



BURNS BRIDGE TRANSACTIONS
Economic, Social & Environmental Infrastructure

MIRIAM VALE SHIRE COUNCIL

ENGINEERING ESTIMATES AND FINANCIAL IMPLICATION
OF PIPELINE AND DESALINATION OPTIONS FOR AGNES
WATER AND 1770

July 2007

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1 Introduction

Burns Bridge Transactions (BBT) has been engaged by Miriam Vale Shire Council to review the development of the water supply options for the 1770/Agnes Water Region with respect to:

- > Development of cost estimates;
- > Comparison of options;
- > Market sounding of options; and
- > Impact of options on Budget and affordability.

Based on the information provided and analysis of options by Council a number of key recommendations as to the way forward for Council is provided.

1.1 History

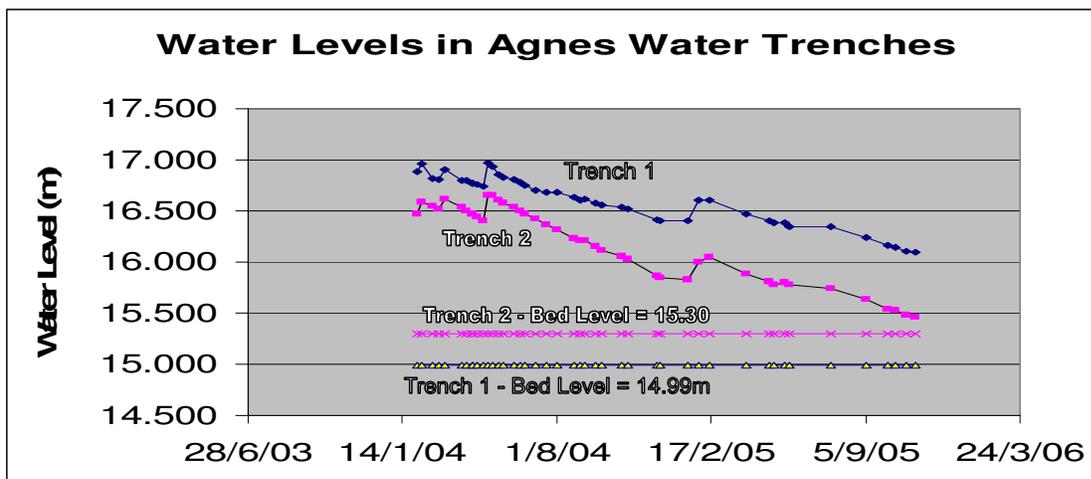
The 1770/Agnes Water Regions' water supply has been through the use of the following assets:

- > Shallow aquifer water harvesting and treatment of Agnes Water;
- > Private bore collection at 1770; and
- > Private water tanks of 1770 and Agnes Water.

The water harvesting at Agnes Water has been through a combination of bores and water supply trenches that intersect this 1½ to 2 m deep aquifer.

The current demand on the aquifer has resulted in a depletion of this resource and ultimately resulted in failure for a key water collection trench. The shallow aquifer water levels are clearly demonstrated below:

Figure 1.0: Aquifer Water Levels



Council had a strategy in place to meeting the long-term needs of this region, however water harvesting by private individuals has resulted in no viable yield being available in the planned catchment.

Council commissioned a magnetic survey of the Shire in 2005 to determine if other water resources are available, but this survey has not yielded any positive outcome.

1.2 Development and growth

The 1770/Agnes Region is one characterised by high land values and in recent times substantial high value growth.

Current development are of significant value (eg Sansara Development of ~ \$300M) and are progressing on the basis of water supply, wastewater treatment and road infrastructure being available to meet the development time table.

The current serviced population of 1800 persons will grow substantially over the next 5 years based on:

- > Connection of 1770 to water and sewer (700 persons); and
- > Analysis of approved development at Agnes Water.

Growth within the Shire has been significant and has over the 12 month period to June 2004 averaged 6%* and for the previous year this was 4.3%*. Given that the majority of the growth is within the 1770/Agnes Water region alone the actual growth for this area is in excess of the Shire average. Population trends, over the next 20 years, based on Planning Information and Forecasting Unit (PIFU) and adjusted by taking into account only nominal growth outside 1770/Agnes Water indicate a range of growth scenarios (high, medium, low).

The population growth for the 20 year period for the 1770/Agnes Water regions is indicated below:

Figure 1.1: Population Growth over 20 Years

Region	Low Growth	Medium Growth	High Growth
1770/Agnes Water	5.4%	6.5%	7.3%

* Planning Information and Forecasting Unit (PIFU), Department of Local Government, Planning, Sport and Recreation

Based on this range of growth forecasts Council has adopted the Medium position for the comparison of the options.

