

Fleet Street Pumping Station – 150 Years of Operation

Paul Montgomery, P.Eng.

Plant Manager, City of Ottawa



Historical Overview

- 1857 – Canada's new capital needs a water supply system
- 1859 – Thomas Coltrin Keefer lends a hand
- 1874 – Fleet Street Pumping Station opens
- 1887 to 1908 – Fleet Street expands to meet demand
- 1911 – Disinfection of raw water supply begins
- 1912 – New covered aqueduct to augment hydraulic power
- 1916 – New High Lift Pump Station on Lemieux Island
- 1932 – Lemieux Island WPP begins operation
- 2024 – Fleet Street still going strong!

1857 – Ottawa needs a better water supply

- Drinking water delivered by licensed carters
- ‘Great Fires’ create urgency: Quebec City (1845), Montreal (1852), Carleton County (1870), Chicago (1871)
- Insurance underwriters calling for fire protection
- Ottawa’s increasing growth
- Other Cities with water supplies: Montreal (1819), Toronto (1841), Kingston (1850), Hamilton (1860)



1859 – Thomas Coltrin Keefer

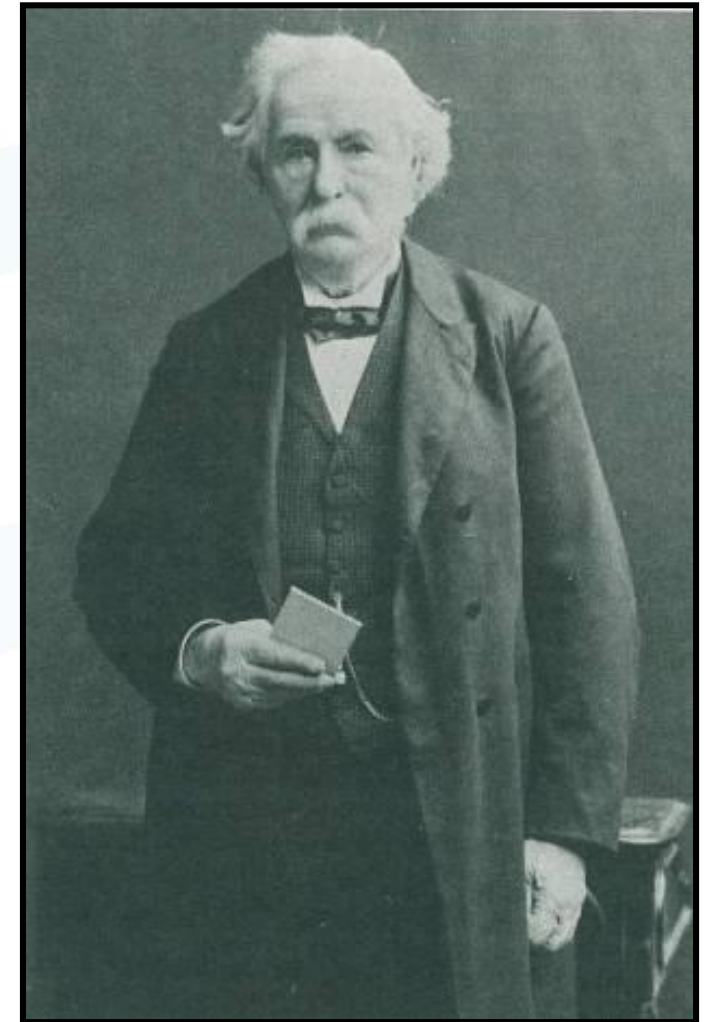
- Prominent Canadian engineer, began career working on Erie and Welland Canals
- Designed systems in Montreal, Hamilton & Toronto
- First commissioned by the City Ottawa, in 1859, to design a water and sewage system (...an aqueduct with a reservoir on Parliament Hill)
- In 1868, Ottawa's Water Works committee affirms the creation of a water works (...and then a fight broke out)
- By 1869, Keefer again commissioned again and prepares a further report (Report on Water Supply for the City of Ottawa). Keefer's report was endorsed by the Water Works Committee



Courtesy of
Alistair MacKenzie P.Eng., FCSCE
Canadian Civil Engineering History
& Heritage

