WATER METERING – THE TAURANGA JOURNEY

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ABSTRACT

Tauranga City Council (TCC) implemented universal water metering and volumetric charging across the city some 10 years ago. Approximately 39,000 meters were installed which resulted in significant benefits including:

- A 30% reduction in peak demand, which enabled a proposed water scheme to be delayed by at least 10 years. This resulted in substantial deferment of capital expenditure as well as other cost savings.
- Socio-economic benefits were realised by TCC and the community - customers pay for water they use.
- Ongoing demand management initiatives are more efficient and sustainable, in line with Resource management Act (RMA) requirements.

However, this success was accompanied by a number of technical, administrative, logistical and procurement challenges. The meter fleet is now maturing and an initiative is underway to ensure optimal renewal whilst sustaining demand management benefits in the long term.

Whilst the "low-hanging fruit" has been plucked by implementing universal water metering in Tauranga, various supplementary opportunities have been identified to further enhance benefits to TCC and customers which include, investigation into the use of smart metering, consumption profiling and water tariff options.

There is a growing interest in New Zealand around water metering and Tauranga's experience may be of interest to councils who are considering this option.

KEYWORDS :

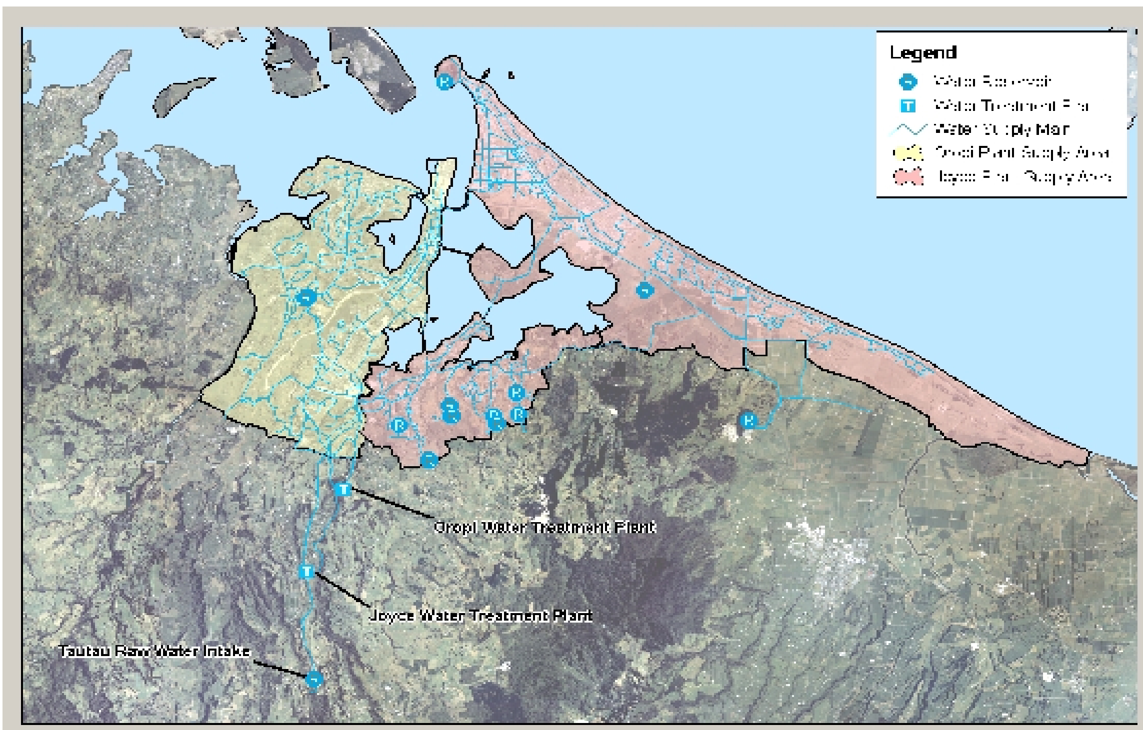
Universal Water Metering, Water Demand Management, Meter Asset Renewal, Revenue Management

1 INTRODUCTION

Tauranga City Council (TCC) embarked on the water metering journey 10 years ago by implementing universal water metering and volumetric charging across the city. There is a growing interest in New Zealand around water metering and Tauranga's experience may be of benefit to councils which are considering this. This paper aims to cover various phases of TCC's journey as well as future potential innovations that are being explored to further enhance water management and customer service efficiencies.

Tauranga is a growing and vibrant city comprising over 110 000 people. The population has doubled in the last 20 years and is likely to double again by 2050. Tauranga is a popular holiday destination and therefore faces the challenge of hugely fluctuating seasonal water demands. The terrain varies from a relatively flat and rapidly developing coastal strip (Papamoa through to Mount Maunganui) through hilly terrain in outlying, older and more established areas and semi-rural areas. The City's water is supplied from two spring-fed streams, namely the Waiorohi and the Tautau. Water is purified at two micro filtration treatment plants Oropi and Joyce, (both of which have received an "A" grading from the Ministry of Health). TCC have embarked on a plan to construct a third water supply scheme (Waiari) within the next 5 to 7 years to match growth in demand.

Figure 1: TCC Water Supply Area



Water is presently distributed to the City via approximately 1100km of pipe networks. The network infrastructure comprises a mix of older galvanised and AC piping (being gradually replaced), PE, uPVC and Steel pipes. The city has been divided into 34 district metered areas (DMA's) to take further advantage of water metering and facilitate more efficient water balancing and water demand management.

