Chapter 5 The Role of the Public Utilities Commission Operators

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5.1 Overview

Two serious failures on the part of the Walkerton Public Utilities Commission (PUC) operators directly contributed to the outbreak in May 2000. The first was the failure to take daily chlorine residual measurements in the Walkerton water system. If the Walkerton PUC operators had measured the chlorine residual manually at Well 5 on May 13 or on the days following, as they should have done, they would almost certainly have discovered that incoming contamination was overwhelming the chlorine that was being added to the water. They should then have been able to take the necessary steps to protect the community. Although daily monitoring of the chlorine residual probably would not have prevented the outbreak, it is very likely that it would have significantly reduced its scope.

The second failure relates to the manner in which the PUC operators responded to the outbreak in May 2000. This failure is primarily attributable to Stan Koebel. When Mr. Koebel learned from test results for the samples collected on May 15 that there was a high level of contamination in the system, he did not disclose the results to the health officials in the Bruce-Grey-Owen Sound Health Unit (the local health unit) who were investigating the outbreak of illnesses in the community. Instead, he misled them by assuring them that the water was safe. Had Mr. Koebel been forthcoming about these results, the local health unit would have issued a boil water advisory by May 19 at the latest, and 300 to 400 illnesses would probably have been prevented.

In this chapter, I will review the roles of the operators of the Walkerton PUC in relation to the events in May 2000. The two people who exercised managerial or supervisory control over the water system were Stan Koebel and his brother Frank Koebel.

Stan Koebel had been the general manager of the Walkerton PUC since 1988. In May 2000, he held a class 3 water distribution operator licence, which he had received through a grandparenting process. At the Inquiry, Mr. Koebel accepted responsibility for his failures and apologized to the people of Walkerton. I believe he was sincere.

The evidence showed that under his supervision, the PUC engaged in a host of improper operating practices. These practices included mislabelling sample bottles[1] for microbiological testing, failing to adequately chlorinate the water, failing to measure chlorine residuals daily, making false entries on daily operating sheets, submitting false annual reports to the Ministry of the Environment (MOE), and operating wells without chlorination. There is no excuse for these improper practices.

Although Stan Koebel knew that these practices were improper and contrary to the directives of the MOE, he did not intentionally set out to put his fellow residents at risk. A number of factors help to explain, though not to excuse, the extraordinary manner in which the Walkerton PUC was operated under Mr. Koebel's direction. For example, many of the improper practices had been going on for years before he became general manager. Further, he and the other PUC employees believed that the untreated water in Walkerton was safe: indeed, they themselves often drank it at the well sites. On occasion, Mr. Koebel was pressured by local residents to decrease the amount of chlorine injected into the water. Those residents objected to the taste of chlorinated water. Moreover, on various occasions, he received mixed messages from the MOE itself about the importance of several of the MOE requirements. Although Mr. Koebel knew how to operate the water system mechanically, he did not have a full appreciation of the health risks associated with failing to properly operate the system and of the importance of following the MOE requirements for proper treatment and monitoring.

None of these factors, however, explain Stan Koebel's failure to report the test results from the May 15, 2000, samples to the local health unit and others when asked, particularly given that he knew of the illnesses in the community. It must have been clear to him that those to whom he spoke were unaware of these results. I am satisfied that he withheld information about the adverse results because he wanted to conceal the fact that Well 7 had been operated without chlorination for two extended periods in May 2000. He deceived both the local health unit and the MOE, and in doing so, he put the residents of Walkerton at greater risk. When he withheld the information, he probably did not appreciate the seriousness of the health risks involved and did not understand that deaths could result. He did, however, know that people were becoming sick, and he should have informed the health unit of the adverse results at the earliest opportunity.

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[1] The sites at which the samples were collected were misrepresented.

Frank Koebel had been the foreman of the Walkerton PUC since 1988. He was the operator who, on May 13 and May 14, went to Well 5, failed to measure the chlorine residuals, and made false entries in the daily operating sheet. Like his brother, Frank Koebel was also sincerely sorry for the role he played in these events.

Most of the comments I have made about Stan Koebel apply equally to Frank Koebel, with one exception: Frank Koebel was not involved in failing to disclose the May 15 results to the local health unit. He did, however, on his brother's instructions, alter the daily operating sheet for Well 7 on May 22 or May 23 in an effort to conceal from the MOE the fact that Well 7 had operated without a chlorinator.

Stan and Frank Koebel lacked the training and expertise either to identify the vulnerability of Well 5 to surface contamination or to understand the resulting need for continuous chlorine residual and turbidity monitors. The MOE took no steps to inform them of the requirements for continuous monitoring or to require training that would have addressed the issue.

5.2 The Qualifications of the Supervisors

5.2.1 Stan Koebel

Stan Koebel was the general manager of the Walkerton PUC in May 2000. Although he was certified as a class 3 operator of a water distribution system, there were significant gaps in his knowledge about the possible threats to the safety of water and the importance of treatment and monitoring practices.

Mr. Koebel began his employment at the Walkerton PUC in 1972, at the age of 19. He had a Grade 11 education. His father was the foreman of the Walkerton Works Department at the time.

Mr. Koebel initially worked on the water system under the supervision of the general manager of the PUC, Ian McLeod, but beginning in 1976 he focused more on electricity after completing the lineman apprentice program. In 1981, Mr. Koebel was promoted to the position of foreman and became responsible for PUC employees who worked on both water and electricity. When Mr. McLeod retired in 1988, Mr. Koebel became the general manager of the PUC.

As general manager, Mr. Koebel had the important responsibility of ensuring that safe drinking water was supplied to the residents of Walkerton. Yet he was not required to complete any courses or undergo an examination to qualify as the senior operator of the water system. When Mr. Koebel became the general manager in 1988, the only course he took was a leadership seminar on the supervision of employees. The course had no content relating to the operation of a water system.

In 1987, the MOE had introduced a voluntary grandparenting program for water operators. Mr. McLeod had submitted Stan Koebel's name to the MOE in 1988, and Mr. Koebel had been certified as a class 2 operator. He had not been required to pass a test. In the years that followed, his certification was renewed as a matter of course. He had been recertified in 1996 after the Walkerton water system was reclassified as a class 3 water distribution system, again without the MOE assessing his knowledge and skills. In May 2000, he held a class 3 water distribution licence with an expiry date of February 2002.

There was a good deal that Mr. Koebel did not know about matters relating to the provision of safe water. Mr. Koebel testified that he had never read section 4.1.2 of the Ontario Drinking Water Objectives (ODWO) – the section on the indicators of unsafe water. He did not know what *Escherichia coli* was, nor was he aware of the implications to human health of *E. coli* in drinking water. He was unaware that the presence of *E. coli* or fecal coliforms in a sample from the distribution system indicated that the water was unsafe. Moreover, he had never read the section of the Chlorination Bulletin on the importance of maintaining a total chlorine residual of at least 0.5 mg/L after 15 minutes of contact time and before the first consumer is supplied with water. He did not understand the distinction between total chlorine and free chlorine, two important concepts in the Chlorination Bulletin. Nor had Mr. Koebel read the section of the Chlorination Bulletin regarding notifying the MOE of adverse bacteriological results. Mr. Koebel stated that he did not fully understand such terms as "turbidity" and "organic nitrogen": consequently, he did not always fully comprehend portions of the MOE inspection reports on the Walkerton system and correspondence from the MOE's Owen Sound district office.

Section 17 of Ontario Regulation 435/93, passed in 1993 pursuant to the *Ontario Water Resources Act*, provides that every operator employed at a waterworks facility must receive at least 40 hours of training each year. The provision further states:

(2) The training may include, for example, training in new or revised operating procedures, reviews of existing operating procedures, safety training and studies of information and technical skills related to environmental subjects.

(3) The owner shall ensure that records are maintained of the training given under this section including the names and positions of operators who attend training sessions, the dates of training sessions, the duration of each training session and the subjects considered at each training session.

Stan Koebel interpreted the meaning of "training" in this regulation unreasonably broadly. In his view, marketing and leadership courses, a cardiopulmonary resuscitation course, or simply accompanying an MOE environmental officer on an inspection of the water plant constituted "training" for the purposes of the regulation. In the training logs for 1998 and 1999, Stan Koebel showed 16 hours' credit for attending a marketing course and 6 hours for the MOE inspection of the Walkerton water system by Michelle Zillinger in 1998, despite the fact that the inspection took only 2 hours.

