November 1, 2001

Mr. Harry Swain
Walkerton Inquiry

Harry,

Introduction
Here are some thoughts as you requested on the issue of standards and the water industry. These thoughts are the results of my own observations and in consultation with other colleagues who are knowledgeable on this issue. Please note that these are introductory comments to the issue and I hope you find them helpful as you work to come up with recommendations that will prevent another Walkerton from happening.

Observations Regarding Standards
Standards are complex and multi-faceted in every industry. Here are some of our observations:

From a general macro-level, every industry is subject to three basic sets of standards: firstly, government regulations which address broad issues, basic quality assurance and codes; secondly, industry standards provide more specific direction; finally, operational standards become more site specific while meeting regulatory requirements. For instance, in our work, before we begin we undertake a “functional specification” that defines the scope of the work and the standards to be used.

In the case of automation technology, there are practices and general standards such as electrical (e.g. National Electrical Manufacturers Association Standards), national fire protection, underwriters laboratories, etc. which set the framework for many activities, including automation. In this general way, one could always argue that there are "practices" in every industry including water. The issue, then are how rigorous these standards are, and how they are implemented.

Standards Vary From Industry to Industry
Specific standards vary considerably from industry to industry in terms of automation, performance and compliance. For instance, our experience with standards in pharma, nuclear, and food contrast with water where there are few standards. In fact, it is well known that in the water industry there are few performance benchmarks - these are only now emerging. Interestingly, in the case of critically important control or automation technology, the water industry undertakes a customized approach incorporating few standards.

The Importance of Automation Technology and Water
In the case of automation in the water industry, the clear tendency is to delegate this critical work to a third or even a fourth party who is given general parameters and as long as they claim to meet these parameters the job is acceptable. Too often, general contractors who **low bid** the work win jobs. The general contractor, in order to profit does so by "leveraging" their sub-contractors. As a result, the automation technology is often completed by a distant sub down the “food-chain”. This is understandable given the low-bid environment and secondly, since water has been relatively late in adopting automation technology as opposed to, for example, manufacturing where automation controls are often viewed as a central part to a successful operation.

Conventional Approach Is Customized
Given the above, if automation is put in a water facility, it is always based on a custom approach that is premised on "integrating" bits and pieces of hardware and software to create a system - so long as it "works" and the price is met is all that really matters. Many parties like this approach for many reasons. It creates dependent business relationships especially for consultants, integrators and even for specialized IT in-house personnel because every system is unique. Therefore, clients continue to depend on these parties for future trouble-shooting. The relatively small scale

of the industry (e.g. many small sites) has also facilitated this tendency. The problem is that these custom systems are expensive, time consuming to implement, may lack reliability, are hard to service and because of their cost only relatively large communities can "afford" them. Regrettably, this is also why so many are incomplete and many do not work very well (if they exist at all).

Compounding this is the fact that most water consultants are focused on other aspects of the industry and few are specialized or may not even understand automation from a technical perspective, let alone its larger significance as a strategic tool to increase productivity and manage risk. Clearly, automation can greatly increase operational efficiency. At the same time it can lower risk by taking out the human factor and incorporating continuous system feedback. The latter, is critical in water where automation can continuously monitor key water quality indicators (e.g. chlorine residual, turbidity etc.) thereby minimizing system failure. If a parameter is beyond a threshold, one knows immediately and if the system feedback loop is interrupted, one will know that, too.

Capital Investment vs. "Intelligent" Operations

The water industry has taken an approach that reflects a philosophy of heavy investment in capital infrastructure, not "intelligent" maintenance and operation (e.g. automation and controls and trained personnel). The analogy is like buying a Cadillac and installing a Model T ignition and having a driver who has little or no training. Ironically, the automation technology, which represents a marginal cost, ends up being underutilized to the detriment of operational performance and management of capital costs.

An analogy is Stelco's main facility that was built in the 1940's. With modern technology we were able to assist Stelco to retrofit it and bring it to a performance level where they can now compete with anyone. Stelco determined that they do not need to build a new facility - instead they invested in automation that improves operational performance. In this way, large capital costs can be deferred or even eliminated.

Ironically, a lack of automation controls and system information undermines the ability of the water industry to plan their capital investment. It is with detailed operational data that decision-makers can thoughtfully estimate operational and capital forecasts. In many systems this operational information is simply not available.

