

# Optimized Corrosion Control Program

Champlain Water District



# Introduction

- Champlain Water District's Corrosion Control Program began in 1984 and achieved optimization under the Lead & Copper Rule (LCR).
- CWD's optimization activities are implemented using a framework that complements CWD's longstanding goals.

# Champlain Water District Charter

- Municipal entity chartered by the Vermont Legislature to provide drinking water to served municipal systems
- Eight (8) publicly elected commissioners, one from each member city/town
- Serves 75,000 population





**Adirondack Mountains**

**Broad Lake**

**Shelburne Bay**



## Shelburne Bay

Data:

Volume: 33 Billion Gallons

Depth at Intake: 75 feet

½ Mile out



**Lake Champlain – i.e. the Broad  
Lake**

**Data:**

**Volume: 6.8 Trillion Gallons**

# Background - Treatment



- 23 MGD modified direct filtration-type plant in South Burlington, VT
- Serve 75,000 people
- 3 Contact Adsorption Clarifiers & 8 deep bed multi media filters

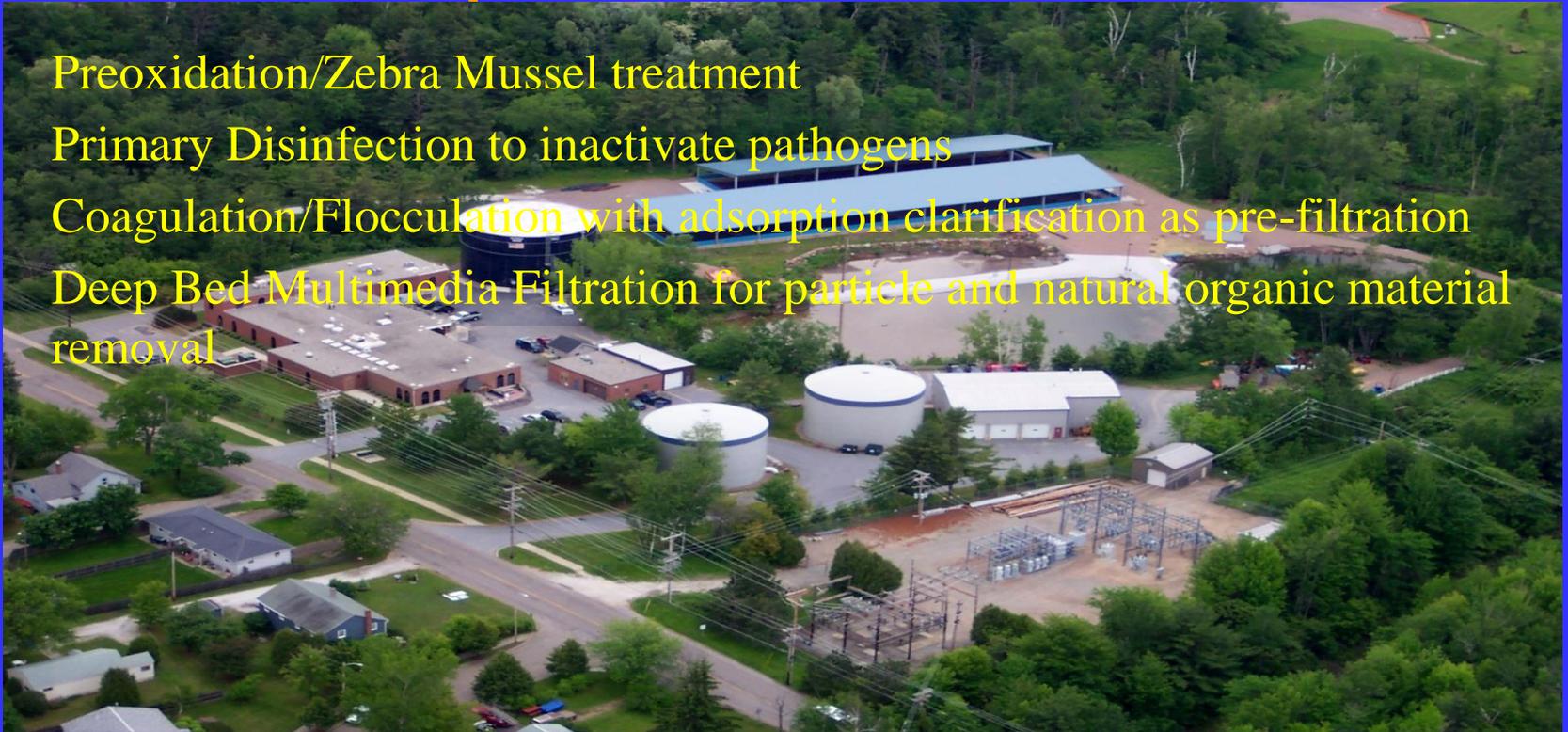
# Champlain Water District

Preoxidation/Zebra Mussel treatment

Primary Disinfection to inactivate pathogens

Coagulation/Flocculation with adsorption clarification as pre-filtration

Deep Bed Multimedia Filtration for particle and natural organic material removal



Fluoridation for Vermont Department of Health Dental Division recommendations

pH adjustment to consistent, neutral pH

Secondary disinfection to ensure safe, effective residual throughout the distribution system, and to reduce formation of disinfection by-products

Corrosion control treatment to reduce lead and copper leaching from home plumbing

# CWD process

## Water Quality Goals

### Turbidity

- Less than 0.10 ntu on Combined Filter Effluent (CFE)
- Less than 0.10 ntu on Individual Filter Effluent (IFE)

### Particle Counts

- Less than 20 cts/ml greater than 3 microns
- Less than 35 cts/ml greater than 2 microns
- Further optimization of Pre chlorination to lower DBP levels

### Partnership for Safe Water

- Phases 3 & 4

# Partnership for Safe Water

- Phase 3 – Self assessment (Completed 1997)
- Phase 4 – Excellence in Water Treatment (Completed 1999)



# Filtration WQ Instrumentation

- Turbidimeters
  - CFE (Lab or on-line) (Lab- calibrated weekly)
  - IFE (on-line) (verified monthly, calibrated qtrly)
- Particle counters
  - Annual maintenance at factory.