Stan Koebel went to some conferences on waterworks during his employment at the PUC. He attended annual conferences sponsored by the Ontario Municipal Waterworks Association, he went to meetings put on by the Georgian Bay Waterworks Association, and he participated in workshops put on by the Ontario Water Works Association. Although chlorine disinfection and turbidity in wells and surface water were discussed at some of these conferences and workshops, Mr. Koebel testified that he did not adequately understand the importance of chlorinating the Walkerton water supply. He believed that the water was safe without chlorination, and he himself frequently drank the untreated water.

It is clear that Stan Koebel did not receive training even close to the required amount – 40 hours a year – and that much of what he recorded as training was not focused on water safety issues. It is important to note that his failure to receive the required training was not related to a shortage of funds at the Walkerton PUC, which allotted between $1,500 and $3,000 a year for training. The PUC had large reserves, and there is no evidence to suggest that requests for training funds were ever denied by the commissioners.

5.2.2 Frank Koebel

Frank Koebel was the foreman of the Walkerton PUC in May 2000. Like his brother Stan Koebel, he was poorly informed about matters relating to water safety. He had been hired by the PUC in 1975 at the age of 17. He had a Grade 12 education. In 1983, he became a journeyman lineman after completing courses at the Ontario Hydro Training Centre in Orangeville. Before 1988, about 75% of his time was devoted to waterworks and 25% to hydroelectric power. He became the foreman of the PUC in 1988, the year his brother Stan became the general manager.

Frank Koebel had also received his certification through the voluntary grandparenting process. Ian McLeod had submitted Mr. Koebel's name to the MOE in 1988, and Frank had been certified as a waterworks operator that year. He had received his class 2 and later his class 3 water distribution system operation certification without being required to complete any courses or undergo any examinations to test his skills and knowledge. A letter sent to him by the Ontario Environmental Training Consortium in 1996 stated that the Walkerton facility had been reclassified on the basis of new criteria and that his licence had:

> been upgraded to a Water Distribution Class 3 … The upgrade was assessed under the Voluntary Grandparenting provision Regulation 435/93. Therefore, you will not be required to write an examination. Your hours of additional education/training were not assessed at this time.

Frank Koebel had never read the ODWO sections concerning microbiological and chemical testing or its provisions on measures to be taken in case of adverse sample results. He was unaware that the presence of *E. coli* was an indicator of unsafe drinking water. He was not familiar with the Chlorination Bulletin, which provided important information on the monitoring of water systems, minimum chlorine residuals, and chlorination equipment. Frank Koebel believed that Walkerton had good-quality water at source and that chlorinating it was unnecessary. As was the case with Stan Koebel, the terms "organic nitrogen," "turbidity," and "total and free chlorine" had little meaning for him. Despite the fact that he was the PUC foreman, Frank Koebel was not familiar with Ontario Regulation 435/93, which addressed the licensing of operators, the classification of waterworks facilities, and mandatory training requirements.

Frank Koebel testified that he had had the opportunity to attend courses on the operation of a waterworks. He had never been told that he could not participate in a training course because there was not enough money. Although Mr. Koebel had attended some conferences on the operation of a waterworks, he had not taken full advantage of the training opportunities because he had been "busy either with the hydro or the water" and could not "be away any length of time." He had never taken a course on chlorination in the 25 years that he had worked at the Walkerton PUC. Mr. Koebel acknowledged at the hearings that he did not have the requisite knowledge to perform his job as foreman of the PUC.

5.3 Improper Operating Practices

The evidence disclosed that for over 20 years, the Walkerton PUC had engaged in a number of improper operating practices that significantly increased the risk of producing unsafe drinking water. One of these, the failure to monitor chlorine residuals daily, contributed directly to the outbreak in May 2000. However, to properly understand the seriousness of the operating deficiencies in Walkerton, it is useful to review each of these practices. They show a serious disregard for MOE requirements and repeated failures by Stan Koebel to do what he said he would.

5.3.1 Microbiological Sampling

5.3.1.1 *The Importance of Sampling*

The Ontario Drinking Water Objectives (ODWO) require that samples from a municipal water system undergo microbiological testing. The importance of such testing is explained in sections 3.1 and 4.1 of the ODWO:

> *Microbiological quality of drinking water is the most important aspect of drinking water quality because of its association with water-borne diseases*. Typhoid fever, cholera, enteroviral disease, bacillary and amoebic dysenteries, and many varieties of gastro-intestinal diseases can be transmitted through water …
>
> *Contamination by sewage or excrement presents the greatest danger to public health associated with drinking water*, and microbiological

> testing provides the most sensitive means for the detection of such pollution … Occasional outbreaks of water-borne diseases emphasize the continuing importance of strict supervision and control over the microbiological quality of drinking water supplies. [Emphasis added]

The ODWO prescribes both the frequency and the locations at which water samples are to be collected. For a population the size of Walkerton's, samples are to be taken weekly from the raw water source, the point at which the treated water enters the distribution system. Concerning the number of samples to be collected from the distribution system, the ODWO states that if the population does not exceed 100,000, a minimum of eight samples and a further one sample per 1,000 population are to undergo microbiological testing each month. Since Walkerton had a population of approximately 5,000, a minimum of 13 samples should have been collected monthly from the distribution system.

It was the practice of employees at the Walkerton PUC to collect water samples on the first working day of each week and to send them to a laboratory for microbiological testing. Prior to 1996, the samples from the Walkerton water system were analyzed at the Ministry of Health's laboratory in Palmerston. After the provincial privatization of laboratory testing in 1996, G.A.P. EnviroMicrobial Services Inc. tested the samples from Walkerton. This arrangement continued until the end of April 2000, when A&L Canada Laboratories began to conduct the bacteriological analyses for the Walkerton PUC.

Over the years, there were two significant and recurring problems in the microbiological sampling practices of the Walkerton PUC: sample bottles were routinely mislabelled by PUC staff, and an insufficient number of samples were collected. A discussion of these two problems follows.

5.3.1.2 *Mislabelling*

Each Monday (or Tuesday, if Monday was a holiday), Stan and Frank Koebel (and sometimes Allan Buckle, a PUC employee who was not a licensed operator) collected the water samples. Normally, the practice was to take four samples for each well in operation: one from the raw water, one from the treated water before it entered the distribution system, and two from the distribution system. Thus, if two wells were in operation on a testing day, eight samples would be collected and sent for testing. It was the expectation of the laboratory and

the MOE that PUC staff would place a label on each bottle to identify the site at which the sample had been collected. For years, the PUC staff collected water samples at locations other than those indicated on the sample bottles sent to the laboratory.

Stan and Frank Koebel, as well as Allan Buckle, testified that they frequently collected water samples at the wells and labelled the bottles as having come from sites in the distribution system. They would go to one of the wells and fill one bottle with raw water and another with treated water. A third bottle would be filled from the treated tap at the well but would be labelled as having come from the distribution system. Stan Koebel generally filled a fourth bottle with water from the PUC office or his home. Mr. Buckle stated that 99.9% of the samples he labelled as having come from 125 Durham Street, a site in the distribution system, were actually collected from the treated tap at Well 7. The practice of mislabelling samples also occurred at Geeson and Chepstow, two subdivisions where PUC employees also collected samples.

Stan and Frank Koebel understood that if a sample was taken at the pumphouse and not from the distribution system, it would not provide information on the quality of the water in the system. PUC operators and the MOE might therefore not be alerted to any problems in the distribution system. When asked why they had routinely mislabelled sample bottles, Stan Koebel's response was "complacency," and Frank Koebel's was that he "didn't need the aggravation." This practice saved them time – although, I would note, not much time.

Another practice of PUC employees was to fill sample bottles labelled "Well 5 treated" and "Well 5 raw" with water from the PUC shop at 130 Wallace Street. The explanation given for this practice was that Well 5 "was very close to the [PUC] shop and it was time saving."

5.3.1.3 *Insufficient Sampling*

MOE inspection reports, as well as correspondence from the MOE throughout the 1990s, specified the number of samples to be submitted by the PUC for microbiological analysis. For many years, however, the Walkerton PUC did not collect the number of samples required by the ODWO.

In the report of the 1991 MOE inspection of the Walkerton system, bacteriological quality monitoring was listed as a deficiency. The inspection report

recommended that monitoring be upgraded from 9 to 13 samples, which were to be collected monthly at various locations in the distribution system. On June 23, 1995, Stan Koebel received a letter from Willard Page, district manager of the MOE office in Owen Sound, which set out the minimum recommended number of microbiological samples to be collected for the town. The letter said that raw and treated water sampling was to be conducted weekly and that a total of 13 samples was to be collected from the distribution system each month.

In the report of the 1995 MOE inspection of the Walkerton system, the inspector noted that the PUC was still failing to meet the minimum requirements of the bacteriological sampling program.[2] In the summer of 1997, Walkerton was placed on a list of municipalities that were not conforming to the minimum sampling programs. The list was compiled by the MOE for the purpose of issuing a Director's Order for these water systems. After Stan Koebel undertook to comply with the minimum sampling program, Walkerton was removed from the MOE list in the fall of 1997.