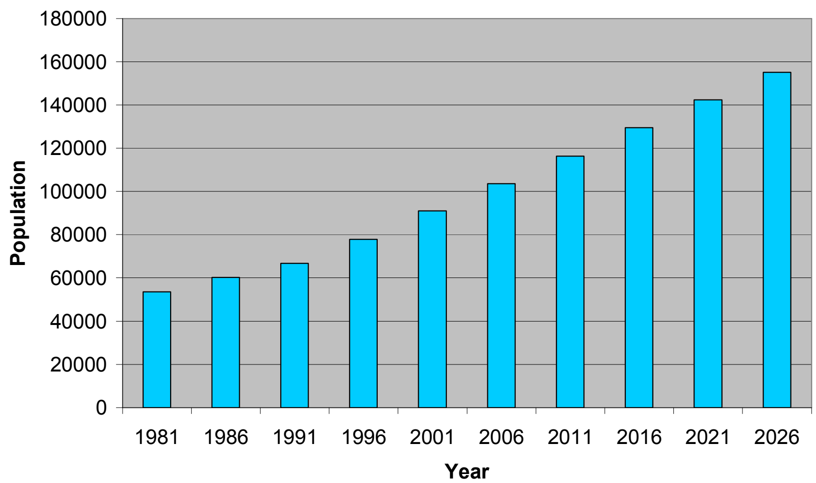
The city's water connection profile comprises approximately 90% residential and 10% commercial and industrial consumers. The consumption split is approximately 80%/20% respectively. The residential meter fleet comprises a mix of 1.5m3/hr Kent MSM (predominantly), Actaris and Sensus class C meters on 20mm manifolds which include backflow prevention devices. Commercial/ industrial meters range in size and make. The meter fleet is gradually maturing and a renewals program is currently being implemented. The average consumer (combined) uses approximately 214 m3 p.a. (peak 500 l/person/day - combined) whilst the average residential consumer uses approximately 176m3/connection p.a. (2009 figures).

2 THE JOURNEY TO DATE

2.1 KEY DRIVERS IN THE DECISION-MAKING PROCESS

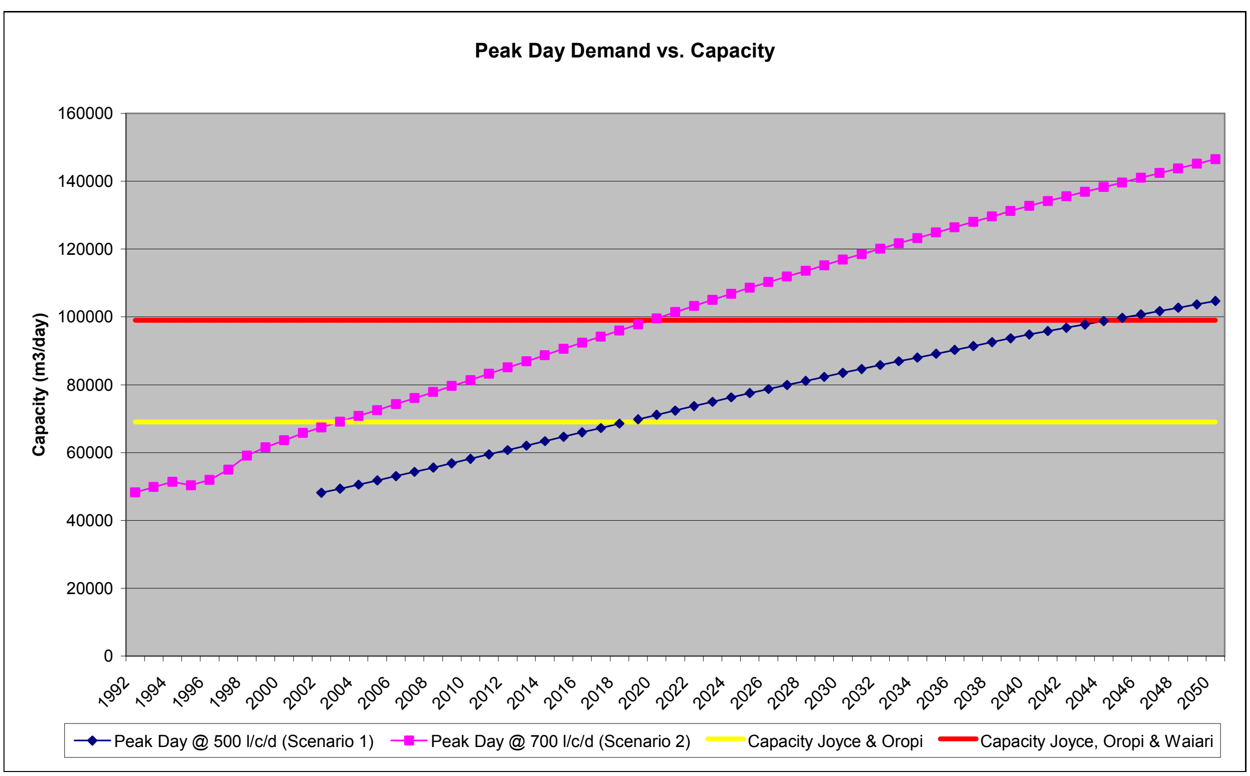
Population growth and water demand have risen rapidly in Tauranga albeit slowing recently as a result of the economic downturn.

Figure 2: Population Projections



Based on demand projections, it was predicted that the capacity of the existing plants would be able to cope with a combined peak demand of up to 700 l/ca/d until approximately 2004/5, necessitating the implementation of a new water scheme (Waiari) by that date.

Figure 3: Peak Demand Projection vs. Capacity



These challenges triggered the need during the mid 90's for council to evaluate available options, namely:

- Building the new supply scheme (Waiari) estimated at approximately $75m (albeit phased) capital cost.
- Reduce water demand to delay the need for the new scheme.

It was decided to further explore various demand management initiatives to delay capital expenditure on the proposed new scheme. Universal water metering was considered as a key component of this approach and the ***key drivers*** for considering this option were therefore seen to be:

- Concerns over run-away demand and the impact this would have on providing more capacity and a need to manage demand.

- Fairness and equity – consumers should pay for what they use.

- There is also an overarching requirement of the Resource Management Act (RMA) to manage water sustainably.

- Provide a mechanism for measuring and managing water demand.