This realization has important policy implications because the industry is consistently raising concerns about the need for additional funds. Notwithstanding the need for cost recovery water pricing and economy of scale issues, this industry will always be short of cash if it never fully appreciates that automation and control is a major key to saving money and achieving effectiveness.

Adoption of Standards Is Slow

Standards are migrating very, very slowly into water - it will take years and years. A committee at the American Water Works Association called UCA (Universal Communications Architecture) has the mandate to make it easier for water technology systems to talk to each other. Because there are no common communication standards in water, the industry pays a major premium for parties to re-invent communications and automation infrastructure for each project. This approach entails great costs both from a monetary and liability perspective. But for the reasons above and more, it will take a very long time if ever for quality standards to be adopted in water. With major infrastructure costs and confidence issues some industry leaders see UCA as just the tip of the iceberg as a way to manage these challenges. By the way, the gas and electric industries have been adopting UCA standards for this reason for years as a key strategy to improve reliability and lower costs and bring improved technology to smaller systems.

A Different Approach – Standardization

In light of the above, when the Ontario Clean Water Agency (OCWA) approached us in 1997 they

knew they had a challenge. They had many remote sites all over the province and the cost of trying to bring monitoring technology to these sites would be prohibitive using a conventional approach especially for smaller systems. The time and expenses needed to implement a conventional approach would clearly not have met their needs either. To OCWA's credit, they had a vision for a standardized water monitoring, control and data management system. With our knowledge from other industries we worked in partnership with OCWA to develop a new generation of monitoring technology. As a standardized monitoring and control system (called Outpost) it could be implemented quickly in a turn-key fashion, have high functionality, was cost effective in the sense that it did not require specialized IT personnel to operate it and it was also cost competitive so it could reach even small systems.

So in this respect, Outpost is unusual because it reflects a standardized approach to automation with an operator's (OCWA) commitment to high operating standards. It also reflects a set of Automation Standards we developed for OCWA across the board, not just for monitoring. This standard could, in principle, be used for any water operation. These standards were developed because we wanted OCWA to have a clear reference point that they could use to evaluate automation and ensure some measure of quality control and at the same time, save money by doing things right the first time and saving on standardized maintenance practices etc. This approach clearly represents a different way of going about business. It represents a standardized and “off-the shelf” approach vs. an expensive customized, site by site approach. Outpost collects all critical water quality data (including lab data) in a central, accessible repository for real-time viewing.

Why the Risk of another Walkerton Continues

It is also worthwhile to note that Automation Standards do not just relate to technology but also people. Operator training and a careful review of every system to ensure that it is "repeatable, reliable and taper-proof" is the key. There are, however, many actors that do not think in these terms at all. Unfortunately, this is why it is possible that another Walkerton will happen; this industry does not have an inherent interest in changing. In spite of having many good personnel, all the incentives as outlined above, are systematically stacked against it changing. It has taken and continues to take an enormous amount of commitment and vision by an operator like OCWA to make it happen. As a note, the Ministry of Environment, through OCWA, now owns the rights to the Outpost technology in Ontario.

The Role of the Regulator

Therefore, in terms of recommendations, I can only reflect on discussions with colleagues who have experienced this dynamic in other industries. In the case of Pharma, it took the FDA to simply legislate requirements and standards along with heavy fines (e.g. $100 million - $200 million fines are not uncommon). This happened after a number of terrible tragedies. Finally, FDA assumed a strong audit or regulatory function (on site of the producer) directly between the producer and consumer.

Moves by the Province of Ontario to introduce heavy fines are certainly positive and bring a new reality to the industry. Just as significant if not more is the associated legal liability associated with this industry in light of Walkerton and North Battleford. Clearly, the industry has been now placed on watch by the insurance industry. As parties undertake legal actions this will represent a much greater impact than fines as leading members of the insurance industry have stated that premiums will increase significantly across the board and some municipalities will have exclusions on their policies for water.

In water, the regulator could either legislate the specific means or not in achieving water quality outcomes. Either way, the key role of the legislator is to at least legislate the outcomes or results. With the former scenario, it would be necessary to legislate not only the quality parameters for water but that the means to get there must follow certain practices and standards. One would also have to require that each plant have written standard operating procedures. In short, the province would have to legislate some basic standards on automation to ensure operators meet

the new regulatory requirements reliably, consistently and cost-effectively. Unfortunately, the regulator currently does not have timely information on key quality indicators that would suggest whether a problem exists or not.