Despite Mr. Koebel's previous assurance, by the time of the MOE inspection in February 1998, the Walkerton PUC still had not satisfied the requirements of the minimum sampling program. Only 8 or 9, rather than the required 13, bacteriological samples were being collected from the distribution system each month. Mr. Koebel told the inspector in February that the PUC would comply immediately, but again it failed to do so. In a letter dated May 6, 1998, which forwarded the inspection report, Philip Bye, supervisor of the MOE's Owen Sound office, threatened to issue a Director's Order if the PUC did not comply. In his letter of response dated July 14, 1998, Stan Koebel said that the PUC would comply by the end of July. It appears that in the following months, the PUC more or less complied by taking the required number of samples. But Mr. Koebel's conduct to that point showed a serious disregard for proper operating practices.

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[2] The "minimum requirements of the bacteriological sampling program" were set out under the ODWO as a guideline. In 1995, the MOE initiated the Minimum Recommended Sampling Program, based on the ODWO. Both of these programs are referred to as the "minimum sampling program" or "minimum bacteriological sampling program" throughout this report.

5.3.2 Inadequate Chlorination

The operators of the Walkerton PUC routinely failed to add the required amount of chlorine at the well sites. The Chlorination Bulletin states that "disinfection, to kill pathogenic organisms, is the most important step in any water treatment process." The standard mandated by the bulletin for groundwater sources, unless the supply has been "proven free of hazardous bacteriological contamination," is a total chlorine residual of at least 0.5 mg/L after 15 minutes (preferably 30 minutes) of contact time before the water reaches the first consumer.

It was clear to the Walkerton PUC as early as 1979 that a 0.5 mg/L chlorine residual was to be maintained at Well 5. In its application for a Certificate of Approval for Well 5, the PUC submitted a hydrogeological report prepared by Ian D. Wilson Associates that described Well 5's vulnerability to contamination. Fecal coliforms had been found in water samples from the well at various times in a 72-hour period. The report recommended that because the bacteriological testing indicated "pollution from human or animal sources," the supply "should definitely be chlorinated and the bacteria content of the raw and treated water should be monitored."

During their review of the PUC's application for a Certificate of Approval for Well 5, MOE staff had raised concerns about the security of the water source that supplied Well 5 in a memo dated October 24, 1978. To discuss these concerns, a meeting was held on November 23, 1978, between representatives of the PUC, the Town of Walkerton, the MOE's Owen Sound office, and the MOE's Approvals Branch. The participants at the meeting reached an understanding that the PUC would maintain a minimum chlorine residual of 0.5 mg/L at Well 5, after 15 minutes of contact time, before the water reached the first consumer.

The importance of maintaining a 0.5 mg/L chlorine residual after 15 minutes of contact time at all three wells was pointed out in the reports of both the 1995 and 1998 MOE inspections.[3] John Apfelbeck, the inspector who

[3] In the report of the 1991 inspection, Brian Jaffray of the MOE had recommended maintaining a chlorine residual level of between 0.3 mg/L and 0.5 mg/L. The residuals he had obtained during that inspection were 0.3 mg/L and 0.35 mg/L and therefore conformed with what he understood a proper residual to be. However, his reference to 0.3 mg/L as the lowest acceptable residual was in error, at least for Well 5, because from the time of that well's approval the expectation was that the Walkerton PUC would maintain a minimum total chlorine residual of 0.5 mg/L after 15 minutes of contact time.

conducted the 1995 inspection, wrote that it was important to ensure that "an adequate chlorine residual is maintained in water in the distribution system at all times" and that a "minimum total chlorine residual of 0.5 mg/L after 15 minutes [of] contact time must be maintained in the water discharged to the distribution system from all wells at all times."[4] The MOE inspector in 1998, Michelle Zillinger, also observed that the minimum total chlorine residual level of 0.5 mg/L was not being maintained by the PUC; under the heading "Action Required" in her inspection report, she included the maintenance of a total chlorine residual of 0.5 mg/L after 15 minutes of contact time.

Stan Koebel testified that the reports of the 1995 and 1998 MOE inspections made it abundantly clear that a "minimum total chlorine residual of 0.5 mg/L after 15 minutes' contact time must be maintained in the water discharged to the distribution system for all active wells, at all times." Evidence of Mr. Koebel's belief is found in the chlorine residual entries in column 11 of the daily operating sheets. On the daily operating sheets for the wells in the 1980s, the 1990s, and the year 2000, the operators nearly always entered 0.5 mg/L or higher as the chlorine residual at the three wells. As will be discussed below, most of the chlorine residual entries in the daily operating sheets are fictitious.

Neither Stan nor Frank Koebel thought it necessary to adhere to the MOE guideline by maintaining a minimum total chlorine residual of 0.5 mg/L. Most of the PUC staff believed that Walkerton had good-quality water at source and that it was unnecessary to disinfect the water. Their lack of education and training undoubtedly contributed to this view. PUC employees themselves would readily drink raw water at the well because it was clean and clear and "always tasted better than the treated [water]." Stan Koebel testified that he generally set the chlorinator to slightly less than 0.5 mg/L and that Frank Koebel would lower it to approximately 0.3 mg/L several times a month. Stan Koebel testified that one of the reasons they added less than the required amount of chlorine was that they had received complaints from town residents from time to time that the water had too much chlorine, which affected its taste. Stan Koebel testified that he considered "any" amount of chlorination in the distribution system to be sufficient, even 0.01 mg/L, the lowest measurement on a HACH digital chlorine residual analyzer.

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[4] The 1995 inspection led to a report released in January 1996.

The only objective evidence of the amount of chlorine actually added by the PUC employees is found in the chlorine residual measurements taken by the three MOE inspectors in 1991, 1995, and 1998. In all, the inspectors took nine residual readings of the treated water at the well sites. All measured less than 0.5 mg/L: they ranged from 0.12 mg/L to 0.40 mg/L, and the average was 0.27 mg/L. It is clear that as a matter of practice, the operators of the Walkerton system added significantly less chlorine than was required.

5.3.3 The Failure to Monitor Chlorine Residuals Daily

The Chlorination Bulletin says that the chlorine residual test "must be performed as frequently as needed to ensure that an adequate chlorine residual is maintained at all times." Considerations such as raw water quality, variation in chlorine demand, and changing flow rates "must be taken into account."

To ensure that the minimum total chlorine residual levels of 0.5 mg/L were maintained, it was necessary to measure the chlorine residuals on a daily basis. The daily operating sheets were designed to record the chlorine residual levels for the operating wells on each day of the month.

At the November 1978 meeting concerning the vulnerability of Well 5, the MOE representatives, the PUC, and the Town of Walkerton reached an understanding that the PUC would monitor the chlorine residuals daily and record the results on the daily operating sheets. According to the minutes of the meeting, "the importance of maintaining a chlorine residual at all times was emphasized in light of the presence of bacteria in the well water."

The importance of measuring the chlorine residuals on a daily basis was also stressed in MOE policy documents. In addition, the reports of the 1995 and 1998 inspections emphasized the importance of maintaining a minimum chlorine residual of 0.5 mg/L after 15 minutes of contact time. One could *maintain* a residual only if regular (daily) monitoring was taking place. Despite clear directions from the MOE, PUC staff did not measure the chlorine residuals each day. The PUC operators testified that the chlorine residuals were measured only about once a week.

This problem was exacerbated, moreover, by the fact that the method frequently used by PUC staff to test the chlorine residuals was inaccurate. Although the Walkerton PUC had used a HACH digital chlorine residual analyzer since

1998 and a chlorometric tester before that to measure the chlorine residuals, Stan and Frank Koebel, as well as Allan Buckle, often used the "bubble method" to obtain a "guesstimate" of chlorine residuals. The bubble method involved looking at a glass-encased bubble on the gas chlorinators at Wells 6 and 7: numbers inscribed on the bubble indicated whether chlorine was entering the system. PUC employees testified that if the bubble showed numbers between 2 and 3 or between 4 and 5, chlorine residuals of 0.5 mg/L and 0.75 mg/L, respectively, would be entered on the daily operating sheets for the well.

Even when the PUC operators actually measured chlorine residuals, they did not generally wait for the required 15 minutes of contact time. As a result, the residual readings they noted may have been higher than if they had waited 15 minutes. Further, until 1998, the PUC operators did not measure chlorine residuals in the distribution system, as specified in the ODWO. After the 1998 MOE inspection, Stan Koebel began measuring chlorine residuals in the distribution system, but he did so only sporadically.

