Village of Pemberton

Cost-Benefit Analysis for Water Metering

Prepared for:
Village of Pemberton

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1. BACKGROUND

The Village of Pemberton has recognized that recent growth of the community, as well as limited water supply capacity, have the potential to impact the community significantly. Since 2004, the Village has been exploring options for reducing water consumption. In particular, the Village wished to explore the business case for a universal metering program.

Earth Tech (Canada) Inc. (Earth Tech) was commissioned by the Village to undertake a cost-benefit analysis of a universal water metering program for the Village. This study also reviewed other options for reducing water consumption.

Earth Tech's approach to the project involved the following steps:

- Review of water production information from the existing Well 2-97
- Identification of a range of water use reduction options, including universal metering
- Cost-benefit analysis of universal metering and other prioritized options

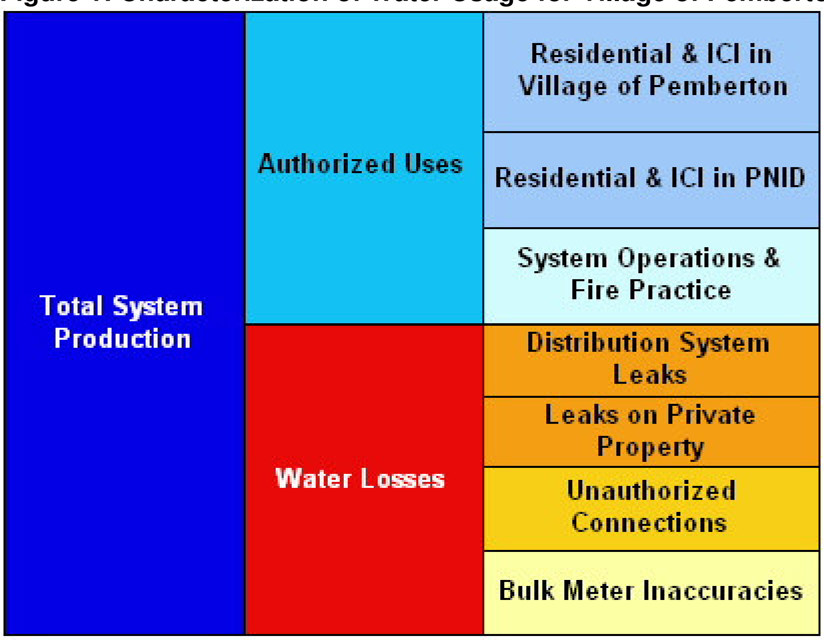
This report summarizes the outcome of this process, and provides some options for how the Village may elect to proceed with this project.

2. REVIEW OF WATER USAGE IN THE VILLAGE

2.1 Characterization of Water Usage

The Village of Pemberton supplies water to residential, as well as Industrial, Commercial & Institutional (ICI – includes local industry, shops & services, municipal property) customers within the Village. It also supplies the Pemberton North Irrigation District in the Squamish-Lillooet Regional District, and may in the future supply the Pemberton Industrial Park (currently supplied by Mt. Currie). Earth Tech reviewed customer information and discussed the performance of Pemberton's water distribution network with municipal staff, so as to characterize the various types of water usage within the Village. Figure 1 below illustrates this water usage characterization.

Figure 1: Characterization of Water Usage for Village of Pemberton Water System



In determining options for reducing waste usage in the village, it will be necessary to address all types of water usage.

