REVIEW OF WATER METERING COSTS IN TAURANGA CITY COUNCIL

Executive Summary

This report deals with a query that was received concerning the economic impact of Water Meters on Tauranga's community. The two scenarios that have been reviewed are Scenario 1 Water demand management implemented using universal water metering and volumetric charging for water and Scenario 2 the projected situation had water meters not been introduced. The financial analysis evaluates the projected costs of the two scenarios over a 30 year period. The basis of comparison was to determine all costs that would differ from the situation that exists with water metering having been adopted. The assumptions and basis for these is highlighted.

While there are other methods of water demand management that could have been employed the success of these methods can not be accurately established. Water metering is recognised as an effective and fair method of implementing water demand management and reducing peak water demands.

Based on the overall comparison of the two scenarios it is estimated that there would have been a projected nett average savings of at least $3.4 million a year over the 30 year period of analysis. As highlighted in the review, these projected savings do not include a cost evaluation of various other potential economic, environmental, social and sustainable benefits that have accrued.

Water metering and volumetric charging for water is still seen as an effective method of water demand management to be complemented by other methods that are being evaluated to further improve the water demand management in the City.

Purpose of the Review

In response to a query (Appendix A) concerning the economic impact of Water Meters on our community, the following provides an overall evaluation.

Background

Universal water metering and volumetric water pricing was initiated in Tauranga in 1999 and water billing on a volumetric basis commenced in July 2002. The basis on which this was implemented was to provide a fair and equitable service to customers. In addition, there have been numerous other benefits realised; including economic and environmental and the availability of detailed business information. As the query is related to the economic benefits, this report will focus primarily on this aspect. There are associated benefits which are not as easy to quantify in financial terms.

One of the ways in which water metering has saved money is in delaying the need to invest capital in a new water processing facility together with the corresponding operational, depreciation and debt servicing costs. As suggested in the query, there are costs associated with having water meter assets, namely; cost of installation, reading, billing and meter replacement.

This review undertakes to look at the comparison of costs between the following two scenarios that are applicable throughout this document namely:
Scenario 1 Water demand management implemented using universal water metering and volumetric charging for water.
Scenario 2 The projected situation had water meters not been introduced.

The most effective way of comparing the benefits of water metering and predicting what may have happened without universal water metering is to consider expenditure in the 30 year period financial years spanning 2002/03 to 2032/33. (This period covers the start of the Water Demand Management (WDM) measures and also allows the evaluation of the costs of bringing the Waiari Scheme online under both scenarios).

Impact of Metering / Water Demand Management

As can be seen in Figure 1, the introduction of water metering significantly reduced water consumption (and hence production). Due to the Waterline customer education programme,

which started around 1999, and raised public awareness of charging for water on a volumetric basis, reduction in water demand in fact preceded billing. Actual water meter billing commenced July 2002.