The failure to monitor chlorine residuals daily flowed directly from the practice of underchlorinating the water: there was little sense in measuring a residual unless the goal was to achieve the required level. It can also be attributed to Stan and Frank Koebel's ignorance of the importance of maintaining a chlorine residual.

5.3.4 Inaccurate Operating Sheets

Because the PUC operators added inadequate levels of chlorine and did not monitor chlorine residuals daily, they made false chlorine residual entries in the daily operating sheets to conceal their improper practices.

In November 1978, at the meeting of the MOE and the Walkerton PUC about the vulnerability of Well 5, it was understood that the PUC would maintain daily operating sheets for that well. The information in the daily logs was to include the date and time of record taking, the name of the operator on duty, the meter reading, the pumping rate, the chlorine solution, and the chlorine residual reading. Although it was not included as a condition on the well's Certificate of Approval, there was an expectation at the November 1978 meeting that the PUC would monitor the chlorine residuals daily at Well 5, maintain a minimum chlorine residual of 0.5 mg/L after 15 minutes of contact time, and record the results on the daily operating sheets.

The practice of making false entries for chlorine residuals in the daily operating sheets began almost immediately. At the time of the 1979 MOE inspection, the residuals recorded in the daily operating sheets differed from the residuals measured by the inspector. It was evident in that year's inspection of Well 5 that inaccurate numbers had been inserted by PUC operators in the "chlorine residual" column of the daily operating sheet. The 1979 inspection report noted that in contrast to the 0.3 mg/L chlorine residual measured by the inspector, the operating authority had recorded a chlorine residual of 0.5 mg/L. A comparison of the daily operating sheets and the chlorine residuals measured by the MOE inspectors in 1995 and 1998 shows similar discrepancies, although it is not clear whether the residual readings were entered into the daily operating sheets at the same time as the inspections occurred.

For more than two decades before May 2000, chlorine residual readings were entered on the daily operating sheets for all the operating wells for days on which the residuals were not actually measured by PUC staff. Occasionally, false entries were made in the column that designated the operator. Stan Koebel acknowledged at the Inquiry that other people's initials would sometimes be inserted in the "operator" column of the daily operating sheets. Mr. Buckle testified that since he was not licensed to operate the waterworks, he was reluctant to inscribe his initials as the operator on the daily operating sheet. Moreover, entries in the columns "chlorine solution level" and "chlorine used in previous 24 hours" sometimes contained fictitious numbers.

The daily operating sheets for the wells in the 1980s and the 1990s reveal that either 0.5 mg/L or 0.75 mg/L was generally entered as the chlorine residual. Most of the chlorine residuals recorded in 1998, for example, are 0.75 mg/L, and as Stan Koebel acknowledged, virtually all of the entries on the 1999 daily operating sheets are false.[5] Fictitious entries in the daily operating sheets continued until the outbreak in May 2000.

5.3.5 Inaccurate Annual Reports

Stan Koebel began to submit annual reports to the MOE in 1998. The annual reports were based on information in the daily operating sheets and consequently contain inaccurate and misleading information. For example, in the

[5] It is, of course, virtually impossible to detect the same residual day after day for a month, let alone for an entire year.

"Annual Summary of Treated Water and Waste Water Flows, Turbidity and Disinfectant Residual" for 1998, the numbers for "Treated Disinfectant" are based on false chlorine residual measurements in the daily operating sheets for the three wells. In fact, Mr. Koebel calculated an average of the falsified numbers, a 0.60 mg/L chlorine residual, for the MOE. Similarly, the "Annual Summary of the Distribution System Bacteriological Data" for that same year contained inaccurate information. Entries in that report for "Number of Samples with Detectable Residual" and "Treated Disinfectant Average Residual" are also based on fictitious numbers. At the Inquiry, both Stan and Frank Koebel agreed that MOE officials would be misled by such records and therefore would not be alerted to potential drinking water risks to the health of Walkerton's residents.

5.3.6 The Operation of the Wells Without Chlorination

The ODWO says that waterworks operators must take measures to ensure that the disinfection process is functioning at all times. According to the Chlorination Bulletin, chlorination is the primary method for water disinfection and is "the one step in water treatment specifically designed to destroy pathogenic organisms and thereby prevent water-borne diseases." Moreover, the Chlorination Bulletin requires continuous and adequate disinfection for water supplies obtained from a surface water source or from a groundwater source that is or "may be" contaminated. The 1995 and 1998 MOE inspection reports also stated that a 0.5 mg/L total chlorine residual after 15 minutes of contact time was to be continuously maintained at all three wells.

Despite the requirement for continuous disinfection in MOE policy documents and in the inspection reports, the Walkerton PUC operators at times allowed a well to operate without chlorination. Again, they believed that the water in Walkerton was of good quality at its sources and were not convinced of the need for chlorination. It was therefore not a concern to either Stan or Frank Koebel that a well would sometimes operate without a chlorinator for a few days.

For two lengthy periods in May 2000, Stan and Frank Koebel allowed Well 7 to pump unchlorinated water into the system. From May 3 to May 9 and from May 15 to May 19, the well operated without a chlorinator.

On May 3, the chlorinator at Well 7 was removed by PUC staff on Stan Koebel's instructions. When Stan Koebel left Walkerton on May 5 for a

conference in Windsor, he was aware that Well 7 was pumping unchlorinated water and that this situation would reduce the chlorine residual in the distribution system. During Stan Koebel's absence from Walkerton between May 5 and May 14, Frank Koebel did not install the new chlorinator. The well pumped unchlorinated water into the distribution system until May 9, when it was turned off.

When Stan Koebel returned to the Walkerton PUC on May 15, he reactivated Well 7. Well 7 again operated without chlorination from May 15 until May 19, the day on which the new chlorinator was installed by PUC staff.

Both Stan and Frank Koebel knew that it was wrong to allow a well to pump unchlorinated water. This explains the "revisions" made by Frank Koebel, on his brother's instructions, to the May 2000 daily operating sheets on May 22 or May 23. The brothers were attempting to conceal the fact that Well 7 had operated without a chlorinator. I discuss this issue in more detail below.

5.4 The Relationship Between the Walkerton Public Utilities Commission and the Ministry of the Environment

The MOE's Owen Sound office was the provincial regulator responsible for overseeing the Walkerton facility. I will review the manner in which the MOE exercised this oversight role in a later chapter. In this section, I discuss the relationship from the perspective of the Walkerton PUC. The message received by Stan Koebel from the MOE, no doubt unintended by the ministry, was that although the requirements for treating, monitoring, and testing the water were important, they were not important enough to cause the MOE to take any steps to ensure that they were followed.

As the PUC's general manager, Stan Koebel was involved in MOE inspections of the Walkerton system in 1991, 1995, and 1998. As will be discussed, Mr. Koebel did not address many of the deficiencies identified in the three MOE inspection reports. Several of the deficiencies specified by MOE inspectors in the early and mid-1990s had still not been addressed by the time of the 1998 MOE inspection – the last before the outbreak. Sometimes Mr. Koebel did not understand the terms used or was not conversant with MOE guidelines, policies, and legislation. On other occasions, he simply did not do what he said he would. The MOE threatened to take, but never actually took, decisive steps to ensure compliance with its requirements.

Although staff at the PUC, with the exception of Stan Koebel, did not accompany MOE officials on inspections of the Walkerton water system or read MOE inspection reports, they were aware of any impending inspections. The MOE would contact the PUC to inform Mr. Koebel that the facility would be inspected in about a week. In turn, Mr. Koebel would instruct the PUC staff to clean the pumphouses, to ensure that the equipment operated properly, and to ensure that records were "presentable." Frank Koebel testified that he had never experienced an unannounced "spot check" by MOE inspectors in his 25 years of employment at the PUC.

When Stan Koebel was notified of the upcoming November 1991 inspection, he took measures to ensure that the chlorinators were working properly, that the chlorine was set at a sufficiently high level,[6] and that the pumphouses were clean. Mr. Koebel accompanied the MOE inspector, Brian Jaffray, on his inspection of the premises. During the approximately two-hour inspection, Mr. Jaffray visited the wells, collected water samples, and took notes on the system.

The inspection report was sent to the PUC several months later, in March 1992. Three issues were identified as deficient: the lack of weekly bacteriological quality monitoring, flow calibration problems, and the absence of a contingency plan. It was recommended that the bacteriological quality monitoring be upgraded to 13 samples a month from the distribution system and that these samples be collected at various locations throughout the system. As previously mentioned, only nine distribution system samples were being collected each month by PUC staff.

