



Canada's Walkerton Water Contamination Event: Impact on Drinking Water Regulations

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Walkerton Outbreak



May 2000, 2300 people (48%) became ill and 7 people died due to bacterial contamination of the town's water supply well.

Primary Causes:

- Farm runoff contaminated the bore
- Inadequate chlorination

Secondary Causes:

- Operator negligence
- Underlying deficiencies in the regulatory and management systems

Inconsistent Approaches

4 out of 10 Canadian provinces had enforceable drinking water regulations

Treatment Varied – significant differences between large and small suppliers

Increasing number of outbreaks occurring/detected

1983 – Edmonton AB (9,000 cases estimated)

1986 - Penticton BC (3,100 cases)

1990 - Creston and Erikson BC (124 cases)

1993 - Milwaukee (**403,000 cases**)

1996 - Cranbrook BC (2,000 cases)

2001 - North Battleford (5,800-7,100 cases)



Some larger utilities were implementing advanced water treatment ahead of formal regulations (following AWWA)

Canadian Regulatory Structure

The Federal-Provincial-Territorial Committee on Drinking Water (CDW) develops The ***Guidelines for Canadian Drinking Water Quality*** (GCDWQ)

Provincial Governments:

1. Set treatment standards
2. Approve source water protection plans
3. Issue licenses and permits for treatment plants
4. Oversee compliance

Local Governments:

1. Own and operate the infrastructure
2. Set water rates



Ontario (Rapid Response Under Pressure)

May
2000

- Walkerton Outbreak

August
2000

- Mandatory risk assessment for groundwater supplies

2002

- Comprehensive new regulations published

New Ontario Regulations

2002 Ontario Safe Drinking Water Act

- Ministry of Environment made lead agency for drinking water
- System licenses include permit to take water, operational plan, financial plan
- System owners subject to statutory standard of care
- Regulations for treatment, distribution, and monitoring
- Regulations for laboratories
- Certification and training requirements for operators
- Inspections and enforcement

2002 Sustainable Water and Sewage Systems Act

- Mandated full cost-recovery in rates

Infrastructure Funding: 1/3 each for federal/provincial/municipal

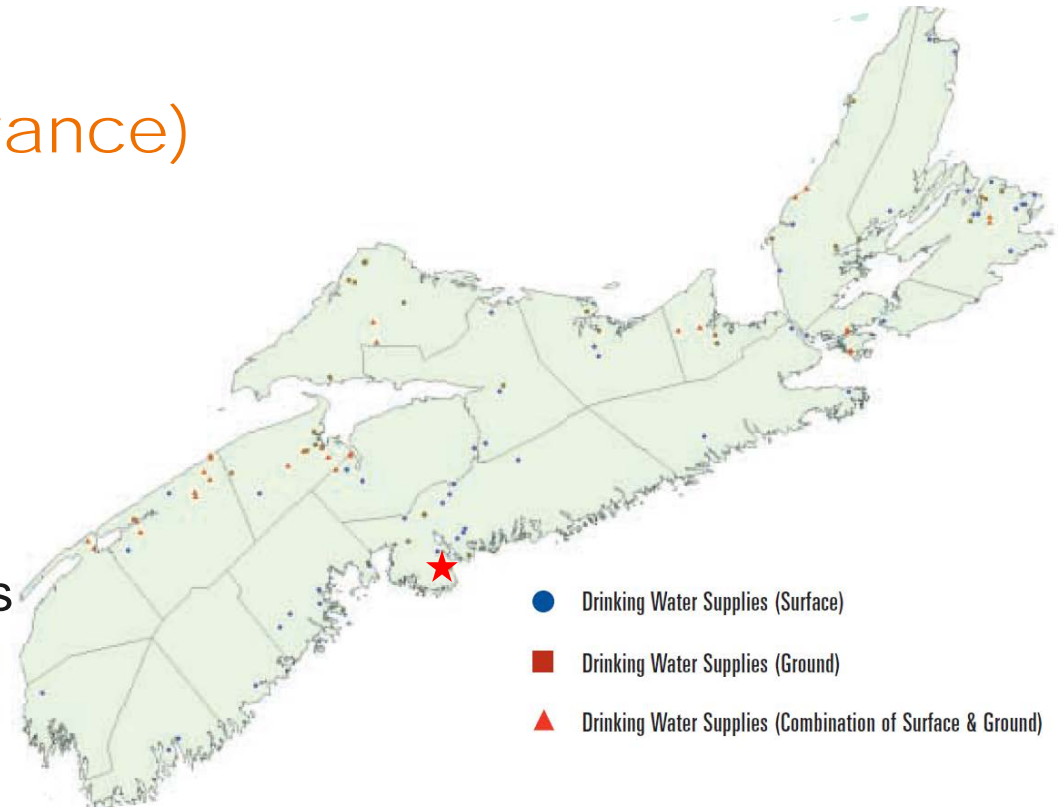
Nova Scotia (Planning in Advance)