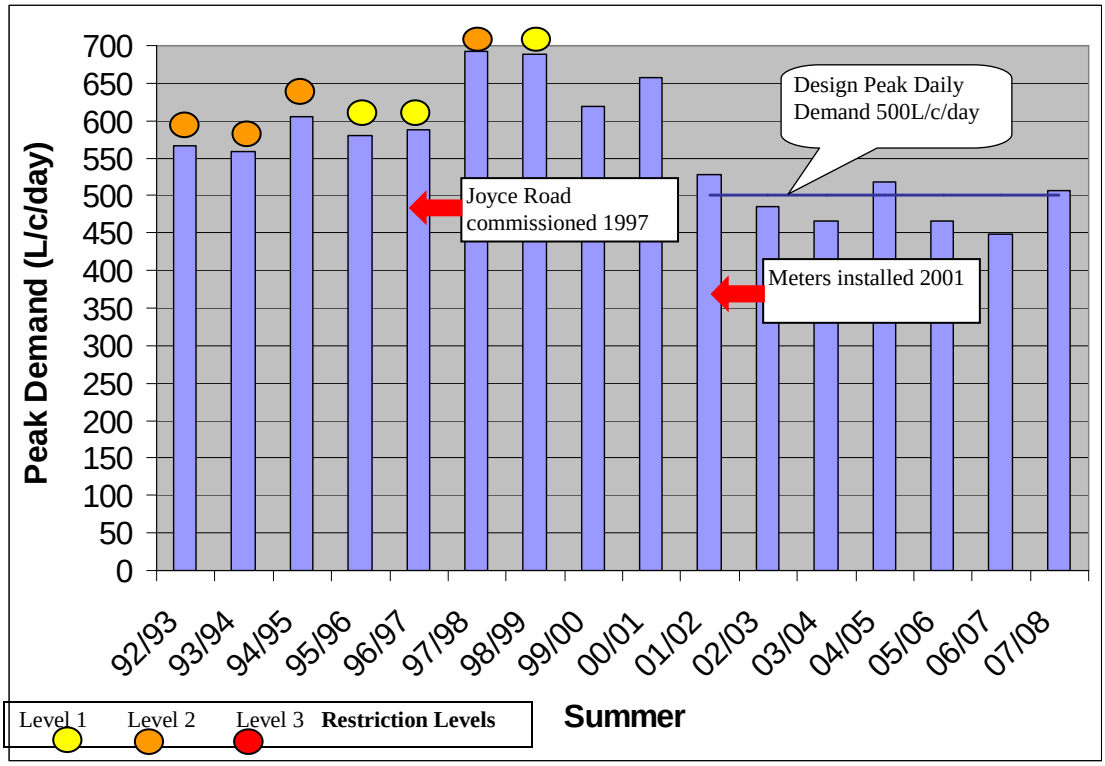

Figure 1 Showing the Peak Demands Pre and Post Meter together with the restriction level implemented where indicated.

It should be noted from Figure 1 that some form of water restriction was required each summer prior to metering being introduced. Since the introduction of metering, there has been no requirement to apply water restrictions even with a population increase of about 24,000 (27%) people during this period.

When the Joyce Rd plant upgrade was commissioned in 1997, this did not bring any relief to the situation and despite the additional capacity available, peak demands increased to 700 litres per capita per day (i.e. demand rose to meet the additional capacity and this meant that restrictions still had to be employed). It is further noted in the 1997 Tauranga District Council Asset Management Plan that if the demand was left unrestrained and unmetered, the peak demand was anticipated to rise to 880 l/c/d. It was this growing demand that prompted the need to pursue metering as a water demand management tool and as a fairer and more equitable way of providing water services to the City. Water metering and volumetric charging gave consumers the opportunity to self-manage their water use and eliminated cross subsidisation of high water consumers under the fixed charge UAC system.

There are other methods of achieving water demand management including; the use of alternative sources for water, such as the use of rainwater or greywater for watering the garden and toilet flushing, water efficient fixtures in the home, pressure reduction interventions, seasonal water restrictions, allowing water supply to run out during high demand periods etc.

The impact of these methods of water demand management on water usage in the City is difficult to ascertain as it is dependant on uptake. However as an indication, in a report undertaken to assess various water saving measures on water demand in the City (based on a typical implementation rate of 10% for existing residential developments) gave the following results:
Introduction of a combination of Water Saving Device fixtures, Rain Water Storage Tanks for outdoor use, and greywater recycling for Dual Flush toilet flushing would provide reduction of 4% on the overall water demand.

If this was made mandatory to install these systems for 100% of all future developments an overall saving of 18% on water demand by the year 2031 (in 20 years) would be achieved.

It must be noted that water metering is internationally recognised as an effective, fair and equitable method of achieving water demand management and it also reduces peak water demands. The introduction of water meters and volumetric charging in 2002 resulted in a 25% reduction on average usage and 30% reduction in summer peak demand.

In the Tauranga context water restrictions have not been sustainable in changing customer behaviour as reflected in Figure 1. However, the introduction of water metering and volumetric charging has been successful in changing the way people use water. The case for the implementation of water metering was explored as early as 1994 and an independent audit at the time reported that water metering was in the “best interests of Tauranga residents”.

