential of up to 70,000 ML	77
Shannon – Ouse – Clyde	Dams to store and release 21,000 ML into the Clyde and Ouse catchments.	53
Mersey – Forth	19,000 Ml from Hydro storages from Forth-Don to Kindred areas.	32
Upper Macquarie	20,000 ML dam in the Upper Macquarie catchment	27
Upper South Esk	Approx 20,000 ML dam in the South Esk catchment	21
Meadstone	30,000 ML dam in the upper St Pauls	13
Sassafras – Wesley Vale	5,000 ML through the Australian Paper pipeline to 5 districts in the Sassafras-Wesley Vale area.	10
Meander Dam pipelines	Pipelines to deliver a total of 10,000 ML to Hagley, Caveside, Quamby and Rubicon.	6
Winnaleah	A 6,000 ML extension to the existing scheme	6
Headquarters Road	1,900 ML dam in the Great Forester catchment	4
	Total New Water Volume = 247,000 ML	$350

3.3 Business case outcomes

The key outcomes are as follows;

1. To provide a temporary and emergency supply of high quality water to the South-East this season to prevent an impending disaster following the drying up of the Craigbourne Dam and the imminent imposition of a 0% of allocation "take" from Stage 1 of the SEIS.
2. To enable work to proceed to confirm preliminary feasibility studies to provide a more permanent solution to the water supply problems in the SEIS.

3.4 Outputs

If the outcomes described above are achieved, intensive developments will continue in the SEIS district, with the following outputs being achieved in five years time;

1. Further investment from existing investors of over $18 million, principally in fresh vegetables and wine grapes.
2. An increase in the value of production of $36 million, principally in wine grapes, fresh vegetables and stone fruit.
3. An increase in annual wages paid of $6.3 million or an additional 160 FTE's.

4. Critical assumptions and constraints

4.1 Assumptions

This preliminary Business Case has been prepared on the basis that;

1. The Craigbourne Dam, which at full supply level (FSL) holds between two and three years supply of irrigation water, is now dry. Under these conditions, no water will be made available to Stage 1 irrigators in the South-East irrigation district during the coming summer.
2. The Dam has only occasionally reached FSL since its completion in 1986.
3. The lack of supply this summer will have a dramatic financial impact on many agricultural businesses, especially those in Stage 1 of the scheme, and may have a longer term marketing affect on the area's reputation for reliability and quality. In anticipation of the season, some growers are already managing trees and vines for survival rather than production.
4. Water from the Coal catchment contains quantities of "salt" that is likely to negatively impact crop performance over time. The "salt" concentration is of major concern in the Coal River south of the Fingerpost Road Bridge.
5. Rainfall and stream flow analyses for the South-East district clearly demonstrate that climate change has been operating in the area for some time. Future climate predictions indicate that the area will be subjected to reduced annual rainfall, higher temperatures and higher levels of evapotranspiration.

These factors alone indicate that additional sources of water supplies for irrigation must be found for the South-East as a matter of urgency. The projected $18 million of expenditure by existing operators plus any new investors in new development over the next five years will be put in jeopardy unless water of better quality, greater quantity and greater reliability can be assured.

4.2 Constraints

The major constraint is time. Other constraints include;

1. Recognition of the urgency to find solutions to the water problems in the SEIS.
2. Funding to enable the projects to proceed.
3. Agreement with stakeholders and participation of the owners of properties affected by the pipelines and the location of dam sites.
4. Legislative issues such as threatened species.
5. Planning approvals to allow works to proceed (Resource Planning and Development Commission's approval of including water pipelines as a permitted use in Planning Schemes, where that use is not already permitted, is understood to be imminent).
6. The availability of materials and contractors to construct the urgently required temporary pipeline from Granton to the Coal River.

7. Approval to negotiate with DIER to use the Bridgewater Bridge/Derwent River and the location of the proposed Brighton by-pass and transport hub.
8. The ability of Hobart Water to provide sufficient flows to satisfy irrigators.

5. Stakeholder management

5.1 Stakeholder identification and analysis

Key stakeholders include;

1. Irrigators in Stage 1 and Stage 2 of the SEIS.
2. Hobart Water
3. Coal River Products Association
4. Brighton Council
5. Clarence City Council
6. Clarence Recycle Water Authority
7. Tasmanian Irrigation Schemes Pty Ltd
8. Tasmanian Irrigation Development Board
9. Department of Primary Industry and Water
10. Department of Economic Development & Tourism
11. Department of Infrastructure, Energy & Resources
12. Resource Planning and Development Commission

6. Analysis of options

Tasmanian Irrigation Schemes Pty Ltd (then as the RWSC) received a report in July 2008 on a study for options to enhance water supply in the South-East irrigation district. This report, together with a supplementary report prepared in November 2008, indicated that a supply and storage solution was possible.

This Business Case includes relevant extracts from these reports.

6.1 Process of option development

A number of factors have shaped the investigation for alternative water sources[10].

1. The Coal River below Brown Mountain Road is problematic to use as both a regional drainage channel and an irrigation supply channel

2. Craigbourne Dam has to be considered as problematic in providing the original design supply of 5,400 ML per year (3,500 ML to irrigators). Given current rainfall patterns and stream flows, the Dam is probably only capable of supplying around 2,000 ML per year.

[10] Feasibility Study on Options for Enhancing Water Supply in the South -East Irrigation District (Jun 2008). A report for the Rivers and Water Supply Commission by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.

3. Other than White Kangaroo Rivulet, there are limited if any opportunities to abstract winter flows from streams within the district to enhance or maintain irrigation supply.

4. There is a definite benefit to the region from water now available from the Clarence Recycled Water (CRW) scheme. This benefit is becoming more significant on a daily basis with the scheme consistently oversubscribed. This will improve prospects for water use in Stage 2 of the SEIS where it overlaps with the CRW scheme. The realities are that recycled water provides the ability for existing enterprises to diversify and use extra water, rather than underpin the high value requirements for the SEIS district.

5. The supply from the Derwent River provided via Hobart Water should be seen as the source of water to support and augment the region for high value agricultural development. The supply of water to the region from Hobart Water is an issue of providing infrastructure rather than doubts about the available resource.

6. The growth in the Brighton area has affected Hobart Water's ability to get water into the SEIS area in summer and to an extent in autumn and spring. We are advised that this is a result primarily of a bottleneck in the Cobbs Hill Road area of the East Derwent supply system. Hobart Water has indicated there are a number of ways of solving this and have indicated a willingness to co-operate, subject to funding.

7. It should also be noted that public statements by the State Government have indicated that the planned Midlands Water Scheme pipeline has the potential to put water into the top end of the Coal River and thus into Craigbourne Dam. Given the currently available published information, it is likely that the cost effectiveness of water from Hobart Water is likely to be higher given the volumes required, especially for the areas south of Campania.