The proposal to implement universal water metering was publicized via the media during the mid 90's. This resulted in a *Citizen Initiated Referendum* (CIR) which indicated public discontent with the concept, partially due to misconceptions and mis-information. However, a forward-thinking group of elected members pursued the key drivers and, following further public consultation made the challenging political decision in 1999 to implement universal water metering for reasons (drivers) mentioned above.

The process that followed spanned nearly three years from 1999 to 2002 and had its fair share of challenges, some of which are discussed below.

What are your drivers?

2.2 PLANNING AND PREPARATION

2.2.1 EDUCATION AND ADVISORY SERVICE

In 1997, coinciding with the decision-making process relating to water metering, an initiative named Waterline was implemented to provide information and education about water demand management and conservation, to promote the efficient use of water and to assist domestic customers with the repair of internal leaks. This proved successful and demand reductions were in fact realised before implementation of metering got underway - primarily as a result of customers paying more attention to how much they consumed, identifying and fixing leaks which they otherwise may not have realised.

During the consultation and decision-making process, it became evident that anti-metering lobbying was further misleading consumers and Waterline's role was extended to further inform customers of the expected impacts and benefits. The Waterline program has been hugely successful in all these endeavours and has now been expanded to include consumer education and support on broader initiatives covering all three waters in a "source to sea" approach.

Are your customers fully informed?

2.2.2 DATA VERIFICATION

A key element of the planning process included analysis of the rates database, customer data and the geographic location of connections to the water supply system. It soon became evident that available information could not be relied upon and a team of field staff was commissioned to visit each property and verify connection location and information, land use and geographic details. This process involved extensive database scrubbing and resulted in a far more robust and reliable data set. Despite this however, further challenges arose when it was realized that reticulation connectivity and as-built information was not always reliable which resulted in wasted time, complications on site with regards to incorrect matching of connections and consumers, frustrations and delays.

How accurate are your service connections and rates records?
Have you considered data management?

2.2.3 EQUIPMENT RESEARCH AND SPECIFICATION

Certain areas such as the Borough of Mount Maunganui (prior to amalgamation in 1989 with Tauranga) were already metered and it was observed that twin tailpieces on in-line meters there contributed significantly to leakage. It was hence decided to explore the use of manifold meters which would alleviate this problem and would allow easier maintenance and renewal in future as meters could be screwed out and replaced without the need for uncoupling from the reticulation. A decision was therefore made to install manifold meters. Further, a resolution had been passed in 1997 to install backflow devices for public health and safety reasons. The selected manifolds included dual check inserts which, at that stage, were considered to offer superior backflow prevention.

In order to establish an appropriate size of meter, a pilot study was undertaken comprising 40 Council staff and resulted in a clearer understanding of consumption profiles and meter requirements. This led to the decision to specify 1.5m3/hr meters and 20mm manifolds. Meter boxes were investigated and ultimately a decision was made to allow sufficient clearance for possible later inclusion of an automated meter reading (AMR) device, should this be found to be an appropriate solution. A customised design was negotiated with suppliers to accommodate TCC requirements. Commercial 20mm manifold connections utilised the same meter box but had the added protection of a concrete base and cast iron lid.

Have you allowed sufficient time for research, planning and preparation?

2.3 IMPLEMENTATION

2.3.1 TARGETS AND PLANNING

An implementation program was prepared that set a target period of 2.5 years for the installation of 35,000 residential meters across the city. This was later expanded to include approximately 4,000 commercial/industrial sites. This implied an installation target of 60 meters per day to achieve 39,000 in 2.5 years. In order to facilitate management of installation and, as a means of recourse if targets were not met, Tauranga was divided into 30 Meter Areas (Separable Portions). Failure of the contractor to achieve target allowed TCC the opportunity to separate portions of the work and make alternate arrangements.

2.3.2 COMMUNICATIONS

A process of public relations and communication was established to provide customers with notification well in advance of meter installers entering an area. The process initially comprised seven staged letters but was refined to two letters of advance notification and information. Internal information sessions were arranged to prepare TCC staff and teams for implementation.

Do you have an adequate communication strategy?

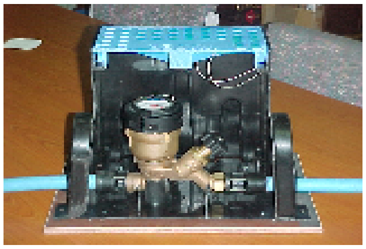
2.3.3 PROCUREMENT

Meters, boxes and manifolds were procured directly by TCC. Kent 1.5m3/hr V210 manifold meters were selected on the basis of technical merits and cost. The selected meter also provided a rotary dial at the centre which allowed customers to identify low flow and the possibility of leaks. Meter boxes had been pre-specified as mentioned earlier. The installation contract was evaluated on the basis of *lowest price conforming*.

2.3.4 INSTALLATION

Picture 1 shows a typical domestic water meter installation comprising a meter box, water meter, manifold including a dual check backflow device, generally installed approximately 0.5m from the customer's boundary.

Picture 1: Typical Meter Installation



The installation targets of 60 meters per day were met. Key success factors that enabled this included:

- The contractor adopted a positive attitude and customer communications protocol from the outset and appointed a dedicated team for this purpose.
- Consumers were notified well in advance, public relations were strong during the entire course of the contract, and a hotline response arrangement was established.
- Each meter was provided with two additional bar-code stickers to improve the efficiency and accuracy of data capture. The contractor retrieved one for record and payment purposes, the other was stuck on a plan for data capture purposes.
- Three teams were established to:
    - Locate, excavate and prepare the meter site.
    - Install the meter box, manifold and meter.
    - Reinstate grass, capture bar codes and readings.
- In order to avoid shut-downs, generally, live tie-ins were adopted.
- Procurement and delivery of meters was carefully planned on a "Just in time" basis to avoid excessive storage requirements and to ease cash flow.