The need for an additional water supply from the Waiari scheme is triggered once the peak daily demand exceeds the combined capacity of the existing processing plants (i.e. 69,000 m^3/d). The reduction in water demand following the introduction of metering has led to a delay in the need for the Waiari water processing facility by about 12 years, which otherwise would have been required by 2005. (See figure 2).

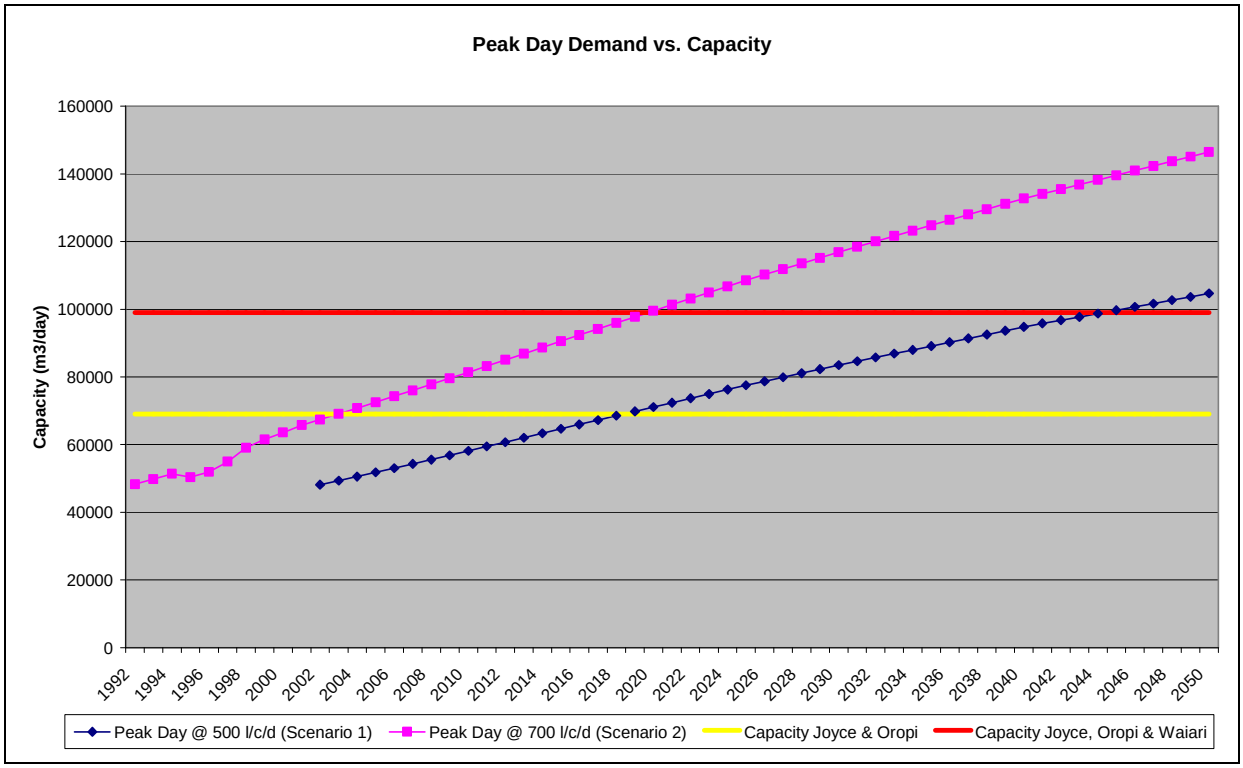

Figure 2 – Projected Peak Day demands for the two scenarios are shown. Scenario 1 - Peak demand based on 500 l/c/d the peak demand realised after water metering was introduced. Scenario 2 - Peak demand based on 700 l/c/d which was peak realised prior to water metering.

The combined maximum capacity of the existing processing plants (69,000 m^3/d) is shown as well as capacity once the first phase of the Waiari plants is in place (99,000 m^3/d). These are included to show where the peak demands under both cases exceed the plant capacity.