Demand for water from the SEIS is expected to rise by 109% over the next 10 years (

8. Figure 11).

Figure 11: Water Demand From SEIS

	Current Use[1] (ML)	Use in 1-5 Years[10] (ML)	Use in 6-10 Years[10] (ML)	Increase (ML)	Increase (%)
Stage 1	2,995	4,350	5,890	2,895	97%
Stage 2	1,380	1,870	3,260	1,880	136%
TOTAL	4,375	6,220	9,150	4,775	109%

6.2 Options considered

Options considered in the ARM July 2008 report consisted of both short and medium-long term solutions. Since the July report a number of other options were considered which were examined in a Supplementary Report provided to TIS in November 2008[11].

Of significance is the general conclusion - all the investigations to date indicates that the only practical reliable source for the South-East region is the Derwent River and provided via the Hobart Water network.

[11] Feasibility Study on Options for Enhancing Water Supply in the South -East Irrigation District Supplementary Report (November 2008). A report to Tasmanian Irrigation Schemes Pty Ltd by Agricultural Resource Management, Hydro Tasmani a Consulting and Armstrong Agricultural Services.

ARM et al July 2008 report

1. The preferred option for a medium-long term solution - Construct a pipeline from Daisy Banks Dam along the river and to a dam at "Ferniehurst" on the Brown Mountain Road. Given the length of the pipeline, a pump station would be installed along the mainline to ensure sufficient water transfer during filling from Hobart Water. This dam currently holds around 1,000 ML but has a very poor yield, being filled via catchment drain from an adjacent stream. This makes it ideal to work as a storage dam for Hobart Water, as it would have little intrusion of poor quality water. The "Ferniehurst" site should be able to provide a highly cost effective storage of up to 5000 ML in the future. It should be noted that whilst it would appear logical to augment this area via the Hobart Water pipeline that extends to Campania, this pipeline is of insufficient diameter and would require a major upgrade back to Tea Tree. The cost has been estimated at around $2.1 million.

2. Use an existing dam site on Duckhole Rivulet in the Back Tea Tree owned by Casimaty and Harvey. A feeder line could be built to Daisy Banks. However, it is possible that this site may be being considered for use for the Clarence Recycled Water Authority. However, if this fails to proceed, the site may become available.

3. Upgrade Hobart Water's supply at Cobbs Hill Road at Bridgewater, inclusive of storage. This supply is provided via the east (north) Derwent trunk main and could be significantly improved with a link across the river at Bridgewater and an upgrade of the Cobbs Hill area infrastructure. This would improve supplies to Daisy Banks and also provide potential for irrigation water to be supplied to the Brighton/Broadmarsh and Bagdad areas. There is scope for Hobart Water to develop many variants of this which could achieve the necessary outcomes.

ARM et al supplementary November 2008 report

The Supplementary report examined prospects for a temporary supply of water. Given the current state of the Craigbourne Dam, the temporary scheme may be required for at least two years.

In addition, six options were studied for a medium-long term "river replacement" supply. A map showing their location is included as Attachment 11.5.

- "Logie Farm" A
- "Logie Farm" B
- "Roslyn"
- "Ferniehurst"
- "Wattle Banks" A
- "Wattle Banks" B

6.3 Option analysis – scheme design

The analysis presented here is based on the Supplementary report options.

Temporary (possibly two year) option – Lay an above ground poly main from either Granton or Cobbs Hill – subject to discussions with Hobart Water. This would essentially follow the existing railway line and Middle Tea Tree Road and deliver water into the Coal River at Finger post Road. A connection would also be made into the "emergency" pipeline constructed during the winter of 2008. This would provide a link back to "Daisy Banks". A map of the proposed system is shown in Attachment 11.4. Details and costs are described in Figure 12 below.

Figure 12: Temporary Scheme Details

Flow	Pipe Required	Pipe Cost	Estimated Installation Cost *	Estimated Total Cost *	Volume per day	Volume per 180 days	Volume per 360 days
(L/s)		($ million)	($ million)	($ million)	(ML)	(ML)	(ML)
75	400 Poly	3.40	0.74	4.14	6.5	1,166	2,333
100	450 Poly	4.30	0.82	5.12	8.6	1,555	3,110
125	500 Poly	6.31	0.98	6.29	10.8	1,944	3,888
150	500 Poly	6.31	0.98	6.29	13.0	2,333	4,666
175	560 Poly	6.66	1.02	7.77	15.1	2,722	5,443
200	560 Poly	6.66	1.02	7.77	17.3	3,110	6,221

* Includes $0.10 million for connection. No cost allowance has been made for crossing Bridgewater Bridge and Lyell Highway ($0.25 million ?)

1. Permanent medium-long term "river replacement" option

Design data for each of the six options are described in Attachment 11.6. Based on the analysis, the "Ferniehurst" dam offers the best option for a large storage to store Hobart Water during the off season. It offers the lowest potential cost per ML of water stored. It is at around the correct elevation and therefore minimises pumping issues.

According to the Supplementary report, the owners of "Ferniehurst" have let their water allocation licence lapse. They will need to apply for a new allocation for the dam (they should be able to get an allocation equal to the previously expired allocation (228.5 ML). An agreement will need to be reached with the owner with regard to lease or purchase of the site. This should therefore be a priority. Other normal surveys and studies will also be required to accompany this application.

The "Wattle Banks" B site on White Kangaroo Road offers a backup that is of suitable elevation and is closer to the existing pipe network so requires less pipe infrastructure. The site is not as efficient as the "Ferniehurst" site and provides no immediate benefit, however it should be considered as a backup option. Discussions should be commenced with the owners of the site to confirm whether it can be seriously considered.

The alternative "river replacement" option of a permanent pipeline from Granton to "Ferniehurst" has been canvassed in the ARM reports but has not been costed. A number of unknown factors such as the negotiation of the Bridgewater Bridge/Derwent River and the new Brighton by-pass and transport hub developments make cost estimates problematic at this stage.

6.4 Description of options

1. Temporary system (Granton to Coal River)

This project involves the laying of an above ground poly main from either Granton or Cobbs Hill – subject to discussions with Hobart Water. This would essentially follow the existing railway line and Middle Tea Tree Road and deliver water into the Coal River at Finger post Road. A connection would also be made into the "emergency" pipeline constructed during the winter of 2008. This would provide a link back to "Daisy Banks".