55,000 sq. km

920,000 people

54% of population obtains water
from 85 municipal water suppliers

Remainder rely on private well
bores



★ Halifax Water

- Serves 360,000 people
- 3 large ISO 14001 WTPs
- 6 smaller community WTPs



Nova Scotia Regulatory Evolution

Regulatory
Response

1995

- ***Environment Act***
 - Dept. of Environment lead agency
 - Mandated development of water strategy

2000

- ***Water and Wastewater Facilities Regulations***
 - GCDWQ made legally-binding standards

2002

- ***Drinking Water Strategy for Nova Scotia***
 - Multi-barrier approach Detailed treatment standards
 - Source protection Given until 2008 to meet new standards

2010

- ***Water for Life***
 - Overall water resources strategy

Nova Scotia Regulatory Evolution

Department of Environment added additional staff resources

- Supervisor of the Drinking Water Program
- Source Water Protection planners, hydrogeologists, water treatment specialists, data management specialists, inspectors

New registration of 1,800 small systems

- 15 or more service connections or serve 25 or more people at least 60 days/year...
- Required to monitor and notify if coliform bacteria present or health-related guidelines exceeded
- Must take corrective actions

Resources for private well bores

- Private well owners responsible for ensuring their wells are constructed to provincial standards
- Testing *recommended* (not legislated)

Infrastructure Funding: funded by municipalities

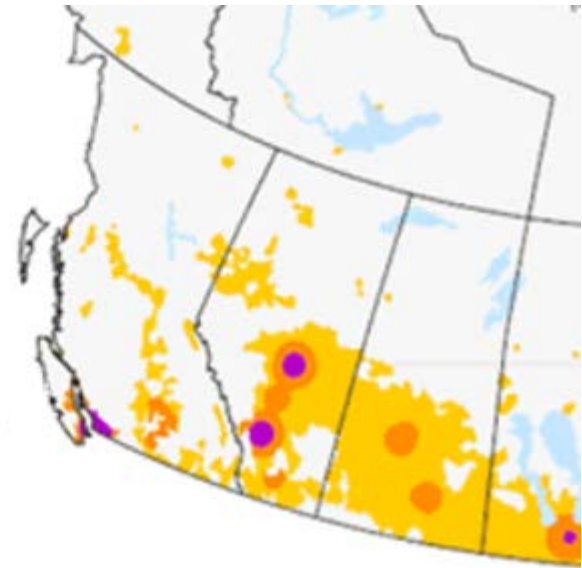
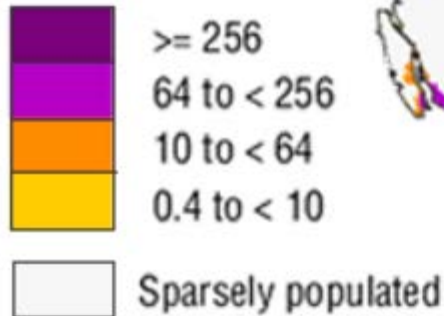
Alberta

4.3M people in 2018

- 600 municipal water systems
- Agricultural region with concentrated towns

Alberta recognized that largest number of regulatory violations occurred in the smallest systems

Population density
(persons per km²)



