



Sustainable Water and Waste Water Utility Management

An Engineer's Perspective

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Introduction

Vital to protecting public health and the environment is the proper functioning of a municipality's water and wastewater infrastructure. The failures, in Walkerton and North Battleford are Canadian examples of what can happen when our systems fail.

In Ontario this has resulted in the promulgation of some of the toughest clean water regulations in Canada. Known as *Operation Clean Water*, the government is developing an umbrella of initiatives designed to ensure safe drinking water and protect the environment. It is wide ranging and envelops drinking water protection, groundwater preservation, nutrient management, water shed planning and one initiative that may seem out of place but is vital to the overall strategy's success, asset management.

Our water and wastewater infrastructure is one of the largest assets a municipality has and can not protect public health and the environment unless it is adequately funded. Protecting the enormous investment in public infrastructure is a never ending task and will be one of the most challenging issues our public officials face in this century.

As a result the Ontario government has put forward asset management legislation that received royal assent in December of last year and is known as the *Sustainable Water and Sewage Systems Act*, Bill 175. It is designed to move municipalities towards full-cost accounting, asset management and full-cost recovery of water and wastewater services. It goes beyond Governmental Accounting Standards Board's requirements in the US for state and local governments known as GASB Statement 34 which required public agencies to begin to report the assets they own and reveal the financial programs to look after these assets. The purpose of GASB 34 is to develop a financial model that better defines what is the full cost of owning and operating water and wastewater systems.

Background

As in the US and other parts of the world, Canadian municipalities will be facing serious infrastructure needs in the next 20 years. The reason for this needs to be understood and goes back to the late 1800s, early 1900s and 1920s and most recently the period from 1950 to 1970 when major growth occurred in Canada. Infrastructure was put in place during these growth cycles and this infrastructure is now reaching the end of its generally accepted life-cycle. To sustain the infrastructure and prevent breakdown, refurbishing or replacement of the infrastructure is needed and reinvestment in our infrastructure essential to that effort.

In Toronto over 80% of the watermains are over 80 years old. Over 80% of the pipes are cast iron, either sand cast or spun and 15% ductile iron. Depending on the material a different life-cycle can be expected ranging from 100 years to perhaps 75 years. Performance criteria such as leakage, rusty water problems, low pressure etc. can alter replacement schedules. As well, the need to replace or renew other major infrastructure such roads may make it prudent to replace watermains and sewers before their expected life-cycle is reached. The American Water Works Association predicts by 2030, "the average large utility will have to spend about three times as much on worn-out pipes as its spending to-day."



With respect to above ground assets (treatment plants), they also were constructed in several waves normally as regulatory requirements changed and became more restrictive. They placed much larger financial demands on the municipalities over a shorter period as they were not spread out as in-ground infrastructure (pipes) normally is. As well, plants have shorter life-cycles due to the mechanical and electrical equipment used.

There will in future be more stringent treatment requirements such as higher level filtration requirements to remove disinfection by-products, higher levels of bacteria removals etc. and advanced technologies will be needed to meet these requirements such as membrane technologies, UV etc.

Above grade infrastructure is however readily visible where in-ground infrastructure out of site and in some cases out of mind until a catastrophe strikes.

Measuring the "Gap"

For a variety of reasons re-investment in water and wastewater infrastructure has lagged behind what should have been appropriated or reserved and a significant "Gap" now exists. For the water and wastewater utilities in the US this "Gap" is estimated at \$34 Billion in Canadian dollars. In Canada it is about \$4 Billion dollars.

In England and Wales, their privatized water companies have spent over \$115 Billion in the last 15 years in maintaining and improving the water environment. In the UK despite their rates doubling there are still pressures by the regulator (OFWAT) to increase the amount being spent to higher levels and to require clear long-term strategies for asset management that errs on the side of caution so the water and wastewater systems are safe and reliable.

The City of Hamilton has recently completed an analysis of their water and wastewater system and in order to close the Gap an increase in the annual rate of 15% per year over 5 years was considered necessary.

In Toronto a recent study shows an increase in the rate of 8% over the next 10 years to look after the replacement of aging infrastructure which equates to a doubling of the present rate.



Present Spending

If we examine Ontario Municipal Affairs data there is no real increase, 0.98 Billion in 1995 and 0.99 in 2001.