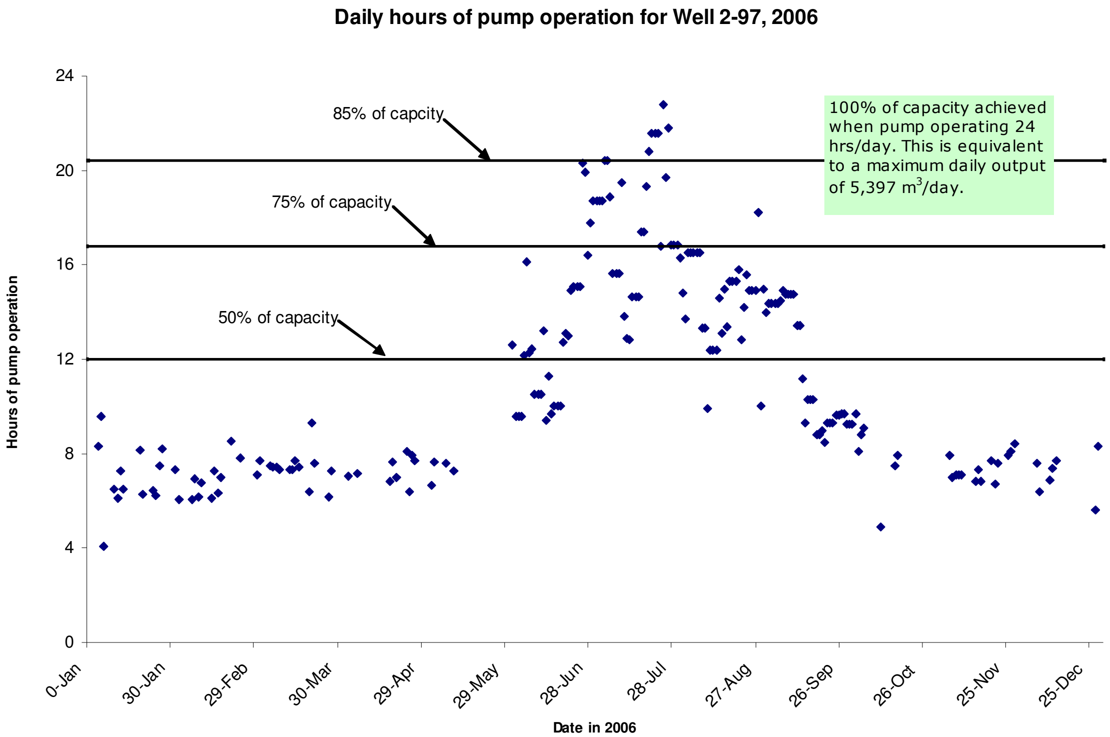
2.2 Well Production Information

Earth Tech reviewed water production information for Well 2-97 provided by the Village for 2006, and January to August 2007, to estimate gross water consumption for the Village and other serviced areas, namely the Pemberton North Irrigation District (PNID). This water production information was based on pump run-time records provided by the Village, and the estimated maximum pumping capacity rate for Well 2-97 of 62.5 litres/second, established in May 2007[1].

Since there is no meter on the reservoir, well production rates were assumed to be equivalent to water consumption rates for the Village. Based on this assumption, the pump rates and run times were used to estimate the total annual consumption for the Village at **786,335 m^3**.

Earth Tech also examined the current supply capacity, in terms of the ability of the well to produce sufficient water to meet seasonal fluctuations in water demand. Figure 2 below shows the trend in pump production per day for 2006, based on the run-time records.

Figure 2: Daily Hours of Pump Operation for Well 2-97



This trend is consistent with typical annual consumption patterns, which show higher values in summer months due to higher outside usage of water, e.g. for irrigation, swimming pools, etc. It is important to note that in 2006, there were periods during the summer months where the pump was in operation for over 20 hours per day, indicating that the water supply infrastructure is operating at or near full capacity for short periods of time.

[1] Technical Memorandum#4 (July 4th 2007), Golder & Associates

3. CONSIDERATION OF UNIVERSAL METERING

The Village wishes to consider how universal metering might be applied as a solution to some of the water capacity issues discussed above. The following sections review the premise for universal metering, and provide a cost-benefit analysis based on projected costs to implement a universal metering program for Pemberton.

3.1 Program Structure

Universal metering involves the application of the user pay principle to water usage for all customers within a water distribution system. This is typically implemented as a transition from a flat rate system. Under a flat rate system, users pay a fixed price, regardless of the amount of water they use. With a universal metering program in place, users are charged based on the amount of water they use. This typically results in a greater awareness of the amount of water being used, and also triggers the desired effect of reducing water usage. Data collected by Environment Canada, as well as Earth Tech through the National Water and Wastewater Benchmarking Program, indicates that residential water usage is lower for metered customers, as compared with equivalent unmetered customers.

There are four main reasons for metering, all of which are understood to apply at some level in the Village:

- Equity – with a metered system, end users become directly accountable for their water use, and are charged based on what they use. This provides a financial incentive to conserve water. Those customers who voluntarily implement water conservation measures within their household or property are able to reap the benefit of reduced costs, once a metered system is in place.
- Water Efficiency/Conservation – since most metered customers use less water than unmetered ones, implementing a metering program can sustain the existing source of water supply for longer, and free up existing supplies to support future growth. From a sustainability perspective, the less water the Village needs to extract and distribute, the lower overall environmental impacts will be.
- Economic Benefits – lowering water usage can reduce maximum daily demand rates, which in turn influence the amount of required supply capacity. The extension of supply capacity by reducing demand instead of expanding supply can allow the utility to delay capital expansion, and reduce operating costs associated with extraction, treatment and distribution.
- System Management – installing meters throughout the system provides a powerful management tool that enhances the utility's ability to detect and target leaks, identify

areas in need of repair, manage flows and pressures more efficiently, and measure areas of real water losses.

3.2 Water Usage Reduction Potential

From a water usage reduction perspective, general estimates are that a universal metering program can result in 10-20%[2] sustained reduction in residential usage, provided that metered water rates are established appropriately. Although initial water usage may drop below these levels at the point of introduction of a metering program, most municipalities have found that water usage may increase again after time, as people become more complacent about water use, and adjust to the new financial structure[3]. Based on the estimated consumption development in Section 3.2, this would result in the savings shown below.

Table 1: Estimated Water Savings from Metering

TOTAL ESTIMATED ANNUAL CONSUMPTION	ESTIMATED USAGE REDUCTION @ 10%	ESTIMATED USAGE REDUCTION @ 20%
786,335 m^3	78,634	157,267

To determine the value of reducing water usage in the Village, Earth Tech developed a preliminary cost estimate for universal metering, and contrasted this with the current costs of water production.

3.3 Cost of Universal Metering Program

The cost of a metering program depends on a number of factors that will need to be taken into account in the design and implementation of a universal metering program.

