
Case Study:
The Walkerton Experience

The Events of May 2000

The Walkerton Public Water System.....

- Operated by the Walkerton Public Utility Commission (PUC)(Walkerton, Ontario, Canada)
- For years Stan Koebel was the general manager and his brother Frank was the foreman
- 3 Groundwater sources with chlorine treatment

The Story

May 8 through 15

- Heavy rains, totaling 134 mm/5.25 Inches
- The heaviest was on May 12, 70mm/2.75 inches
- May 9 – 15 Well #5 was the primary source of water
- May 13,14,15 - Frank Koebel performed daily rounds following a long standing practice of not measuring the chlorine and making fictitious entries into the log. The Cl₂ residual, if any, was most likely consumed by the contamination, leaving no disinfectant

The Story

May 15

- May 15 – Stan Koebel returns after being gone for a week and turns Well #7 on without chlorination – a new chlorinator had been installed
- May 15 – 3 bac't samples are taken by PUC employee, samples labels did not indicate the true location where the samples were taken- samples most likely taken from the PUC workshop

The Story

May 15 , 16 & 17

- May 15 -Stan Koebel takes one sample from the distribution system and 3 from a water main construction site
- May 16 all samples are received by the lab
- May 17 lab advises Stan Koebel that the 3 samples from the construction site are positive for total and fecal coliforms (*E. coli*) and that the other samples did not look good either

The Story

May 17

- May 17 – Lab faxes results: 3 out of 4 of the construction site samples positive TC & FC, samples that undergone additional membrane testing showed gross contamination

*No lab results were sent to the Health Unit until
6 days later!*

The Story

May 18 & 19

- May 18 – First indications of widespread illness, members of the public contact the PUC. Stan Koebel assures them ‘the water is safe to drink’.
- May 19 – More illness, bloody diarrhea, vomiting, a Doctor contacts the Health Unit suspecting *E. coli*.
- May 19 -The Health Unit begins an investigation with the hospital, retirement homes, schools and the PUD- Stan Koebel.

The Story

May 19

- May 19 – Stan Koebel when contacted twice informs the Health Unit that he thinks the water is ‘OK’, does not mention positive samples, or that Well 7 had been in operation May 15 thru today without chlorination!

If the health unit was informed of the test results or the lack of chlorination a boil order would have been issued on this day!

The Story

May 19 & 20

- May 19 – Stan Koebel begins flushing and super chlorinating the system, days later the residual is elevated in the system and at the wellheads.
- May 20 – A stool sample from a child tests positive for *E. coli*, outbreak is expanding rapidly.
- May 20 – Health Unit contacts Stan Koebel. He informs them of the system residuals, creating false comfort with the Health Unit.

The Story

May 21

- May 21- Robert McKay, an employee of the PUC places an anonymous call to the Health Units Environmental Emergency Center. Informs of positive test results in the Walkerton system.
- May 21 – Stan Koebel is contacted by the Health Unit and leads caller to believe the positive samples were only from the construction site.

The Story

May 21

- May 21 – *E.coli* is confirmed at the Ownens Sound Hospital (earlier stool sample was presumptive).
- May 21 – Health Unit responds by issuing a boil order for the Walkerton System over AM/FM radio. Some don't become aware on this day.
- May 21 – Doctor contacts Mayor requesting that further public notification be done. The Mayor takes no further steps to warn the community!

The Story

May 21 & 22 – The first death

- May 21 – The Health Unit takes 20 water samples within the distribution system.
- May 21 – Walkerton hospital receives 270 calls for serious abdominal pain & diarrhea. A child is airlifted to London, Ontario for emergency treatment.
- May 22 – Stan Koebel provides for the first time the adverse test results from May 17 and asks Frank to change the Well 7 log to conceal that it had operated without a chlorinator.

The Story - May 23

- May 23 – Stan Koebel provides altered well logs.
- May 23 – Two sample results test positive at dead ends within the system (places not effected by Stan Koebels super chlorination and flushing efforts). When informed of these results Stan Koebel provides, for the first time, the May 15 adverse sample results.

Walkerton Facts & Conclusions

The end.....

- 7 people die
- 2,300 people became ill
- Many have permanent organ damage
- It was all preventable!

A community devastated



- Suffering friends and family of lost ones
- Uncertainty about the future – will it happen again?

Let's talk about it.....

- Who is ultimately responsible for the health of your customers?
- What are the weak links are in your operations?
- Does anyone in your utility approach their job like the Koebel's?
- In the event of an emergency do you have a plan in place? Do you know what to do in the event of an emergency?
- Could this happen in your community?
- stop for short presentation (15-30 min)

Walkerton Facts & Conclusions

What went wrong at the Utility?

- The output could have been prevented with the use of chlorine residual & turbidity monitoring at Well #5.
- Operators lacked the training to identify either the vulnerability of Well #5 to surface contamination or the need for continuous monitoring.

Walkerton Facts & Conclusions

What went wrong at the Utility?

- The scope of the problem would have been substantially reduced had chlorine residuals been measured daily at Well #5

- For years the Operators engaged in a host of improper operating practices:
 - Inadequate chlorine dosages
 - Inadequate monitoring
 - False chlorine residual entries in operation logs
 - Misstating the locations of bacteriological testing
 - The Operators new these procedures were incorrect and contrary to primacy guidelines and regulations

Walkerton Facts & Conclusions

What went wrong at the Utility?

- The Utility Board was not aware of improper treatment and monitoring practices of the operators – However the Board failed to respond to a 1998 inspection noting significant water quality concerns and operations deficiencies.

Walkerton Facts & Conclusions

What went wrong at the Utility?

- The general manager concealed from the Health Unit and others the adverse test results from water samples and the fact that Well #7 had been operating without a chlorinator in the prior weeks/months.

Had either facts been disclosed the Health Unit would have issued a 'boil order'

on May 19 and 300 to 400 illnesses could have been avoided!

Walkerton Facts & Conclusions

The Regulatory Agencies- what happened?

- The primacy agency should have detected the Utilities improper treatment and monitoring practices and assured they were corrected.
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- The Health Unit acted diligently to issue the boil water advisory (once it was aware), however it should have been more broadly disseminated.
- Budget reductions led to the discontinuation of government laboratory testing services in 1996 – the government should have enacted legislation mandating that testing labs immediately notify Health Units of adverse results.

Walkerton Facts & Conclusions

The Agencies- what happened?

- New budget reductions made it less likely that the Primacy agency would have identified both the need for continuous monitors at Well #5 and improper operating practices.

The Physical Causes

The Well – point of entry

- Shallow
- Casing extended ~ 15 feet
- Water table 8 – 40 feet
- Nearby surface water influence
- Fractured rock
- Bacteria quickly moved from the ground surface to the water supply

The Farm

- Manure was spread near Well 5, and was the primary source of the contamination.
- The owner of the farm was not faulted in anyway.
- Farmer was using the widely accepted 'best management practices' when spreading the manure.

Walkerton Facts & Conclusions

The beginning...

- The contaminants, largely *E-coli* and *Campylobacter jejuni* entered Well #5 on or shortly after May 12. Primary source: Cattle manure from local farm.
- On May 18 the first symptoms of widespread illness in the community -20 children are absent from school, two are admitted to the hospital with bloody diarrhea.
- On Monday May 22 the first person dies.

Conclude with a discussion regarding

- What was wrong
- The importance of an ERP