It is clear from the evidence that Mr. Koebel was aware at least as early as 1990 that the PUC was not satisfying the MOE sampling requirements. In that year, Stan Koebel signed a grant application prepared by B.M. Ross and Associates Ltd. That document, which sought funds for a needs study of the Walkerton water distribution system, stated that the MOE bacteriological objectives were not being met.

It was also recommended in the report of the 1991 inspection that a chemical/physical quality monitoring program be established. The PUC was instructed to submit to the MOE an annual report containing a bacteriological summary of the raw and treated sample results, the chemical and physical results, a

[6] Even at that, the chlorine levels measured by the inspector were only 0.3 mg/L and 0.35 mg/L.

description of any plant upsets and corrective action, and a list of waterworks extensions or modifications.

Prior to the MOE inspection in October 1995, Stan Koebel received two important letters from the district manager of the MOE's Owen Sound office. The letters, dated June 6, 1995, and June 23, 1995, respectively, specified the minimum number of samples to be collected at the Walkerton waterworks and stipulated that the PUC was to notify the MOE as soon as possible of any treated water or distribution system bacteriological analysis indicating unsafe drinking water quality. Mr. Koebel was also provided with a copy of the ODWO.

Mr. Koebel stated that before the May 2000 tragedy, it had been his understanding that the laboratory, not the waterworks operator, would notify the MOE of adverse results. He testified that he had likely read only portions of the June 1995 correspondence from the MOE and had therefore assumed that he had no obligation to contact the MOE's Owen Sound office regarding unsafe drinking water results in either treated or distribution system water samples.

In October 1995, Stan Koebel was advised of another upcoming MOE inspection. Preparatory steps were taken to ensure that the chlorination equipment was operating properly and that the premises were clean. In John Apfelbeck's two-hour inspection of the Walkerton water system, he collected samples from the three wells and tested the chlorine residuals. The measurements obtained by Mr. Apfelbeck on October 31, 1995, ranged from 0.12 mg/L to 0.4 mg/L.

The MOE inspection report that was sent to the Walkerton PUC on January 29, 1996, stated that *E. coli* had been present in one or more samples on three sampling occasions. It emphasized "the importance of ensuring that an adequate chlorine residual is maintained in the distribution system at all times" and "that a minimum total chlorine residual of 0.5 mg/L after 15 minutes [of] contact time must be maintained in the water discharged to the distribution system from all wells at all times."

The report also noted the absence of a physical/chemical quality monitoring program as a deficiency: in the report of the 1991 inspection, the PUC had been asked to establish such a program. The report further noted that the PUC continued to fail to meet the requirements of the minimum bacteriological sampling program. I note that this failure persisted despite the recommendation in the previous inspection report and the MOE's two June 1995 letters to Mr. Koebel setting out the required sampling program. A further deficiency

specified in the report of the 1995 inspection was that the Walkerton PUC was not complying with the requirements in Ontario Regulation 435/93 for keeping records of training received by waterworks operators. Finally, the report stated that the safety guidelines in the Chlorination Bulletin were not being met: wells that used chlorine gas were not equipped with chlorine leak detection equipment and alarms, and the doors to Wells 3 and 6 were not equipped with panic bars.

About four months after Mr. Koebel received the report of the 1995 inspection, he wrote a letter to the MOE's Owen Sound office in response to the deficiencies identified by Mr. Apfelbeck. It is clear from his letter that he had not addressed many of the deficiencies.

Much of the letter was cast in the future tense. Mr. Koebel stated that physical and chemical sampling "will" be done by A&L Canada Laboratories and that all wells "will" have a minimum total chlorine residual of 0.5 mg/L after 15 minutes of contact time. He also discussed the provisions of the Chlorination Bulletin and said that Wells 3 and 6 "will" have panic bars by the end of 1996; Wells 6 and 7 "will" have leak detection equipment, including an alarm; and an automatic chlorine residual monitor "is" proposed for the 1997 budget.

In the letter, Mr. Koebel failed to discuss one of the deficiencies identified in the inspection report: non-compliance with Ontario Regulation 435/93. Mr. Koebel testified that he had "missed it" and that Larry Struthers, the MOE environmental officer responsible for Walkerton, did not raise the issue with him later.

The last MOE inspection before the May 2000 tragedy occurred on February 25, 1998. Like her predecessors, Michelle Zillinger gave advance notice of the inspection to Stan Koebel. A few days before the inspection, changes were made to the daily operating sheets. In particular, Stan Koebel changed a dash in the "chlorine residual" column for Wells 6 and 7 on February 20, 1998, to reflect a chlorine residual of 0.4 mg/L. His explanation was that Allan Buckle had likely taken the readings on February 20 but failed to record the chlorine residuals.[7]

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[7] The February 1998 daily operating sheet was unusual in that it included entries that, like 0.4 mg/L, broke from the established pattern of 0.5 mg/L and 0.75 mg/L, thus creating a more realistic picture of what the residuals would have looked like if they had actually been measured.

The MOE inspection report received by Mr. Koebel on May 6, 1998, indicated that many of the deficiencies identified in the 1995 inspection had still not been addressed. The number of adverse bacteriological results had increased. *E. coli*, an indicator of unsafe drinking water quality, had been present in a number of treated water samples from Wells 5 and 7 and at several locations in the distribution system. Moreover, the minimum total chlorine residual level of 0.5 mg/L was not being maintained. On the day of the inspection, the chlorine residual at Well 7 was 0.4 mg/L and the reading at Well 6 was 0.35 mg/L.

Ms. Zillinger's inspection report said that "given the frequency of adverse bacteriological results, it is imperative that the required chlorine residuals be maintained in the distribution system." It also said that according to the daily operating sheets, the chlorine residual levels had occasionally fallen below the required 0.5 mg/L. Ms. Zillinger also discussed the MOE's June 23, 1995, letter to the PUC stipulating that a disinfectant residual must be detected in 95% or more of the distribution samples collected each month. Despite this letter, Stan Koebel had not been monitoring the chlorine residuals in the distribution system.

Again, it was noted that the Walkerton PUC was not satisfying the requirements of the minimum recommended sampling program. Only 8 or 9 bacteriological samples were being collected each month from the distribution system, rather than the required 13 samples. In the covering letter that accompanied the inspection report, the MOE threatened to issue a Director's Order pursuant to section 52(2) of the *Ontario Water Resources Act* if the PUC did not conform with the minimum sampling program. However, the MOE did not invoke any mandatory abatement measures, like issuing a Director's Order, to ensure that compliance would ensue.

Two other deficiencies from the 1995 inspection remained outstanding: the failure to maintain training records as required by Ontario Regulation 435/93 and the failure to develop a contingency plan for the waterworks.

After the 1998 inspection, Stan Koebel failed, as he had in the past, to address several of the deficiencies identified in the report. His explanation was that he had had other priorities. When he wrote to Philip Bye on July 14, 1998, most of the problems in the system had not been remedied. The letter to the MOE's Owen Sound office was again cast in the future. Mr. Koebel wrote that the PUC "will" be maintaining a minimum total chlorine residual of 0.5 mg/L and that "hopefully" it "will" be purchasing equipment "in the future" to ensure

the continuous maintenance of a 0.5 mg/L chlorine residual. In fact, he had no intention of increasing the chlorine residual to 0.5 mg/L. His explanation at the Inquiry was that he was "trying to get a balance between customer complaints and meeting the Ministry of the Environment's guidelines." Nor did Mr. Koebel purchase continuous chlorine residual monitors.

Mr. Koebel also wrote in the letter to Mr. Bye that the PUC "will" be working on a contingency plan by the end of 1998; no plan was completed by that time. He stated that the PUC "will" be upgrading employee Robert McKay to class 3 certification for water treatment and water distribution. But by May 2000, the month of the tragedy, Mr. McKay still had only a class 1 licence. At the hearings, Mr. Koebel stated that if a Director's Order had been imposed by the MOE, the PUC would have responded to the deficiencies identified in the 1998 inspection report.

Michelle Zillinger testified that she did not think any actions had been taken by environmental officers at the MOE's Owen Sound office to follow up on the February 1998 inspection of the Walkerton waterworks. Although the MOE did not determine whether the deficiencies had been remedied, Mr. Bye sent a letter to Mr. Koebel on August 10, 1998, thanking him for the PUC's "cooperation and attention to the concerns raised in the status report." Moreover, Donald Hamilton, an environmental officer at the MOE's Owen Sound office, wrote to Stan Koebel on January 15, 1999:

> The Ministry conducted an inspection of your facility on February 5 [*sic*, 25], 1998. There has been a noticeable improvement in the operation of your water works since that time. I thank you for your effort and cooperation in this regard.