3.3.1 Pricing Considerations

The location of the meter installation will influence the costs of the programs. Some municipalities elect to install meters at the property line, so that the meter clearly remains within the control of the water system operator, rather than the customer. Another advantage of this choice is that customers may be more motivated to track and repair leaks on their side of the property line and meter, as this leakage will directly contribute to their water usage bill. Issues regarding damage or inconvenience sustained as a result of the meter installation are also minimized because most of the work occurs outside of the property boundary. However, installations at the property line are typically more costly that those installed in the building, due to the need to excavate to expose the service connection. This may be of particular concern

[2] Neptune Technology Group
[3] Earth Tech National Water and Wastewater Benchmarking Initiative data, based on consumption per capita in metered and un-metered cities in BC

where services are deeply buried, as is the case in municipalities with severe winters, where frost zones tend to be deeper.

Installations inside the property, e.g. within the dwelling, or in a crawlspace, are typically less expensive since less excavation to expose the service connection is required. Inside installations may also offer weather protection for the meter. However, inside installations may result in reduced or restricted access to the units, making monitoring of the service more challenging. The ability to read the meter on a set schedule may also be impeded. If leaks occur between the meter and the property boundaries, customers may be less inclined to repair leaks, as these will have no impact on registered water use through the meter.

It is also important to note that the cost per installation will also be influenced by the number of installations to be undertaken. Generally, meter installation costs can average $500 - $1000 per unit for larger numbers of simple installations not requiring extensive excavation or reconfiguration of service lines. However, since mobilization costs for meter installations will be the same regardless of whether many or only a few meters are installed, the cost per unit installation may be higher when small numbers of installations are required.

Metering costs will also be influenced by how often and by what means the meters will be read. Radio frequency read meters are available that facilitate rapid reading of meters, through transmission between the meters and the reading device. These tend to be more expensive that simpler hand-held meter readers, which require more manual involvement and tend to be a slower method of reading.

Earth Tech contacted meter system suppliers to obtain information, and also sourced pricing from municipalities in the lower mainland that are implementing metering programs.[4]

Table 2: Unit Costs for Meter Installation Scenarios

	Internal installation:	External (pit installation)
Meter with Touchpad	$275/dwelling	$800/dwelling
Meter with Radio transmitter	$400/dwelling	$1000/dwelling

The type of meter reading equipment for radio read meters must be considered for costing purposes. There are two levels of equipment efficiency, details and prices are given below:

- Basic radio meter reading equipment @ $10,000. This would be adequate for a town like Pemberton given the relatively small size and number of meters would allow all to be read in less than a day. This unit would facilitate drive-by reading at about 5 km/hr, with

[4] Information provided by Neptune and District of West Vancouver, based on installations in 2005 and 2006

a vehicle traveling slowly through the village. This pricing was used in the estimate; upgrades at a later date are possible.

- Superior radio meter reading equipment @ $35,000, which provides a more powerful hardware, facilitating drive-by reading at 40km/hr around the village

3.3.2 Parameters for Cost Estimate Development

In order to develop a cost for the universal metering program for the Village, budget quotes were obtained on an "average" basis for supply and installation of residential meters. Pricing was obtained for both internal and external installations, and for both touch pad and radio transmitter reading. Costs provided include plumbing, work scheduling, project management, provision of installation details.

It was also noted that an allocation should be made for an education and awareness campaign specifically related to the meter installation. An allowance of $15,000 was used for all metering options.

Finally, the number of meters that would be required was determined, based on a review of the water services customer listing provided by the Village. The following numbers were used:

Table 3: Number of Properties Requiring Meters

Property Type	Number of Units Requiring Meters
Residential	846
Commercial	98
Institutional	5
Total	949

3.3.3 Capital & Operating Cost Estimates

The table below summarizes projected capital costs for the metering program, based on the assumptions outlined above. Total costs were also amortized over a ten-year period to provide an annualized capital cost estimate.

Table 4: Capital Costs for Universal Metering Program

	With Radio Reading		Direct Reading	
	Internal Installation	External Installation	Internal Installation	External Installation
Domestic properties	$338,400	$846,000	$232,650	$676,800
Commercial properties	$39,200	$98,000	$26,950	$78,400
Institutional properties	$2,000	$5,000	$1,375	$4,000
Basic Radio Reading Equipment	$10,000	$10,000		
Education Program	$15,000	$15,000	$15,000	$15,000
Total Cost	**$404,600**	**$974,000**	**$275,975**	**$774,200**
Amortized annual cost	**$54,972**	**$132,335**	**$37,496**	**$105,189**

Operating costs for a universal metering program include reading the meters, plus any extra billing that may be required. When metering, it is common for meters to be read on a quarterly basis such that customers, and municipalities, can relate to the amount of water being billed for; in turn allowing for better management of consumption if desired. As the majority of Pemberton's current customers are billed annually, a significant rise in the cost for producing bills may occur, as estimated in table 7. The costs of reading meters was considered directly, that is by assuming the number of meters that can be read in a day and then calculating the cost of this, based on a real workers wage. Meter reading costs were estimated as shown in Table 5.

Table 5: Estimated Meter Reading Costs

	Direct Read	Radio Read
Total number of meters	949	949
Number of meter reads per day	250	all
Person Days Required per Quarter to read all meters	3.8	0.5
Estimated Cost per Quarter for Meter Reading*	$704.00	$88.00
Annual Meter Reading Cost	$2,816.00	$352.00

* Cost based on 1 FTE @ $22/hour working for an 8 hour day.

