

Waterworks under pressure

York Region is the fastest growing regional municipality in the Greater Toronto Area (GTA), welcoming about 23,000 residents every year. Its population is expected to double by 2031. There's an innovative plan in motion to keep the water running.

York is the only region in the GTA with no direct access to a Great Lakes water source, which makes for unique challenges in water and wastewater servicing. Factor in the population explosion, and there are serious challenges facing York Region in providing a safe, reliable, long-term water source.

The urban area municipalities of Vaughan, Richmond Hill, Markham, Newmarket and Aurora are all serviced through agreements with the neighbouring municipalities of Durham, Toronto and Peel. But the rest of York Region is a different story.

Controlling cost and supply

In the early 1990s, three major factors flagged the need for an innovative solution to long-range water supply planning. First was concern over sustainability. At the time, 75 per cent of the region's water supply was purchased from the then municipality of Metropolitan Toronto. The ability of Toronto supplies to sustain the rapid growth in the region at a reasonable cost was not certain. There was also a desire to explore options that would

allow the region a greater measure of independence and cost control.

Secondly, studies of groundwater resources in the Aurora/Newmarket area indicated that the sustainable yield of the

common source aquifer might soon be exceeded. It would be necessary to replace or supplement this supply with a Great Lake-based source within a decade.

Finally, studies showed that the cost of

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Tapping into York Region's strategy for water supply

Figure 1. General pipeline routes show the range of alternatives considered for York Region's long-term water supply plan.



"Water for Tomorrow"

Launched in September 1998, the "Water for Tomorrow" program will save 19 million litres of water daily, at about one quarter of the cost of constructing new infrastructure for the same yield. Expected to cost \$10.2 million over six years, the program has four main components. They are:

- ▶ retrofitting of bathroom fixtures—in households, schools and small businesses—with water efficient showerheads and early closing toilet flappers installed free of charge;
- ▶ free water audits and training to higher industrial, commercial and institutional water users;
- ▶ leakage reduction through leak detection/repair and flow modulated pressure control; and
- ▶ public education, including broad scale publicity, plus custom-designed curriculum modules for grades 7-8, to be delivered to York Region public and separate schools.

A comprehensive maintenance program is also in place to ensure savings are achieved and sustained.

Lake Simcoe water supply

This project comprises a 50-million-litre-a-day membrane filtration plant and ancillary works to service Keswick, Sutton and the lakeshore community in between. The Class Environmental Assessment for the project was completed by Consumers Utilities (CU) within nine months at a cost of \$1.6 million. Now the region is negotiating a project management agreement with CU for design, construction and post-construction services.

Lake Ontario supply via Durham West

Considering the scope and magnitude of establishing a new 365-million-litre-a-day water supply system from Lake Ontario, the region elected to complete the environmental planning requirements as an individual environmental assessment. Environment ministry approval of the terms of reference for the individual environmental assessment has been obtained. The environmental assessment is scheduled to be completed by August 2001, at a cost of approximately \$8 million. Construction costs are expected to be roughly \$500 million for an intake pipe, treatment works, storage reservoirs and transmission mains.

For further information, visit York Region's website at www.yorkwater.on.ca

providing a new, Great Lake-based water supply could be about \$800 million.

The region was faced with the need to plan, implement and finance a huge undertaking in a relatively short period of time. Due to the complexity of potential solutions in terms of sources—Lake Ontario, Lake Simcoe or Georgian Bay—and the number of municipalities that might directly be affected, a public-private sector partnership was formed to help formulate a long-term strategy for water supply.

Choosing a private partner

In 1994, the region began a two-stage process to select a private sector partner. A task force of both regional politicians and senior staff was appointed to make the selection, with assistance from Ernst & Young management consultants.

Following a publicly advertised request for qualifications, a short list of three consortia was asked to submit proposals. After a "due diligence" review of the operations of consortia and their current clients, Consumers Utilities (CU) became the region's partner in March 1996.

CU is a joint venture of Enbridge/

Consumers Gas and North West Water (NWW Canada). This team brought together a major Canadian utility with a water and wastewater treatment service provider with international technical expertise. NWW Canada has extensive experience in the design, construction and maintenance of complex water treatment systems, using newer technologies.

Developing the long-term strategy

By May 1996, regional council had approved a management structure, work plan and budget for the development of the region's long-term water supply master plan. Technical work had already begun in earnest.

Comprising staff from CU and York Region, the management team reported to the task force already established (to select the private sector partner). Working groups were formed for major disciplines: technical (including engineering and environmental), finance, government relations, communications and legal.