The graph shows that under the 700 l/c/d scenario the Waiari first phase would have been required by 2005 and a further upgrade (second phase) would be required by 2020. Based on the projections and on the lower peak demand of 500 l/c/d the need for the first phase of the Waiari has been delayed by at least 12 years and the delay to upgrade to the second phase of the Waiari by about 25 years. (Note that the factor of 1.1 that is normally used to determine the capacity of processing plants to accommodate maintenance and downtime at the plant has not been applied and this would require the plants to be built even sooner.)

The actual peak and average demands during the period before and after metering and the impact on both the peak and average demand since then is shown below (see Figure 3). The graph confirms the basis of the peak demands used in the above scenarios.

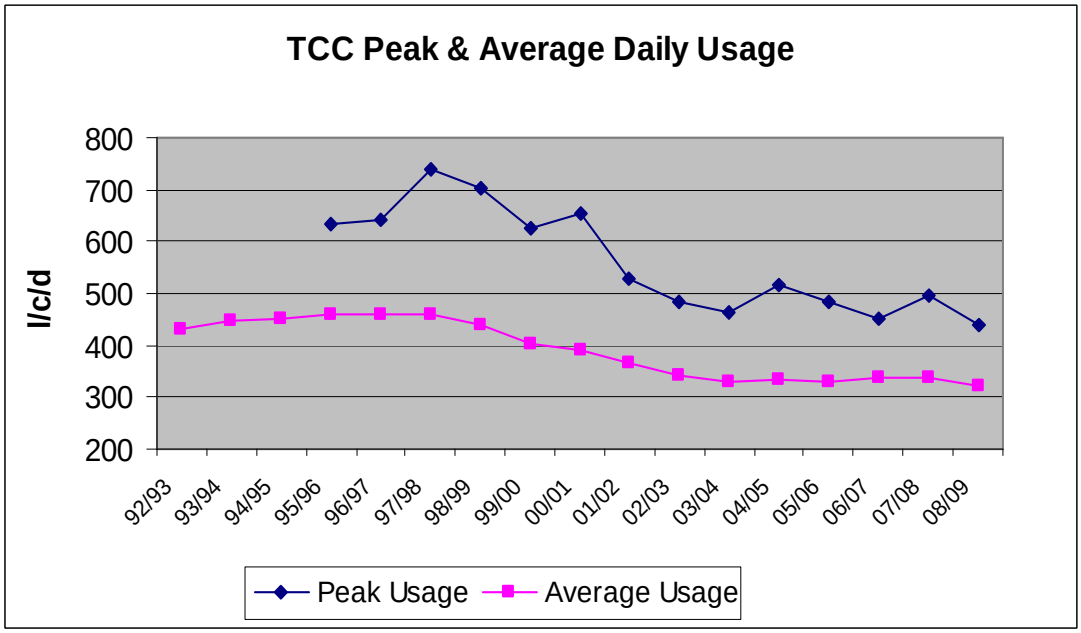

Figure 3 Actual peak and average water usage during the pre and post meter periods.

Together with the reduction in water demand there was also a corresponding reduction in wastewater volumes treated. (See Figure 4). This has decreased the volume of wastewater that needs to be treated and has delayed the need to upgrade infrastructure in the wastewater treatment and collection systems.