Municipal Spending in Ontario on Municipal- Water, Stormwater and Wastewater				
Data from MARS – Provided by Ministry of Municipal Affairs and Housing				
"Year	Ontario Grants (\$)	Canada Grants (\$)	Municipal Contribution (\$)	Total Annual Expenditures (\$)
1996	\$266,265,743	\$36,692,265	\$675,644,868	\$978,602,876
1997	\$202,554,679	\$19,051,077	\$637,692,819	\$859,298,575
1998	\$87,252,130	\$14,205,527	\$869,973,321	\$971,430,978
1999	\$46,106,264	\$12,556,550	\$694,979,971	\$753,642,785
2000	\$69,784,225	\$2,496,950	\$692,274,305	\$764,555,480
2001	\$18,678,919	\$535,063	\$971,136,618	\$990,350,600

Similarly if we look at Statistics Canada data federal government spending on environment has decreased from 1.5 Billion in 1998 to 1.4 Billion in 2002 and provincial and territorial government spending has decreased from 1.714 Billion to 1,446 Billion. Local government spending on environment is reported at 6.4 Billion in 1997 and in 2001 at 6.9 Billion. In the past decade spending has not kept up with inflation or the increase in population.

To close the “Gap” is a tremendous funding challenge to agencies providing water and wastewater services and requires a long term commitment and an effective asset management plan.

In Ontario, Bill 175 will hopefully become the legislative catalyst for closing the “Gap” and reinvesting in our infrastructure.

Understanding Asset Management

Asset management is a well established management process and can be defined as managing capital assets to minimize the total cost of owning and operating them while delivering the level of service demanded by the customer and the regulator. Simply put, it is good business practice and needs to be one of the founding blocks of a progressive utility’s strategic thinking.

Asset management goals need to be aligned with the objectives of the organization and issues such as:

- Immediate response to customer needs i.e., service disruption, contaminated water supply, basement flooding , raw sewage overflows to the environment
- Extending services to new customers
- Financial goals such as maintenance of adequate reserves, bond rating, rate impact on current and future customers



- Regulatory requirements such as the Safe Drinking Water Act, Nutrient Management Act, compliance with orders

The benefits of an asset management program are:

- A comprehensive and up to-date asset inventory data base is established
- Through condition assessment the deficiencies in the existing infrastructure can be determined
- Replacement value of the existing infrastructure and deficiencies in the infrastructure can be estimated
- An orderly and logical repair and replacement program can be developed that looks at life cycles of and the benefit of better maintenance management practices that will result in longer asset life-cycles
- Provides logical and well defined justification for infrastructure financial requirements
- Reduces rate increases
- Supports continuous improvement of water and wastewater systems
- Demonstrates due diligence in looking after water and wastewater infrastructure.

The Asset Management Process comprises a number prescribed steps:

- Determining the level of service to be provided
- Carrying out and continuously updating your asset inventory
- Carrying out asset condition assessments
- Identifying major deficiencies
- Estimating the replacement cost of the asset deficiencies
- Estimating the expected repair/rehabilitation over the life-cycle of the asset
- Carrying our financial analysis of various repair/rehabilitation/replacement scenarios
- Assess the risk of various repair/rehabilitation/replacement scenarios
- Determine the most effective and economic scenario
- Integrate into the Capital Investment Plan

Risk Identification

In carrying out the above process the assessment of scenario risk is key to managing the closing of the “Gap” as the requirement of a “Do everything” scenario can not normally be funded.



As an example, Toronto currently allocates \$ 47 million per year for watermain and sewer replacement which allows replacement on average of 0.5 percent (200 year life) of the replacement asset value for watermains and 0.35 percent (285 year life) for sewers.

The City's 2002 needs study identified that \$195 million per year is required for the next 10 years an increase in \$148 million and an increase in the water/wastewater rate of 37%. After that period the funding requirement drops off to \$120 million per year.

Recognizing the financial and practical limitations, the City approved for 2002 a 9% rate increase, comprising a 5% increase for a wide range of capital improvements and a 4% increase for an accelerated pipe renewal program over the next several years. This will increase the renewal rate for watermains to 2.3 percent of the replacement asset value for watermains and 0.68% for sewers and is designed to close the "Gap".

Until the "Gap" is closed there is an element of risk but with proper asset management the "Gap" has been identified and logical and documented steps can be taken to close it.

Meeting the Challenge

Asset management requires a disciplined, planned approach to reinvest in the renewal and refurbishing of water and wastewater infrastructure. It requires change management and leadership, applying adequate resources and funding and good communication are vital to the success of this initiative. Elected officials are under increased pressures and scrutiny to improve the efficiency of service at the lowest possible cost and without a proper understanding of asset management it will be seen as another ploy to spend money and raise the rates.

Hopefully this presentation has helped to better understand the need to look at asset investment more closely and to protect a vital municipal asset.