Table 6 below provides a summary of annual costs for the various metering options.

Table 6: Summary of Estimated Metering Program Costs

	With Radio Reading		Direct Reading	
	Internal Installation	External Installation	Internal Installation	External Installation
Meter Reading Operations Cost	$352	$352	$2,816	$2,816
Amortized annual cost	$54,972	$132,335	$37,496	$105,189
Total Annual Cost Estimate	**$55,324**	**$132,687**	**$40,312**	**$108,005**

Building on this understanding of the potential costs of implementing universal metering, Earth Tech also undertook a review of the financial aspects of the existing water system, so as to quantify potential savings associated with water usage reductions. The 2007 Financial Plan provided by the Village was used to determine "water production costs" as distinct from overall "operational expenditures". It was recognized that a considerable portion of the operating expenditures for the water system are fixed costs that do not change with a slight increase or decrease in water production. The real cost, or saving, associated with varying water production is associated with power consumption, chemical use and maintenance (including labour costs). As a detailed breakdown of these costs was not available, the following assumptions were applied to the 2007 operating budget line items to develop a cost relating to increasing or decreasing water supply to the village, and the additional administration costs for quarterly billing:

- 50% of System Operations costs are directly associated with water production such as maintenance and repairs relating to the number of hours equipment operates or the flow that it passes, associated labor, chemical purchase, power use.
- 5% of Administrative costs and directly associated with water production, and the additional cost of quarterly billing
- No other line items contribute directly to water production costs

These percentages were applied to the 2007 Operations Budget as shown in Table 7:

Table 7: Water Production Cost Estimate

Budget Line Item	2007 Budget Allocation	Assumed % Attributed to Water Production	Water Production Cost
Administration	$196,276	5%	$9,814
System Maintenance	$229,408	50%	$114,704
Total	**$452,734**		**$124,518**

Combining this water production cost with the 2006 water production total of 786,335 m^3 resulted in a unit cost of water production of $0.16/$m^3$. It is important to note that these savings may be an overestimation since the costs related directly to the volume of water produced are known to be quite low, since there is no water treatment required currently in the system.

When applied to the potential 10% -20% savings estimated to result from metering (from Table 1), the "value" of water saved through metering could be determined:

Table 8: Potential Savings in Water Production Costs from Universal Metering

Metering Effectiveness	Savings in m^3	Savings in $
10% Water Reduction	78,634	$12,452
20% Water Reduction	157,267	$24,904

When contrasted with the total annual costs for metering in Table 6, which range from $40,312 to $132,687 depending on the technology choices, it can be seen that metering would cost the Village more than the value of water saved on an annual basis.

3.4 Benefit Analysis

In addition to this financial analysis, Earth Tech also considered the potential benefits that would accrue to the Village under such a program, to provide a more comprehensive assessment of the value of implementing universal metering. This was evaluated in the context of the four main "reasons to meter" outlined in the Program Structure section above.

3.4.1 Equity

The ability to bill customers directly on the basis of their water consumption will create a financial incentive to reduce water consumption. However, it is important to note that there may be some negative reaction to a metered rate system, particularly from those users who currently are high consumers of water, and are in fact paying less that their "fair share" under the existing flat rate system. The Village will need to consider the "value" of equity principles as part of the determination to move to universal metering.

It is also very important to note that achieving equity through metering comes not only from meter installations, but properly structured metered rates that produce the desired incentive effect. Equitable billing will therefore require extensive review and re-organization of billing rates to ensure fairness is achieved for all stakeholders. In addition, metered rates will need to account for at least partial cost recovery for the meter installation campaign, as it is unlikely that attempts to pass on up-front installation costs to customers would be feasible or supported by the community.

3.4.2 Economic Benefits

Consideration was also given to the potential benefits that metering could offer the Village in terms of long-term capital infrastructure investment. While Pemberton's water resources are quite adequate to meet its current Fall, Winter and Spring water demand, it is struggling to meet current summer demands. During the summers of 2006 and 2007 Pemberton's water demands very nearly surpassed its supply capability since, on some occasions, Well 2-97 was seen to pump for over 20 hours per day (operating between 85 and 100% of total supply capacity). The Village is currently aware of this problem and is working towards the construction of a new well to add to existing water supplies. This well is due to come on-line in 2008, and will increase water available to village by some 28%[5].

At some point in the future it is likely that the Village will need to expand its water supply infrastructure to cope with increasing population growth. If water metering is implemented, and is able to provide a sustained reduction in water usage, then this will help to extend the life of existing assets (the two wells) and postpone capital infrastructure upgrades.

According to a report produced for the SLRD[6], the population in Pemberton and the surrounding areas is predicted to grow at 5.4% per year. This will increase the number of resident water users in the area from 2909 people in 2006 (this number includes residents in the PNID), to 8392 people in 2026.

The SLRD report outlines various ways in which Pemberton's population will be accommodated in the Village, including: development of the Benchlands area; infill development within the current Village boundaries, and expansion of the existing Village boundary. Such growth will directly increase the demand for water in the area, but may also affect Pemberton's per capita water consumption rates.