In his testimoney, Mr. Koebel acknowledged that two years before the May 2000 tragedy, he was given a clear "road map" by Ms. Zillinger of exactly what he had to do to ensure that the drinking water in Walkerton was safe. Yet he did not take the necessary actions to address several of the deficiencies identified in the 1998 inspection report, and he reverted to the improper chlorination and monitoring practices. When asked at the Inquiry to provide an explanation for his inaction, his response was "complacency."

The MOE was aware in the years leading up to May 2000 that the Walkerton PUC was not conforming with several ministry requirements.[8] Despite repeated assurances, the PUC failed to fulfill its undertakings to the MOE. It was clear to the MOE environmental officers during the three inspections in the 1990s that the PUC was not complying with the minimum bacteriological sampling program and that it was not maintaining minimum total chlorine residuals of 0.5 mg/L. Nevertheless, the MOE took no action to make legally enforceable the requirements that were consistently being ignored by the PUC. Neither a Director's Order nor a Field Order under the *Ontario Water Resources Act* was issued. Instead, the MOE chose a voluntary approach to abatement. While in no way excusing Stan Koebel's disregard for MOE requirements, the ministry's failure to take stronger measures in the face of his repeated failures likely sent the unintended message that these requirements – all in the form of guidelines and recommendations, rather than legally enforceable regulations – were not important enough for the MOE to ensure that they were followed.

5.5 The Relationship Between Stan Koebel and the Public Utilities Commissioners

Stan Koebel was responsible for reporting to the public utilities commissioners on the operation of the water system. The commissioners were unaware of the improper operating practices of PUC staff, because Mr. Koebel was not forthcoming about the manner in which he operated the system. They spent next to no time addressing matters related to the quality of Walkerton's water, relying almost completely on Stan Koebel to provide safe water to the town's residents.

James Kieffer, chair of the PUC, testified that during the ten years in which he served as a commissioner, water quality was not generally discussed at the monthly PUC meetings. In the time devoted to water issues, discussions focused on financial matters and impending projects at the waterworks, rather than on the quality of Walkerton's drinking water. Particularly since the end of 1998, after Ontario's *Energy Competition Act* came into effect, most of the discussions at the PUC centred on the restructuring of the electrical utilities.

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[8] Stan Koebel never disclosed to MOE officials that he was not taking samples from the distribution system at the specified locations, that he was not measuring chlorine residuals daily, that the annual records contained fictitious entries, that he operated wells without chlorinators from time to time, and that he had not read the ODWO or the Chlorination Bulletin. MOE officials, for their part, never questioned his qualifications to operate a municipal water system.

Commissioner Richard Field testified at the hearings that 75% of the meetings were devoted to hydro issues.

As will be discussed in Chapter 6 of this report, the PUC commissioners had little training in or understanding of the water system. The terms "*E. coli*" and "chlorine residual" were unfamiliar to them, as were the indicators of unsafe drinking water outlined in the ODWO. They did not know about the requirements in the Chlorination Bulletin. Nor were the commissioners aware of the requirement in Ontario Regulation 435/93 that waterworks employees should receive a minimum of 40 hours' training annually.

Although the commissioners reviewed the reports of the 1995 and 1998 MOE inspections of the Walkerton water system, they did not understand many of the deficiencies that were identified in the reports. When the 1998 report was presented at the PUC meeting on May 20, 1998, Stan Koebel discussed the inadequate number of samples collected from the water system, not the occasions when *E. coli* had been found in the system or the failure to maintain the required chlorine residuals. Mr. Koebel was not questioned at the meeting about the large number of samples that contained *E. coli*, largely because the commissioners were unfamiliar with this bacteria and did not know that it could be fatal.

During the approximately 12 years in which he was general manager of the PUC, Mr. Koebel failed to adequately inform the commissioners, either through the monthly manager's report or in discussions at the monthly PUC meetings, about problems in the system that could compromise the water quality in Walkerton. He did not alert the commissioners to adverse sample results received from the laboratory, and he was not candid about the amount of chlorination entering the system. In fact, Mr. Koebel misled the commissioners on a number of occasions.

For example, at the meeting on October 12, 1999, subsequent to the enactment of the *Energy Competition Act*, the issue of whether the Municipality of Brockton should assume control of the Walkerton waterworks was discussed. Prior to the meeting, Mr. Koebel prepared a presentation taking the position that the Walkerton PUC should retain its employees and equipment and continue to operate the water system. It stated that the PUC and its staff were "still providing the best service and promoting the best interest of the utilities customers," as they had been doing since 1953. The presentation also said that staff "carries out daily sampling for chlorine residual." Stan Koebel knew

that this statement was false: chlorine residual testing generally took place only once a week, and fictitious chlorine residual measurements were regularly inscribed on the daily operating sheets. In addition, the presentation implied that sedimentation and filtration processes were used by the PUC to treat the water supply, when in fact they were not.

Another example of Stan Koebel's misstatements to the commissioners occurred on May 18, 2000, at the time of the Walkerton outbreak. The manager's report presented at the PUC meeting that day stated that "we are currently rebuilding the chlorine equipment at our #7 pumphouse." Mr. Koebel did not disclose that Well 7 had operated without a chlorinator from May 3 to May 9 and from May 15 to the date of the meeting. In fact, the commissioners were unaware that the new chlorinator for Well 7 had been at the PUC since December 1998 and had not yet been installed. They were also unaware that adverse results had been received from A&L Canada Laboratories on May 17 or that members of the public had contacted the PUC to inquire about the quality of the water because people in Walkerton were becoming ill.

5.6 Well 5: Continuous Monitors

One of the causes of the tragedy in May 2000 was the failure to install continuous chlorine residual and turbidity monitors at Well 5. Neither Stan nor Frank Koebel was aware of the seriousness of the vulnerability of Well 5 to surface contamination. Nor were they familiar with the 1994 amendments to the ODWO requiring continuous monitoring of chlorine residual and turbidity levels to protect public health.

Stan and Frank Koebel both believed that the reason for the development of Well 5 in 1978 was that the PUC wished to provide Walkerton residents with softer water. Well 5 was referred to as a "band-aid" or "stop-gap" solution in attempts by the PUC to supply softer water. Frank Koebel believed that Well 5's water would be softer because Well 5 was a shallow well. He did not think that Well 5 was more vulnerable to contamination than was a well drilled to a deeper depth. In his view, any drilled well was a safe well.

Stan and Frank Koebel were also not familiar with the findings of the 1978 Ian D. Wilson Associates report, a copy of which was in the PUC office. This report stated that the bacteriological testing of samples at Well 5 indicated pollution from human or animal sources and that shallow aquifers were

susceptible to pollution. It recommended that the Town of Walkerton purchase property in the vicinity of Well 5 to protect the water supply. The report also recommended that the bacterial content of the treated and raw water should be monitored and that the supply "should definitely be chlorinated." Stan Koebel testified that he was unaware of the recommendation that the town should acquire land surrounding Well 5 because of the well's vulnerability to surface contamination. He did not turn his mind to the possibility that farming activities could result in contamination of the water at the well.

In the years following the release of the report, Stan Koebel acknowledged that he did become somewhat concerned about the impact of surface activities on Well 5's water quality. For example, correspondence from the MOE in 1990 discussed Mr. Koebel's concern about the installation of fuel tanks near the well. At the hearings, Mr. Koebel stated, "I was concerned about a possible fuel leak down the road and getting into the aquifers, thereby [into] our main water supply." He also became aware from the laboratory reports in the 1990s that on several occasions, Well 5 samples contained total coliforms and *E. coli*. The vulnerability of Well 5 to contamination was also adverted to in the 1992 "Water Distribution System Rehabilitation Needs Study." Nevertheless, he did not understand eiher the degree to which the well was susceptible to contamination from surface activities or the serious consequences of such contamination.

In the 1994 amendments to the ODWO, section 4.2.1.1 was changed to require water supply systems that serve populations of 3,300 or more, and that use groundwater that is under the direct influence of surface water without filtration, to continuously monitor chlorine residuals.[9] The 1994 amendments also required such systems to monitor turbidity levels either continuously or by taking grab samples every four hours. As discussed in Chapter 4 of this report, installing continuous monitors at Well 5 would have prevented the tragedy in May 2000.

In the 1997 capital budget of the PUC, $6,000 was allocated to acquire an automatic chlorine residual monitor for Well 7. However, it was never purchased. A chlorine residual monitor was, however, mentioned by Stan Koebel in his July 14, 1998, letter to the MOE, in which he responded to the deficiencies it had noted in its 1998 inspection. Mr. Koebel wrote:

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[9] More specifically, the requirement is to continuously monitor "disinfectant residuals (equivalent to free chlorine)" – a type of chlorine residual.