Practical Challenges

- Progress was very dependant on weather, accuracy of information provided and access to the property. Rain inhibited progress in poor drainage areas, which necessitated relocating contractors to the coastal, sandy strip to minimise delays. Once efficiencies picked up, the contractor was able to reduce the field staff contingent whilst still retaining required targets.
- The importance of the box and base relationship was not adequately communicated to the contractor which resulted in a number of mutilated boxes causing them to collapse under load. Specifications required meter boxes to be square on boundaries and this proved to be very difficult in many cases. This requirement caused delays and was relaxed to allow more flexibility and practicality.
- The locations of *points of supply* were often not as expected, primarily due to inaccurate As-Built reticulation information, thus resulting in inadvertent disconnections and irate customers.
- Parent-child options proved in many cases to be a waste of funds and frustrating to customers. In hindsight, installing direct connections and dedicated meters for each property and replacement of old galvanised connections at the outset would have been more cost-effective in the long-run.
- Customer related issues e.g. grit under tap washers, hot water cylinders overflowing and burst internal water pipes were challenging and needed efficient attention by a dedicated team to limit customer frustrations and negative impact on the contract.

Have you considered potential challenges and long-term implications?

2.3.5 IMPACT ON TCC RESOURCES

Besides initial field investigation, initial planning and procurement, there were many other demands on TCC resources including:

- Site quality control which required a full-time engineer and two field staff who attended weekly site meetings and addressed on-site queries and issues.

- TCC staff captured meter locations, serial numbers and readings into council's asset management, GIS and financial systems. TCC originally allowed for 3 back-office personnel to capture data and answer queries. Continuing issues with rating database anomalies and queries resulted in TCC unexpectedly increasing the number of back-office staff from to 3 to15 during the latter phases of the installation contract. Interestingly, the contractor was able to decrease staff contingencies as efficiencies picked up during the latter phase.

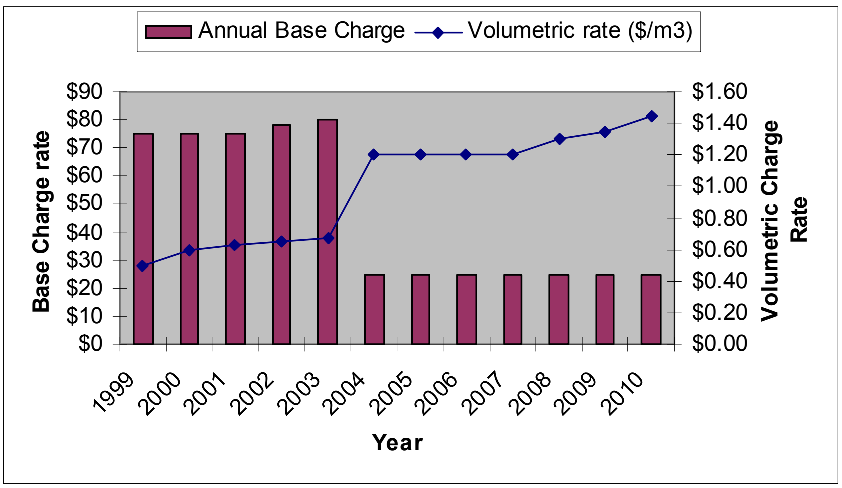
- Further requirements of TCC staff included initial planning, management of communications, checking and reconciliation of data, managing the field data verification program of information, answering queries, preparation for the dummy billing run and implementation.

Have you allowed sufficient back-office resources?

2.3.6 WATER CHARGES

Prior to the implementation of universal metering, a uniform annual charge (UAC) mechanism was utilized to bill Tauranga residents for water. UAC rates varied from less than $100 p.a. in the mid 90's to approximately $230 p.a. in 2002 at the transition to volumetric charging. Figure 4 below illustrates the mix of volumetric and annual base charges that were applied pre- and post-water meter installation in Tauranga.

Figure 4: Tariff Structures (Inclusive of GST)



Wastewater is presently charged as a UAC and is a component of the rates bill.

2.3.7 METER READING AND BILLING

Meter reading was incorporated into the maintenance service contract. It was decided to utilize portable hand held terminals (HHT's) for capturing meter readings in order to reduce data capture errors and improve efficiencies. Two meter readers presently read all meters on a quarterly basis with the exception of the large consumers whose meters are read on a monthly basis.

Dummy invoices were issued to customers during the meter installation process as part of the public relations and educational program. The dummy invoice provided customers with an understanding of their water use, water tariff and an indication of what they could expect to pay once formal billing was implemented. Consumers were advised by letter and through the media of the meter reading cycle plan for their area and when they could expect their first usage-related water bill.

Have you developed a public relations plan to off-set propaganda and misinformation challenges?

2.3.8 CUSTOMER PERCEPTIONS

Despite original opposition to metering resulting primarily from misunderstandings, customer feedback was positive and, partly as a result of intensive public relations exercises by TCC and the contractor, cooperation from customers was very good.

2.4 IMPLEMENTATION COSTS

The installed value was approximately $9.8 m for 39,000 meters i.e. resulting in an approximate installed cost of $250/meter. Additional costs which need consideration include; time for preparation; field investigations; supervision; administration and back-office time. There are of course ongoing annual costs relating to meter reading, billing and renewal. These are reflected in Table 1 below:

Table 1: Annual Meter Reading, Billing and Renewal Costs

Item	Item cost	No. p.a.	Annual Cost per meter
Meter reading cost per meter	$0.87	4	$3.48
Average cost of billing per meter	$1.37	4	$5.48
Meter replacement every 15 years	$150.00	1/15	$10.00
Total cost per annum			**$18.96**

<u>Note</u>: The cost of billing per household includes; staff time to process and generate the bill; queries; paper and postage. The cost of renewing water meters (covered later in the paper) includes the meter, dual check backflow insert, labour, administration and logistics.

Have you considered operating and renewal costs in your budget?