Based on the uncertainty of how much water the Village will use in the future, Earth Tech considered two water use scenarios to predict future water use. The scenarios are for maximum summertime use only; this is because it is the peak usage rates which define when a resource is incapable of meeting demand and thus needs upgrading. The scenarios have been considered over a 20 year period and are based on the following data.

- 2006 population = 2909
- Population growth = 5.4%
- 2026 population = 8392
- Well 2-97 produces 62.46l/s (5397 m^3/day)

[5] Technical Memorandum#4 (July 4th 2007), Golder & Associates
[6] Pemberton and Are Sub-Regional Land Use Planning Study: Draft 2 (April 30th 2007), Stantec

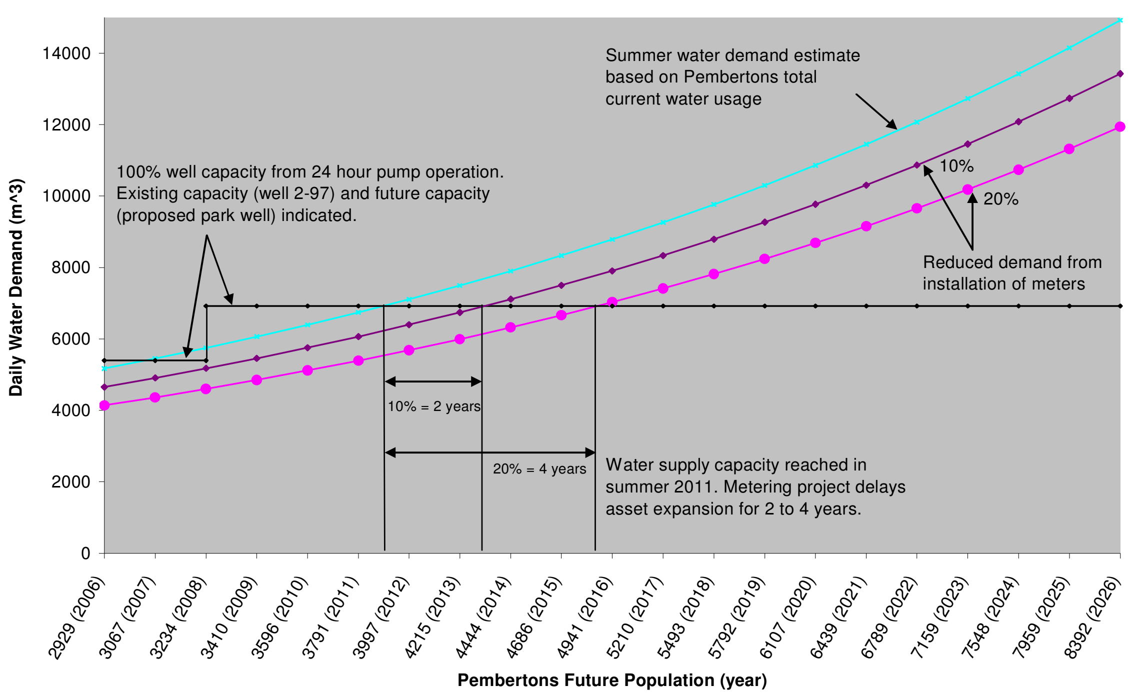
- Well 2-97 + proposed “Park” well produce 80.13 l/s (6923 m^3/day)
- Pumps run continuously over 24 hour period (feasible under very short term operation, as is the nature of peak water demand)
- Metering may provide a 10 to 20% reduction in peak water demand

Scenario 1: Worse Case Estimate Based on 2006 Peak Water Usage – 5172 m^3/day

On July 26th 2006, Well 2-97 recorded 22.8 hours of pump operation, which equates to 5172 m^3 of water production. This figure was divided by the 2006 population to give a peak per capita usage of 1.77 m^3/day. Scenario 1 assumes that per capita water usage remains constant over time, and therefore combines this usage rate with population predictions to show peak water demands for the next 20 years. From the graph below we see that this rate of water consumption will cause the Village to run out of water on its highest use days by summer 2011, even with a new well in operation.

The graph also shows that by installing a comprehensive water metering and pricing program, the Village could continue to have sufficient water until the summers of 2013 or 2015, depending on how successful the program is at reducing water consumption.

Scenario 1: Summertime Water Demand/Supply and potential savings from water meter installation. Worst case estimate based on 2006 water use - 20 Year Projection



This graph also helps us to see how future capital investments could be delayed by the effects of a successful metering program. Initially, we see that metering prolongs the life of existing infrastructure by 2 to 4 years. In addition, it can also be seen that the scale of future water supply infrastructure will be less due to the impact of a successful metering program, as savings resulting from metering will grow as time passes, i.e. the difference between "metered" and "unmetered" demand expands over time. Table 9 below shows this impact over time:

Table 9: Change in Water Savings Due to Metering

Capacity Needs	Savings in 2016 (m3)	Savings in 2026 (m3)
10% Reduction in Demand	878	1492
20% Reduction in Demand	1757	2984