2. Permanent medium-long term "river replacement" option

"Ferniehurst"

The Ferniehurst dam is currently registered as dam ID # 361 on the DPIW data base with a 340 ML capacity and an 8 metre wall height. The water allocation for this dam was previously listed as 228.5 ML, it has however been expired for a number of years. Therefore at this point in time the dam does not have a water allocation and the owner can't legally store or take water into storage. The expired allocation cannot be re

issued, and an application needs to be made for a new allocation. Given the Ramsar wetland at Pitt Water and the level of existing allocations, typically new water allocations are not granted in the Coal River catchment. However as it is an existing dam, there may be some opportunity to have one issued in this instance. It would however be likely to have strict "take" conditions applied to it.

The actual current actual capacity of the dam is likely to be greater that the 340 ML as listed on the dam licence. By ARM's estimates it is somewhere between 500 and 1,000 ML. An application has previously been made to enlarge the existing dam. This included a detailed site survey and a vegetation survey.

The site survey and subsequent wall and storage model was based on a new wall location 350 metres downstream from the current wall. Based on a 35 metre high embankment at this location approximately 5,000 ML of storage could be achieved.

The vegetation survey completed in 2001 by AJ North & Associates identified a number of plant communities and threatened plant species that would be affected by dam construction. These included approximately 3 ha of Black Peppermint *E. Amygdalina*. Around 0.5 ha of native grassland primarily Kangaroo Grass would also be lost. Rayless Mayweed (*Stellaria multiflora*, listed as rare) was recorded within the vicinity of the area to be inundated by the proposed dam.

The Black Peppermint is located downstream of the current dam wall and is in the vicinity of the previously proposed new wall. Impacting the species could be avoided by constructing the new wall at or adjacent to the existing wall, albeit with the loss of storage capacity of around 1,000 ML and the costs of additional earth works.

The extent Rayless Mayweed was poorly described in the previous report, and it is likely additional work would be required to further clarify the extent and numbers present.

From and engineering perspective, as the proposed dam would be greater than 25 metres in height and has a high C hazard rating or similar, engineering by a expert team will be required for pre-construction investigation, embankment and spillway design, construction supervision and works as executed reporting. A team of engineers is required to design the dam and costs of around $100,000 would be expected. Preliminary investigations indicate that adequate quantities of good material would be available for construction.

Given this dam is in place and has a large capacity already, it could be used in the short term at its current size. In the medium to long term an increase in capacity would further benefit all parties.

"Wattle Banks" B

Vegetation within the site includes pasture along the gully bottom. The northern side of the potential storage is dominated by White Gum (*Eucalyptus viminalis*), while the southern section of the proposed storage is White Peppermint (*Eucalyptus pulchella*) forest. Both of these communities do not have a conservation status. There is however numerous threatened flora species recorded in the general area (none at the actual dam site); it is likely a detailed site survey would be required to determine if any specific threatened species are located within the proposed site.

From and engineering perspective as the proposed dam would be greater than 25 metres in height and have a high C hazard rating or similar, engineering by a expert team will be required for pre-construction investigation, embankment and spillway design, construction supervision and works as executed reporting. Engineering costs would typically be in excess of $100,000.

The catchment area of this site will result in a requirement for a considerable bypass channel around the dam site to allow for natural catchment flows to pass downstream. This will add to construction costs. The availability and suitability of construction materials require confirmation.

6.5 Level of commitment to recommended option

The level of commitment by irrigators to the temporary and longer term options presented here is extremely high. Given the affects of climate change, a rapid and cost effective solution to the water shortage in the South-East is urgently required.

6.6 Detailed analysis of the recommended option

Details of the recommended options are included elsewhere in this report. The non-permanent Hobart Water pipeline from Granton is the most urgent but it will only provide temporary relief to irrigators. Further studies are required to substantiate the feasibility of the "Ferniehurst" or "Wattle Banks" B option and it is recommended they be funded for commencement as soon as possible.

7. Cost:Benefit

not v. economic - needs full benefits in longer term

A full cost: benefit analysis is yet to be undertaken on the options presented here. The CRPA survey has indicated that growers are expecting to lose around $9 million in output in the 2008-09 season alone due to insufficient water.

If it is assumed that the total capital cost of the "Daisy Banks" to "Ferniehurst" pipeline and the "Ferniehurst" dam is around $5.50 million (Figure 13) the cost:benefit ratio is 5.50:9.00 or 1:63.

Figure 13: Approximate Cost:Benefit

Activity	Cost ($ Million)
Pipeline Dairy Banks to Ferniehurst, say	2,50
Studies/Approvals/Construction Ferniehurst Dam, say	2.00
Other/Contingencies	1.00
TOTAL	5,50

Further work and analysis is required to measure the cost:benefit of possible additional works to provide irrigators in the South-East with the projected water demand in the next five to ten years.

8. Risk management

8.1 Risk identification

Risks that have been identified include the following. Measures are possible to mitigate against some of the risks but additional studies will be required to identify measures to cover all risks.

Temporary supply - Granton to Coal River

1. Indecision on proceeding with option (situation is critical).
2. Inability to lay pipeline along railway line.
3. Inability to obtain approval to negotiate the Bridgewater Bridge/Derwent River and the proposed Brighton by-pass and transport hub.
4. Fire and/or damage to polypipe.

"River replacement" option - "Daisy Banks" to "Ferniehurst"

1. Lack of participation of owners of "Ferniehurst" and "Wattle Banks".
2. Inability of "Ferniehurst" to obtain a new water allocation.
3. Inability to obtain the necessary approvals.
4. Inability to complete works on time.

9. Implementation strategy

9.1 Timeline and key milestones

An estimate of the timelines is presented below. This is subject to confirmation.

Temporary supply - Granton to Coal River

	2009						
	D	J	F	M	A	M	J
Emergency approval of funding							
Approval to negotiate Bridgewater Bridge/Derwent River and Brighton							
Pipe procured and laid							
Water starts to flow							

"River replacement" option - "Daisy Banks" to "Ferniehurst"

	2009												2010					
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Discussions with property owners																			
Further studies																			
Approval given																			
Dam works, lay pipe																			
Water starts to flow																			

9.2 Budget and expenditure

It is recommended that TIS apply for immediate access to the IDB's funds to make an immediate start on the temporary supply option. The WIF would have otherwise been a source of expenditure, but the Government has only budgeted a total of $5 million expenditure from this fund during 2008-09. Section 6.3 of this report shows that the capital cost of this scheme is around $4.5 million, of which pipe costs comprise $3.4 million. As the pipe is to be laid on top of the ground, a high proportion of the $3.4 million would be recoverable for re-use elsewhere in other projects.

The full cost of proceeding with the "Daisy Banks" to "Ferniehurst" pipeline should also be funded from IDB funds. More preliminary work is required to confirm the feasibility of this option and it is desirable for this to commence immediately. However it is important that this work look at a permanent solution to water supplies

in the South-East, which should take into account the increasing demand for water and the increased availability of recycled water.

