Design▲Build

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Good-Neighbor Policy Drives Water Project

By Elaine S. Siliver

The population in the Greater Toronto Area is exploding. The birth rate is increasing and people are flooding into the attractive metropolitan area from other parts of Canada and outside North America. The population may soon double and all of those people will need clean water.

Precast concrete Airport Road Reservoir and Pumping Station will help meet region's burgeoning water needs. *(Photo courtesy of Kenaidan Contracting Ltd.)*

To meet this surging demand, the Southern Ontario Regional Municipalities of Peel and York, surrounding the city of Toronto, formed a unique arrangement that has Peel building infrastructure to provide water for York. They did it by creating the fast-track, design-build Airport Road Reservoir and Pumping Station in the city of Brampton to make sure water flows into everyone's taps.

As a November completion date looms, the design-build team of Kenaidan Contracting Ltd., Mississauga, Ont., and its design subcontractor, MacViro Consultants, Markham, Ont., are on time and on budget with a $28 million, 9.2-million-gallon, four-cell reservoir and 338-ft by 131-ft pumping station that will provide Peel and York with over 100,000 gallons of fresh water a day. The work also includes a surge tank and fuel storage buildings.

The rush is justified by the numbers facing regional planners. "York Region had a population of 610,000 in 1996 and has a projected population of 1,345,000 in 2028," says a Labor and Demographics Branch official in the Ontario Ministry of Finance. The Region of Peel had 879,000 people in 1996 and will have 1,693,000 in 2028. York's current population is 852,000 and Peel has 1,123,000 people.

The Region of Peel gets its water from Lake Ontario where it is treated lakeside and pumped to reservoirs. The Airport Road Reservoir was in its master plan, but the transmission line to York was new. "We entered into the agreement to benefit from their infrastructure and to provide us with a second water supply partner. Our first supplier is from Toronto," says Ilmar Simanovskis, York manager of water resources planning. "We are essentially land locked. Lake Simpcoe provides water to the north region while smaller communities are serviced by ground water. We felt it was prudent to have a second partner."

Team was challenged by large suction headers and multi-zone discharge headers in large pumping station. *(Photo courtesy of Peel, Water & Wastewater Treatment)*

Under a 2001 agreement, York will receive water from Peel's water treatment facilities from 2005 to 2031. York will pay a total of $52.4 million to Peel to purchase surplus capacity from the Lakeview Water Treatment Plant and feeder mains beyond what is required to meet system requirements for Peel. The two municipalities are sharing the

cost of the Airport Road Reservoir 50:50, with Peel taking the active role of project owner.

Desirable Details

This is the first design-build project for Peel, but it is an experienced owner and it sped into action after inking the agreement. "We put together prequalification documents by mid-2002," says Anthony Parente, manager of capital works for Peel Water & Wastewater Treatment. "Then we started developing our contractor document and by July 2003 we awarded the contract and commenced construction in late 2003." The request for proposals also served as a detailed set of project requirements. "Some people might say that [the level of detail in the RFP] did not allow for much flexibility," Parente says. "But we believe we were able to keep our standards for pumping equipment and generators, etcetera and then say, 'Now you guys make it happen.'"

The detail paid off. Kenaidan and MacViro performed a lot of facility construction planning while the project was still in the design phase. "We met with the owner to understand its intents and concerns for the water–beyond the RFP," says Gian Fortuna, Kenaidan project director. "We wanted to understand why they were building this and who the users were. The owner is an experienced builder and it was helpful in providing the info." In fact, the specifications were so tight and the understanding between the partners so clear that there have been only nine owner-driven change orders nine months into the project, says Mani Ruprai, project manager for KMK Consultants, Brampton, Ont., and the owner's representative. "The owner really got what it wanted."

"We worked from November backwards and we knew what we had to have in place," says Fortuna, "We went through an understanding of the pipeline and loads and we were able to develop pump curves and worked from there to building the facility." Ruprai also credits the design-build team with creatively managing the schedule. "There are two thousand pieces of equipment, including a generator and other pieces with long delivery times," he says. "The design had to get done fast to get the orders in."

