

ENGINEERING PROFESSION STILL MULLING OVER LESSONS OF WALKERTON

By Michael Mastromatteo

Although engineering played no part in the series of mistakes, omissions and mismanagement that culminated in the Walkerton tainted water disaster of May 2000, the profession has been key in ensuring that a similar event never happens again.

This past May marked the 10th anniversary of the Walkerton tainted water disaster, a sad event in Ontario history in which seven people died from drinking water contaminated with a strain of E. coli bacteria.

More than 2400 Walkerton-area residents fell ill from the contamination, and economic losses amounted to more than \$155 million. In addition to the human costs, the incident led to a crisis of confidence in the quality of drinking water in some Ontario communities. It was a sharp blow to the province and its policy-makers, who have long prided themselves on the safe stewardship of our precious water resources.



The Ontario government appointed Mr. Justice Dennis O'Connor to head up a detailed investigation into what went wrong in Walkerton in May 2000. The subsequent *Report of the Walkerton Inquiry* found that fraud and mismanagement in the operation of the public water utility were major contributing factors. It also recommended increased oversight and regulation of Ontario water systems and advocated a new "source-to-tap" water protection regime. Here, Justice O'Connor speaks with residents of Walkerton about the impact the tragedy had on their lives.

A subsequent investigation, including the much-publicized *Report of the Walkerton Inquiry*, prepared by Justice Dennis O'Connor, identified a number of underlying causes for the disaster, with fraud and mismanagement by the community's water utility operators being at the top of the list.

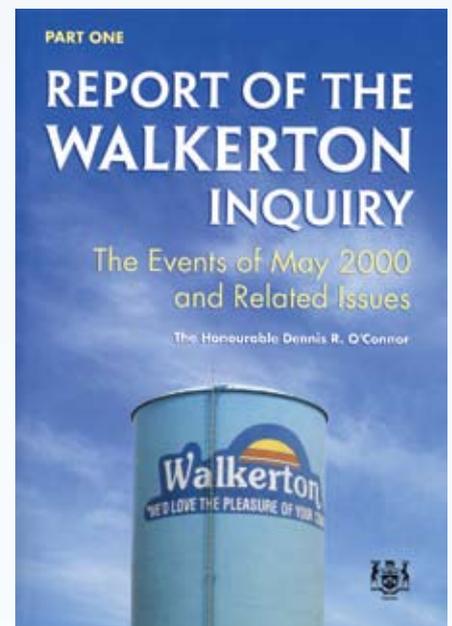
As the O'Connor report noted in Part 1: "For years, the (Walkerton) public utilities commission (PUC) operators engaged in a host of improper operating practices, including failing to use adequate doses of chlorine, failing to monitor chlorine residuals daily, making false entries about residuals in daily operating records, and misstating the locations at which microbiological samples were taken. The operators knew that these practices were unacceptable and contrary to environment ministry guidelines and directives."

The report also faulted the water utility managers for an unhealthy reliance on well water being less susceptible to the harmful bacterial contaminants that eventually made their way into the groundwater in and around Walkerton.

Although operator mismanagement was ultimately at the heart of the problem, there were additional concerns raised, such as insufficient oversight of the system, lack of regulation, failure to engage engineering consultants, privatization of testing labs, and even cutting back on the number of professional engineers employed by the Ministry of the Environment.

Also noted was the lack of an effective early-warning system when the first evidence that something was going terribly wrong came to the attention of local officials.

Although Walkerton was never regarded as a failure of engineering, the situation seemed to cry out for some response from the engineering community, especially in its role as steward of technology for the greater public good. Engineering, in fact, has a strong record of technological achievement in the protection of drinking water, and it was the first of the senior regulated professions to link drinking water purity with improvements in general public health.



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ALTHOUGH WALKERTON WAS NEVER REGARDED AS A FAILURE OF ENGINEERING, THE SITUATION SEEMED TO CRY OUT FOR SOME RESPONSE FROM THE ENGINEERING COMMUNITY, ESPECIALLY IN ITS ROLE AS STEWARD OF TECHNOLOGY FOR THE GREATER PUBLIC GOOD.

PEO RESPONSE

PEO initially responded to the disaster with a letter to then Ontario premier Ernie Eves pledging the co-operation of the province's professional engineers in better protecting drinking water systems.

PEO also won standing at Part 2 of the O'Connor commission, at which it delivered its report, *Roles and Responsibilities of Professional Engineers in the Provision of Safe Drinking Water*. In essence, PEO called for water system operators to take better advantage of the engineering expertise already out there to safeguard water quality.

Similarly, the Ontario Society of Professional Engineers (OSPE) recommended to the O'Connor commission greater overall scrutiny of water system operations.

OSPE recommended stepped-up involvement for professional engineers, particularly in monitoring ongoing operation of water treatment and distribution systems, and in taking part in decision making for the design and replacement of water system components, such as pipelines or chlorinators. In addition, OSPE called for engineers to assess and report on all municipal water systems every three years.