The proposed serviced population trends for the next 5 years based on the above are as follows:

Figure 1.2: Population Trends

Year	2005	2006	2007	2008	2009	2010
Serviced Population	1421	1506	1597	2543	2696	2587
Basis of Prediction	Current Population	Based on Development of DA's	Based on the addition of 1770	Based on Development of DA's	Based on 6.5% overall growth	Based on 6.5% overall growth

The population predictions for the period 2005 – 2008 are based on Council planning for known developments accounting for significant growth in the short term. Council recognise that a 6.5% annual growth rate is a substantial percentage increase over a 20 year period, however this is based on a small starting population base in a region that is subject to significant backlog demand.

Planning to date has been based on an annual population growth of 6.5% pa with a preference for staged infrastructure commitments to account for the likely change in population growth.

2 Project Challenges

2.1 Water demand and timing demand

Council recognised that timely meeting of this backlog demand is a major challenge as the current water commitment to existing and approved developments is more than two times the available water capacity available to Council through existing resources. This commitment to supply water for developments under construction will result in Council's capacity being exceeded by mid 2007.

Council is also unable to meet the demand to service the town of 1770 until after it commissions a new water supply despite the current health concerns at 1770.

2.2 Water supply options summary

Based on extensive survey of the region and option assessment Council has finally short-listed three options for consideration.

The final three options analysed are described with key risks as follows:

Figure 2.0: Option Risk Analysis

Option	Description	Key Risks
1	Staged pipeline from Gladstone WTP through Eurimbula National Park to Agnes Water.	<ol style="list-style-type: none"> 1. Overcapitalisation and underutilisation of asset 2. Attaining approvals for a Pipeline corridor through Eurimbula National Park 3. Approvals and construction timetable not able to meet critical delivery needs
2	Staged pipeline to Gladstone with stage 1 being connection to a water supply bore at Miriam Vale	<ol style="list-style-type: none"> 1. Overcapitalisation and underutilisation of asset 2. Attaining approvals for drawing bore water from the catchment of Baffle Creek 3. Approvals and construction timetable not able to meet critical delivery needs
3	Modular desalination plant at Agnes Water.	<ol style="list-style-type: none"> 1. Environmental approvals (GRMPA/EPA) 2. Use of more complex technologies 3. High treatment costs.

Options 1 and 2 are derivatives of a single pipeline connection from Gladstone Area Water Board's reticulation system to Agnes Water (via Miriam Vale) using a shortened route (Option 1) and low cost bore (Option 2) to reduce costs. These cost measure do present a significant environmental risks and upon a full risk analysis these low cost derivates may not be sustainable.

2.3 Option details

The pipe size was determined to be within the range of 200 mm to 225 mm diameter pipe based on a balance of construction and pumping costs. Smaller diameter pipeline options were only marginally cheaper but at a significant pumping cost penalty.

The details of the options are as follows:

Option 1: Staged pipeline connecting Gladstone reticulation system with Agnes Water through the Eurimbula National Park.

Stage 1 would consist of a single, ductile iron cement lined (DICL) pressure pipe (both 200 mm and 225 mm diameter options considered) with ultimately 7 pump stations to re-pump the water along the pipeline length. The initial stage will require 2 pump stations to meet the initial low demand.

Stage 2 of the pipeline would involve installation of the additional 5 pump stations and ultimately a duplication of the pipeline.

Option 2: A staged pipeline with the first stage being a pipeline to Miriam Vale and a bore close to Baffle Creek with ultimate connection to Gladstone.

Stage 1 is a single DICL pipeline (both 200 mm and 225 mm diameter options considered) plus a bore located adjacent to Baffle Creek.

Stage 2 of the pipeline would involve a duplication of the pipeline between Agnes Water and Miriam Vale plus a new pipeline to Gladstone.

Option 3: Desalination plant. This is a proposed staged development of a desalination plant with 100% of the seawater intake pipeline installed (7.5 ML/d) and desalination plant upgrades based on 1.5 ML/d modules (approx. 2,500 persons). The plant would be positioned on Council freehold land adjacent to the existing water treatment plant off Springs Road at Agnes Water.

2.4 Analysis of Project Hurdles

Before these options can be fully analysed it is important to identify and resolve issues and risks that have the potential to render an option as non-viable. These major project issues and risks can be viewed as hurdles that need to be overcome before the particular option is able to proceed. Analysis of the three options with respect to hurdles is as follows:

> **Option 1: Pipeline to Gladstone through Eurimbula**

This option includes a pipeline route that is shortened by some 20 kilometres by a more direct path through the Eurimbula National Park and represents a capital cost saving of some \$5M based on a supply and lay rate \$250/m.

Hurdle: National Parks advise that a route through the National Park is not viable.

Mitigation: By-pass National Park through Miriam Vale (This Option therefore reverts to Option 2).

> **Option 2: Pipeline to Miriam Vale and Gladstone**

The pipeline route to Gladstone runs along road reserves and stage 1 comprises a bore located adjacent to Baffle Creek at Miriam Vale. This is a lower cost, staged option.