The goal of the partnership was to identify, by December 1996, a preferred overall strategy for water supply to meet the

region's needs up to 2031. This meant that, within the space of seven months, the partnership would have to identify, evaluate and recommend a solution out of a staggering number of potential alternatives.

The decision was made early in the work plan to follow the master planning process in the widely recognized *Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects*. This approach was beneficial for completing the subsequent environmental assessment requirements for individual projects identified in the strategy. However, selecting this approach meant fulfilling all of the requirements of the environmental assessment planning process, including public consultation, documentation and the examination of all feasible alternatives within a very short schedule. Ultimately, the partnership went well beyond the minimum requirements outlined in the Class Environmental Assessment document in developing a long-term water supply strategy.

A nontraditional approach

The daunting amount of work required by such an aggressive schedule could not have been accomplished using a traditional approach to commissioning consulting services. Specialized consulting teams completed the work under the direction of the appropriate technical working group. In all, 16 separate consulting firms were

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involved in the work. All commitments and milestones of the partnership were completed on time and within the \$1.5-million budget.

Major activities included:

- ◆ an independent peer review of regional population, employment and housing forecasts;
- ◆ an independent water demand forecast, using the software package IWR MAIN;
- ◆ an assessment of potential water use efficiency measures;

- ◆ a critical review of groundwater resources;
- ◆ an assessment of potential Lake Simcoe water takings and Great Lakes Charter issues;
- ◆ an engineering evaluation and costing of 14 different Great Lakes piping routes among seven pipeline corridors. General pipeline corridors are shown in Figure 1;
- ◆ environmental inventories of representative routes, covering some 3000 kilometres across southern Ontario;
- ◆ a review of alternative commercial structures for implementation and service delivery;
- ◆ an assessment of financial impacts; and
- ◆ public, government and stakeholder consultation, including 10 public information centres, countless presentations and newspaper articles, and a mailing to every household in the region.

The four-part plan

All commitments and milestones of the partnership were completed on time and within budget. Regional council endorsed a four-part program as its preferred long-term water strategy on December 19, 1996. The components are:

- ◆ optimization of Toronto water supplies and identification of infrastructure requirements within the region;
- ◆ a comprehensive water use efficiency program: "Water for Tomorrow";
- ◆ construction of a Lake Simcoe-based water supply for northern York Region (Georgina);
- ◆ construction of a new Lake Ontario-based water supply through the western part of Durham Region; and
- ◆ development of a strategy for the continued use of groundwater within the region. The overall strategy for water use in York Region is shown in Figure 2.

(See sidebar on p. 30 for further details on the four-part plan.)

Making it happen

From January to September of 1997, major decisions concerning execution of the strategy were made, and detailed legal agreements for the next phase were negotiated.

It was determined that the required infrastructure could be financed by the region without a major increase in water rates or development charges. Only municipalities are eligible to collect development charges under current legislation, and York Region enjoys a triple "A" credit rating and, therefore, low financing charges. At the conclusion of the review of financing and utility delivery

Figure 2. Strategy for water supply in York Region



models, York Region elected to maintain sole ownership of its water supply system.

Since CU was recognized as key to the success of the strategy development, the region entered into project management agreements with CU to run the four component projects. Implementation began in the summer of 1997, when the region's water supply master plan was filed for public comment and project management agreements were executed.

All four component projects are managed in the same way. York Region has a performance-based agreement with CU for delivery of the complete project package. CU has, in turn, agreements with subconsulting teams. In most cases, the subconsultants are formed into consortia to reduce the coordination and management requirements of region and CU staff. This structure permits the region significant control and full access to

the project team, while minimizing staffing resources and requirements. ◆

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Infrastructure optimization study

The infrastructure optimization study was the first project completed under the long-term water strategy. It was finished in January 1998 at a cost of \$620,000. The study assessed the region's internal water transmission infrastructure requirements to the year 2031, considering the water supply sources identified in the master plan.

It was the first project in Canada to use a powerful new computing technology called genetic algorithms to optimize a water supply capital infrastructure program. Developed by Optimal Solutions of the United Kingdom, the optimization software runs within a hydraulic network analysis package and integrates into the region's existing geographic information system. The software uses the principles of natural selection to test generations of solutions for "fitness," in terms of satisfying hydraulic model performance criteria, costs and other criteria.

The net effect is that the traditional "trial and error" approach to perfecting system performance and cost is replaced by software that is able to test literally millions of possible solutions. The optimization study identified savings estimated at 33 per cent, or approximately \$54 million, in the south urban area alone.