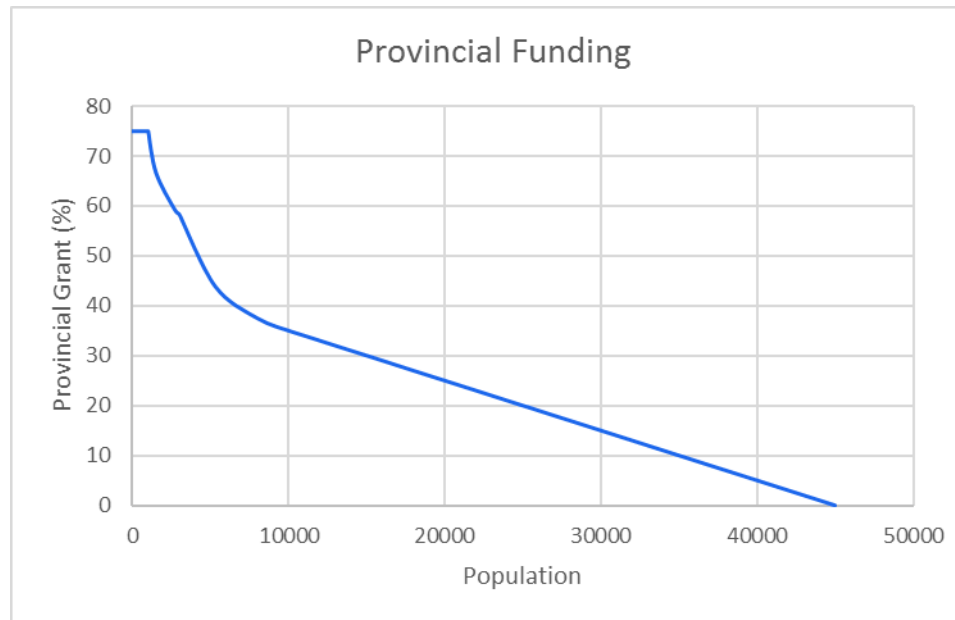
Source: Statistics Canada, Census of Population, 2006.



Alberta: Small System Grants

Grant program to fund small system infrastructure

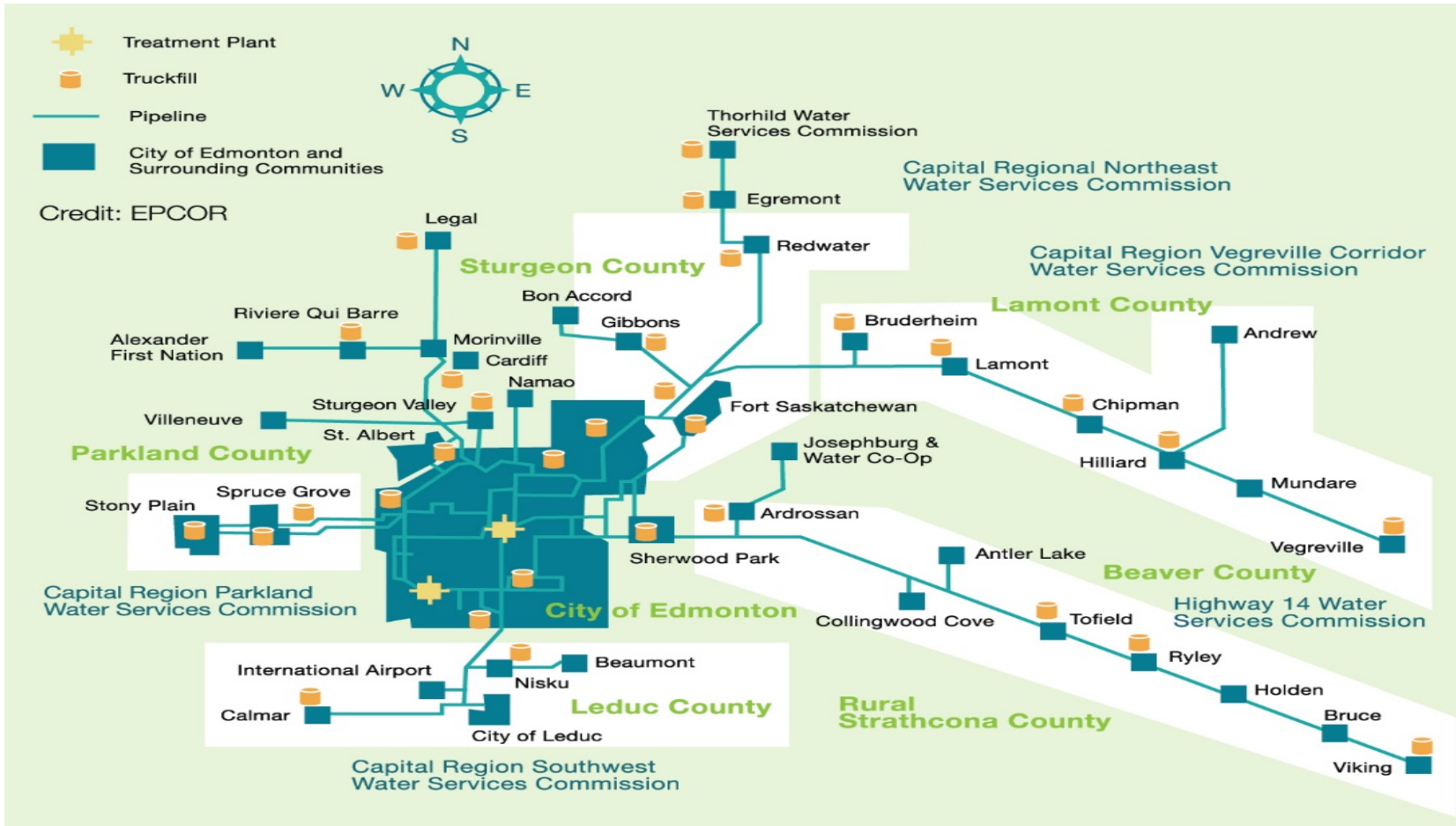
- Sliding funding scale based on population