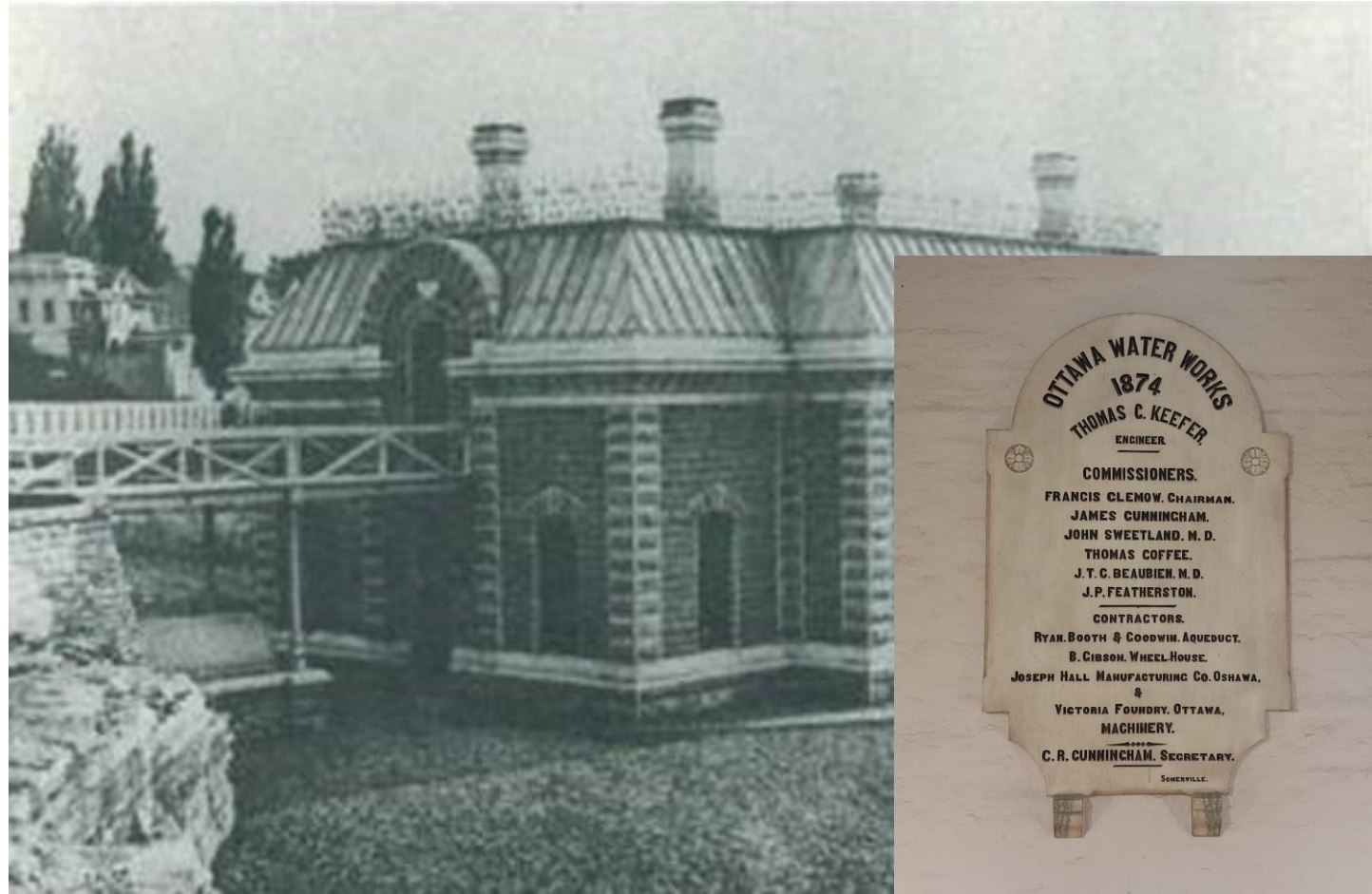
1872 – Thomas Coltrin Keefer

- Three years later, in 1872, Ottawa City Council passed a bylaw for the establishment of a water works and appointed Keefer as their chief engineer (reportedly for a salary of \$3,000)
- Keefer first estimates suggested a cost of \$350,000, for the selected system. Final costs for the pumping station, the power water aqueduct, a wheelhouse, a couple of bridges, and the distribution piping was \$930,693.
- Keefer went on to become a founding member and first president of the Canadian Society of Civil Engineers
- He passed away in Ottawa, in 1915, at the age of 94