"It was quite a feat," Fortuna says of the schedule. "Jeff [Radley, project manager and the hydraulic mechanical engineer with MacViro] pulled together a design in a few months that should have taken a year and a half." Radley says there were a few things about the owner requirements that were unusual, making the speed of design even more amazing. "It is unusual in a facility of this type to have three zones for water discharge," he says. That means that the water leaving the reservoir goes to three places. The York line will get 100,000 gallons of water and the two Peel lines 31,000 and 33,000 gallons each. York also has an 18-mile-long transmission line.

For the incoming water, carried in a suction header, Peel decided it wanted redundancy to avoid a problem it encountered at a different pumping station. Radley needed to design two headers. "This changes the station design," he says. The suction headers are 72 in. dia and the discharge headers are 42 in. dia and 36 in. for Peel and 72 in. for York.

The process water pipe in the pumping station also proved a challenge. The steel pipes are not off-the-shelf items so the team had to figure out the most efficient way to manufacture and install them. "We did research about coating the size of pipe we were using," says Fortuna. "We selected a zinc primer, an epoxy top coat and a final finish of polyurethane, which gives it color and toughness. We chose to do the coating in the shop to have control over the process," he says. To facilitate handling these 24-in. to 72-in.-dia cement mortar-lined pipes, the team decided to apply the cement in the field. "We choose to do this because of weight reasons and handling," he says. "Without the cement, the pipes are much easier to handle."

Team decisions about how to handle the thousands of pieces of equipment, including the pipes, a 3-MW generator and the pumping station equipment, were crucial to meeting the relentless schedule. One major decision affected the schedule significantly. The team decided to complete most of the pumping station building in time to accept all the equipment. "Then, using tower cranes, we dropped all the equipment inside and only then put a roof on," says Fortuna. "As it turned out, this worked out well because it took the pressure off of us having to build the pumping station in the winter." While the roof

was off the building, the team also dropped a 7.5-ton bridge crane in so workers could easily move the equipment around.

The two tower cranes also let the team ignore snow on the ground during the critical months. "The tower cranes allowed us to work though the winter without having to clear roads for mobile cranes," Fortuna says. And the cranes added to the owner's confidence. "The contractor went at the project gung-ho," says Parente. "He reached 90% of the site with the tower cranes. We are not used to seeing that kind of hardware on a project like this."

Massive pipes and pumps will control water flow from the 9.2-million-gallon, four-cell, underground reservoir. *(Photo courtesy of Peel, Water & Wastewater Treatment)*

Experienced specialty contractors also made a difference. "Having everyone at the table, the biggest advantage in design-build, someone is going to tell you if something is feasible or not because they are a participant on the team," says Parente. "I would insist that our subs be present. We needed them to advance the schedule." And having everyone meet together helped solve the problem of controlling the temperature while pouring 15,000 cu m of concrete during winter. "We ended up with a checkerboard of concrete mix design," explains Radley. They used 10 mixes that were appropriate for different temperatures and for different parts of the reservoir. "We solved the problem of controlling the temperature with a series of answers that covered a series of conditions," he says. The team tested the reservoir and found only two places where there was water seepage in the concrete, confirming the checkerboard approach.

The team also used its collective ingenuity when steel prices made steel grating for the suction heads prohibitive. They went with fiberglass instead, 900 sq m of it, which is normally more expensive than steel. "This turns out to be even better than steel," says Fortuna. "It's lighter to lift." It also is chemically inert and does not have to be galvanized to prevent corrosion.

How does a first time design-build user view it? "We needed design-build," says Parente. "We're paying about a 20% premium for schedule and quality and we have a good contractor–very progressive and innovative."

The author, a freelance writer, lives in the Hudson River Valley of New York state and reports frequently for Design-Build and other publications.