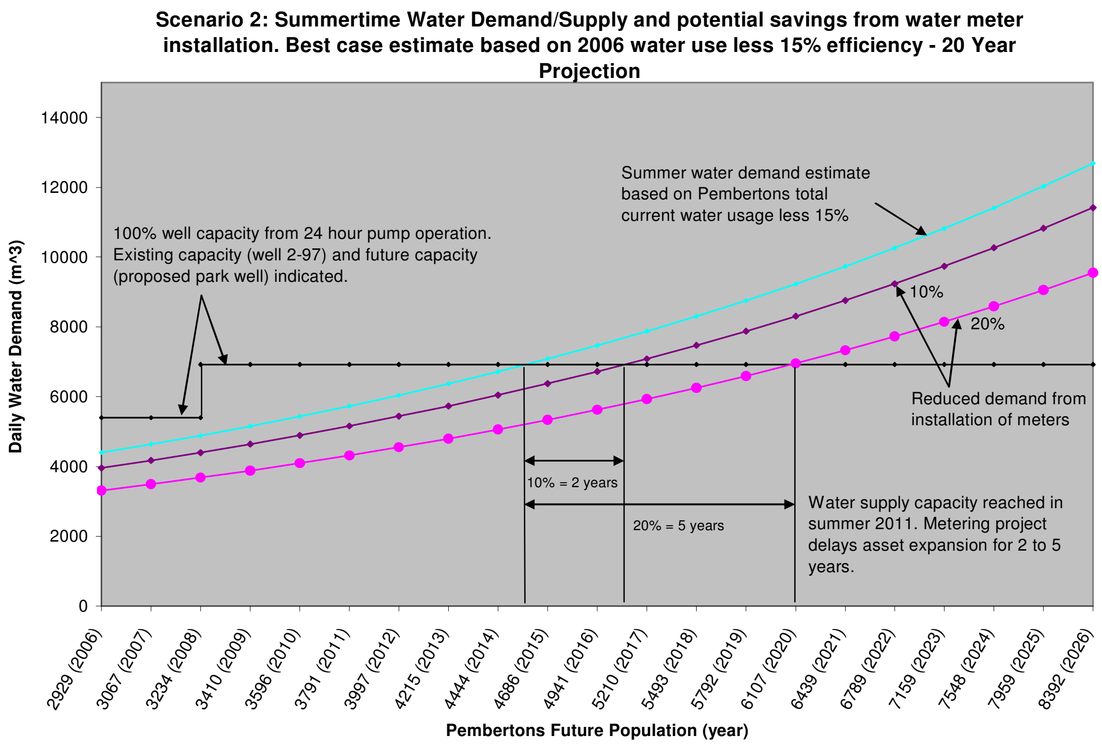
It is important to recognize that as this difference in demand grows, the costs associated with meeting this increased capacity need are also likely to increase, not only as a result of having to provide new water sources, but also the possibility that additional levels of treatment, e.g. for a surface water source, may be required.

Scenario 2: Best Case Scenario with Conservative Water Demand Reduction of 15% from 2006 Water Usage – 4396 m^3/day

Scenario 2 considered the possibility that even without any action to install water meters, or to educate the public on water use, new residential development could lower per capita water use in the Village. This would likely be due to factors such as:

- New developments requiring new water distribution infrastructure (pipes), which will likely be more reliable (less leaky) than the current water distribution system;
- The likelihood that new developments will (or could be required by local By-Law to) install more water efficient/reliable toilets and appliances than those of previous developments;
- New developments providing higher density housing than existing properties (less gardens to water);
- An increasing ratio of population to Industrial, Commercial and Institutional (ICI) water users. That is, the populations water demands will increase faster than those of local ICI users (note: water use in this study allocates Pemberton's entire water production figure – including ICI use, unauthorized connections and leaks - to that of its population).

This assumed reduction of water use equates to an equivalent 2006 usage of 4396 m^3/day or 1.51 m^3/day per person. Combining this with population predictions over the next 20 years we produced the following graph:



From the graph we see that this rate of water consumption could cause the Village to run out of water on its highest use days by summer 2014, even with a new well in operation. The graph also shows that by installing a comprehensive water metering and pricing program, the Village could continue to have sufficient water until summers of 2016 or 2019, depending on how successful the program is at reducing water consumption.

This graph also helps us to see how future capital investments could be delayed by the effects of a successful metering program. Initially, we see that metering prolongs the life of existing infrastructure by 2 to 5 years. As discussed under Scenario 1, the scale of future capital expenditure to increase capacity will also be greater in an un-metered environment.

3.4.3 Water Efficiency/Conservation Benefits

In terms of the water conservation benefits, it is clear that any efforts to reduce the amount of water utilized by the Village will achieve some environmental and conservation benefits. In the Pemberton valley, the ability to extend current water resources could also have spin-off benefits to agricultural operations in the valley, where specialist farms may also be extracting water from the same groundwater system. In terms of the overall sustainability of the community, water consumption reduction could also translate into reduced energy consumption, e.g. less hot heating water requirements.