1874 – Fleet Street Pumping Station

- On October 24, 1874 Keefer's plans go into operation!
- A headworks (wheelhouse) structure was located on Nepean Bay, on the Ottawa
- A 760m long rock cut aqueduct conveyed power water to the station's turbines
- By 1876, three turbines drove three, triple piston pumps for a firm capacity of 27 ML/d (19" bore by 42" stroke)



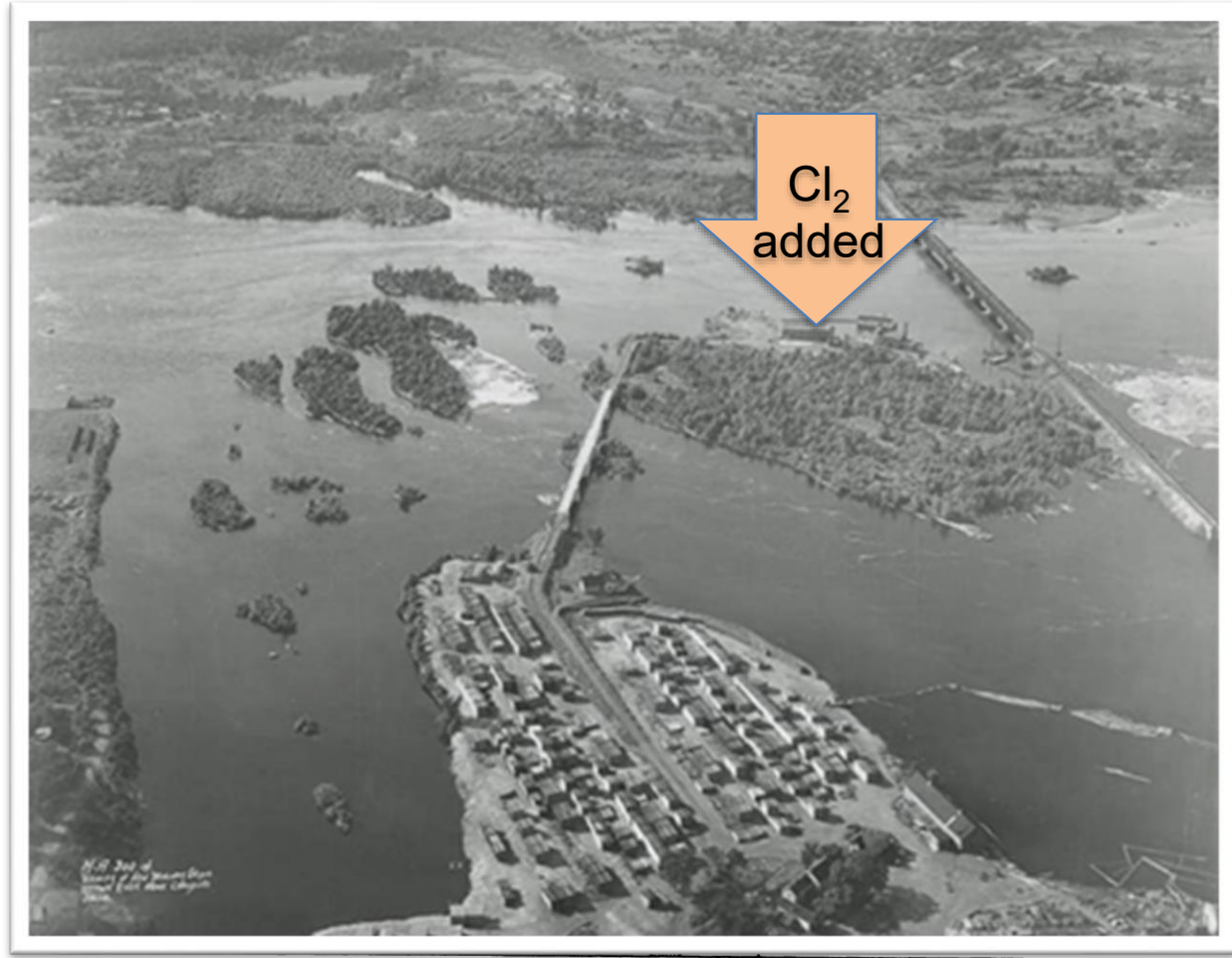
1887 to 1908 - Fleet Street Expands

- In 1887, Robert Surtees was now the Water Works Engineer
- With Surtees in 1890, a fourth, triple piston, 45ML/d pump was added (25.9" bore by 60" stroke)
- Surtees called for improved sewage works upstream