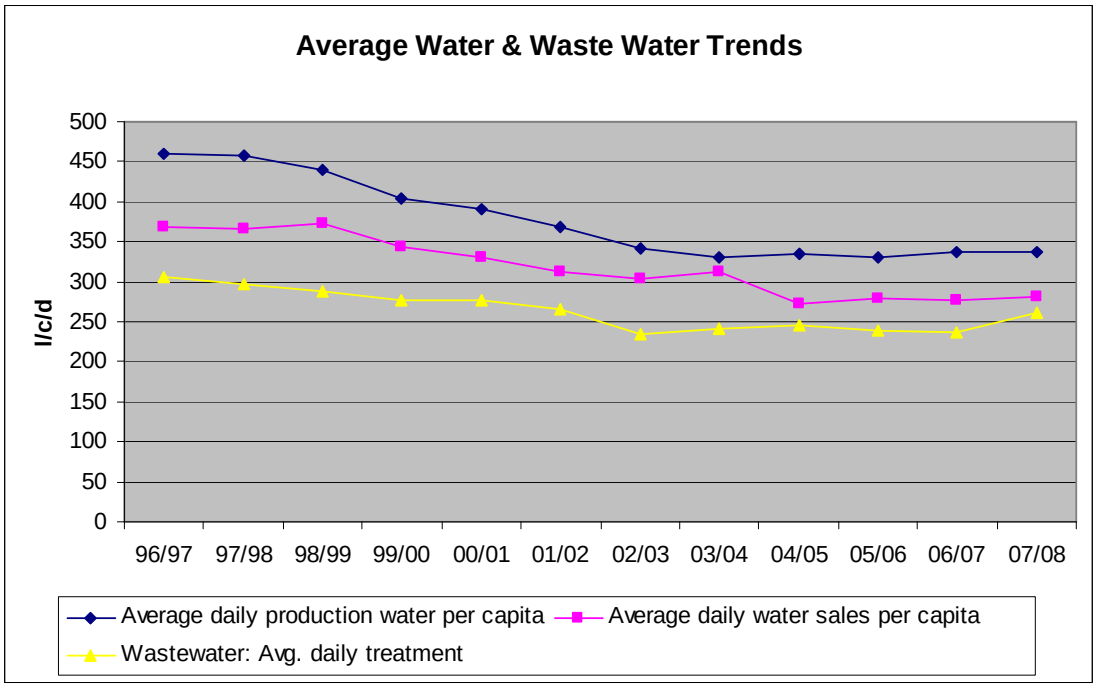

Figure 4 showing the average daily water production and sales together with the average wastewater treated.

The financial implications of the two scenarios are discussed below.

Financial Review

To illustrate the cost implications of the two scenarios discussed in this report, a spreadsheet was prepared. This shows estimated costs for each of the two scenarios over a 30 year period broken down into three 10 year blocks. The period selected was between 2002/03, the year in which water billing commenced and 2032/33. (This period covers the start of the Water Demand Management (WDM) measures and also allows the evaluation of the costs of bringing the Waiari Scheme online under both scenarios). The spreadsheet data & interest and depreciation calculations are provided in Appendix B.

Assumptions

1. The basis of the review was to highlight the specific areas of cost that would be different for the two scenarios and project the implications of these scenarios on the costs over the period of analysis. It was further assumed that all other costs remained equal.
2. All costs have been reflected in today's dollars except for the capital cost of meters which was the amount paid between 1999 and 2002 for implementing metering.
3. In addition the capital costs of the Waiari in today's dollars has been decreased by inflation (at a rate of 2.5% per year) to bring it back to 2004/05 dollars in the "without meters" scenario as this is the time this plant was scheduled for operation had metering not gone ahead.
4. Interest was calculated at a rate of 7% per annum.
5. Depreciation was based on 10, 25, 50 or 100 years depending on the asset type.

The following basis was included in the spreadsheet:
With Metering Scenario 1 (See Table 1 below)

1. Meters have been depreciated over a period of 15 years based on an economic meter renewal model which is annually reviewed taking into account factors such as throughput, failure rate, accuracy, replacement cost and cost of water. This would fund the meter renewal programme and maintenance.
2. Debt servicing of the capital amount for meters
3. Meter Reading costs
4. Meter billing costs
5. Waterline Costs over and above those that would have been in place irrespective of metering and taken as 50% of total costs.
6. All costs were reflected as being introduced from the inception of water billing in the 2002/03 financial year and have been carried through for the 30 year period.
7. The cost associated with the Waiari was introduced from 2017/18 as per the current LTCCP and these include debt servicing and depreciation.