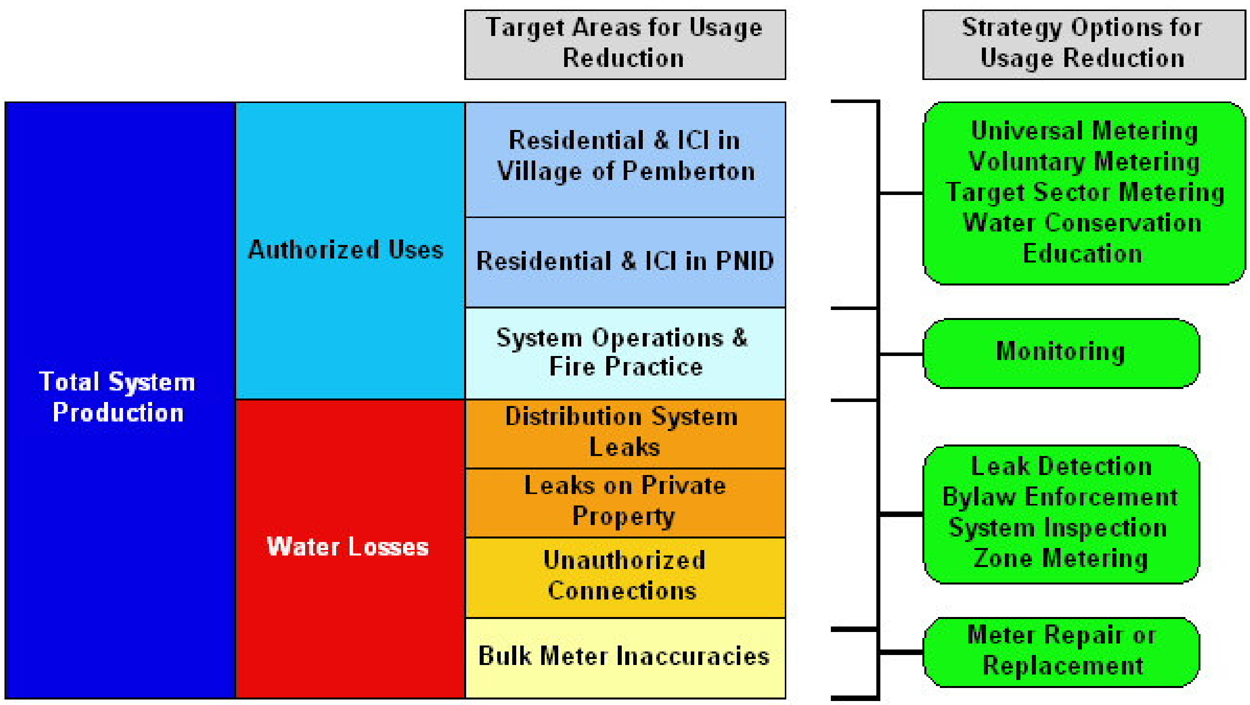
3.4.4 System Knowledge Benefits

Metering will provide significant benefits for the Village in terms of understanding how and where water is consumed, and assist in the identification of leaks or other system weaknesses. In addition, the installation of meters system-wide would also provide increased operational understanding, which could be leveraged to further optimize system operations.

4. APPROACH TO IMPLEMENTATION OF UNIVERSAL METERING

As the preceding sections demonstrate, universal metering will represent an increase in annual costs for the Village. This however will need to be weighed against the potential advantages in terms of equity, economic benefits and system knowledge, as well as the options of delaying capital expenditures.

The Village may also consider the approach of phasing in the universal metering program, and also considering how other strategies could be employed. Other options could include a voluntary metering program, as well as targeted metering, for example of the ICI sector. The following sections outline some alternative approaches that may be considered, as outlined in the figure below.



The sections that follow provide greater detail on these options, including a description of the option, and its suitability as a water usage reduction strategy for Pemberton.

4.1 Voluntary Metering

Under a voluntary metering program, customers may volunteer to have a meter installed on their service connection. Meters are typically offered at no charge to customers, and metered rates are structured to recover the cost of the meter and its installation over time. To be effective, a voluntary metering program should incorporate the following:

- Appropriately structured metered and flat rates, so that customers who opt for a meter are likely to save money, provided that they are applying water conservation practices consistently
- Clear understanding about the type, location and size of meter to be installed, as well as the meter reading process that will be applied, as all these factors will affect the costs of the program
- Commitment from the utility to read the meter on a regular basis in accordance with the billing schedule, and to bill the customer on a metered rate basis
- Long term objective to transition to universal metering, that will need to be reflected in progressively increasing flat rates, to encourage more customers to make the switch to a meter

Many municipalities in BC have voluntary metering programs, and these target primarily single family residential customers. Some, such as the City of Richmond, offer a program for multi-family customers, e.g. apartment buildings, as well.

Voluntary metering programs are a good way to encourage the expansion of metering within the system area, without having to commit to the upfront costs of a universal metering program. The overall benefits outlined above for universal metering will ultimately be realized, but may be delayed as the cumulative effects of voluntarily metered customers will only be felt once a “critical mass” of metered customers exists.

4.2 Target Sector Metering

Target sector metering focuses the application of metering to specific users or sectors within the customer base. A common target group is Industrial, Commercial and Institutional (ICI) users. These customers may be significant users of water, and therefore specific consumption information about these customers is desirable. Alternatively, these customers may be paying very high flat rates for water, while actual consumption is considerably lower. An example of this type of user would be a storage facility, which would likely only have a few bathrooms contributing to water consumption, but would be charged the high flat rate.