2.5 BENEFITS

2.5.1 FAIRNESS AND EQUITY

The following charts illustrate the comparison between metering and volumetric charging and uniform annual charge (UAC) on a range of typical customers:

Figure 5: UAC Charges (2002) - Equivalent Cost Per m3

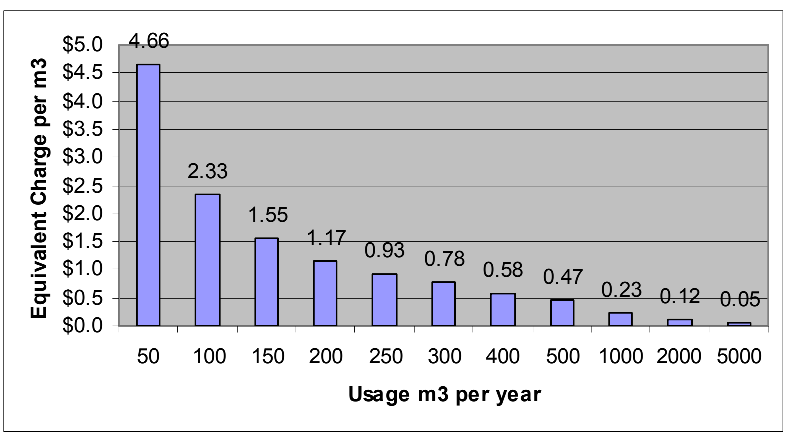


Figure 5 simplistically illustrates the concern regarding fairness and cross-subsidisation e.g. a single person consuming very little water pays a relatively high charge per m3 compared with a user consuming large quantities of water but paying the same UAC. Table 2 illustrates a domestic annual water bill based on an average domestic water consumption of 176m3 p.a.

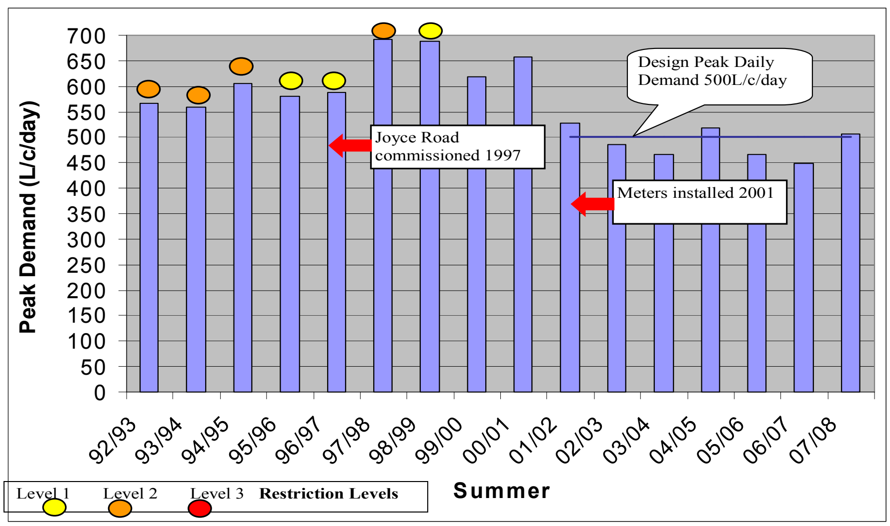
Table 2: Average Domestic Annual Water Bill

Annual fixed charge		$25
Volumetric charge = annual average consumption x tariff	176 m3 p.a. x $1.45/m3 (2011)	$255.20
Total annual charge		$280.20

2.5.2 REDUCTION IN WATER DEMAND

The implementation of universal water metering and the Waterline initiative, resulted in a reduction in peak demand of approximately 30%, with average demand reducing by about 25%. This enabled the proposed Waiari water scheme to be delayed by at least 10 years which resulted in a deferment of capital expenditure.

Figure 6: Reduction in Demand (L/person/d) resulting from implementation of Universal Water Metering

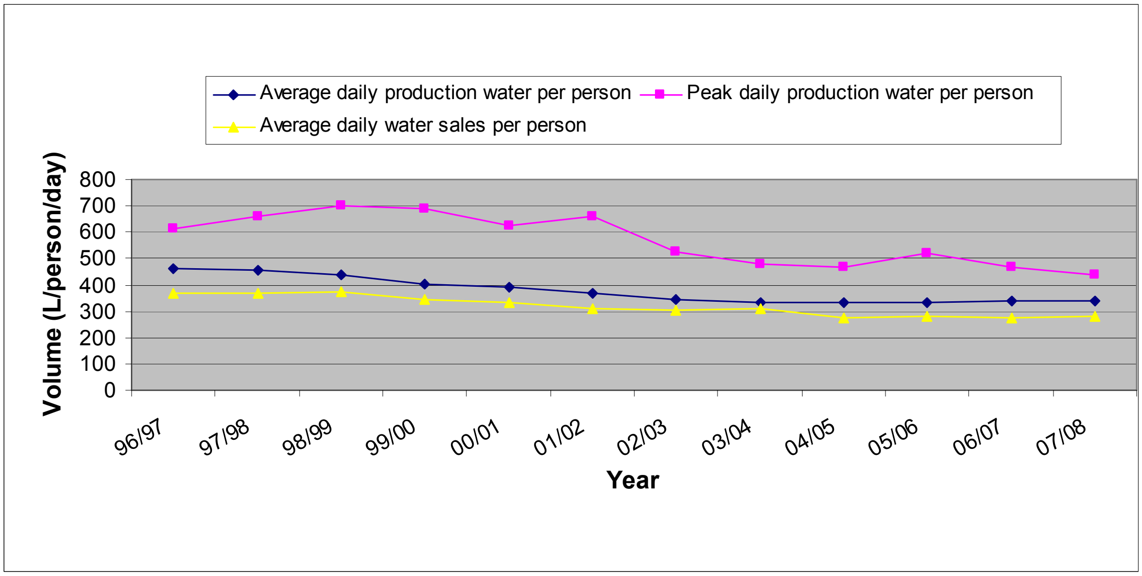


With reference to Figure 6, the following observations are important:

- Joyce Rd plant upgrade was commissioned in 1997. However, this brought no 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).
- Some form of water restriction was required each summer prior to metering being introduced. Since the introduction of metering, there has been no requirement for restrictions even with a population increase of about 27% during this period. Restrictions were also found to have a limited impact and were not considered as a sustainable solution.