Hurdle: Baffle Creek is protected catchment and DNRW will not allow Council to locate a bore that draws water direct from this catchment.

Mitigation: Extend pipeline direct to Gladstone (Awoonga pipeline) without bore on Baffle Creek.

> **Option 3: Desalination**

This option is represented by a staged membrane plant at Agnes Water.

Potential Hurdles: Great Barrier Reef Marine Park Authority (GRMPA) approval and EPA approval.

Higher operational and maintenance skills required than currently available in the Shire.

Mitigation: Advice from GRMPA and EPA indicate no hurdles on barriers to approvals process (Allow for delays in risk analysis). Involve experienced water utility operators.

The final Options analysed for full consideration are therefore:

- > *Awoonga Pipeline: Pipeline only (200 mm and 225 mm diameter DICTL pipe options) routed to Gladstone via Miriam Vale and Bororen at a distance of 105 kilometers.*
- > *Desalination: A 7.5 ML/d capacity desalination plant with 1.5 ML/d modules located on Council land off Springs Road, Agnes Water.*

3 Options Review – 20 Year Analysis

3.1 Whole of life Review

Council undertook an initial review of the whole of life cost of the two Awoonga pipeline options and the desalination option based over a 20 year comparison. A 20 year analysis is typical for most infrastructure investment decisions.

The whole of life costing analysis includes the following costs:

- > NPC CAPEX – Capital cost incurred, and adjusted via building index for escalation.
- > NPC OPEX – Operations costs is real dollars and adjusted via CPI for escalation.
- > NPC – Terminal Value. The serviceable life of each of the various components of each option is different (e.g. pipes last longer than pumps). Therefore the residual value of each asset at the termination of the comparison (20 years) needs to be accounted, and is added back into the analysis as a positive value.

Council’s Engineers, Cardno MBK, provided initial capital, operating and maintenance costs for analysis of the two pipeline options (Section 2.3 above) and the desalination option. Based on those inputs LGIS modeled the desalination and pipeline options on a 20 year horizon yielding the following output from their spreadsheet:

Figure 3.0: NPC Analysis of Options (20 Year review)

Costs	Awoonga Pipeline 200mm diameter (\$000s)	Awoonga Pipeline 225mm diameter (\$000s)	Desalination (\$000s)
NPC CAPEX	\$41,286	\$41,276	\$24,061
NPC OPEX	\$11,172	\$9,835	\$7,987
NPC Terminal	-\$16,396	-\$16,656	-\$1,706
Total NPC	\$36,062	\$34,455	\$30,342

Comparison of the above NPC calculations indicate that the desalination option has a lower whole of life cost (13%) however the analysis is significantly influenced by the NPC Terminal Value for the options. For the pipeline options the NPC Terminal Value is of the order of 50% of the Total NPC. This NPC Terminal value is high as the asset life for the pipelines is of the order of 80 years and the analysis has been carried out over 20 years. For the Desalination Option, with a lower asset life, the NPC Terminal value is lower. Therefore the 20 year comparison is particularly sensitive to the asset life and this may not represent an accurate comparison.

In order to provide a more accurate comparison and to minimise the impact of the different asset life of the options an 80 year comparison was developed and is discussed in Section 4 below.

3.2 Whole of life Review (with subsidy)

In undertaking the 20 year options analysis, LGIS also provided a preliminary analysis of those options based on the ‘net cost to Council’ – i.e. after taking into account a possible 40% subsidy position.

BBT advised that this supplementary analysis is not accurate nor appropriate for Council based on the following:

- > The available subsidy position of the options differ, as Council is likely to be eligible for both SCAP subsidy (100%) in addition to the WASP subsidy (40%); and
- > Based on advice from the Department of Local Government and Planning, Council should consider the “whole of Government (Council plus Government)” lifecycle costs, not just net costs to itself

On this basis the LGIS post-subsidy comparison was not further considered.

3.3 Affordability Analysis

A number of approaches with respect to affordability are available to Council and the following cases have been analysed by Council and are reported here within for completeness.

The 225 mm diameter Awoonga pipeline option was determined to represent the lower whole of life cost option and the affordability analysis is based on this option and the desalination option. Both options are compared to the desalination option prepared for Councils Business case.