- By 1901, the building was expanded again, this time, by Newton Ker
- By 1908, two more double piston, double acting 36ML/d pumps had been added (19" bore by 26" stroke)



1911 – Epidemics obligate Disinfection

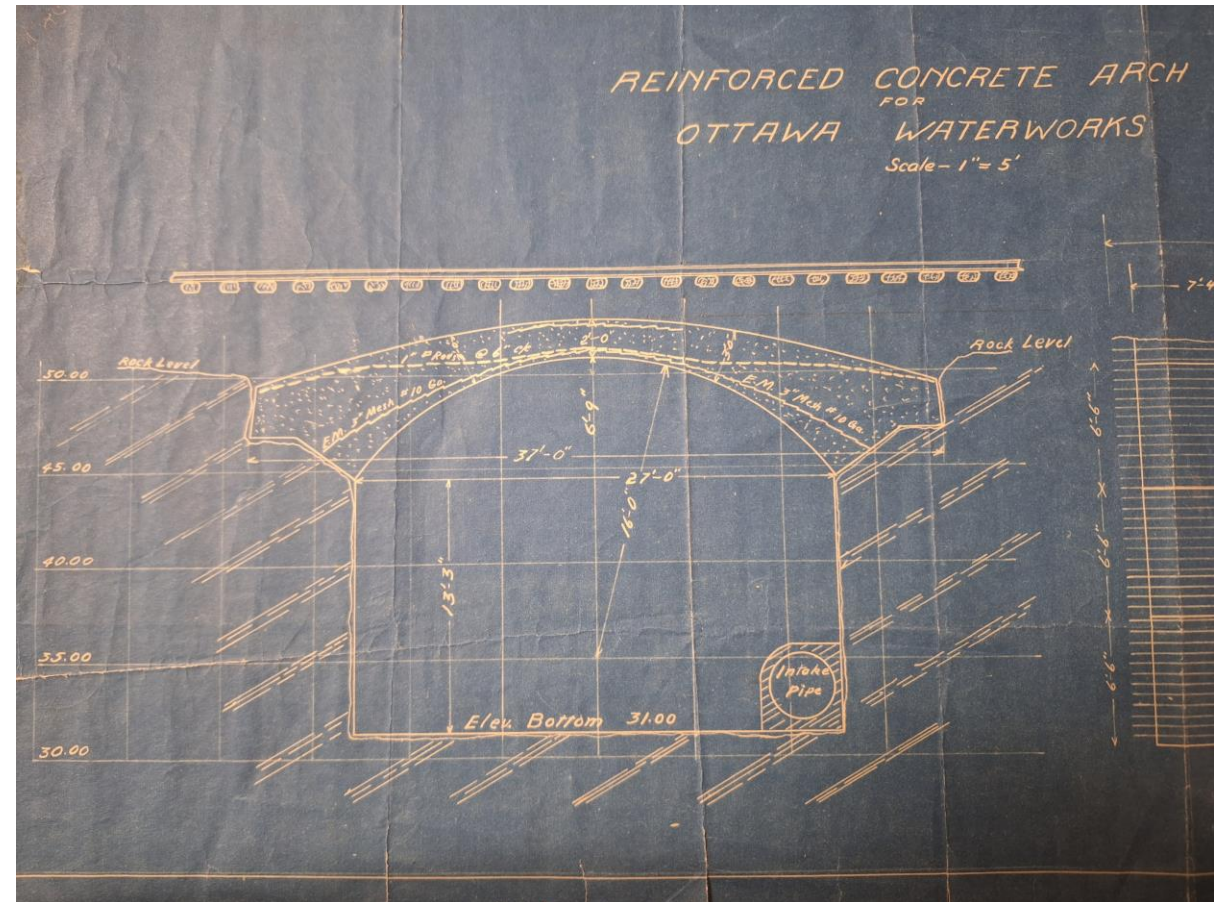
- As Surtees has noted, upstream (westerly) development, without the benefit of sewage works, resulted in illnesses and deaths
- Ottawa experiences a typhoid epidemics in 1911 & 1912, by 1915 typhoid was attributed to 512 deaths
- Defective drinking water intake pipes, starting at Lemieux Island and supplying Fleet Street were suspected
- In 1913, hypochlorite of lime addition was initiated, at Lemieux Island