But now, 10 years later, Ontario is still debating the lessons that might be drawn from Walkerton, specifically for engineers.

NEW LEGISLATION

After the release of the O'Connor report, the Ontario government and the Ministry of the Environment busied themselves with implementing its 120 specific recommendations. The environment ministry now says all pertinent recommendations have been implemented, making Ontario one of the leading jurisdictions for water source protection.

Key pieces of legislation derived from the O'Connor report are the *Safe Drinking Water Act* (2002) and the subsequent *Clean Water Act* (2006). Regulations made under these acts call for active testing and sampling of water, with a view to its potability. By moving from drinking water quality guidelines to regulation, these acts brought enforceability and compliance to the drinking water equation.

The legislation also strengthened earlier regulations calling for owners of municipal and non-municipal drinking water systems, both residential and non-residential, to file reports compiled under the supervision of professional engineers.

In fact, the environment ministry's safe drinking water legislation post-Walkerton has been designed to impose a "source-to-tap" protection regime, as recommended by Justice O'Connor in his two-part report.

In addition to legislative and regulatory enhancements in the wake of Walkerton, the O'Connor report precipitated new thinking and attitudes about water as a "not to be taken for granted" commodity in Ontario. As Justice O'Connor noted in the report, some of the problems leading to the Walkerton disaster stemmed from system operators and their municipal government overseers being unwilling to devote proper resources and expertise to the care and oversight of water systems. The report urged Ontarians not to rest on their laurels when it comes to safe drinking water, and asserted it's no longer appropriate to scrimp and save when it comes to maintaining water systems.

ENVIRONMENT MINISTRY INITIATIVES

Accordingly, the environment ministry sought to bring more uniformity to the regulation and management of water system operators, both for large municipalities and remote communities in the far north. With the intention of bringing Ontario to a world leader position in drinking water safety, the



As part of its response to the tainted water disaster of 2000, the Ontario government established the Walkerton Clean Water Centre (WCWC) as a central training facility for water system operators throughout the province. At right is a conventional pilot plant and ozone facility operating under a supervisory control and data acquisition system.

Below, three guests take part in an exercise at the WCWC's onsite water testing laboratory.



In a recent report, Ontario's chief water inspector indicated that more than 99 per cent of drinking water tests reported by municipal residential drinking water systems met the province's more rigorous new standards.

More recently, the province established the Walkerton Clean Water Centre (WCWC), whose primary role is to provide training and instruction to the operators of all water systems throughout the province. The inconsistent approach to the training and conduct of water system operators, particularly in smaller communities with fewer resources, was deemed a contributing factor in the Walkerton fiasco.

Former PEO president Bob Goodings, P.Eng., a past CEO of Gore and Storrie (now CH2M Hill), one of Canada's largest environmental engineering consulting firms, represented OSPE at the O'Connor commission into the Walkerton disaster.

"One of the outcomes from the O'Connor report was the issue of source water protection," Goodings says. "The Ministry of the Environment put this issue to the 25 or so conservation authorities across the province, [which in turn] helped establish terms of reference on land use controls that could impact on groundwater sources and surface water sources for municipal water systems."

Goodings says political and economic factors drove the events of

ministry has instituted rigorous water system inspections; mandated operator certification and training; and instituted reporting rules for water quality testing labs. It has also drawn up standards for measuring contaminants and disinfection levels, and imposed compulsory water testing and information sharing protocols—this latter action aimed directly at the belated warning problems that beset the Walkerton community back in 2000.

Other initiatives post-Walkerton have included capital upgrades for a number of community drinking water systems. According to John Thompson, P.Eng., director of engineering services, Ontario Clean Water Agency (OCWA), such upgrades included the addition of chemically assisted filtration relative to surface water sources, groundwater under the direct influence (GUDI) of surface water sources, and disinfection upgrade projects to satisfy the new CT (Concentration multiplied by Time) concept modeled after American regulations. These initiatives ranged from minor adjustments to major changes, depending on the circumstances at the particular drinking water system.

Another of the more prominent initiatives undertaken by the environment ministry post-Walkerton was the appointment of a chief water inspector, whose role it is to report on progress in the better regulation, training and management of Ontario's diverse water treatment systems.



Saad Jasim, PhD, P.Eng., president, Ontario Water Works Association, conducts a training session at the Walkerton Clean Water Centre. As the first-ever CEO of the centre, Jasim is at the forefront in helping municipalities adjust to the new regulations, post-Walkerton, for the safer treatment and protection of water systems. Jasim believes Walkerton has sensitized engineers and other professionals to a new attitude of vigilance in the protection of public health.

Walkerton, rather than technical factors. “The [municipality] of Walkerton would not hire an engineering consultant,” he notes, “and the environment ministry staff were so overstretched with all the environmental problems in the area that they could only devote about 5 per cent of their time to dealing with water and sewage problems.”