The following financial cases are analysed:

- > Twenty year annual cash flow analysis
- > Five year budget position

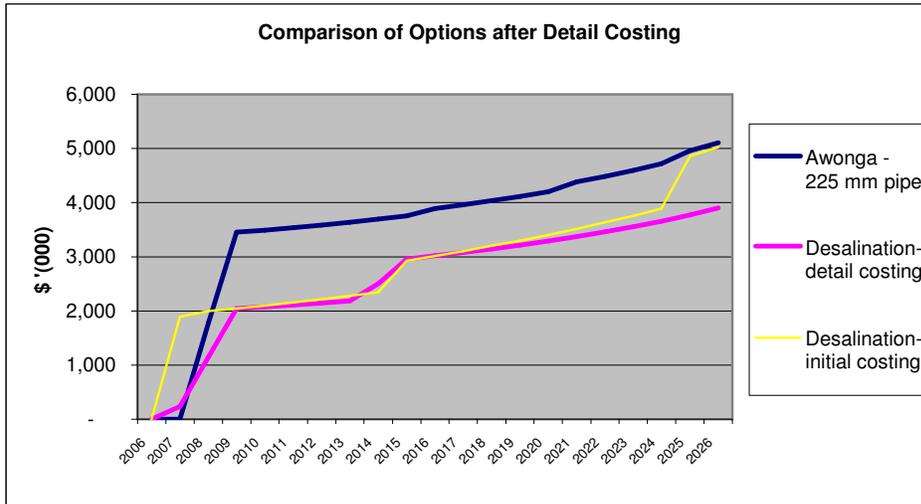
A key affordability indicator available from the above analysis is the Annual Cash Flow associated with each of the options. Earlier financial analyses by QTC on a whole of Council basis indicate that the cash flow associated with the desalination option prepared for Councils Business Case is affordable (shown as Desalination - initial costing) and this is Councils base case for the twenty year analysis.

Twenty Year Cash Flow Analyses

Detailed analysis of the costs for the pipeline option and the desalination option has resulted in more accurate capital and operation cost determination. A “Cash Expenditure” graph has been prepared to the following options:

- > 225 mm diameter Awoonga pipeline option
- > 7.5 ML/d desalination option (Desalination- detail costing)
- > Desalination option as presented in Business Case (Desalination - initial costing)

Figure 3.1: Comparison of Price adjusted position and Options*



*Annual cash expenditure including depreciation.

The cash flow graph indicates that Awoonga pipeline option has significantly higher annual cost and the Desalination option has lower annual cost to Council. When compared to the Business Case position the Desalination option has increased in costs over the first two year and from that time the annual costs are aligned.

Five Year Budget Position

Council has also developed five year budgets for both the Awoonga Pipeline and Desalination Options to determine the affordability of these options.

The Scenarios under consideration include:

- > A. Base Case (existing business) with budget capex commitment being the provision of water and sewage services to 1770 only;
- > B. Desalination Options in addition to the Base Case above being:
 - B.1 Normal 40% subsidy for Desalination
 - B.2 Normal 40% subsidy and interest only loan
 - B.3 Optimal Funding 90% subsidy (Federal 50%, State 40%)
- > C. Pipeline Option with 40% subsidy in addition to the Base Case above.

These options have been developed by Council for the 1770/Agnes water function or business unit based on a “stand alone” business entity without subsidy or a Community Service Obligation (CSO) from general rates. The key outputs from these analyses are the Water Rate (\$/kL), the Water Connection Fee (\$/annum) and annual Developer Charges.

The analysis has been undertaken based on a developer contribution of \$1,100,000 pa for the budget period, as loan redemption is to be met by these Developer Contributions.

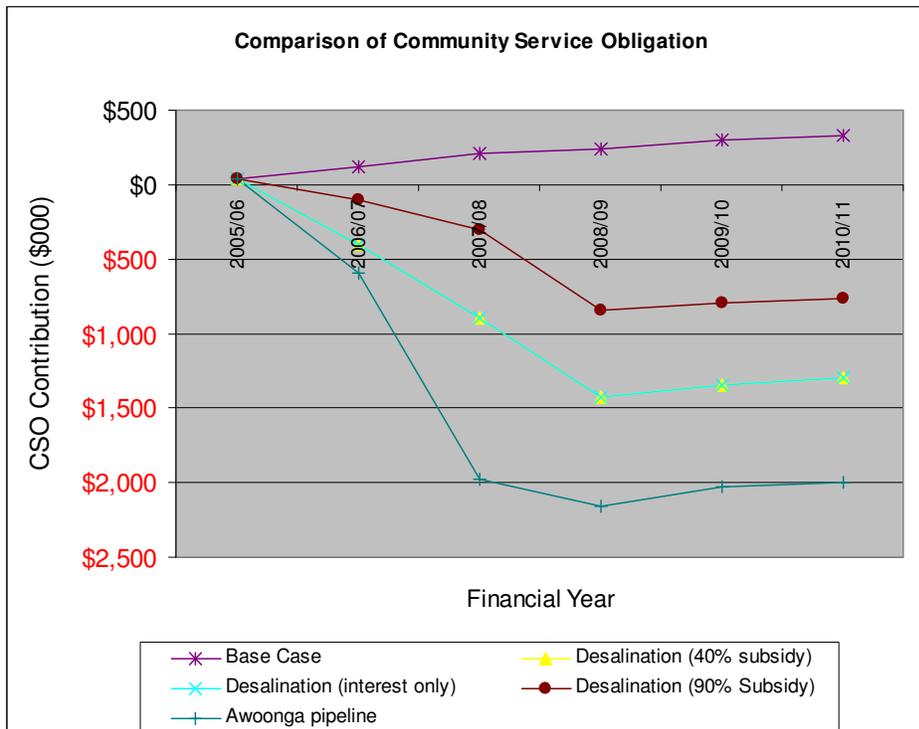
The current charges for water for 1770/Agnes Water used for the comparison are:

- > \$350/annum connection fee
- > \$2.80/kL for reticulated water

The following analysis for the above five scenarios indicate the impact on these charges over the budget period (2004/05 – 2010/11) and are based on maintaining the constant developer contribution of \$1,100,000 pa.

For each of the options graphed below are the community service obligations and annual balance of the constrained works reserve/headworks fund indicate the affordability over the five year budget period.

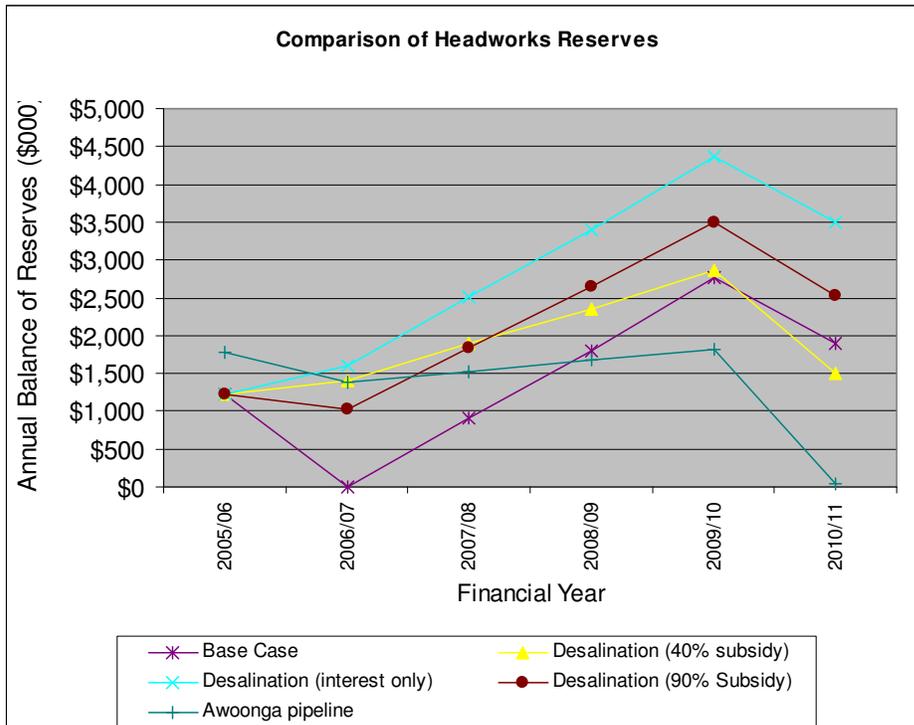
Figure 3.2: Comparison of Community Service Obligation



The Base Case position is “do nothing” where Water Supply is not provided to 1770/Agnes Water and results in a position where Council does not provide a CSO for the Water Supply as the balance remains positive.

On the basis that Council is committed to the provision of water to the 1770 / Agnes Water region the best position modeled for Council is the 90% funding position with the CSO averaging approximately \$800,000 pa.

Figure 3.3: Reserves Balance



Based on the above model the reserves balance Council maintains indicates a healthy position with respect to all the above options however as these funds effectively provide for the cost of the funding (interest and loan redemption) the options with the lowest level of borrowings (90% subsidy) and lowest level of interest (interest only loan) provide the best position for the balance of these reserves.

Summary Position

Based on the Options analysed the current budget and analysis of future costs indicate that water supply to 1770/Agnes Water is not sustainable without some form of significant CSO. The water charge, connection fee and debt servicing costs are based on four key costs associated with the additional infrastructure being:

> Depreciation

Traditional straight line depreciation may not be the most appropriate model for Council for this infrastructure package and Council should look at alternate methods.

> Debt Servicing

Costs of servicing the debt can be achieved by reducing the loan via subsidies. The Department of Local Government already provides a 40% subsidy for these types of infrastructure projects however Council does need to maximise the subsidy position with an aim of 90% through a mix of State and Federal funds.

> Operations costs

Increased operations costs (power, chemicals, maintenance, labour etc) will be a result of the additional treatment process, additional assets and/or use of high cost technology. The operations cost estimates are based on an incorporation of existing services into a single

operations entity and not simply an addition to the existing cost basis. Some further efficiency may be achieved by outsourcing to an experienced water utility.