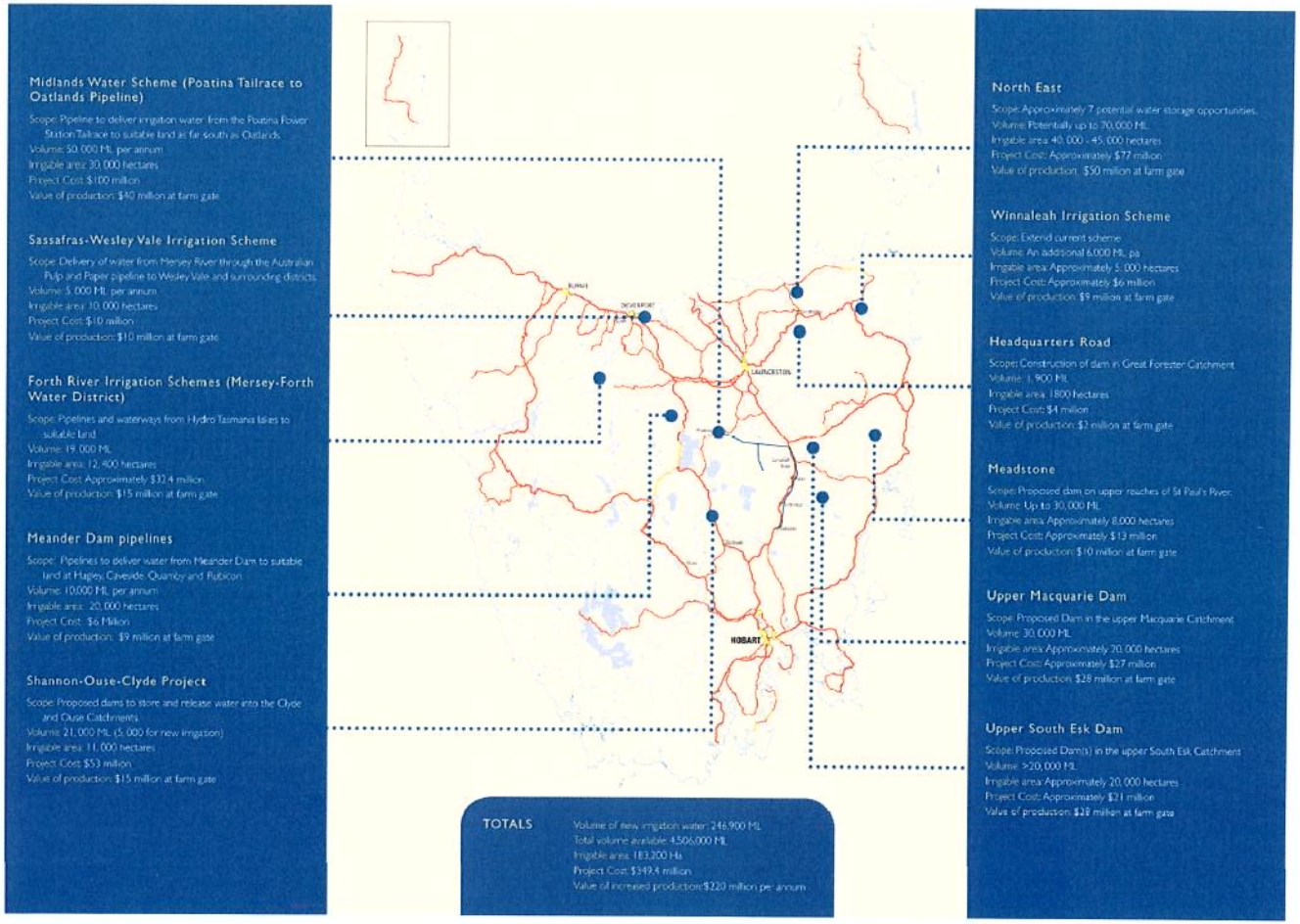
10. Recommendations

It is recommended that;

1. TIS applies to the Government to make available sufficient funding to enable an immediate start on the laying of a temporary pipeline to enable Hobart Water to pump water from Granton to the Coal River in line with investigations undertaken by ARM et al during 2008. It is expected that this pipeline would stay in place for two seasons during which time a more permanent solution to the water supply problem in the South-East is found. Such funds could possibly be sourced from the State Water Infrastructure Fund or Commonwealth environmental funds..
2. In light of the effects of climate change and the reduced reliability of the Craigbourne Dam, it is recommended that work begins immediately on a "river replacement" strategy by confirming the feasibility of installing a pipeline from "Daisy Banks" to a dam site identified on "Ferniehurst" or possibly "Wattle Banks". This pipeline would enable Hobart Water to create a buffer supply to augment the Craigbourne. It can also be used to extend the availability of water large horticultural developments in the vicinity of Brown Mountain Road. Funding sources for this project could include the State Water Infrastructure Fund..
3. An alternative option of a permanent pipeline from Granton to "Ferniehurst" should be included in a "river replacement" analysis. However, realties might mean that the pipeline from "Daisy Banks" can be built more quickly.
4. Due to the increasing supply of recycled water in the area, it is recommended that studies be undertaken to identify a more integrated solution to the water problems in the SEIS. However, this work should not take precedence over the more urgent "Daisy Banks" to "Ferniehurst"/"Wattle Banks" option.
5. To facilitate the "Ferniehurst" or "Wattle Banks" developments, it is recommended that the project be added to the IDB's task list.
6. It is finally recommended that the Government be made aware of the urgency of making an immediate start on both the temporary and permanent projects described in this report.

11. Attachments

11.1 Current Irrigation Development Board projects



11.2 Summary of CRPA survey

Information Updated 26 November 2008

Activity	Current Area	Investment Since 1988	Current Value of Annual Production	Current Employment Level	Area Next 5 Years	Investment Over Next 5 Years	Annual Production in 5 Years	Employment Level in 5 Years
	(Ha)	(S)	($)	($)	(Ha)	(S)	($)	($)
Lucerne	137	1,093,000	615,000	237,500	305	655,000	1,158,000	440,000
Walnuts	36	760,000	69,600	114,500	36	642,000	1,025,000	135,000
Fat Lambs	170	605,000	728,000	89,900	255	70,000	878,000	104,900
Olives	95	4,150,000	670,000	395,200	127	1,475,000	2,505,000	790,400
Stone Fruit	294	22,750,000	8,620,000	3,966,200	302	2,025,000	15,780,000	5,094,760
Fresh veg	280	24,000,000	30,346,000	9,053,240	320	4,500,000	38,000,000	10,700,000
Other	91	1,210,000	1,420,000	510,000	346	710,000	2,870,000	760,000
Peas	479	1,250,000	1,100,000	76,640	1,200	250,000	2,750,000	191,600
Poppies *	140	500,000	450,000	40,000	400	500,000	1,500,000	100,000
Seed crops	104	5,000,000	1,505,000	261,180	290	900,000	2,250,670	361,100
Grapes **	245	14,500,000	23,000,000	3,745,000	350	6,000,000	35,000,000	1,532,800
Cereals	600	700,000	1,000,000	60,000	1,200	250,000	2,000,000	120,000
TOTAL	**2,671**	**76,518,000**	**69,523,600**	**18,549,760**	**5,131**	**17,977,000**	**105,716,670**	**24,830,560**
				(469 FTE)				(628 FTE)