1912 – A New Power Water Aqueduct

- Conveyance of power water became a known constraint
- A new covered Aqueduct under Ottawa Street (now former) alignment was built
- Aqueduct is 500m long, 6m high at obvert x 8m wide
- Reinforced concrete arch structure bearing on bedrock

(n.b. today, rock walls are protected with concrete in some areas and abandoned trenches impact arch's bearing capacity)



2024 - Ottawa's Drinking Water System

Britannia and Lemieux Island Surface Water Plants

- 5 reservoirs
- 4 elevated tanks
- 17 pumping stations

Communal Well Supply Systems

- Carp
- Munster Hamlet
- Kings Park
- Richmond West
- Shadow Ridge
- Vars

Total Value: > \$1 Billion

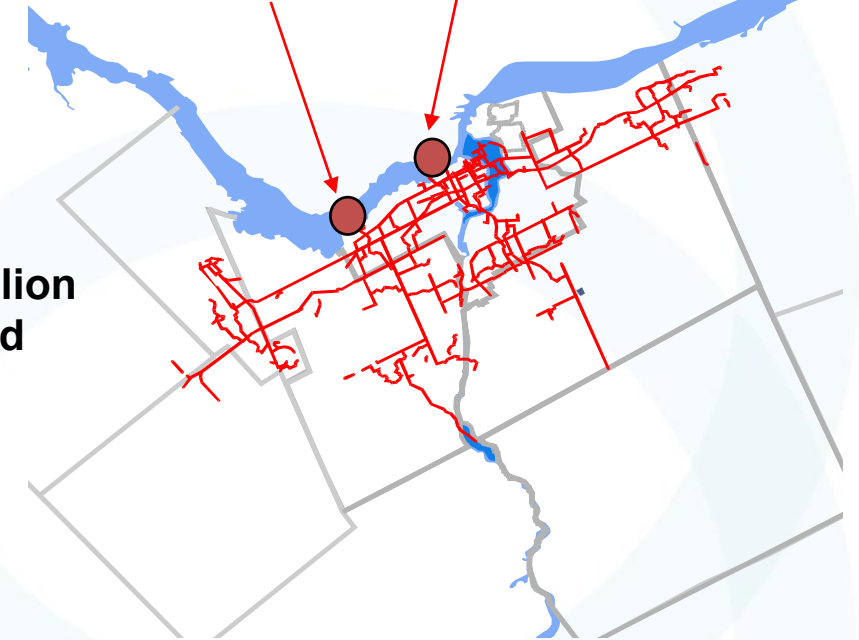
Britannia Plant
Cap: 360 ML/d



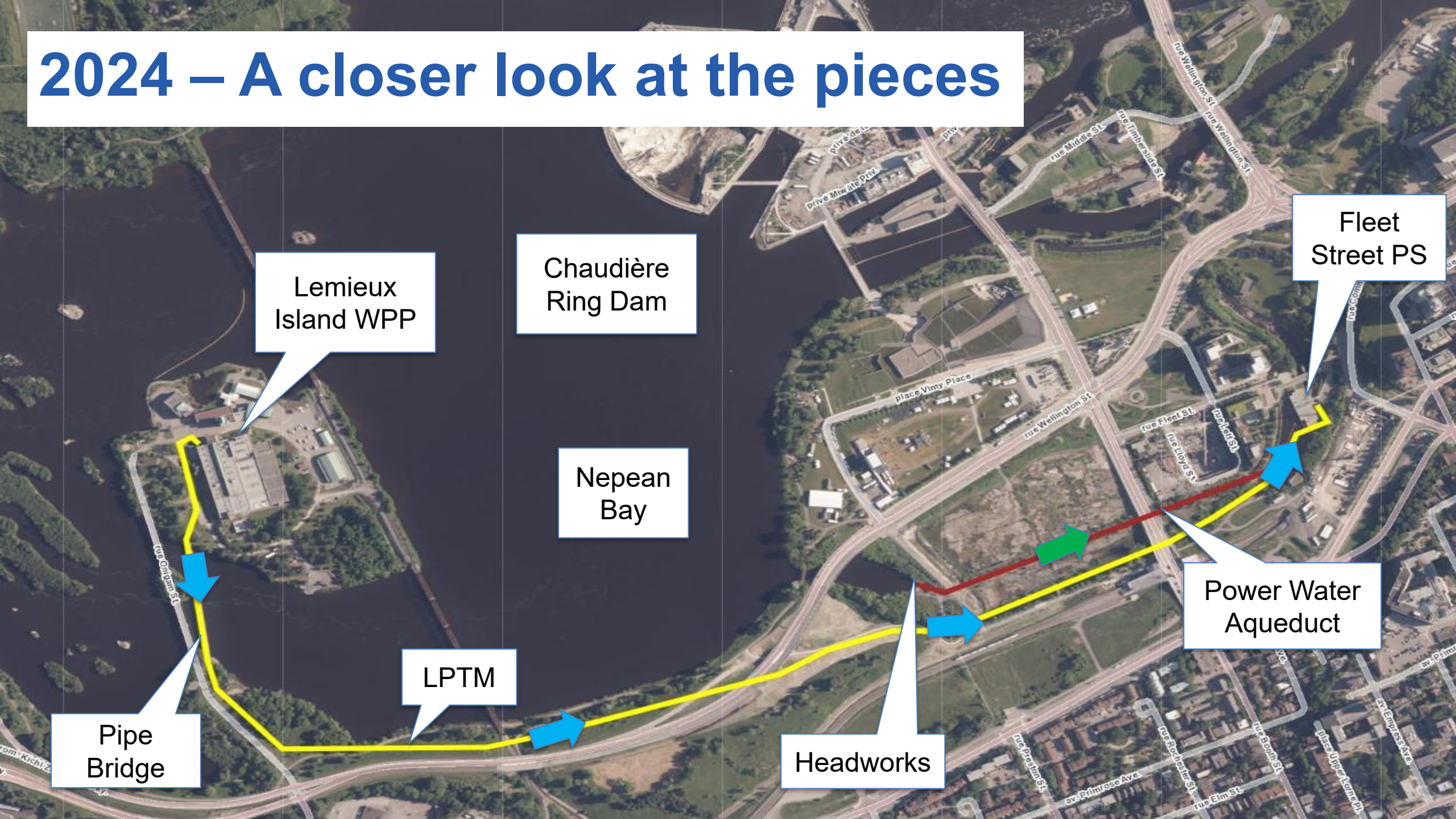
Lemieux Island Plant
Cap: 400 ML/d



Service Population ~ 1 million
Avg. Demand ~ 275 ML/d
(Million Liters of Water a Day)



2024 – A closer look at the pieces



Lemieux
Island WPP

Chaudière
Ring Dam

Fleet
Street PS

Nepean
Bay

Power Water
Aqueduct

Pipe
Bridge

LPTM

Headworks

2024 – A closer look at the pieces

- Lemieux Island WPP supplies the City with up to 400ML/d, with its own electric pumps and the water turbine powered pumps at Fleet
- Treated drinking water from Lemieux flows via 2006 Low Pressure Transmission Main, 2200m long, 1676mm diameter
- 1912 Covered Aqueduct still provides power water to Fleet Street despite continued erosion of exposed, soft bedding planes in the rock walls
- 1981 Headworks facility uses two 2.4m by 2.4m modulating gates to maintain steady forebay level
- Open Power Water Aqueduct no longer in use and serves as a pipeline route for the LPTM
- Headworks and Fleet Pumps are controlled by PLC with remote operation at Lemieux Island
- Fleet Street, forebay and aqueducts form parts of a combined heritage designation

An aerial photograph showing a large concrete structure, likely a forebay, with a large pipe extending from it. The structure is situated in an urban area with modern buildings, trees, and a parking lot. The water in the forebay is dark and appears to be flowing through the pipe. The surrounding area includes a mix of greenery and built-up structures.