> We will be maintaining a total chlorine residual of 0.5 mg/L for all our active wells. Hopefully we will be purchasing equipment in the future to ensure [that a] residual of 0.5 mg/L is kept up at all times.

Mr. Koebel did not purchase a continuous chlorine residual monitor after the 1998 inspection to assist in fulfilling his undertaking to continuously maintain a 0.5 mg/L chlorine residual at all active wells. However, the MOE never required, or even requested, the PUC to do so.

There is no evidence to suggest that either Stan or Frank Koebel was aware of the 1994 ODWO amendments. The MOE took no steps to bring these amendments to their attention. Moreover, the MOE did not require waterworks operators to take training specifically focused on issues relating to identifying vulnerable water sources or understanding the need for continuous monitoring where such vulnerability exists. It is interesting to note that when Stan Koebel did consider purchasing a chlorine residual monitor, it was for Well 7, the most secure of the three water sources, and not for Well 5, the most vulnerable. He obviously did not know about Well 5's vulnerability to surface contamination and did not have the training or expertise either to identify that vulnerability or to understand the connection between vulnerable water sources and the need for continuous monitoring.

5.7 The Working Environment at the Walkerton Public Utilities Commission

Evidence was introduced at the Inquiry regarding the working environment at the Walkerton PUC. It falls into two categories: (1) alcohol consumption at the workplace by PUC employees, and (2) the pressure arising from the passage of the *Energy Competition Act* in 1998 and from municipal amalgamation in 1999. Although the working environment, particularly in the months leading up to the outbreak, was far from satisfactory, I am not satisfied that it contributed to the outbreak.

Alcohol had been consumed by the Walkerton PUC staff for many years before the tragedy occurred. Beer was stored in the refrigerator at the PUC shop. Frank Koebel had a drinking problem. PUC employees Allan Buckle and Robert McKay testified that they sometimes smelled alcohol on Frank Koebel's breath and noticed that his speech was slurred. On at least one

occasion, Stan Koebel drove his brother home during the working day because of Frank Koebel's excessive drinking.

In 1997 and 1998, Frank Koebel suffered two heart attacks. In 1998, he spent five weeks at the Homewood Institute in Guelph to deal with his alcohol problems and recover from the second heart attack. Stan Koebel decided at that time to prohibit the storage of alcoholic beverages in the refrigerator at the PUC shop.

Drinking beer at the workplace was symptomatic of a cavalier, undisciplined attitude among PUC staff. However, the improper operating practices do not appear to have been the result of drinking beer on the job. Apparently that practice had ended after Frank Koebel's heart attack, whereas the improper operating practices continued. While clearly unacceptable, I do not believe that drinking alcohol on the job was responsible for the May 2000 tragedy.

The working environment at the PUC was also affected by the passage of the *Energy Competition Act* and by municipal amalgamation.

In January 1999, the Town of Walkerton, the Township of Brant, and the Township of Greenock amalgamated to establish the Municipality of Brockton. The Townships of Brant and Greenock had two communal wells: one in the Chepstow subdivision and the other on Geeson Avenue. After the amalgamation, the Walkerton PUC became responsible for operating these wells. Thus, the amalgamation somewhat increased the work of PUC employees.

The enactment of Ontario's *Energy Competition Act* (Bill 35) also had an impact on the operation of the water system in Walkerton. This legislation required municipalities to decide by November 2000 whether to retain, sell, or lease their electrical utilities. Stan Koebel said that he had spent an inordinate amount of time on the issue of electrical restructuring and that only 5% of his time had been devoted to the water operation at the PUC. He testified that by April 2000, he was uncomfortable with the manner in which the PUC was operating:

> There [were] too many ongoing projects that I wasn't getting a handle on, and being away too often for the amalgamation talks with the electricity side, not spending enough time in our own utility. I felt like I was losing it.

At this time, the Municipality of Brockton was also contemplating whether the Walkerton PUC's water operation ought to become a department of the municipality. On May 1, 2000, John Strader, superintendent of the Works Department, presented a report to the Brockton municipal council that described the duties of a prospective waterworks supervisor employed by the municipality.

Staff at the PUC were concerned that if Brockton assumed responsibility for the waterworks, there would be a surplus of workers and PUC employees would be laid off. As Frank Koebel said, "There was a lot of uncertainty amongst us. Nobody knew whether we were going to have the same position as [we] were holding at that time." Stan Koebel was anxious that the municipal council was making decisions on waterworks projects and was imposing charges to customers for water services without consulting him. He testified, "I was getting a feeling I was left out there."

Robert McKay was also concerned about his continued employment at the Walkerton PUC. In March or April 2000, he contacted the MOE's Owen Sound office to obtain information on the rules and regulations applicable to persons who do not hold a licence as a waterworks operator. He was informed by Larry Struthers, an environmental officer at the Owen Sound office, that unlicensed operators were not permitted to collect water samples or take readings at a water treatment plant. After hearing this, Mr. McKay decided that if necessary he would "bump" Allan Buckle, who was not certified as a waterworks operator. Mr. McKay believed that pursuant to the collective agreement, he had seniority over Mr. Buckle. Mr. Struthers did not ask Mr. McKay, during their conversation, whether the Walkerton PUC employed unlicensed operators.

Although additional stress resulted from the possible restructuring of the waterworks and from the municipal amalgamation, I am satisfied that this stress did not contribute to the outbreak in May 2000. The improper operating practices – the failure to chlorinate and to monitor chlorine residuals daily – had been going on for years and would have continued regardless of the *Energy Competition Act* or municipal amalgamation.

5.8 The Operators' Response to the May 2000 Outbreak

I have already described the actions of Stan and Frank Koebel in May 2000 in some detail in Chapter 3 of this report. In this section, I will highlight the relevant events and my conclusions.

Stan Koebel failed to inform the Bruce-Grey-Owen Sound Health Unit in a timely way about the adverse test results derived from samples taken on Monday, May 15, from the Walkerton water system and from a watermain construction project along a section of Highway 9. If the local health unit representative had been informed of these matters when he first contacted Mr. Koebel about the illnesses reported in Walkerton on Friday, May 19, 300 to 400 people would probably have been spared infection.

On May 15, at 6:15 a.m., Stan Koebel turned on Well 7. It had no chlorinator. The well operated from then until shortly before noon on Friday, May 19, without a chlorinator.

On May 15, the Walkerton PUC sent a number of water samples to A&L Canada Laboratories for microbiological testing. These included three samples from the Highway 9 construction site and four samples from the Walkerton system.

On May 17, Robert Deakin of A&L telephoned Mr. Koebel and indicated that the three construction site samples and three of the Walkerton system samples had tested positive for both total coliforms and *E. coli.* Later that day, Mr. Deakin faxed the test results for both sets of samples to the Walkerton PUC. One of the Walkerton system samples, which had undergone the more extensive membrane filtration test, showed massive contamination.

Starting on May 18, residents of Walkerton began to telephone the PUC and ask questions about the safety of the water. They were assured by a staff member, who had consulted with Stan Koebel, that the water was fine. Stan Koebel then instructed Frank Koebel to install the new chlorinator at Well 7.

That evening, Stan Koebel attended the Walkerton PUC's monthly meeting. As was his practice, he submitted a manager's report in writing. He did not disclose to the commissioners that he had received adverse samples from the construction project and the Walkerton distribution system or that Well 7 had been operating without chlorination.

When the health unit's local public health inspector, James Schmidt, contacted Stan Koebel on the next day, May 19, and inquired whether there were any problems with the water system, Mr. Koebel responded by saying that he "thought the water was okay." The same day, David Patterson of the health unit contacted Mr. Koebel to discuss inquiries from the public about the quality of Walkerton's water. Mr. Koebel assured Mr. Patterson too that the water was fine.

It was no coincidence that within half an hour of speaking to Mr. Patterson, Stan Koebel went to the PUC shop at 130 Wallace Street. He wanted to make sure that the chlorinator at Well 7 had been installed: he was told that it had been, on that day. He told both Frank Koebel and Allan Buckle that the samples from the Highway 9 construction project had contained bacterial contamination. After Mr. Buckle left, Stan Koebel also told Frank Koebel that he was concerned that there was bacteriological contamination in the distribution system. He also told his brother that the PUC office had received telephone calls from town residents and from the health unit, asking if the water was safe to drink.

Starting on the evening of May 19 and throughout the following long weekend (May 20 through May 22), Stan Koebel increased the chlorination and intensively flushed watermains in Walkerton's water distribution system. He said that he did this as a "precautionary measure" in response to the adverse water test results and because of his having learned that people in Walkerton were becoming sick. Despite his concern that the water was contaminated, Mr. Koebel certainly hoped and probably believed that the increased chlorination would make the water safe. Although by May 19 he must have been seriously concerned that the water was making people ill, I am satisfied that he did not know that *E. coli* was potentially lethal.