As shown in Figures 6 and 7, the average and peak demands reduced substantially following the implementation of universal metering.

Figure 7: Average and Peak Production Trends (Combined)



2.5.3 REDUCED WASTEWATER

Coupled with the reduction in water demand, as also illustrated in Figure 7, there was a corresponding reduction in wastewater volumes generated. This decreased the volume of wastewater that needed to be conveyed and treated and, as a result, has resulted in operational savings which has also delayed the need to upgrade infrastructure in the wastewater treatment and collection systems. This alone had a significant impact when considering the renewal of the discharge consent for the TCC treated wastewater sea outfall.

2.5.4 REDUCED WASTEAGE AND LEAKAGE

The selected meter has a 'low flow/ leak indicator' (small rotary dial) which provides customers with the ability to identify potential leakage and take appropriate actions. This, coupled with customer information on how to read their meter and detect leaks, proved very successful, even prior to the first bill being issued.

2.5.5 ECONOMIC IMPACT ON COMMUNITY

An evaluation was undertaken to compare the economic impact that universal water metering has had on Tauranga's community. The comparison considered two scenarios:

1. "With meters": Taking cognisance of the impact which universal water metering and volumetric charging have had.

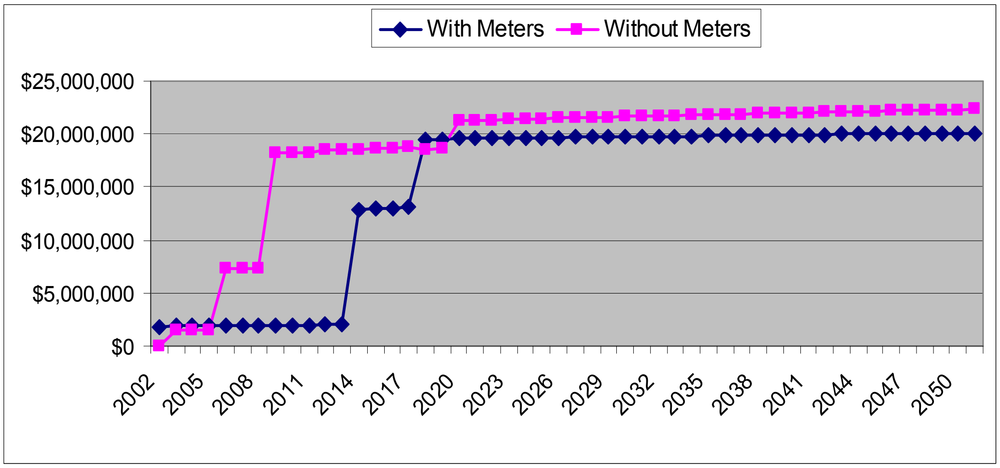
2. "Without meters": Projecting a situation that could likely have been expected had universal water metering and volumetric charging not been introduced.

The basis of the evaluation was to review 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 30 year period of analysis.

(A) COSTS

The predominant benefit of reduced water demands, resulting from universal water metering, was the deferment of water and waste water infrastructure capital costs. Although water metering introduced increased operating costs (meter reading, billing, water meter maintenance and renewal) these were offset by the reduction in the water and waste water treatment costs which resulted. The reduction in peak and average water usage deferred the need for the implementation of the new water treatment plant (Phase 1 of the Waiari, 30,000 m^3/d) and associated reservoirs and pipelines by about 10 to 12 years and it is projected that the subsequent upgrade (Phase 2, a further 30,000 m^3/d) would be delayed by about 25 years. The water usage reduction also had a direct impact on deferring certain waste water infrastructure upgrades by at least 5 years. The comparison of relevant costs is shown in Figure 8 and highlights the overall costs associated with the two scenarios.

Figure 8: Comparative Costs for the two Scenarios under Consideration



The following is a brief explanation of the events and associated (additive) cost elements referred to in the above illustration:

With meters:

- 2002 – 2014: Depreciation and interest cost of meter installation ($9.8m capital cost) plus operational costs.
- 2014 – 2017: Implementation of phase 1 of deferred wastewater infrastructure ($130m capital cost).
- 2018 +: Waiari phase 1 depreciation and debt servicing ($69m capital cost).

Without meters:

- 2002: no additional cost.
- 2003 – 2005: operating costs of treating additional water and wastewater.
- 2006 – 2008: Waiari phase 1 depreciation and debt servicing ($69m capital cost).
- 2009 – 2019: Implementation of wastewater infrastructure (deferred under "with meter" scenario) ($130m capital cost).
- 2020 +: Waiari phase 2 depreciation and debt servicing ($26m capital cost).

It can be seen from the Figure 8 that although some additional costs were incurred in the initial years under the "with meter" scenario, the costs in the "without meter" scenario are consistently higher and continue to increase with time.

From a financial management perspective, the introduction of universal metering and volumetric charging has had a significant impact on TCC external debt levels. Had water metering not been introduced, Council would have had to borrow at least an additional $49.18 million (this being the difference between the cost of the Waiari Water Scheme and that of implementing water metering i.e. $58.95 million less $9.77 million). In order to avoid exceeding debt limits, it would have been necessary to decrease other capital expenditure.

(B) SAVINGS

Overall the analysis predicts that universal metering (over the 30 year period of analysis) has provided and will continue to provide significant savings to TCC. This is primarily due to the delay in capital expenditure associated with infrastructure upgrades and the reduction in water and wastewater that needs to be treated under the "with meters" scenario.

The estimated savings over the period of analysis are shown in Table 3.