> Corporate Services

Current requirements now provide for Corporate Services Costs to be distributed over all Council “business units” and the impact that this has on the current costs is an additional \$170,000/a resulting in an increase of \$85/annum to the current \$350/a connection fee.

4 Options Review - 80 Year Analysis

4.1 Population Growth

To undertake an analysis of a number of options over a long period, the growth rate over the analysis period can be the key factor determining the cost of the options. Based on current data available, Council determined the following estimate of growth over a period of 80 years:

Figure 4.0: Estimate of Growth Rate over 80 year analysis

Years	Annual Growth Rate
1- 20	4.5%
20 – 40	2.8%
40 – 60	2.8%
60 – 80	1.4%
Ultimate Population	25,000 persons

The growth pattern determined reflects the current high growth and assumes that this growth tapers off over the long term.

4.2 Pipeline Option Costs

On the basis of the need for an 80 years analysis Council's engineers, Cardno MBK, further developed asset planning for the two pipeline options and the desalination option for detailed costing. Based on the above population growth and the detailed cost of options the following options are considered:

- > A two-stage 200 mm diameter pipeline, with pump stations brought on line to match growth, with an additional pipeline stage planned for 2055
- > A single-stage 300 mm diameter pipeline, with pump stations brought on line to match growth

The capital and operations/maintenance costs of these options are summarised as below.

Capital Cost:

The pipeline route is approximately 105.8 km in length and recognizing the impact that pumping costs will have on the whole of life analysis the capital costs and operations costs for both pipeline options have been developed. Previous analysis of pricing risk indicated that the pipeline laying conditions along the identified route was the highest physical risk to the pricing, and particular attention to quantifying this risk has been applied to these estimates. The capital costs estimate for the two pipe options are as below:

Figure 4.1: Capital Cost Estimate for 200 mm diameter Awoonga Pipeline

Stage 1	Quantity	Unit	Rate	Cost
Pump stations*				
Stage 1	9	each	\$480,000	\$4,230,000
Stage 2	1	each	\$480,000	\$4,230,000
Pipeline				
Stage 1 (2007)	105.8	Km	\$30,990,000	\$30,990,000
Stage 2 (2055)	105.8	Km	\$30,990,000	\$30,990,000
Contingency	1	each	20%	\$14,082,000
			Total	\$84,496,000
* See Figure 4.3 below				

Figure 4.2: Capital Cost Estimate for 300 mm diameter Awoonga Pipeline

Stage 1	Quantity	Unit	Rate	Cost
Pump stations*				
	6	each	\$480,000	\$2,880,000
Pipeline				
2007	105.8	Km	\$30,990,000	\$38,857,000
Contingency	1	each	20%	\$8,347,000
			Total	\$50,084,000
* See Figure 4.3 below				

Notes to Figure 4.1 and 4.2:

1. The cost of the pipeline options have been based on laying rates provided by a local contractor with construction experience along the same alignment. The rates used reflect the ground conditions expected and the length of pipeline subject to these conditions. Cardno MBK have adopted these laying rates and built an estimate for the full design and construction of the pipeline option complete with pump stations, fittings, crossings and treatment of the final product.
2. The Average Asset life for the pipeline assets are 25 years for pump stations and 80 years for pipelines.

The two options represent a different approach to the pipeline as follows;

- > A two stage, lower initial capital cost, higher operation cost option (200 mm pipeline); and
- > A single stage, higher initial capital cost, lower operations cost option (300 mm pipeline).

The pump station implementation plan below indicates the order of the pump station installation and reflects the different approaches.

Figure 4.3: Pump Station Plan for 200 mm and 300 mm diameter Awoonga Pipeline

Pump Station Number	200 mm two staged Pipeline Year Installed	300 mm single staged Pipeline Year Installed
1	2007	2007
2	2018	2043
3	2026	2051
4	2033	2064
5	2039	2072
6	2043	2077
7	2047	
8	2050	
9	2052	
10	2081	

Operations Costs

Operations costs for the pipeline include the following annual costs:

> Power

Based on water supply demand and pump installation

> Repairs and maintenance for pipeline

The allowance for this cost is typically based on a percentage of the initial capital costs at 0.3% p.a.

> Repairs and maintenance for pump stations

The allowance for this is 5% of the initial capital cost

> Labour and expenses

Again a cost of 0.3 % p.a. has been allowed.

> Water Cost

As the pipeline will source treated water from Gladstone an allowance of \$1.00/KL has been made based on a proposed GAWB rate of \$0.91/KL. There is potential for these costs to increase substantially over time, particularly as a result of Calliope withdrawing from their water agreement with Gladstone Area Water Board.