Fleet Street PS Forebay

Fleet Street PS Forebay



Turbine Chamber, Turbine and Runner



Fleet Street PS - By the numbers...

$$\text{Power In} = \rho g Q_{\text{in}} H$$

$$(Q_{\text{in}} = 25\text{m}^3/\text{s}, H = 7.35\text{m})$$

$$\therefore P_{\text{in}} = 1800\text{kW (or 2400hp)}$$

$$\text{Power Out} = \rho g Q_{\text{out}} H$$

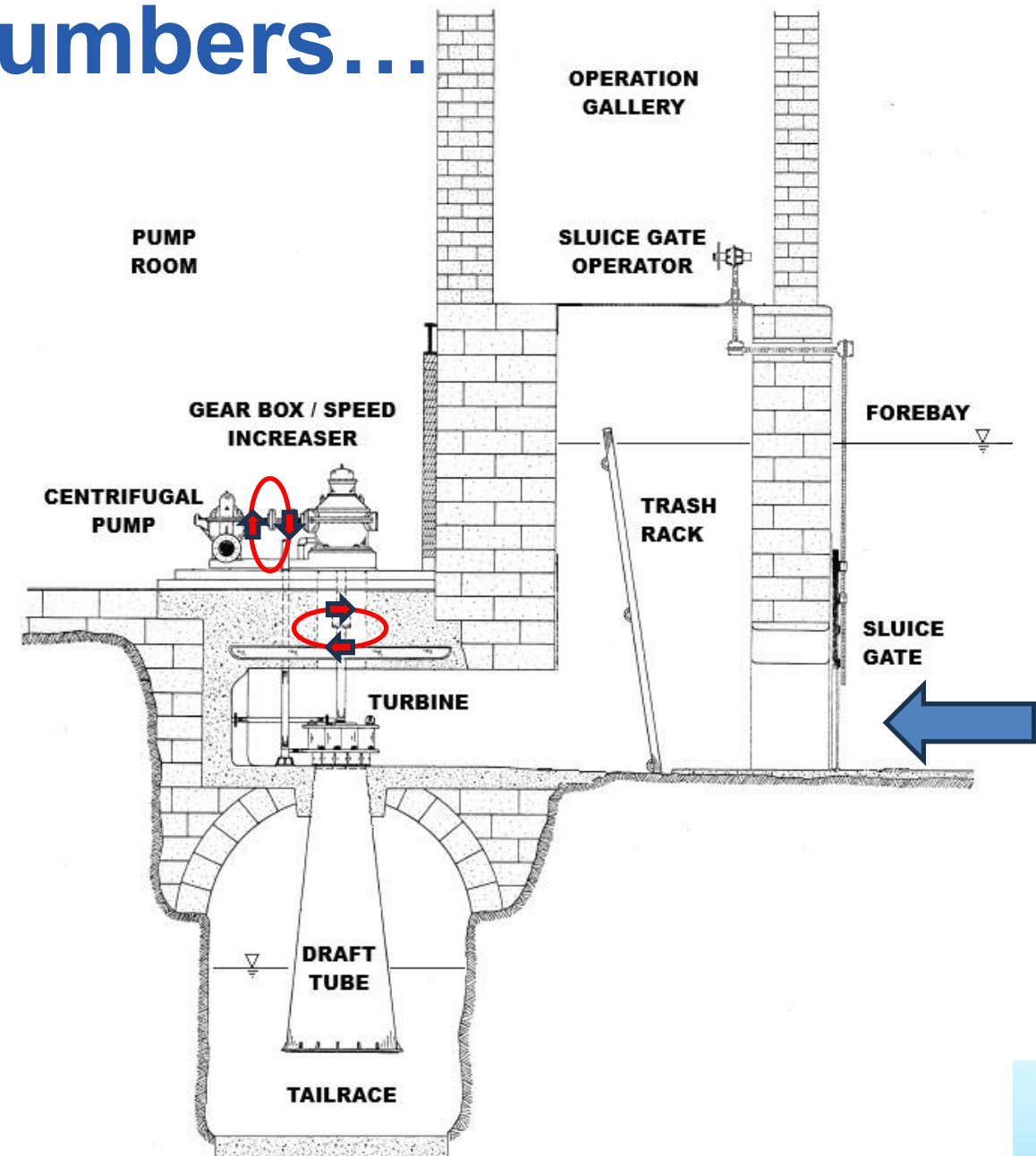
$$(Q_{\text{out}} = 2.3\text{m}^3/\text{s}, H = 51.9\text{m})$$

$$\therefore P_{\text{out}} = 1170\text{kW (or 1570hp)}$$

$$\text{Overall Hydraulic } \eta = 65\%$$

With average output, Fleet saves approximately \$1.2M/yr in electricity costs

Fleet also avoids significant standby power equipment at Lemieux for 200ML/d of high lift pumping