Without Metering Scenario 2 (See Table 2 below)

1. Waiari Depreciation & Debt Servicing introduced from 2005/06 as the plant was projected to be required by 2005.
2. In addition the depreciation and debt servicing for the second phase of the Waiari was included from 2020 as reflected by the projected demands using the 700 l/c/d peak demand forecast.
3. Additional Operating Cost Water – this is the additional cost of producing water in excess of the current demand. This was determined by taking the average per capita usage before and after meter implementation. The difference of 117 l/c/d was multiplied by the varying population and by the variable cost of water processing (i.e. 17c per cubic metre).
4. Additional Water Plant Costs - these are the additional operating cost estimated for an additional water plant to be operated and maintained on an ongoing basis. This cost was included from the inception of the Waiari in 2005/06 and terminated when the Waiari is commissioned in the "with meter" scenario.
5. Additional Operating Cost Wastewater - this is the additional cost of treating wastewater in excess of the current demand. This was determined by taking 75% of the additional water usage reflected in 3 above and this was multiplied by the variable cost of wastewater treatment (i.e. 26c per cubic metre).

An overview of Operational and Capital Expenditure for both scenarios is provided in Tables 1 & 2 below.

Table 1 Impact of Metering on Capital and Operating Expenditure

With Water Meters (Scenario 1)			
Meter Capital Cost	9,770,000		
Operational Expenditure	2002 - 2012	2012 - 2022	2022 - 2032
Depreciation - meters	6,513,333	6,513,333	6,513,333
Debt Servicing - meters	6,782,008	6,782,008	6,782,008
Meter Reading	1,407,240	1,407,240	1,407,240
Meter Billing	2,525,560	2,525,560	2,525,560
Waterline Additional Costs	1,390,000	1,390,000	1,390,000
Waiari Capital	Current $'s		
Waiari Intake & Treatment Plant	44,828,480		
Waiari Reservoirs	5,999,240		
Trunk Main (Waiari to Poplar Lane)	17,816,000		
Total	68,643,720		
Operational Expenditure	2002 - 2012	2012 - 2022	2022 - 2032
Depreciation - Waiari			
Waiari Intake & Treatment Plant	-	3,850,000	7,700,000
Waiari Reservoirs	-	515,000	1,030,000
Trunk Main (Waiari to Poplar Lane)	-	765,000	1,530,000
Debit Servicing - Waiari	-	20,598,113	41,196,225
Years	2002 - 2012	2012 - 2022	2022 - 2032
Total Cost with Meters	18,618,142	44,346,254	70,074,367
Average per year	1,861,814	4,434,625	7,007,437
Total over 30 Years	133,038,763		

Table 2 Impact of No Metering on Capital and Operating Expenditure

Without Water Meters (Scenario 2)			
Waiari Capital	Est.2004/05		
Waiari Intake & Treatment Plant	38,500,000		
Waiari Reservoirs	5,150,000		
Trunk Main (Waiari to Poplar Lane)	15,300,000		
Total	58,950,000		
Years	2002 - 2012	2012 - 2022	2022 - 2032
Depreciation - Waiari			
Waiari Intake & Treatment Plant	5,390,000	7,700,000	7,700,000
Waiari Reservoirs	721,000	1,030,000	1,030,000
Trunk Main (Waiari to Poplar Lane)	1,071,000	1,530,000	1,530,000
Debit Servicing - Waiari			
Annual Interest	28,837,358	41,196,225	41,196,225
Waiari Upgrade (2020) Depreciation	-	1,914,000	6,380,000
Waiari Upgrade (2020) Debt Servicing	-	5,513,795	18,379,317
Additional Operating Cost Water	7,702,649	9,591,620	11,507,752
Additional Water Plant Costs	1,540,000	1,100,000	-
Additional Operating Cost Wastewater	8,835,391	11,002,152	13,200,068

Total Cost without Meters	**54,097,398**	**80,577,792**	**100,923,362**
Average per year	**5,409,740**	**8,057,779**	**10,092,336**
Total over 30 Years	**235,598,552**		

It must be noted that the assumptions and projections in the above analysis, exclude various additional benefits of water demand management and the reduction of peak and average demands, as some of these are difficult to ascertain. However it is important to list these to further highlight the benefits of water demand management. Had the reduction in water demand not been achieved, the City would have incurred significant additional costs over and above those identified above.