Addressing the Strategic Gap

From a regulatory point of view however, there is still a major strategic gap. What's the point of having fines as an inducement to behavioral change if the regulator has almost no timely operational information to ensure quality end-results are being achieved all the time? In short, the strategic gap is that the regulator in water is not positioned effectively between the producer and the consumer in a timely way. In any other industry, including pharma and food, government inspectors are always between the producer and the consumer and they are on-site. In water it is a leap of faith that the producer is delivering a product to the consumer as claimed. Although there are certainly many forms in which this task could be done, this is why it would make sense to have an arms length provincial agency (e.g. food inspection agency or like water monitoring agencies in Europe) that would monitor what is going on all the time not just periodic samples. Like FDA, this means that the Province would assume its proper regulatory/audit function, not the role and liability of the operator. Historically, the province has assumed a "weak", after the fact regulator role - it is impossible and long after the fact to know if parties are complying - by then it's too late. Under the new regs, Stan Koebel can still exist - not as long - but he can still exist for a few days and by then the damage is done.

Regulator Needs Current Continuous Water Quality Indicators

Strategically, the regulator needs to play a strong, pro-active regulatory role - one where they know what is going on and operators know that the regulator is aware. That is probably the only strategy that will change the industry. After a few prosecutions under this regime the industry would adapt. The Province needs to require municipalities not only to monitor continuously using certain automation best practices and standards but the Province also needs to establish the third party that will monitor in real-time the key water quality parameters in addition to lab tests. With this regulatory framework the regulator could ensure that a Stan Koebel could do little damage. This is certainly one of the reasons that OCWA worked to develop the system to ensure fail-safe system design because they recognized that regrettably there will always be some bad operators.

With this kind of system, the regulator could play a strong audit function and in no way break the chain of accountability that the local operator has to operate the system. Fundamentally, this approach would act as a 2nd line of defense, identifying potential problems well before they create serious issues and show up in laboratory tests. It could continuously monitor operational data and alarms on out-of-tolerance conditions and secondly, validate that testing procedures and regulations are being followed. In this way, the regulator would be auditing key water quality indicators all the time.

Current Data Would Support Other Regulatory Roles

In addition to ensuring good water quality, this data would also assist the regulator including valuable performance data. The regulator could actually see data that would assist it from enforcement, research, compliance, approvals, liability safety and emergency preparedness perspective. For example, the regulator could see whether the certificates of approvals given to operators are actually based on reality or just theory. The key is for the regulator to have real **operational data**. For instance, now the Province approves water and wastewater treatment systems but never really knows if performance in the field matches or meets the standards for approval. Again, they are operating with little operational information. With this approach, the Ministry could actually access the performance of technology in the field pro-actively and access how changing conditions impact treatment processes.

From an enforcement point of view, the Province would have strong documentation and could carry out the enforcement role cost-effectively. In all fairness to the regulator, they could never afford to hire enough enforcement officers. With greater information and intelligence is opportunity for much better decision-making including in the area of planning and budgeting. In

addition, information could easily be linked to public access. The issue here would be what information would be displayed. Without this common monitoring system the regulator is unable to proactively ensure parties comply but assist parties to comply before a serious problem develops.

Once certain thresholds were reached and a local operator failed to respond, an alarm could go to the regulator and even local health officials should the local operator fail to correct the situation if it persists. These thresholds would have to be defined by the regulator based on their decisions and defined role. Clearly, this system would be a tool to help regulatory personnel. How they would use it would be their decision.

Improve Safety and Manage Risk

Such a system would improve safety for consumers and mitigate risk. In the case of the Walkerton tragedy lives were lost. In addition, the Province alone based on current evidence will probably be responsible for direct and indirect costs of at least $50 to $70 million. This does not include the indirect costs (e.g. staff time) of having a crisis overtake the focus of most of many Ministries. Clearly, under no circumstances can another tragedy be allowed again. If our stated objective is to prevent another Walkerton, then clearly the status quo must change if not for the sake of consumer safety alone but for monetary costs as well.

On a final note, such a regulatory monitoring strategy could be deployed either provincial wide or regionally regardless of how water is delivered in the future. Regardless of how it would be set up, the key would be for the regulator to be clear on what it views its role – to be pro-active or reactive. This kind of monitoring approach in the final analysis is only a tool to support the role of the regulator to ensure that the final product meets the standard and the risk of another Walkerton would be greatly mitigated.

Thank you for inviting my comments and best wishes in your important task.

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