

# **Treatment Alternatives – Groundwater Supplies: manganese and iron removal**

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**Clean and Safe Drinking Water  
Workshop – Gander, NL**

# History of Fredericton's Water

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- 1883 first water system using Saint John River (unfiltered)
- 1906 redesigned plant included filtration and coagulation
- 1912 chlorination – saving approx 6 persons per year (typhoid)
  - chlorination system cost \$23 dollars, used until 1950
- 1920's bacterial analysis of water, universal water metering
- 1955 first well in Wilmot Park, surface water abandoned 1959
- 1970's onwards manganese and iron concentrations increase



William L Barrett Water Treatment Plant

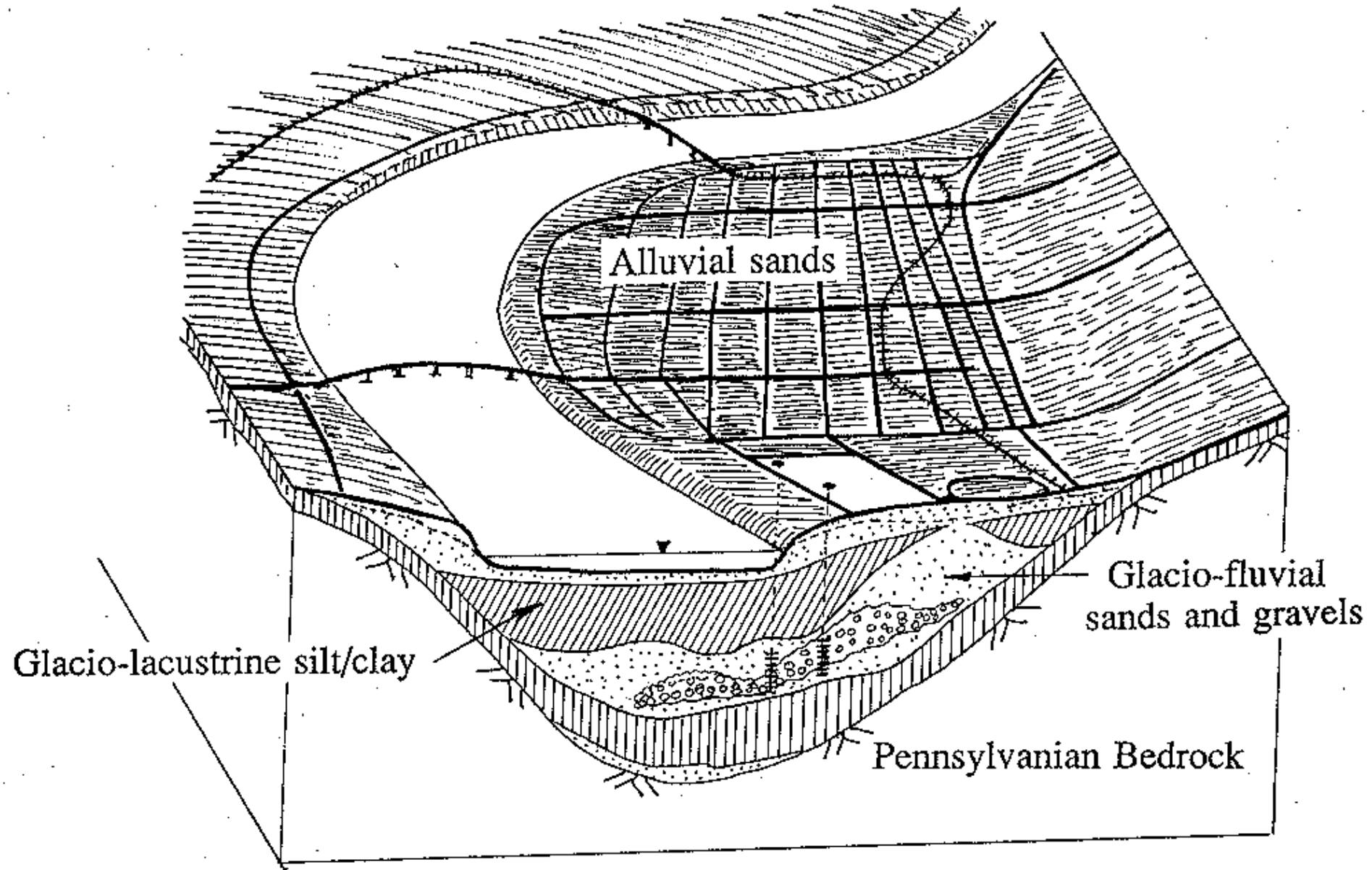
# History of Fredericton's Water

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- 1984 manganese removal plant constructed (upset water customers)
- 1988 pipe line under river to service the northside (even more upset water customers)
- 1992 aquifer protection study begins (designated Feb 2006)
- 1996 plant (W.L. Barrett) capacity expanded to 500 L/sec
- 2000 – 2006 2<sup>nd</sup> wellfield developed
- 2007 – 2009 new water treatment plant constructed (E. J. Bliss)

# Aquifer Cross-Section

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# Southside Frederickton

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# Groundwater Treatment

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- **Wilmot Park well water quality issues:**

- Manganese concentrations (8 wells) 0.03 to 2 mg/L