"Production" refers to final output in whatever form it leaves the Valley

Includes immediately adjacent areas (eg. Tea Tree)

* Add $1,000,000 for wool and beef production

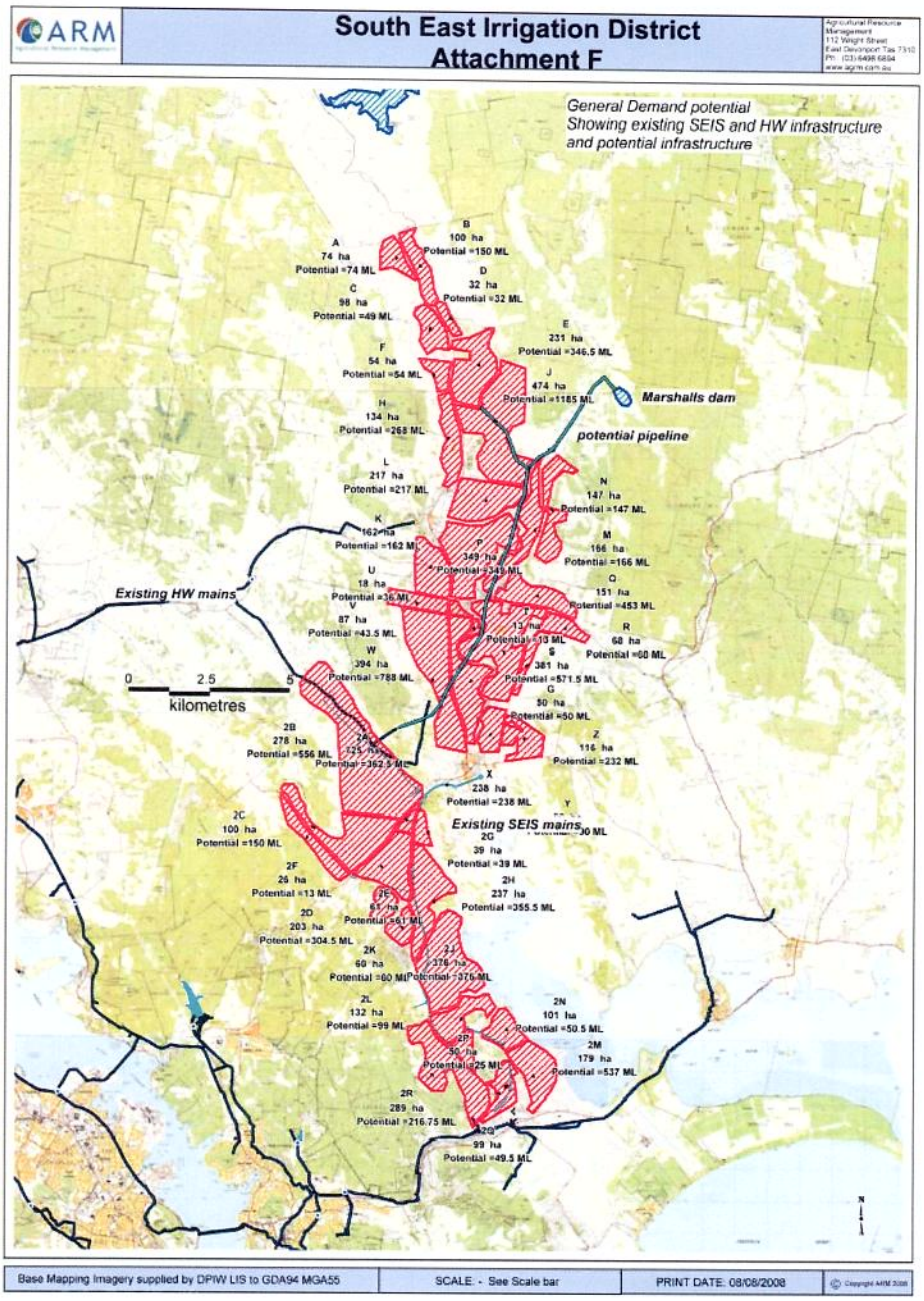
** Current reduced availability of water has resulted in crop management strategies which will directly lead to lost production of around $9,000,000 in 2008/2009

Author's note: Data relates to current investors only. New investors would increase the 5 year projections outlined here.

11.3 Potential water demand

Source: Feasibility Study on Options for Enhancing Water Supply in the South-East Irrigation District (Jun 2008). A report for the Rivers and Water Supply Commission by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.

See overleaf for Stage 1 and Stage 2 tables.