- Grant reduced by 10% if no water metering

Infrastructure Funding: heavily funded by province

Alberta: Regional Systems



Funded at 90 - 100% by province

Over \$1 billion in Provincial funds spent over 25 years

Utility Corporatization, not Privatization

No privatization of public utilities

- Public support for utilities as public assets
- Fear of rising rates if a profit margin is added
- No financial driver for privatization
 - Canadian municipalities have very good credit ratings
 - Private utilities unlikely to borrow money as cheaply as municipalities

Establishment of Municipal Utility Corporations common

- Municipality is sole shareholder
- Corporation owns infrastructure
- Management reports to an independent Board or Directors, not City Council
- Enables for-profit servicing of external customers
- Regulated by Provincial Utility Review Board or Utility Commission
- Examples: Epcor, Halifax Water

Small systems solutions that work

Treatment

- Operator friendly treatment plants – membranes / UV / Cl₂

Contract Operations

- Municipally-owned infrastructure
- Third party commercial operation and regulatory reporting

“Circuit Riders”

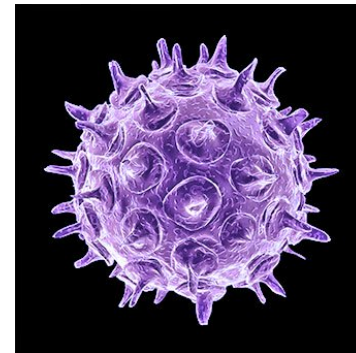
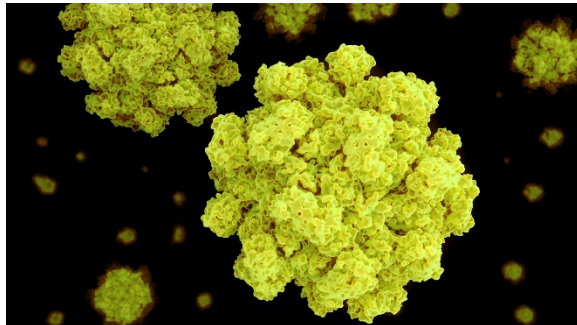
- Senior operators / engineers hired to support multiple municipal operators in a geographic region
- Funded by groups of municipalities or Province

Final Thoughts

Groundwater Disinfection Needed

Health Canada and USEPA: 4-log (99.99%) virus removal

- Viruses detected in confined and unconfined aquifers
- Viruses can transport hundreds of meters in days to weeks
- Viruses can survive 2-3 years in groundwater
- Absence of indicator bacteria does not mean absence of viruses