Table 3: Estimated Nett Cost Savings due to Water Metering

Cost savings spread over 30 years	$141,018,384		
Years (periods)	2002 - 2012	2012 - 2022	2022 - 2032
Cost savings per period	**80,243,027**	**$42,368,849**	**$18,406,509**
Average savings per year per period	$8,024,303	$4,236,885	$1,840,651
Average savings per year	**$4,700,613**		

Based on the overall comparison of the two scenarios it is estimated that there would have been a projected net average savings of about $4.7 million per annum. The net present value of savings over the 30 year period is estimated at about $83 million.

The current average annual water bill is shown in Table 2, whilst the UAC charges during the transition from UAC to volumetric charging are shown in Figure 5 above. Despite the fact that the cost of the UAC at the time was predicted to increase dramatically with the event of a third water processing plant, no provision was made to estimate the escalation of UAC charges into current values. Nevertheless based on the estimated annual savings it is estimated that the average household would be paying at least an extra 40% per annum more for their water if water meters had not been introduced.

It should be noted that the assumptions and projections in the financial analysis exclude savings resulting from less tangible benefits which are generally more difficult to quantify, for example:

- Additional or upgraded water and waste water infrastructure to cater for the City's increased volume throughput under the "without water meter" scenario.
- Capital expenditure associated with additional service reservoirs to cater for the increased storage needed to meet water storage levels of service based on average daily demands.
- Reduced competing demands for water where water resources are constrained. The Regional Council required TCC to demonstrate good management of existing water resources as part of the application for the future Waiari water take consent).
- Meeting Council's obligations regarding sustainable water management as required by the Resource Management Act.
- Reduced environmental impact through treated effluent discharge back into the environment.
- Reduced cost of energy to domestic users through reduced water heating costs.
- Improved understanding and measurement of system water losses and dealing with water leaks when these escalate to an unacceptable level.

- The social impact of water restrictions and the policing of community compliance.
- The social impact of a fair system of water billing and the reduction of cross subsidisation.

It is important to note therefore that, had the reduction in water demand not been achieved, the City would have incurred significant additional costs over and above those identified above.

Have you considered the potential economic impact on your organization and your community?

3 WHAT'S NEXT?

Whilst the *low-hanging fruit* has essentially been plucked by implementing universal water metering in Tauranga, various supplementary opportunities have been identified which could further enhance benefits to TCC and customers, for example, tariff structuring, smart metering and improved water demand management. Additional requirements have also been highlighted including meter performance monitoring and renewals planning, as described below.

3.1 IMPROVED WATER DEMAND MANAGEMENT

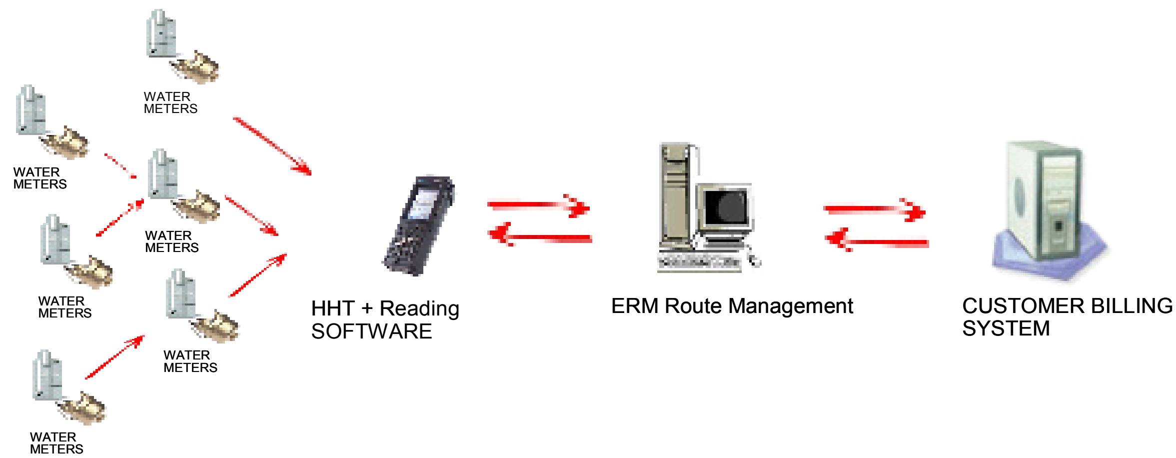
Prior to the implementation of universal metering, TCC divided the city into approximately 30 water demand management areas (not directly related to the 30 meter areas mentioned earlier) and installed bulk meters to facilitate monitoring of night flows and supply trends at a district level. Implementation of universal metering provided an added benefit of enabling water balancing and non-revenue water assessment to be undertaken at district level. The water balancing process has been semi-automated to continually compare supply with demand. Bulk supply records are accessed from TCC's SCADA system whilst data for consumption records are extracted from each meter reading cycle, currently undertaken quarterly. Records are converted to daily flows to account for the time difference between bulk and consumption records. This process has enabled TCC to proactively prioritise and reduce non-revenue water reduction.

Further initiatives include the review of water and wastewater charging mechanisms and tariffs, provision of additional information and conservation guidance on water bills and increased community educational programs.

3.2 SMART METERING

When universal water metering was being planned, consideration was given (e.g. sufficient space in the proposed meter box) for the potential future implementation of Automatic Meter Reading (AMR) as a further value added benefit. This has recently been further explored and during the course of the past two years, Tauranga has undertaken a smart metering trial. This comprised the evaluation of various locally available AMR technologies as well as the business case for mass-implementation. Figure 9 illustrates the configuration of AMR adopted in Tauranga pilot project.