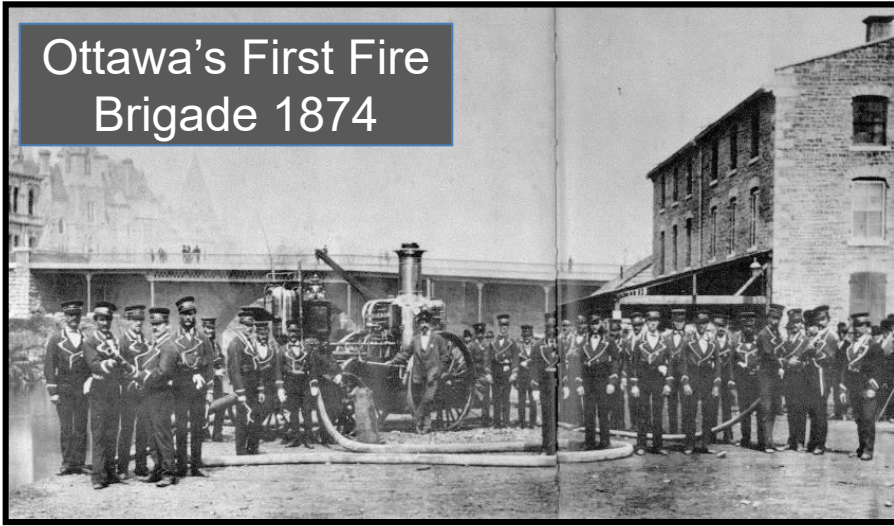


Fleet Street PS Interior

Fleet Street PS Tailrace Kayak Course



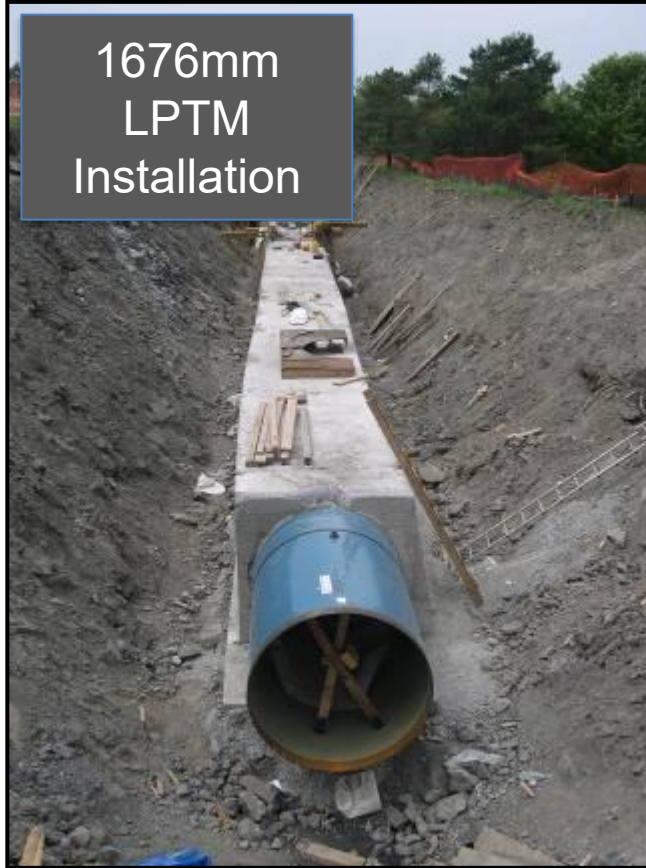
Ottawa's First Fire
Brigade 1874



Thank You!



1676mm
LPTM
Installation



Ottawa Fire of
1900



LPTM Pipe Bridge

