Drinking water contamination in Walkerton, Ontario: positive resolutions from a tragic event

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Abstract In May 2000, *Escherichia coli* 0157:H7 and *Campylobacter jejuni* contaminated the drinking water supply in Walkerton, Ontario. Seven people died and over 2,000 were ill as a result. The Ontario Provincial Government set up a judicial Inquiry into the circumstances surrounding the outbreak and also moved quickly to introduce a new Drinking Water Regulation that incorporated some significant requirements for drinking water providers. The Inquiry itself was in three parts: (a) part 1 related to the events that occurred in Walkerton and why the water contamination occurred; (b) part 1A related specifically to the role of the Provincial Government in the event; and (c) part 2 related to the future of drinking water safety in Ontario with potential to influence regulation on a wider basis. A number of other actions were taken after Walkerton. In August 2000, the Ontario Government, through the Regulatory body, the Ontario Ministry of the Environment (MOE) (a) re-issued and revised the Ontario Drinking Water Objectives (ODWO) as the Ontario Drinking Water Standards (ODWS) and (b) introduced new regulations governing drinking water in Ontario – the Ontario Drinking Water Protection Regulation. One of the key features of the Drinking Water Protection Regulation was the requirement to produce an independent Engineers’ Report on all water systems. This paper provides a unique perspective on the Walkerton tragedy and its aftermath. The author was active in many aspects of the resulting activity (Chair of the Ontario Water Works Association’s (a section of the AWWA) Special Committee involved in Part 2 of the Walkerton Inquiry; author of several of the Engineers’ Reports mandated by Regulation; reviewer on behalf of the Regulator of Engineers’ Reports submitted by others). The Engineers’ Reports were of interest because (1) the drinking water providers (mostly municipalities) were mandated by regulation to complete the Reports by specific dates and are paying for the Reports, (2) the work had to be done by a registered professional engineer who is not an employee of the owner or the operator if a different entity and (3) the engineer had to sign a declaration that the Regulator could rely on the accuracy of the Report. In other words, the Municipality retained the Engineer and paid them to produce the Report – the Engineer essentially carried the liability while the Regulator had the final say in the acceptability of the Report, a sort of eternal triangle of responsibilities. The paper will outline how the drinking water profession in North America worked together to provide the Walkerton Inquiry with the benefit of its experience and knowledge of best practices to the benefit of consumers and the drinking water providers. It will also outline the procedures adopted to produce the independent Engineers’ Reports and how the findings are being applied to further improve drinking water safety in Ontario, across Canada and in similar situations around the world.

Keywords Drinking water inspections; *Escherichia coli* 0157:H7; Walkerton Inquiry

Introduction

In May 2000, *Escherichia coli* 0157:H7 and *Campylobacter jejuni* contaminated the drinking water supply in Walkerton, Ontario. As a result, seven people died and over 2,000 were ill. The Ontario Provincial Government set up a judicial Inquiry into the circumstances surrounding the outbreak and also moved quickly to introduce a new Drinking Water Regulation that incorporated some significant requirements for drinking water providers. The Inquiry itself was in three parts:

- Part 1 related to the events that occurred in Walkerton and why the water contamination occurred;
- Part 1A related specifically to the role of the Provincial Government in the event;
and

- Part 2 related to the future of drinking water safety in Ontario, with potential to influence Regulation on a wider basis.

A number of other actions were taken after the Walkerton tragedy. In August 2000, the Ontario Government, through the Regulatory body, the Ontario Ministry of the Environment (MOE) re-issued and revised the Ontario Drinking Water Objectives (ODWO) as the Ontario Drinking Water Standards (ODWS) (OWDS, 2000) and introduced new regulations governing drinking water in Ontario – the Ontario Drinking Water Protection Regulation (ODWPR, 2000). One of the key features of the Drinking Water Protection Regulation was the requirement to produce an independent Engineers’ Report on all public water systems (approximately 650 systems).

**The Walkerton Inquiry**

Part 1 of the Inquiry was completed in March 2001 and Part 1A in April 2001. These parts of the Inquiry were conducted using judicial processes, including formal provision of evidence and cross-examination. The hearings were all held in Walkerton and this has since been shown to have been crucial in ensuring the credibility of the process in the eyes of the public.

Part 2 was completed in early November 2001 and was conducted very differently to Part 1 and included (a) a series of background Reports commissioned by the Inquiry, (b) invited Reports on key issues from the Parties with Standing (including OWWA), (c) a series of Expert Meetings on each Report topic area (chaired by members of the Inquiry’s Research Advisory Panel), (d) more formal Public Hearings at which each Party was able to outline their major recommendations directly to the Inquiry; and (e) written final submissions. The method by which Part 2 was conducted ensured that the widest possible range of views, including best practices from around the world, was presented and discussed. Parties with Standing encompassed a broad range of stakeholders including environmental activist groups, unions, professional associations in many disciplines, local Walkerton interests and Canada’s First Nations.