- Iron concentrations primarily PW2 0.5 mg/L

- pH values tend to be slightly acidic

- Langelier Index of raw water is negative (-xxx)

- Historic hydrogen sulphide concentrations at PW2

- TOC/DOC concentrations vary from 1 to 4 mg/L



# Wilmot Park – Manganese

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Figure 4.1 Photographs of iron and manganese deposits at Wilmot Park.



# Wilmot Park – PW8

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# New Water Treatment Plant

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- Ultimate treatment capacity for 5 wells at 60 L/s each
- Supply line from wellfield to the new plant
- Delivery of water from WTP to transmission main
- Treated water to mix with water from existing W.L Barrett water treatment plant water
- New building to house processes and personnel

# New Water Treatment Plant

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- New wells have required 10+ years regulatory effort
- PW9, PW10 and PW11 calcium bicarbonate type water
- Mn 0.02 to 0.1 mg/L (subject to change ??)
- Fe trace
- TOC ~ 1 mg/L
- Langelier index  $-1.2$  to  $-1.5$  (5 to 20 C)
- pH 6.4 to 8.0 (lab pH values)
- Alkalinity 55 to 90 mg/L (as CaCO<sub>3</sub>)

# New Water Treatment Plant

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- City Water Utility requirements
- Finished water meeting Canadian Drinking Water Guidelines
- Free chlorine residual (leaving the plant) ~ 1.5 mg/L
- Five day free residual of 0.5 mg/L
- Water pH 7.5 to 8
- Water alkalinity 70 to 90 mg/L
- Langelier saturation index 0 to -1.0
- Water compatibility in the distribution system