4.3 Desalination Option Costs

The desalination plant option comprises a staged plant (five stages of 1.5 ML/d) based on delivery of the following infrastructure:

- > Separate seawater supply intake and brine return pipelines between 0.8km and 1.0km long placed on the sea bed and sized for the ultimate flow of 7.5 ML/d;
- > A pump station to transfer seawater to the desalination plant, sized for the ultimate flow but fitted out with pumps to match the stages;
- > A series of transfer pipes to transfer flow from the pump station to the plant and to return the brine. These pipelines will be installed in two stages (2007 for stage 1 and 2026 for stage 2).
- > A pre-treatment and ultra-filtration package plant to deliver 2.5 ML/d for the 1.5 ML/d (product water) modules;
- > A modular desalination package plant to yield 1.5 ML/d of product water and;
- > A brine pipeline sized for the stage 1 and 2 flow on-shore.

The size of the plant to meet the ultimate population of 25,000 persons is 7.5 ML/d and is based on peak flow calculations and strategic use of storage reservoirs. The plant is planned to be staged to match growth and demand, based on 1.5 ML/d stages. The initial stage is expected to reach capacity and a second stage added in 2020.

Previous risk analysis indicated that the off-shore pipeline was the highest physical risk to option pricing and particular attention to quantify this risk has been applied to these estimates. The current estimate now includes contractor estimates for these items and as a result the costs have increased considerably over previous estimates.

Capital Cost

Based on the above scope the following capital costs were developed by Cardno MBK.

Figure 4.4 Capital Cost Estimate for Desalination Plant

Stage 1	Quantity	Unit	Rate	Cost
Seawater intake pipelines and pump station	1	each	\$5,837,000	\$5,837,000
Desalination Plant	1	each	\$5,584,000	\$6,095,000
Brine discharge pipeline	1	each	\$3,446,000	\$3,476,000
Clear water storage & pipeline	1	each	\$614,000	\$1,792,000
Contingency	1	each	23%	\$3,878,000
			Total	\$19,389,000
Engineering Services	1	each		\$1,378,000
			Total	\$20,888,000
Stage 2 - 2020	Quantity	Unit	Rate	Cost
Complete pre-treatment and desalination module together with storage, pump station upgrade and engineering	1	each	\$3,907,000	\$3,907,000

Notes to Table:

1. The Capital Costs have been estimated by Engineering Consultants Cardno MBK with specialist support as below;
2. The contingency of 23% reflects the higher risk components associated with this option and compares to 20% for the Pipeline options;
3. As noted previously the single largest risk for capital cost is the off shore pipelines. While geotechnical advice indicates good conditions a specialist contractor was commissioned to provide pricing for this specialist area as part of the make up of the Cardno MBK estimate;
4. A specialist membrane consultant was also commissioned to provide detailed estimates of the desalination plant and the necessary components and operations costs; and
5. The Average Asset life for the pipeline assets are 25 years for pump stations, 80 years for pipelines, and 20 years for desalination units.

Operations Costs

A membrane specialist subcontracted by Cardno MBK prepared an operational cost estimate based on first principles analysis as follows:

- > Chemical based on calculated individual chemical usage at the design flow (1.5 ML/d);
- > Labour and maintenance manpower;
Based on four hours/day for an operator and four hours/week for maintenance
- > Power
Individual drives were analysed for usage at the design flow and total kW determined by multiplying the rated power by the hours run.
- > Consumables and maintenance
Allowances for replacement items (instruments, valves, pre-filters, UF membranes, RO membranes and testing equipment) allowed. A 30% contingency was applied to this estimate.
- > Flow Adjustment
All costs (other than labour) were adjusted on a pro-rata basis for the actual flow treated. Labour was considered a constant.
- > Asset replacement plan
- > Independent check of operations costs

Operational Costs Validation

In order to validate the calculation of the Desalination plant power, labour, chemical, maintenance and operations costs an independent check of the Cardno MBK first principles estimate was undertaken.

Arup Water undertook this review and the comparative operations costs over a typical full operations year (2009) are shown below.

Figure 4.5: Comparison of Operations and Maintenance Costs

Cost Item for Year 4 - 2009	Cardno Re-price	Arup Estimate
Water Demand (ML/a)	134 ML/a	147 ML/a
Proportion of plant capacity (%)	25%	26%
Power consumption based on \$0.14/kWh* (\$ pa)	\$93,000	\$82,000
Personnel Costs (\$ pa)	\$62,000	\$70,000
Consumables (membranes, chemicals, cartridges) (\$ pa)	\$75,000	\$58,000
Maintenance (\$ pa)		\$50,000
Total Annual Cost	\$231,000	\$260,000
Operations cost/kL	\$1.72	\$1.77

* Note that power costs adjusted to same basis for comparative purposes only. Excludes asset replacement

The overall Arup estimate of operations costs at \$1.77/kL aligns with the detailed Cardno MBK estimate of \$1.72/kL (on the same cost of power basis).