The Ontario Water Works Association (OWWA) (a section of the American Water Works Association, AWWA) and the Ontario Municipal Water Association (OMWA) (which is an association of elected municipal officials) requested and were granted standing in Part 2 of the Walkerton Inquiry in September 2000. A special joint executive committee of OWWA and OMWA members, as well as Counsel for the OWWA/OMWA, was formed to oversee the process. This structure worked well throughout the process and facilitated the quick action that was almost always necessary. The OWWA/OMWA participated fully in Part 2 of the Inquiry between September 2000 and November 2001.

Ten reports were filed and over 100 recommendations were submitted to provide the Inquiry with evidence on best management practices and policies that were recommended to be employed to protect drinking water systems, based on the collective experience and expertise of the drinking water profession. Final closing arguments were submitted by OWWA/OMWA in November 2001 (WI, 2002a). Both associations shared the costs, which totaled over $175,000 (Can). OWWA and OMWA retained experts in each of the required areas and, although some worked on a pro-bono basis, that was mostly not the case. It was not possible to use local volunteers, in part due to the time constraints, but also because many already had an involvement in some way with the Inquiry or activities in Walkerton, and therefore had a conflict.
Results
OWWA’s recommendations to Part 2 of the Inquiry included the following:

Governance
• one Ministry to be the lead for drinking water (Environment)
• Professional Interest Advisory Forum (PIAF) advising the MOE
• Cabinet Committee oversight

Drinking water standards
• required an enhanced public involvement process (for Health Canada and MOE)
• Health Canada to apply more resources to set standards for the current backlog of new and revised parameters (e.g. turbidity, THMs & TCE)
• improved definition needed for groundwater under the influence of surface water

Regulation
• recognise water industry programs such as the International Water Treatment Alliance, AWWA’s QualServe™ Benchmarking and Accreditation Programs
• improve monitoring plans to recognize small system issues
• develop overall management strategies & training
• improve and clarify inspection and enforcement

Research
• need coordinated approach and support from all levels of government (including recognition of existing academic and water industry sponsored programs such as AWWARF)

Total water management
• planning on a watershed basis
• detailed source water assessments
• groundwater protection policy (largest source of pollution is agricultural non-point source contamination)

Public “Right-to-Know”
• continue water quality reports (with consideration of annual rather than quarterly production)
• adverse water quality reporting
• enhanced public consultation process for utility decisions and standard setting

Training and certification
• mandatory certification
• resolution of grandparenting issue
• enhanced training requirements (52 hours per year)

Full cost pricing
• cover all costs necessary to develop the financial, technical, managerial and operational expertise and capacity of water utilities
• sustainable asset management
• revolving loan fund to assist utilities
• system viability assessment needed
Conclusions – Walkerton Inquiry
The Report on Part 1 of the Inquiry was released in January 2002. More detailed information on what is known to have happened based on the evidence presented to the Inquiry and what conclusions were drawn about the causes in the Part 1 report are presented by Hrudey et al. (2003) at this Symposium. The Part 1 Report received very wide media coverage as did, in fact, the entire Inquiry. The Inquiry process adopted (part judicial and part reports, workshop discussions and hearings) was very effective and clearly had the confidence of the public. The positive coverage of the Part 1 Report and immediate acceptance of its recommendations by the Provincial Government bodes well for enhancing drinking water quality, plus restored consumer confidence in public drinking water supplies.

The Report on Part 2 will be released in March/April 2002 and will be available on the Inquiry’s website (WI, 2002b). The collaboration of many stakeholders in Part 2 of the Inquiry produced a wide-ranging assessment of best practices from around the world. The recommendations will act as a proactive guide to water providers in Ontario, the rest of Canada, and hopefully around the world. This compendium of best practices will provide a lasting legacy for the citizens of Walkerton.

Engineers’ reports
The Engineers’ Reports required for every municipal water system in Ontario are of interest because (a) the drinking water providers (mostly Municipalities) were mandated by regulation to complete the Reports by specific dates and paid for the Reports, (b) the work had to be done by a registered professional engineer who was not an employee of the Municipality or the facility operator if a different entity and (c) the engineer had to sign a declaration that the Regulator could rely on the accuracy of the Report. In other words, the Municipality retained the Engineer and paid them to produce the Report. The Engineer was responsible for the accuracy of the information while the Regulator had the final say in the acceptability of the Report – a sort of eternal triangle of responsibilities. Liability became a large initial issue, when the liability insurance of most Engineers or their firms would not cover the certification requirements.