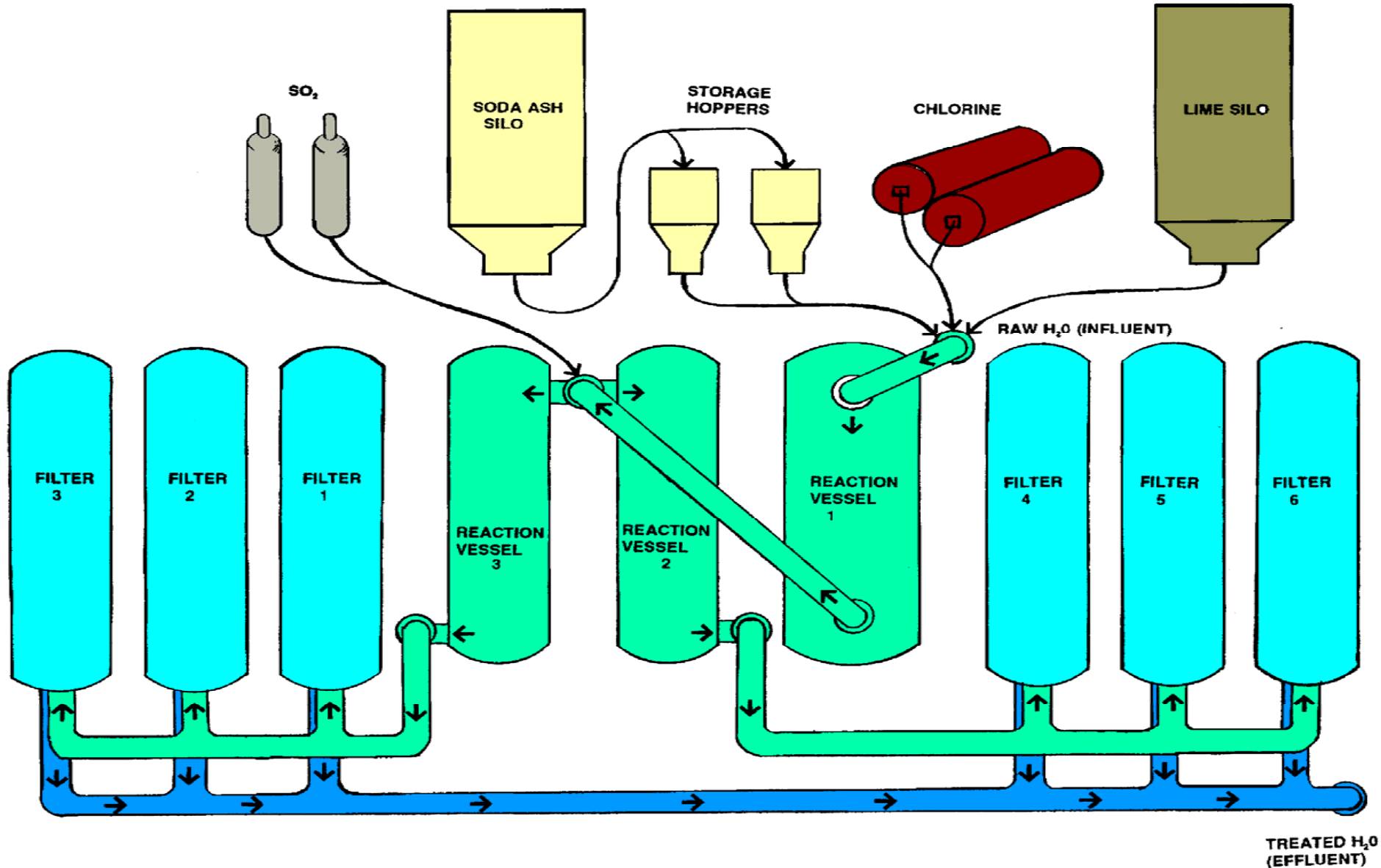
# Treatment Options to Consider

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New technology since original 1980's plant ??

- Biological, proprietary, carbon based, air – peroxide injection
- pH adjustment only and hope Mn & Fe don't increase ?
- Staff toured 7 plants in south west USA
- Conclusion:       Chemical oxidation which is compatible with existing process at W.L. Barrett plant
- Benefits include:
  - Operator familiarity, same parts inventory, similar finished water
  - Local engineering support

# Overview of Plant Process



# Community Considerations

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- New plant location requires ease of access along truck route
- Selected site was the second choice – required additional land acquisition, additional piping & rerouting of previously designed source water supply
- Heritage Preservation Area
- Building appearance needed to blend into the neighborhood
- Selected site was a commercial “brown site”





figure A-14

**HISTORIC PHOTOGRAPHS - 1997  
CLOSURE REPORT  
FORMER ESSO SERVICE STATION  
*300 Waterloo Pkwy., Fredericton, New Brunswick***





Waterloo Row ESSO Demolition, 2007-July-10



Rendering for New Water Treatment Plant





2007/08/22

Engineered Pad, Water Treatment Building





Erosion Control Mats, West Property line





Filtration Room Roof





Arrival of Third Filter and Placement of Filters within Building





Arrival of First Reaction Vessel

# Lime Silo within Building



2008/02/27



## “Blue skin” Covering of Building Exterior







Filtration Room





“South End of Building Exterior





Reclaim Tank at North Building Exterior





Corner Stone – Utility Manager, Engineer & Directors





Filtration Room – Pipe Galley





Filtration Room – Pipe Galley



Inside Filter Vessel – Tie off of R-Bar





2005/07/01

Plant Exterior April 2008









E J Bliss WTP – Exterior Fall 2008