SEIS Stage 1 Demand

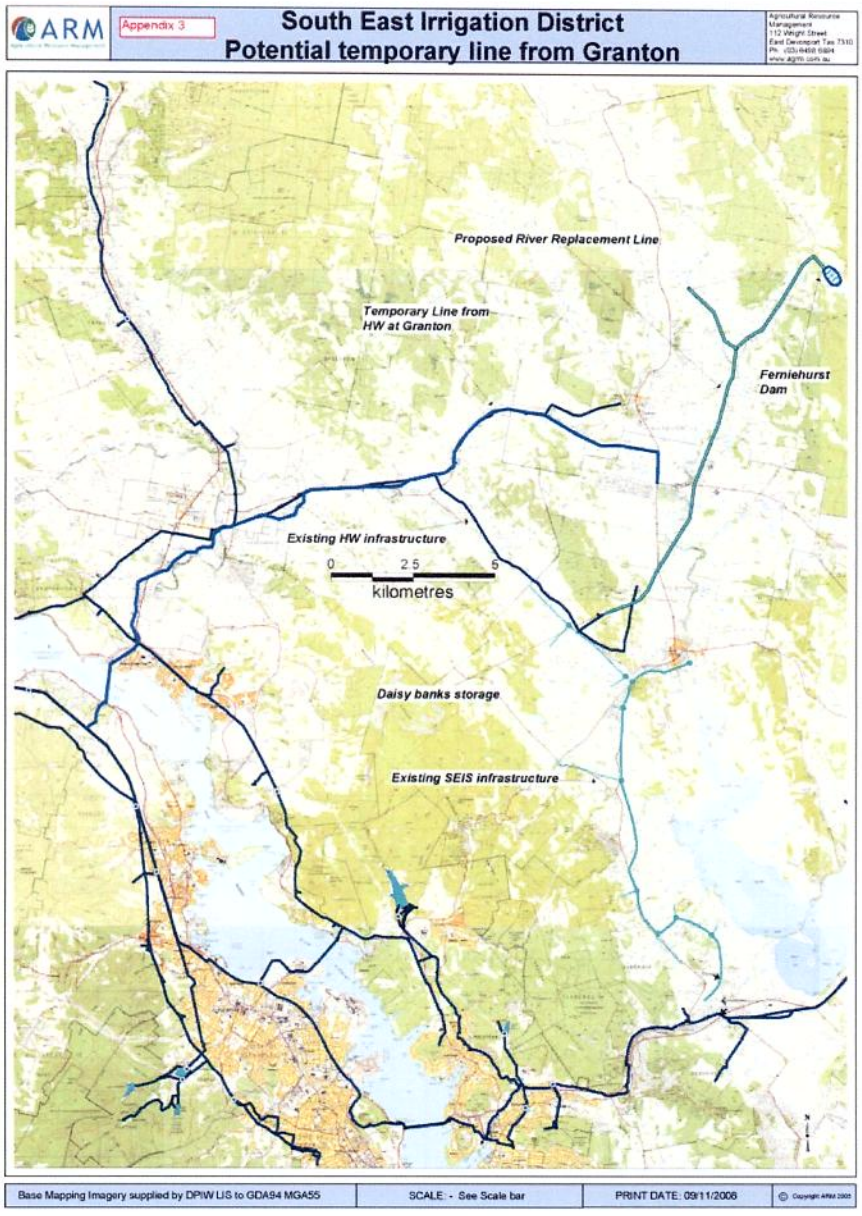
Zone name	Area	Reqt per Ha (1-5 year)	Potential usage (1-5 year)	Reqt per Ha (5-10 year)	Potential usage (5-10 year)
Z	116 ha	2.0 ML/ha	232 ML	2.0 ML/ha	232 ML
W	394ha	2.0ML/ha	788ML	2.0ML/ha	788ML
X	238 ha	1.0 ML/ha	238 ML	1.0 ML/ha	238 ML
S	381 ha	1.5 ML/ha	572 ML	1.5 ML/ha	572 ML
Q	151 ha	3.0 ML/ha	453 ML	3.0 ML/ha	453 ML
P	459 ha	0.5 ML/ha	230 ML	1.0 ML/ha	459 ML
M	166 ha	0.5 ML/ha	83 ML	1.0 ML/ha	166 ML
K	162 ha	0.5 ML/ha	81 ML	1.0 ML/ha	162 ML
L	217 ha	0.5 ML/ha	109 ML	1.0 ML/ha	217 ML
N	147 ha	0.5 ML/ha	74 ML	1.0 ML/ha	147 ML
J	474 ha	1.5 ML/ha	711 ML	2.5 ML/ha	1185 ML
H	134 ha	1.0 ML/ha	134 ML	2.0 ML/ha	268 ML
E	231 ha	1.0 ML/ha	231 ML	1.5 ML/ha	347 ML
F	54 ha	0.5 ML/ha	27 ML	1.0 ML/ha	54 ML
C	98 ha	0.5 ML/ha	49 ML	0.5 ML/ha	49 ML
D	32 ha	0.5 ML/ha	16 ML	1.0 ML/ha	32 ML
A	71 ha	0.5 ML/ha	36 ML	1.0 ML/ha	71 ML
B	100 ha	1.0 ML/ha	100 ML	1.5 ML/ha	150 ML
R	68ha	0.5ML/ha	34ML	1.0ML/ha	68ML
G	50 ha	0.5 ML/ha	25 ML	1.0 ML/ha	50 ML
T	13 ha	0.5 ML/ha	7 ML	1.0 ML/ha	13 ML
U	18 ha	2.0 ML/ha	36 ML	2.0 ML/ha	36 ML
V	87 ha	0.5 ML/ha	44 ML	0.5 ML/ha	44 ML
Y	90 ha	0.5 ML/ha	45 ML	1.0 ML/ha	90 ML
tot	3951 ha		4351 ML		5889 ML

SEIS Stage 2 Demand

Zone name	Area	ReqtperHa (1-5 year)	Potential usage (1-5 year)	ReqtperHa (5-10 year)	Potential usage (5-10 year)
2A	725 ha	0.25 ML/ha	181 ML	0.50 ML/ha	363 ML
2B	278 ha	1.00 ML/ha	278 ML	2.00 ML/ha	556 ML
2C	100 ha	1.00 ML/ha	100 ML	1.50 ML/ha	150 ML
2D	203 ha	1.00 ML/ha	203 ML	1.50 ML/ha	305 ML
2E	61 ha	0.50 ML/ha	31 ML	1.00 ML/ha	61 ML
2F	26 ha	0.50 ML/ha	13 ML	0.50 ML/ha	13 ML
2G	39 ha	0.50 ML/ha	20 ML	1.00 ML/ha	39 ML
2H	237 ha	0.50 ML/ha	119 ML	1.50 ML/ha	356 ML
2J	376 ha	0.50 ML/ha	188 ML	1.00 ML/ha	376 ML
2K	60 ha	0.50 ML/ha	30 ML	1.00 ML/ha	60 ML
2L	132 ha	0.25 ML/ha	33 ML	0.75 ML/ha	99 ML
2M	179 ha	3.00 ML/ha	537 ML	3.00 ML/ha	537 ML
2N	101 ha	0.25 ML/ha	25 ML	0.50 ML/ha	51 ML
2P	50 ha	0.25 ML/ha	13 ML	0.50 ML/ha	25 ML
2Q	99 ha	0.25 ML/ha	25 ML	0.50 ML/ha	50 ML
2R	289 ha	0.25 ML/ha	72 ML	0.75 ML/ha	217 ML
total	2955 ha		1867 ML		3255 ML

11.4 Temporary supply line from Granton

Source: Feasibility Study on Options for Enhancing Water Supply in the South-East Irrigation District Supplementary Report (Nov 2008). A report for Tasmanian Irrigation Schemes Pty Ltd by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.