Reference: Health Canada (2017), Enteric Viruses
USEPA (2006), Ground Water Rule

Current Canadian Regulations

- **Surface Water** - mandatory filtration and disinfection
 - Minimum 3-log giardia/crypto reduction
 - 4-log virus inactivation
 - Chlorine residual in distribution system
- **Groundwaters Under Direct Influence (GUDI) of surface water** - mandatory filtration and disinfection
 - Same as surface water
- **Groundwater** - mandatory disinfection
 - 4-log virus inactivation
 - Chlorine residual in distribution system

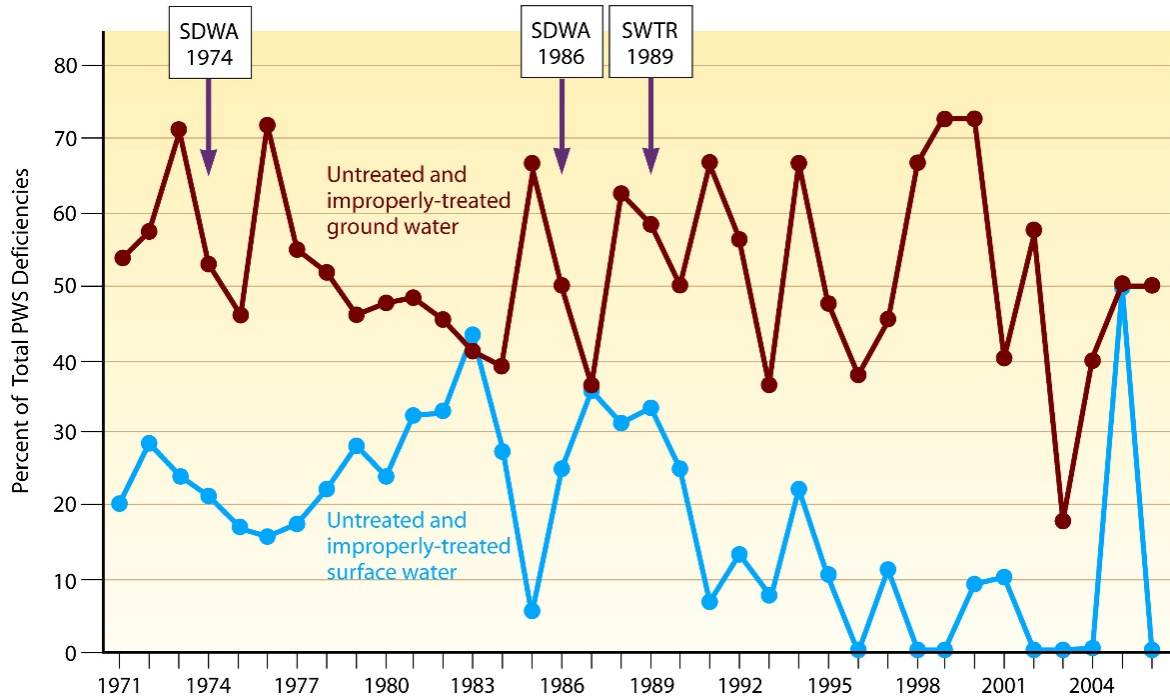
Do Regulations Work?

Canadian waterborne illness data

- Between 1971 and 2001, *Giardia* was the most common causative agent of waterborne disease outbreaks (WBDO); responsible for 51 of 138 WBDOs
- *Cryptosporidium* was responsible for 12 of 138 WBDOs
- Forensic analysis indicates most of these outbreaks would have been prevented by adequate source water protection and water treatment
- **No** *Giardia* outbreaks since 2001
- **No** *Cryptosporidium* outbreaks since 2001

Reference: Health Canada (2012), Enteric Protozoa: *Giardia* and *Cryptosporidium*

Do Regulations Work?



Percentages of outbreak deficiencies in public water systems associated with untreated and improperly treated source water

Introduction of mandatory filtration of surface waters responsible for reducing WBDO rates in surface waters

Improperly treated groundwaters still a problem.

(USEPA Groundwater Rule (2006) not reflected in data)

Questions

“It can be stated unqualifiedly that no community, whatever its size, is too poor to have a pure water supply. It is better to have bad streets, grade crossings, and inadequate public buildings, than to tolerate a water supply of questionable purity...”

- George A. Johnson, *Journal of the American Waterworks Association*, June 1916



George A. Johnson