Costs that have not been included in the analysis for Scenario 1 include:

1. The need for additional Wastewater treatment infrastructure and associated upsizing of collection systems.
2. Additional water pipes to feed existing parts of the City to provide for the increased volume through put.
3. Capital expenditure associated with additional service reservoirs to cater for the increased storage needed to meet the 48 hours (average daily demand) level of service.
4. Improved measurement of water through the system and providing an effective method of highlighting areas for leak detection and repair.

In addition to the above there are other benefits of reduced water demands that do not have a direct measurable cost advantage. Nevertheless there are significant benefits from an overall economic, environmental, sustainability and social view point. These include:

1. Better use of existing water resources and reducing the need to establish new water sources for water supply purposes. This includes the ability to make water resources available for alternative usage such as irrigation.
2. Reduced competing demands for water where water resources are constrained.(EBOP required TCC to demonstrate good management of existing water resources as part of the application for the future Waiari water take consent).
3. Meeting Councils obligation in meeting the requirements of sustainable management contained in the Resource Management Act.
4. Reduced environmental impact through treated effluent discharge back into the environment.
5. Reduced cost of energy to domestic users through reduced water heating costs.
6. Improved understanding and measurement of system water losses and dealing with water leaks when these escalate to an unacceptable level.
7. The social impact of water restrictions and the policing of community compliance.
8. The social impact of a fair system of water billing and the reduction of cross subsidisation.

Overall the data shows/predicts that universal metering (over the 30 year period of analysis) has provided and will continue to provide significant savings to TCC, primarily due to the delay in capital expenditure of a new water processing facility and the reduction in water and wastewater that needs to be treated under the scenario where water meters have been installed and water is charged on a volumetric basis. The estimated savings over the period of analysis are shown in Table 3 below.

Table 3 Estimated Nett Cost Savings due to Water Metering

Potential Savings			
Spread over 30 years	102,559,790		
Years	**2002 - 2012**	**2012 - 2022**	**2022 - 2032**
Savings per period	35,479,256	36,231,538	30,848,995
Average Savings per Year per Period	3,547,926	3,623,154	3,084,900
Average Savings per Year	3,418,660		

Based on the overall comparison of the two scenarios it is estimated that there would have been an average savings of at least $3.4 million a year over the 30 year period of analysis. It is therefore estimated that the average household would be paying at least an extra $81 per annum (30%) more for their water if water meters had not been introduced.