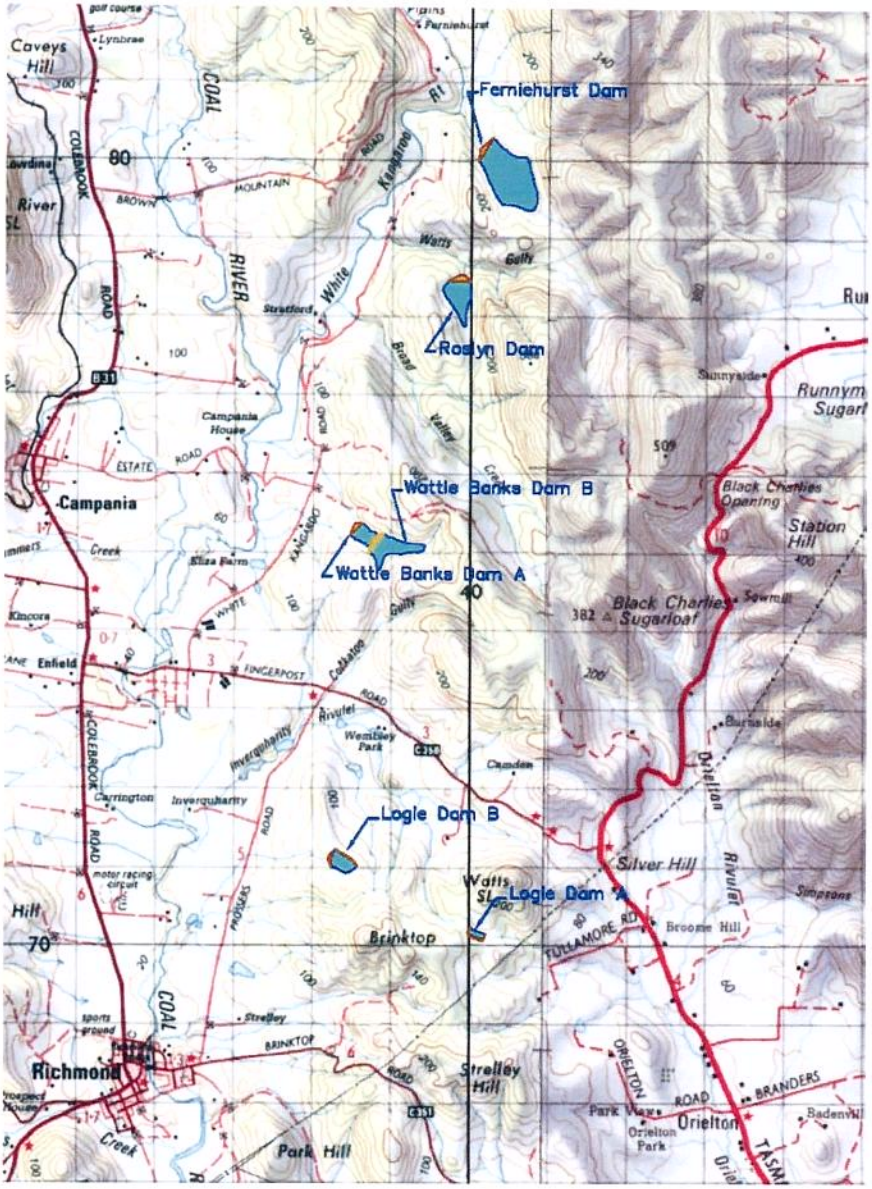
11.5 Dam site location of six "river replacement" options

Source: Feasibility Study on Options for Enhancing Water Supply in the South-East Irrigation District Supplementary Report (Nov 2008). A report for Tasmanian Irrigation Schemes Pty Ltd by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.

SEIS Dam Options

ARM
Agricultural Resource Management

LOCALITY MAP OF DAM OPTIONS



11.6 "River replacement" options comparison

Source: Feasibility Study on Options for Enhancing Water Supply in the South-East Irrigation District Supplementary Report (Nov 2008). A report for Tasmanian Irrigation Schemes Pty Ltd by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.

Description	"Logie" Site A	"Logie" Site B	"Roslyn"	"Ferniehurst"	"Wattle Banks" Site A	"Wattle Banks" Site B
Storage Capacity	100 ML	250 ML	1,300 ML	Existing dam is ~1,000 ML. Potential to increase to 4,000.	850 ML	1,400 ML
Volume of Earth Works	45,000 m3	65,000 m3	380,000 m3	300,000	157,000 m3	271,000 m3
Approx Direct Construction Costs, excluding all costs associated with permit application and additional studies as required.	$225,000	$325,000	$1,900,000	$1,600,000	$785,000	$1,355,000
Surface area at Full Supply Level	1.4 ha	5.2 ha	11.2 ha	1 8.5ha / 40 ha	9.4 ha	11.8 ha
Catchment Area	6.95 ha	14 ha	69.5 ha	172 ha	150.5 ha	124 ha
Storage Ratio (Water to Earth Works)	2.2 to 1	3.8 to 1	3.4 to 1	13.3 to 1	5.4 to 1	5.2 to 1
Maximum Wall Height	9 m	15 m	30 m	27 m	21.5 m	26.5 m
Approx RL at FSL	158 m	130 m	138 m	120m / 135 m	110 m	126 m
Likely Hazard Rating	Very Low	Significant	High C or B	High C or B	High C or B	High C or B
Potential Engineering Input Required	None	High	Very High	Very High	Very High	Very High
Threatened Species / Communities Issues	Possibly	None	Unlikely	Yes	Possibly	Possibly

11.7 Estimated "Dairy Banks" to "Ferniehurst" pipeline costs

Source: Feasibility Study on Options for Enhancing Water Supply in the South-East Irrigation District (Jun 2008). A report for the Rivers and Water Supply Commission by Agricultural Resource Management, Hydro Tasmania Consulting and Armstrong Agricultural Services.