Every municipal water system in the Province (approximately 650) had to produce an Engineers’ Report on their supply and treatment system. A copy of the Terms of Reference may be found at the MOE website (TRER, 2000) along with the Regulation itself, the new Drinking Water Standards and a large number of supporting documents. The emphasis for the Reports was on the effectiveness of disinfection and treatment systems to prevent microbiological contamination including a full system description, assessment of the potential for microbial contamination, characterisation of the raw water source (surface water, groundwater or groundwater under the direct influence of surface water or GUDI), assessment of operational procedures and determination of a system specific monitoring program. (The distribution system was not included other than in the definition of the required monitoring program.)

The Report submission dates (every two months from November 30, 2000 to May 31, 2001) were determined alphabetically by municipality. The original intent had been to determine the dates by greatest system need but the task of deciding which systems had, in fact, the greatest need would likely have been difficult and controversial, even before the real needs had been confirmed. So MOE’s decision to go with alphabetical submission dates was a significant one to launch the program so that the emphasis remained with the focus on the needs, not on the process itself.

As the first series of Reports was submitted in November 2000, MOE also moved to deal with their own resource issues to review and assess the Reports. MOE entered into an
agreement with Consulting Engineers of Ontario for the secondment of suitable staff to the review assignments. It was established that review engineers could not review a Report from their own firm, and each reviewer was asked to sign a confidentiality agreement. A number of Engineers (including the author) therefore found themselves in the interesting, and somewhat unusual, position of working on these Reports from two different perspectives, both as a Report Engineer and Reviewer.

The basic Report reviews were finished in February 2002 but the Regulation required ongoing Engineers’ Reports to be conducted every three years. Despite the potential for conflicts and the important risk management and liability issues involved, the work was conducted in a basically cooperative fashion. In the final analysis, this was because all the participants were very mindful as to why the initiative was started and how very important it was that it be successfully concluded. The eyes of all consumers were, and still are, upon each of the groups involved – Regulator, Municipality and Engineer – and future confidence in public drinking water in Ontario depends on the results.

Results

The end product of the Reports was the issuance of a consolidated Certificate of Approval for every water system in Ontario to replace a multitude of individual existing Certificates, or in the case of older systems, to establish a Certificate where none existed. The Certificate included conditions to be fulfilled by the Municipality and was related to upgrades to rectify deficiencies identified in the Reports, in three general categories: (1) upgrades to meet minimum treatment requirements, (2) upgrades to rectify general deficiencies in disinfection and filtration system, and (3) upgrades to meet “best practices” in other aspects (generally as judged against the Ten States Standards for Water Works) (RWSS, 1997).

The principal issues that arose during evaluation of the Reports were as follows:

• The required raw water characterisations for every system could not be completed in a timely fashion since the workload overwhelmed available laboratory services. This was resolved by an Approval Certificate condition that it be provided before any upgrade works were undertaken.

• The definition of Groundwater Under the Direct Influence of Surface Water (GUDI). The regulation required any such system to provide treatment, but did not include a precise definition. This was resolved by an Approval Certificate condition that required a separate hydrogeological study be undertaken where the potential for GUDI was evident from the Engineers’ Report.

• The Regulation specified that each surface water treatment system must provide a minimum of 3-log inactivation of *Giardia* and 4-log inactivation of viruses. The initial intention was for each system Report to verify whether the minimum was appropriate (based on raw water conditions); however, in most cases there were insufficient data to define the need. (This was resolved by using the minimum as the basic requirement, and including an Approval Certificate condition that increased inactivations would be mandated as required.)

• The Ten States Standards were referenced in the Terms of Reference for the Reports but it was not clear which criteria in this guidance document should become required upgrades. This was resolved by the issuance of a guidance document which concentrated on (a) redundancy and alarms for disinfection processes, (b) filter to waste or an equivalent operating procedure, (c) provision of standby power or system elevated storage to ensure positive system pressures during power outages and (d) wellhead protection for groundwater systems.
Conclusions – engineers’ reports
The Engineers’ Reports provided an independent and cooperative audit of all the municipal water systems in Ontario. The reviews were conducted in the best spirit of peer review and continuous improvement and were not in any way “witch hunts”. The Reports identified deficiencies and provided municipalities with timelines to remedy them. The end result still allows municipalities to resolve deficiencies in a method that best suits their own local conditions, not in a prescriptive “one size fits all” mentality.

A remaining challenge is that there remains considerable confusion in the mind of the public about municipal and private systems, which is leading to misunderstandings as to the applicability of existing and proposed regulations.

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