Within the Village, it is recognized that some of the ICI customers located in the Industrial Park are already metered. Completing meter installations at the remaining properties would be advantageous to have a clearer understanding of water usage in this area, and allow cost recovery through billing to more accurately reflect water usage. The Village would need to commit to regular reading of all customers, and consider whether the industrial/commercial metered rates currently in the bylaw are appropriate, based on the levels of usage from the ICI customers.

4.3 Water Conservation Education

While metering and leak detection programs address the “hard” elements of the water system, water conservation education programs focus the “soft” aspects; customer awareness, knowledge and behaviour, as tools to reduce water usage. Water conservation programs can be designed to address these issues for all types of customers.

The most successful water conservation education programs create lasting behaviour change by first working to understand both barriers to and benefits of water conservation, as perceived by the target audience. Once these have been identified, program strategies should focus on sharing evidence to demonstrate potential benefits of water conservation. Pilot programs can also be utilized to generate interest and allow customers to experience benefits first-hand, e.g.:

- Distribution of dye tablets for toilet tanks to test for leaks
- Distribution of low flow showerheads or faucet aerators and follow-up consumption tracking to see savings
- Installation of water conservation devices in municipal buildings, to show how municipality “walks the talk”
- Water-wise landscaping in community gardens
- Voluntary low-flow toilet installations, provided through municipal resources
- Watering restrictions in summer months

Once pilot programs have been tested, it is important to evaluate their success before full-scale implementation. Working with the communities impacted also helps build buy-in, e.g. forming a citizens’ committee to provide suggestions from customers on how they would like to see the program unfold. On-going evaluation and reporting on performance also helps to reinforce successes.

4.4 Leak Detection

As shown in Figure 4-1, leaks may be occurring both within the main distribution system, as well as within a customer’s property. Leaks have been found to contribute significantly to the total water losses; in some systems as much as 30 – 60% of the water produced can be lost to leaks!

System-based leak detection programs can be effective at reducing water loss prior to usage, provided that the leak detection program is supported by appropriate response from the utility to repair the leaks. System surveys are typically used to detect leaks, and temporary meters may be used to isolate areas where leaks are suspected, so that leak location can be facilitated. It is important to note that system level meters, or zone meters, greatly assist the utility in location and quantification of leaks.

Leaks may also be occurring on private properties. Some municipalities take the approach of installing meters to make customers aware of water usage, and to also encourage leak repair in an effort to reduce high water bills. Where customers are unmetered, the case for private property leak detection may be harder to prove, as customers have little incentive to locate and repair leaks at their own expense.

4.5 Zone Metering

Zone metering allows utilities to evaluate water losses from particular areas of the distribution system. Zones are typically defined by particular pressure zones, or other discrete areas of the system which can be isolated via meters. Once zone meters are installed, they provide significant system information about water usage and losses within the zone, pressure fluctuations or other parameters that can be used to optimize system operations.

4.6 Bylaw Enforcement and System Inspection

Bylaw enforcement is important to reduce illegal use of water from fire hydrants and to prevent the illegal tapping of water lines. On-going system inspections to identify illegal connections or other unauthorized uses of water are also important. In addition to the water usage reduction benefits, bylaw enforcement and system inspection is also important to reduce water quality impacts, such as cross-connection or contamination due to illegal connections.

4.7 System Optimization

Basic system knowledge could be enhanced by the installation of a few key meters within the system. As this report outlines, assumptions were made with respect to water consumption due to lack of accurate metering information on the reservoir and pump. Installation of these meters would provide a clearer platform of information for analysis, and facilitate increased system optimization through pressure analysis, night-time flow measurement, and both daily and seasonal trends.

Earth Tech also understands that the boundary meters measuring water provided to the Pemberton North Irrigation District may be incorrectly sized for the flows provided, and therefore providing inaccurate readings. As a result, water may be “lost” in terms of revenue. Earth Tech understands that the Village has engaged the Squamish-Lillooet Regional District in discussions regarding these meters, and recommends that these be pursued to ensure that these meters are able to accurately record water usage in the PNID.

5. BEST NEXT STEPS

This report is intended to present some basic information about universal metering options for the Village, and identify the costs and benefits associated with implementation of such a program. Suggested next steps for the Village may include:

- Confirmation of the intent to implement a universal metering program for the Village
- Review and refinement of both metered and unmetered rate structures to leverage opportunities for demand side management through financial structures.

In the event that the Village opts to delay implementation of a universal metering program, the benefits associated with enhanced system knowledge and "quick win" strategies should be explored, including:

- Consistent enforcement of the bylaw requirement for new construction to include installation of meters
- Commitment to regularly read existing meters and bill metered customers appropriately
- Consideration of mandatory watering restrictions to better manage peak summer usage in the short term
- Implementation of voluntary residential metering program
- Implementation of a program to meter all ICI customers, and associated review of ICI sector rates to support a metered system for this sector
- Well-structured leak detection and repair program for distribution system
- Better tracking of fixed and variable cost elements associated with water production, to better quantify savings associated with metering

Implementation of these steps will provide a more robust information platform for the Village to base decisions on, and could serve as an opportunity to revisit the cost benefit analysis outlined in this report to determine how a metering program will benefit the Village in the future.