Concept design -Daisy banks to Ferniehurst

Pipeline Chainage	RL at location	l/s	water delivered per day	Water delivered per 160 day season	pipe size and number	Friction loss per m	sector loss	Accumulated friction loss (m)	Cost/m pipe only	installation cost/m	Total cost/m	sector cost	Accumulated cost	Head above starting point	Pumping head	Required boost pumping	Residual head	static head (ferniehurst)	Tariff	Units per ML @3.45 cents per metre head	Pumping Cost per ML	Power required kw	Pump station size cost estimate	sector power cost
0	105	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly									0 m	0 m	0 m	0							
195	100	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	0.4839 m	0.48 m	$101	$33	$134	$26,180	$26,180	-5 m	0 m		0.000	15 m	$0.09	3.45	$0.00	0 kW		$0.00
478	80	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	0.4839 m	0.97 m	$101	$33	$134	$37,905	$64,176	-25 m	0 m		4.510	20 m	$0.09	3.45	$0.00			
709	80	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	0.5732 m	1.54 m	$101	$33	$134	$31,014	$95,189	-25 m	0 m		24.032	40 m	$0.09	3.45	$0.00			
900	60	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	0.4740 m	2.01 m	$101	$33	$134	$25,643	$120,833	45 m	0 m		42.085	60 m	$0.09	3.45	$0.00			
1040	70	154 l/s	13 ML	2000 m	1 x 450 PN 6.3Poly	0.0025 m	0.3474 m	2.36 m	$101	$33	$134	$18,795	$139,628	-35 m	0 m		32.638	50 m	$0.09	3.45	$0.00			
1150	70	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	0.2730 m	2.64 m	$101	$33	$134	$14,768	$154,397	-30 m	0 m		32.305	50 m	$0.09	3.45	$0.00			
1260	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	0.3535 m	2.99 m	$123	$33	$156	$17,213	$171,610	55 m	0 m		52.011	70 m	$0.09	3.45	$0.00			
1350	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	0.2880 m	3.28 m	$123	$33	$156	$14,064	$185,674	-55 m	0 m		51.722	70 m	$0.09	3.45	$0.00			
1450	40	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	0.3214 m	3.60 m	$123	$33	$156	$16,648	$201,342	65 m	0 m		61.401	80 m	$0.09	3.45	$0.00	0 kW		$0.00
2620	30	154 l/s	13 ML	2000 ML	1 x 450 PN 10Poly	0.0033 m	3.9084 m	7.51 m	$152	$33	$185	$216,173	$417,516	-75 m	0 m		67.494	90 m	$0.09	3.45	$0.00			
2950	30	154 l/s	13 ML	2000 ML	1 x 450 PN 10Poly	0.0033 m	1.1010 m	8.61 m	$152	$33	$185	$60,972	$478,488	-75 m	0 m		66.392	90 m	$0.09	3.45	$0.00			
3080	25	154 l/s	13 ML	2000 ML	1 x 450 PN 10Poly	0.0033 m	1.4357 m	8.94 m	$152	$33	$185	$79,448	$496,964	-80 m	0 m		71.058	95 m	$0.09	3.45	$0.00			
4000	30	154 l/s	13 ML	2000 ML	1 x 450 PN 10Poly	0.0033 m	3.5058 m	12.11 m	$102	$33	$185	$194,002	$3072,459	-75 m	0 m		62.880	90 m	$0.09	3.45	$0.00			
4750	40	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	5.4638 m	14.41 m	$123	$33	$156	$137,705	$634,689	-65 m	0 m		50.505	80 m	$0.09	3.45	$0.00			
5140	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	3.6640 m	15.78 m	$123	$33	$156	$137,705	$810,195	-55 m	0 m		39.223	70 m	$0.09	3.45	$0.00			
5550	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	1.9284 m	16.33 m	$123	$33	$156	$137,705	$772,975	-55 m	0 m		39.000	70 m	$0.09	3.45	$0.00			
5650	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	1.6391 m	17.42 m	$123	$33	$156	$137,705	$947,900	-55 m	0 m		37.583	70 m	$0.09	3.45	$0.00			
7000	50	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	5.3031 m	21.64 m	$123	$33	$156	$137,705	$910,050	-55 m	0 m		33.363	70 m	$0.09	3.45	$0.00			
7500	60	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	4.5006 m	22.01 m	$101	$33	$134	$118,147	$1,066,048	-45 m	0 m		22.003	60 m	$0.09	3.45	$0.00			
8000	70	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	2.4814 m	24.12 m	$101	$33	$134	$118,147	$1,028,228	-35 m	0 m		10.882	50 m	$0.09	3.45	$0.00			
9000	65	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	3.7221 m	25.73 m	$101	$33	$134	$118,147	$1,184,195	-40 m	0 m		14.271	55 m	$0.09	3.45	$0.00			
9690	70	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	3.9703 m	28.09 m	$101	$33	$134	$118,147	$1,146,375	-35 m	60 m	60 m	66.911	50 m	$0.09	3.45	$18.63	115 kW	$100,000	
10680	70	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	3.7221 m	29.45 m	$101	$33	$134	$118,147	$1,302,341	-35 m	60 m		65.542	50 m	$0.09	3.45	$18.63			
11690	75	154 l/s	13 ML	2000 ML	1 x 450 PN 6.3Poly	0.0025 m	4.0620 m	33.05 m	$101	$33	$134	$118,147	$1,264,523	-30 m	60 m		66.048	45 m	$0.09	3.46	$18.63			
12000	80	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0025 m	3.7221 m	33.17 m	$123	$33	$156	$137,705	$1,440,048	-25 m	60 m		51.826	40 m	$0.09	3.45	$18.63			
12050	90	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0025 m	3.1018 m	36.15 m	$123	$33	$156	$137,705	$1,402,228	-15 m	60 m		38.847	30 m	$0.09	3.45	$18.63			
13400	120	154 l/s	13 ML	2000 ML	1 x 450 PN 8 Poly	0.0032 m	1.4986 m	37.67 m	$123	$33	$156	$137,705	$1,577,754	15 m	60 m		7.327	0 m	$0.09	3.45	$18.63			
14000	120	154 l/s	13 ML	2000 ML	1 x 450 PN 10Poly	0.0033 m	3.8397 m	39.99 m	$152	$33	$185	$182,592	$1,564,820	15 m	60 m		5.067	0 m	$0.09	3.45	$18.63			

volume required	2000 ML
time taken	150 days
flow	154 l/s

total cost for pump stations		$100,000
pipeline supply and installation costs		$1,564,820
additional costs for crossings etc at	10%	$156,482
planning, design and supervision	12%	$210,550
contingencies at	15%	$305,979
total capital		**$2,345,837**

NB - no allowance for dam access etc

pipe planning daisy to ferrie final

daisy to ferrie

6/08/2008

11.8 Estimated "Daisy Banks" to "Wattle Banks" pipeline costs

Sector	Planned capacity for 180 day season	Detail	Capex								Opex		Capex/ ML
			Pipes etc	Dams	Pump Stations	Fittings	Power to Site	Planning Design	Contingencies	TOTAL	Pumping	General	
						10%		12%	15%			0.5%	
1		Mainline to junction of Wattle Banks dam	$1,043,515		$0	$104,352	$0	$137,744	$192,842	$1,478,452	$10,333	$7,392	
2		Wattle Banks Dam supply Pipe	$247,743		$50,000	$24,774	$20,000	$41,102	$57,543	$441,163	$0.	$2,206	
3		Wattle Banks Dam		$1,400,000				$168,000	$235,200	$1,803,200		$9,016	
	4	Mainline from junction to Brown Mountain Rd	$595,018		$0	$59,502	$0	$78,542	$109,959	$843,022	$0.	$4,215	
Total	2000 ML		$1,886,277		$50,000	$188,628	$20,000	$425,389	$595,544	$4,565,837		$22,829	$2,283

Notes

180 day season is based on 180 days to fill dam and 180 days to supply back to system. This system includes a pipeline to supply to Brown Mountain Rd.

There would be scope to reduce the pipeline size to Brown Mountain Rd