Yet there may still be lessons to be gained for engineers.

Thompson of OCWA says the need for strict compliance with existing and new legislation is certainly one of them, noting that “water purveyors across Ontario increased their focus on compliance as a result of the Walkerton incident and its subsequent impact on provincial legislation.” He also suggests that Walkerton helped underscore that water purity is not the only factor in maintaining safe drinking water quality.

“The Walkerton experience has shown that, prior to the event, many Ontario water purveyors were overly focused on issues that were unrelated to water quality, such as water pricing and minimizing price increases—often without factoring in the actual full cost of water treatment and delivery,” Thompson says. “This issue is the responsibility not of the water operators but the water system management and overseers. An overarching commitment to ‘protecting the public’ as is the primary responsibility embraced by professional engineers through the [*Professional Engineers Act*] and self regulation, would tend to maintain the focus on water quality and public health rather than artificially low price and re-election issues—suggesting that it would be to the public benefit if properly trained professional engineers played a more significant role in the management and oversight of drinking water utilities.”

DANGER OF COMPLACENCY

Saad Jasim, PhD, P.Eng., president, Ontario Water Works Association, part of an international network of water systems professionals, suggests the Walkerton case has alerted engineers and other professionals to the dangers of complacency, leading to overall improvements in the water industry.

Jasim, the first-ever CEO of the WCWC, is also director, Great Lakes Regional Office, International Joint Commission, a Windsor, Ontario-based organization advising governments on water issues affecting Canada and the United States.

He says the Walkerton tragedy has sensitized engineers and other professionals to contemplate problems before they arise, especially when public safety is in the balance. “The responsibility is not only on engineers,” Jasim says. “It is on operators of water systems, operating authorities and the owners of water systems. All must rise to the challenges and the responsibilities to provide safe drinking water to the public.”

In his past role as director of water quality, Windsor Utilities Commission, Jasim saw first-hand the impact on municipalities of some of the regulatory and legislative enhancements. He believes an improved regulatory regime, coupled with mandatory training and certification of system operators, will almost certainly prevent repeats of what occurred in Walkerton in 2000.

For Ron Hofmann, PhD, P.Eng., co-director, University of Toronto Drinking Water Research



Greg Powers, a regional groundwater officer, Ontario environment ministry, draws a sample of groundwater from a culvert next to one of the wells feeding the Walkerton water distribution system. The Ontario environment ministry implemented compulsory water testing and has drawn up new standards for measuring contaminants and disinfection levels as part of its multi-level response to the Walkerton disaster of May 2000.

Group (DWRG), the Walkerton case presented engineers, government leaders and municipal officials an opportunity to emphasize research and innovation as safeguards against another tainted water disaster.

“I would say that the one major consequence of Walkerton is that it has made government, municipalities and their consultants more aware of the benefits of continual improvement, with one aspect of this being investment in research,” he says.

Hofmann and co-director Robert Andrews, PhD, P.Eng., oversee a research consortium of professors and industrial partners who target research to improve drinking water quality across the board. Current priority areas for the DWRG include disinfection optimization, control of emerging chemical contaminants, enhanced membrane treatment and issues surrounding deterioration of water quality in the distribution system.

There’s no question research and innovation into water quality and protection are among the hard-won lessons of Walkerton for the engineering community. A number of environmental engineering firms, including some in Ontario, have developed microfiltration and other innovations inspired in part by the memory of Walkerton.

“It would be difficult to point to any one technology and say that ‘this was created because of Walkerton,’” Hoffman points out. “Instead, Walkerton caused the bar to be raised on drinking water engineering, which has probably spurred innovation and professionalism in many areas, but in ways that are hard to catalogue. For example, new treatment technologies, such as UV light and membranes, may have been more rapidly accepted, partially in response to Walkerton.”

Towards the end of his investigation of the disaster, Justice O’Connor himself opined on the overall significance of the tainted water disaster. “The Walkerton experience warns us that we may have become victims of our own success,” he wrote, “taking for granted drinking water’s safety. The keynote for the future should be vigilance. We should never be complacent about drinking water safety...New pathogens and chemical contaminants will continue to emerge. We will be able to minimize risk to a negligible level in the future only if we constantly monitor the design and management of our water delivery systems to ensure that we are always employing the safest practices available.”

And while engineers cannot be faulted for the fraud and mismanagement that contributed most directly to the Walkerton disaster, they would do well to take its lesson about vigilance, stewardship and influencing public policy in the right directions to heart.

As engineer Thompson of the clean water agency observes: “Professional engineers have the proper educational background and professional commitment to public protection to be trustworthy stewards of excellent drinking water systems for competent public benefit. As a group, we would be well-advised to put ourselves in positions where we can positively influence public policy and public decision making.” Σ