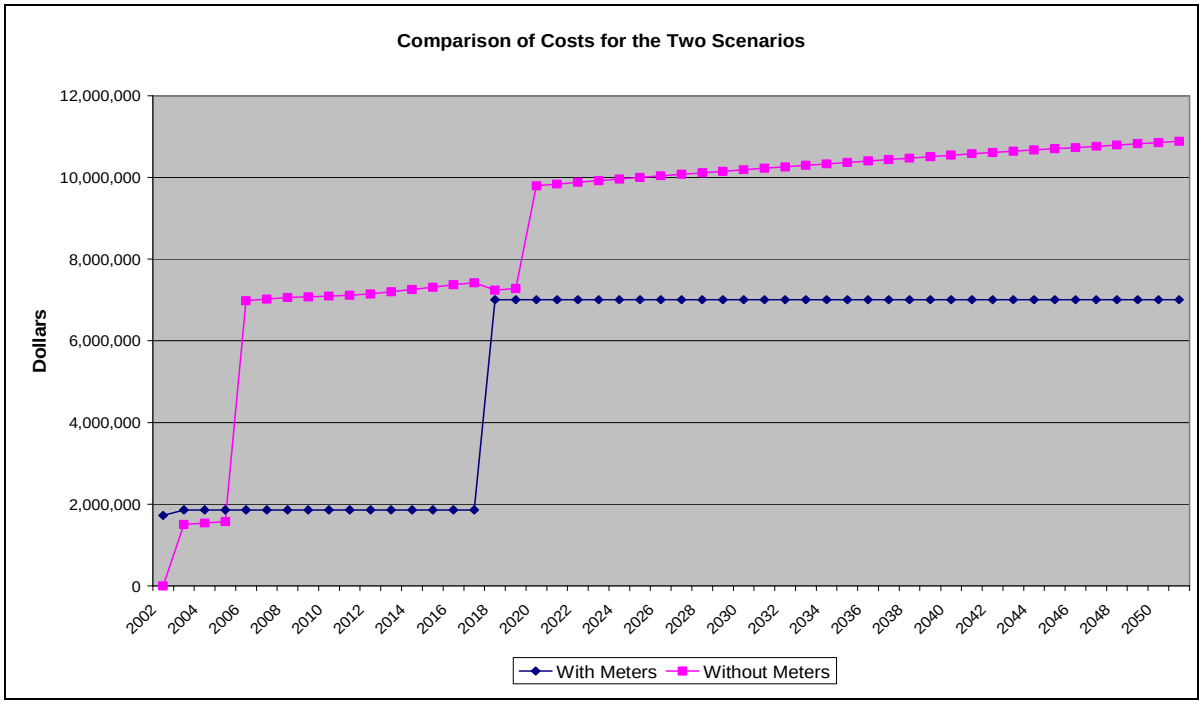

Figure 5 – Costs for the Two Scenarios under consideration.

It can be seen from the above figure that although some additional cost were incurred in the initial years under the “with meter” scenario on average the costs in the “without meter” scenario are consistently higher and continue to increase with time.

Water Costs

The current average water bill is shown in table 4. The UAC charges prior to metering are shown in Table 5. The cost of the UAC at the time was predicted to increase dramatically with the event of a third water processing plant.

Table 4 Average Metered Water Bill

Average Bill with Metering		
Fixed		$25
Volumetric (m^3/annum)	176	
Tariff	$1.40	$246
Total		$271

Table 5 UAC Charges

UAC Pre Metering	
Year	Non-metered rate
93/94	$86.00
94/95	$94.00
95/96	$100.00
96/97	$117.00
97/98	$160.00
98/99	$188.00
1999/2000	$215.00
2000/01	$225.00
2001/02	$233.00

Note - No provision has been made to estimate the escalation of these UAC charges into current values.

From a financial management perspective, the introduction of universal metering and volumetric charging has had a significant impact on Councils external debt levels. In the event the water metering was not introduced, Council would have had to borrow an additional $49.18 million (this being the difference between the cost of the Waiari and of water meters $58.95 million less $9.77 million). In order to avoid breaking its debt limits, it would have been necessary to decrease other capital expenditure. Based on Tables 1 & 2 above, rates revenue would need to have been higher to support the increased Capital and Operating expenditure.

Way Forward

With the continued and predicted growth in Tauranga this has led to TCC requiring a third water processing facility which is planned for about 2017.

Work continues to evaluate other methods for water demand management including leakage and pressure management, customer engagement/education programmes, use of rainwater/grey-water and research into the role of tariff structure, with a view to further delay the need for future infrastructure upgrading and therefore capital investment. The third plant may need to be built for strategic reasons to ensure security of supply to the developing Eastern Coastal Strip however any further water demand measurement measures will assist in delaying capital spend on future processing, reservoir and pipeline upgrades required to meet the growing water supply needs of the City.

Conclusion

The combination of universal water metering, volumetric water pricing and water conservation education has successfully changed the water demand profile in the City. While there are numerous other water demand management methods that can be employed to achieve a reduction in water usage these do not in general meet the criteria of being a fair and equitable method of providing water services to customers and they do not necessarily reduce the daily peak water demands which is the driver for building new water infrastructure.

The evaluation of the overall costs for the two scenarios considered shows that very significant financial benefits are accruing to the community. The average bill has remained in a stable band whereas the UAC would have been significantly higher to cover the estimated additional costs of at least $3.4 million per annum.

Peter Bahrs
Water Supply Manager **March 2010**