Figure 9: Illustrative AMR Infrastructure Layout



In summary, key findings from the pilot project and further research are as follows:

- The business case struggles to stack up for the mass-implementation across the fleet, under the specific circumstances evaluated (tariff, infrastructure costs, tangible benefits). Intangible benefits proved difficult to quantify.
- International feedback has indicated a need to evaluate synergistic smart meter/smart grid solutions that consider multi utility transfer of information using common gateways. This is considered to offer a more robust and attractive business case.
- International interest in smart metering has escalated in recent years and indications are that smart technology (AMI) has overtaken AMR which was trialed in Tauranga. Smart grids and Home Area Networks (HAN) are now *flavor of the year* and the technology is advancing rapidly.
- Standards are still evolving internationally.
- Benefits of smart metering include: Improved meter reading efficiency and accuracy; enables increased frequency of meter readings (dependant on the chosen smart metering solution) which improves information regarding consumption patterns, leakage and backflow issues – useful for the both the supply authority and consumers; enables improvement of water demand management initiatives.

TCC has therefore opted to:

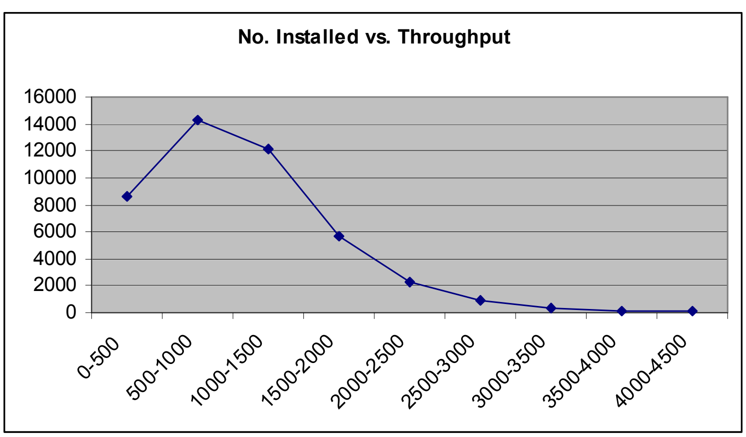
- Implement AMR in specific cases where access to meters is difficult and for certain gated communities where access and privacy are also considerations.
- Trial fixed network (AMI) solutions to test the robustness and effectiveness of available technology.
- Explore synergistic solutions with the electricity industry.
- Watch the industry carefully and take cognisance of the implementation elsewhere in the world as well as the development of standards.

Have you considered the benefits of smart metering?

3.3 PERFORMANCE MONITORING AND RENEWALS PLANNING

Approximately 50,000 meters have been installed throughout Tauranga to date and a good proportion of the fleet is approaching 10 years in operation. It was originally anticipated that meters would be renewed after approximately 10 years of service life. However from monitoring performance and field trials, it became evident that age alone was not a reliable measure and that a more sophisticated performance monitoring and renewal protocol should be adopted.

Figure 10: Installed Base and Annual Throughput



A reactive and proactive approach has been adopted for renewals flagging.

Firstly, meter readings and consumption records and trends are analysed after each meter reading cycle and spurious records (high, low, zero consumptions) are flagged for field investigation and testing in a purpose-built test facility at Oropi water treatment plant. Inaccurate, broken or faulty meters are replaced. Approximately 10% of the originally installed fleet has been replaced to date on this basis.

Secondly, a proactive meter renewal model has been adopted which is based on economics, total throughput, annual throughput and accuracy criteria. The results from in-house reactive meter testing as well as a program of random sample testing have been used to establish a weighted average accuracy curve for the meter fleet. The model utilises this curve plus water tariff, cost of water meter replacement and net present value techniques to calculate the optimal renewal date for each meter. Details of this model are covered in a separate paper. This model has resulted in significant changes to the renewal plan in that the bulk of the renewals are now planned for between 2015 and 2020 i.e. the oldest meter will have been in the ground for approximately 15 to 20 years before renewal. This has in turn had a significant impact on budgeting in the councils ten year plan.

It was decided to replace dual backflow inserts simultaneously with meter renewals for economic reasons. The cost of meter and backflow device replacement, including logistics, labour, administration and materials is approximately $150 per meter. However, this process has only recently been initiated and very few meters were changed out last financial year. Costs were relatively high due to the sporadic nature of the renewal. This unit cost is expected to reduce significantly in years to come when the bulk of the renewals will occur over the span of a few years, as a result of economy of scale.

In line with the above, meter accuracy and failures are carefully monitored through periodic random sampling and testing projects.

4 CONCLUSION AND RECOMMENDATIONS

Implementation of water metering has fulfilled the requirements of the originally identified drivers beyond expectations - an opportunity that may not have been possible without the implementation of the universal water metering project.

Whilst there are numerous 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 fair and equitable or reduce the daily peak water demands (a primary driver for building new water infrastructure). The combination of universal water metering, volumetric water pricing and water conservation education has successfully changed the water demand (particularly peak) profile in the City and enabled the delay of capital and operating expenditure. The return on this investment has been extended to the community who are now charged on a fair and equitable basis for water consumed.

This was our journey – yours may be different…

THINGS TO CONSIDER…

- Clarify your drivers and objectives; obtain necessary buy-in from management.
- Get your data sorted - verify rating data as well as reticulation layout/ connectivity data prior to starting – this will save time and money and avoid frustrations.
- The process includes much more than the meter – research fittings, backflow devices, consider future needs (AMR?) - pilot studies are valuable.
- Planning is vital – allow sufficient time and start early.
- Don't lose sight of your customers – understand their needs, concerns, perspective, fully inform them.
- Communications are vital – start with right mindset across the team, consider a dedicated communications team and assign a "champion" from the outset.
- Prepare your teams - involve operations, financial and communications teams from the outset and ensure responsibilities are clear to all parties.
- Address misconceptions and propaganda challenges as and when they arise – letting them linger will derail and delay the process.

- When technical issues arise, fix them as soon as possible - don't debate and delay the solution – this could lead to bigger issues and repercussions.
- Don't underestimate back-office resource requirements.
- Get to know your customers' consumption profiles – log, test, communicate, analyse data – this will help select appropriate technology.
- Consider meter reading efficiency and data management implications and costs.
- Keep your eye on the developments happening in the smart metering industry and consider and evaluate the costs and benefits of implementation jointly with the installation of water metering.

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