When the local health unit's James Schmidt contacted Stan Koebel on May 20, Mr. Koebel informed him that the system was being flushed and that the chlorine residual levels were 0.1 to 0.4 parts per million (ppm) in the distribution system and 0.73 ppm at the wellhead.

Later on May 20, Christopher Johnston of the MOE's Spills Action Centre (SAC) contacted Stan Koebel as a result of Robert McKay's anonymous call regarding failed water samples. Inexcusably, when asked directly whether there had been adverse samples, Mr. Koebel failed to inform Mr. Johnston that analyses of samples taken from a municipal well and from the distribution system had shown the presence of total coliforms and *E. coli*.

At about 3:00 p.m. on May 20, David Patterson of the local health unit telephoned Stan Koebel and advised him that someone had reported having been warned by a radio station against drinking Walkerton water. But Mr. Koebel was not comfortable about going public with a claim that the water was safe. During this conversation, Mr. Koebel informed Mr. Patterson that he was continuing to flush the watermains and that the chlorine residual levels ranged from 0.1 to 0.3 ppm. In response to Mr. Patterson's question as to whether there had been any unusual events in the water system, Mr. Koebel again referred to the watermain construction and the replacement of the chlorinator. He did not mention the adverse test results or the fact that Well 7 had operated without a chlorinator from May 3 to May 9 and from May 15 to May 19.

Mr. Koebel testified that he was contacted by the mayor of Brockton, David Thomson, on the next day, May 21, and that during their conversation, he assured the mayor that he thought the water was "okay." According to his testimony, he contacted the mayor later that day, after learning of the boil water advisory. He testified that he did not tell the mayor about the adverse test results in either of these calls.

When James Kieffer, the PUC's chair, contacted Stan Koebel after learning of the boil water advisory on the afternoon of May 21, Mr. Koebel was again presented with an opportunity to tell the truth about the adverse sample results and the fact that Well 7 had operated without chlorination. Mr. Koebel told Mr. Kieffer only that he was flushing the system and that the chlorine levels had been increased.

Similarly, when on May 21 the SAC again contacted Mr. Koebel, this time to discuss the boil water advisory, Mr. Koebel maintained his approach of deliberately avoiding the disclosure of adverse results from samples collected on May 15.

Stan Koebel's attempt to avoid any detection of the PUC's operation of Well 7 without chlorination continued through his meeting with MOE environmental officer John Earl on May 22. Instead of telling the truth, he referred to Well 6 having been "knocked out" by an electrical storm, clearly implying that nothing else out of the ordinary had occurred. When asked, however, he provided a number of Certificates of Analysis to Mr. Earl, including the certificate pertaining to the water samples collected on May 15 from the municipal water system, reflecting *E. coli* and total coliforms contamination. This was the first disclosure of these results. He still did not indicate that Well 7 had operated

without a chlorinator. When asked for Well 7's daily operating sheet, Mr. Koebel said that he would provide it the following day.

When Mr. Earl returned to the Walkerton PUC the next day, May 23, Mr. Koebel gave Mr. Earl what purported to be the May 2000 daily operating sheet for Well 7. This document had actually been created by Frank Koebel on May 22 or May 23 to conceal the fact that Well 7 had operated without a chlorinator. It falsely indicated that Well 7 had not operated between May 3 and May 9. It also reflected chlorine residual levels for five days when no chlorinator had been installed at the well.

It was only on May 23 that Stan Koebel began to tell the truth to the local health unit. Even then, he was telling only parts of the truth. In a telephone call with David Patterson, Mr. Koebel was informed that samples collected by the health unit had revealed the presence of bacteria in the water system. Mr. Patterson then asked for the date of the last set of microbiological tests from the Walkerton PUC. Mr. Koebel told Mr. Patterson that samples had been taken on May 15, and then, on being asked for the results, after a pause, told him that the samples had all "failed." However, Mr. Koebel still did not disclose the fact that Well 7 had operated without a chlorinator.

At the meeting in the Brockton municipal council chamber that afternoon, Dr. Murray McQuigge asked Mr. Koebel whether he had anything to say. Mr. Koebel began to discuss new watermains, again implying that they could have caused the contamination. Only after being asked direct questions by Dr. McQuigge did Mr. Koebel admit that the May 15 PUC samples had failed the microbiological tests. He still did not disclose the fact that Well 7 had operated without a chlorinator.

At the council meeting that followed the meeting convened by Dr. McQuigge, Mr. Koebel said that the chlorinator at Well 7 had not functioned properly. In fact, there had been nothing wrong with the unit removed on May 3. He continued to withhold the important fact that Well 7 had been operated without chlorination. Although he admitted that the PUC's May 15 samples had failed, he claimed not to have read the laboratory report until May 18 or May 19. He did not tell the municipal councilors that on May 17, Robert Deakin had told him that the May 15 samples were positive for *E. coli* and total coliforms, and that the plate containing the single sample that had undergone membrane filtration was covered with both types of bacteria.

By May 18, Stan Koebel knew of the adverse results from the May 15 samples and knew that there might be contamination in the water system. He also knew on that day that people were becoming sick. He was alarmed because he had been operating Well 7 without a chlorinator since May 15. He knew that doing so was wrong and did not want this improper practice to come to light.

Mr. Koebel not only did not disclose the truth about Well 7 when it would have been appropriate to do so, he also did not disclose the adverse test results from the May 15 samples. On May 19, after the chlorinator at Well 7 was installed, he began to flush and chlorinate the system. He must have recognized that the adverse results would eventually become known but hoped that by then, resampling and testing would show that the system was free of contamination. He did all this, I am satisfied, to conceal the fact that Well 7 had been operated without chlorination. Indeed, he went so far as to have his brother Frank Koebel alter the daily operating sheet for Well 7 to conceal the truth about Well 7.

Ironically, Well 7 was not the source of the contamination.

5.9 Allan Buckle

Allan Buckle, who had a Grade 10 education, did not hold a licence as a waterworks operator. He was hired by the Walkerton PUC in 1992 as a general labourer. His responsibilities included repairing water leaks, digging post holes, cutting grass, and weeding. Mr. Buckle did not understand the importance of maintaining a 0.5 mg/L chlorine residual after 15 minutes of contact time, nor did he know that it is dangerous to operate a well without chlorination. He did not know what *E. coli* is, and he did not understand that the presence of *E. coli* is an indicator of unsafe water. Nevertheless, Mr. Buckle collected water samples, measured chlorine residuals in the system, and completed the daily operating sheets for the wells. Both Stan and Frank Koebel instructed him to perform these tasks, despite his lack of certification.

Given Mr. Buckle's lack of training and certification, he should not have been involved in operating the PUC water system. Both Stan Koebel as general manager and Frank Koebel as foreman had the responsibility to ensure that only certified employees collected samples, measured the chlorine residuals, and completed the daily operating sheets. Both Stan and Frank Koebel taught Mr. Buckle improper operating practices, including the mislabelling of water

samples and the use of inaccurate methods for measuring the chlorine residual levels. Stan and Frank Koebel must bear responsibility for instructing Mr. Buckle to operate the water system and for teaching him improper operating practices.

5.10 Robert McKay

There was no evidence to suggest that Robert McKay engaged in improper practices in the operation of the water system. Mr. McKay began his employment at the PUC in May 1998, after working for approximately nine years at the Norwich and Brighton Public Utilities. He spent most of his time at the Walkerton PUC working on hydro. In early May 2000, Mr. McKay underwent knee surgery; as a result, he was on sick leave from May 9 to June 5, 2000 – a period that encompassed the time of the outbreak.

5.11 Conclusions

Stan and Frank Koebel engaged in a host of improper and unsafe operating practices during the years leading up to the May 2000 tragedy, some of which had a direct impact on the outbreak. The failure to measure daily chlorine residuals at Well 5 on May 13, or on the following days, was a lost opportunity to detect the contamination and to take the necessary steps to protect the community. As I have found in Chapter 4 of this report, although daily chlorine residual monitoring would not have prevented the outbreak, it is very probable that it would have significantly reduced the outbreak's scope.

Stan and Frank Koebel lacked the training and expertise either to identify the vulnerability of Well 5 to surface contamination or to understand the resulting need for continuous monitors. The MOE took no steps to inform them of the requirements for continuous monitoring or to require training that would have addressed the issue.

Finally, Stan Koebel's repeated failure to disclose the adverse results from the May 15 samples to the local health unit and others led to a delay in the issuance of the boil water advisory. If Mr. Koebel had been forthcoming, as he should have been, it is likely that between 300 and 400 illnesses would have been avoided.