4.4 Whole of Life Review

The final capital, operating, maintenance and replacement costs were consolidated for the pipeline and desalination options and Cardno MBK developed a NPC analysis to compare these options based on a 3%, 5% and 7% discount factors over 80 years.

This period of time reflects the predicted life of the pipeline assets and accordingly no NPC Terminal calculations were required. However as the period under consideration exceeds the life of a number of assets (pump stations, pumps, electrical switchgear, membranes etc) an asset replacement plan was developed and allowances made for the replacement of these assets.

The comparison of the capital, operating, maintenance and replacement costs are indicated below.

Figure 4.6: Comparison of NPC over 80 year analysis*

Option	NPC over 80 years 3%	NPC over 80 years 5%	NPC over 80 years 7%
Pipeline (200 mm diameter)	\$74,626,000	\$52,962,000	\$43,490,000
Pipeline (300 mm diameter)	\$72,882,000	\$59,432,000	\$53,287,000
Desalination	\$56,777,000	\$37,804,000	\$29,465,000

*Cardno MBK NPC analysis

Under this analysis Cardno MBK figures indicate that both Awoonga Pipeline Options represent significantly higher whole of life cost than the Desalination Option. Depending on the discount factor applied the difference varies between 20% (at 7% discount rate) up to 30% (at 3% discount rate).

The differential whole of life costs is therefore significant and on this basis the Desalination Option is clearly the lower cost option to Council.

4.5 Options Impact on Contract Delivery Model

Council has worked through a number of workshops, and adopted a Business Case based on an Integrated Water Strategy.

This strategy involves the delivery of the following infrastructure;

- > Water treatment facility;
- > Treatment of waste water and ultimately an aquifer re-charge facility;
- > Sewer reticulation to 1770; and
- > Water reticulation to 1770.

The current strategy is to engage with an experienced water utility party in the development and delivery of the current planned infrastructure and to form a partnership with this party to manage Council's long term water and wastewater infrastructure needs.

The scope of works, the value of the works and proposed contract model will determine market interest for this type of package.

As the pipeline option will have a significant impact on the scope and value of the works, market sounding was undertaken to determine if this had an impact on the interest of key private sector parties that have to date shown interest. The response of the market sounding can be summarised as follows:

- > Veolia Water – No interest in a pipeline project as their interest is in Integrated Strategy
- > United Utilities – No interest in a pipeline project as United Utilities cannot add value to operations

In summary while the pipeline increases the capital cost of the project the pipeline is seen as a simple construction project and there is no value add, nor sufficient operations revenue to attract operations companies to participate in the bid process.

As it was expected that Council would look at the total project scope as part of its ongoing affordability review, comments were also sought on the concept of scope reduction by removal of the wastewater treatment plant and aquifer re-charge.

Again this significantly reduced the scope, value add and overall attractiveness of the project to the operations companies.

Development of the Awoonga Pipeline or removal of the wastewater treatment plant from the scope will impact on the attractiveness of the project to some market participants that Council is seeking to attract.

5 Recommendations

Based on the cost data developed for a range of Desalination and Pipeline options and the financial modelling by Cardno MBK over a project life of eighty years it is clear that the Desalination option will produce the lowest whole of life outcome and provide the flexibility necessary to match actual growth patterns in the 1770/Agnes Water region.

While Council has committed to growth in the 1770/Agnes Water Region (Corporate Plan and Planning Schemes) the cost to Council for the development of this infrastructure to accommodate this commitment to growth it is not necessarily affordable without significant subsidy.

Affordability has been determined on a balance of costs and charges across:

- > Access Charges to property owners;
- > Water Rates to property owners; and
- > Developer Charges.

Council has modeled the financial impact of these charges based on developer contributions providing for debt servicing, with ratepayers providing for operations and depreciation.

Based on the improved reliability of the cost data developed and modeled by Cardno MBK the following recommendations are made in order to minimise costs to the above parties:

1. *Based on lowest whole of life cost and lowest initial cost, Council adopt Desalination as its preferred technology for the servicing of the water needs of 1770/Agnes Water;*
2. *Council seeks maximum subsidised funding through both the State Government SCAP program and Federal Government NWI program,*
3. *Council review its budget position with regard to:*
 - a. *Community Service Obligation for the 1770/Agnes Water Region;*
 - b. *Level of Developer Contribution necessary to fund the water and wastewater infrastructure;*
 - c. *Corporate Services costs apportioned to the water sector in general; and*
 - d. *Strategy for the funding of depreciation;*
4. *Council prepares technical, commercial and legal documents necessary for a strategic commencement of the Transaction Process once commitment to funding is secured;*
5. *Council resumes the process of obtaining the necessary environmental approvals; and*
6. *In order to continue to maximize market attractiveness, it is recommended that MBR wastewater treatment be included with the project scope for Desalination plant, as proposed in the Integrated Water Strategy.*