  - Investigated and set up count matching
- UVAS analyzer (maintenance plan)



## Excellence in Water Treatment

Champlain Water District  
Peter L. Jacob Water Treatment Facility

In recognition of successful completion of  
Phase IV Third-Party assessment procedures  
of the *Partnership for Safe Water*  
"Working Together to Protect America's Drinking Water"

Presented by the *Partnership for Safe Water*

United States Environmental Protection Agency  
American Water Works Association  
Association of Metropolitan Water Agencies

National Association of Water Companies  
Association of State Drinking Water Administration  
American Water Works Association Research Foundation

1999

2003

2007

2000

2004

2008

2001

2005

2009

2002

2006

2010



**Fifteen-Year  
Excellence in Water Treatment Award  
2014  
Champlain Water District  
Peter L. Jacob Water Treatment Facility**

*In recognition for your continuous commitment to superior water quality by maintaining the Partnership for Safe Water Excellence in Water Treatment Award for fifteen years.  
The Partnership for Safe Water is sponsored by the American Water Works Association, Association of Metropolitan Water Agencies, Association of State Drinking Water Administrators, United States Environmental Protection Agency, National Association of Water Companies, and the Water Research Foundation.*

# “Inter”-functionality of CWD & Municipal Consecutives

- CWD “compliance agent for municipal consecutive systems.”
- All SDWA sampling and reporting conducted via formal agreement dating back 25 + years
- Ownership, operation & maintenance of infrastructure via MOUs.
- 24/7 operation of transmission/storage via SCADA

# Served System Infrastructure

More like a suburban system, not like older urban systems.

- Lead service Lines (LSLs) are not present.
- Target materials are 50/50 lead tin solder and brass fittings in home plumbing.

# Background Water Quality Chemistry

More like a “Great Lake” than a typical low alkalinity New England source.

- Alkalinity - 55 mg/L avg (55 to 59 range)
- Calcium Hardness – 53 mg/L avg (45 to 54 range)
- Total Hardness - 60 mg/L

# LCR Corrosion Optimization Plan 1994

- Historical 1984 – 1991 (i.e. before the Lead & Copper Rule (LCR) !
  - Bench scale coupon comparisons.
  - Consumer location sampling (16 locations)
  - Investigated corrosion inhibitor which reduced rate 78 %.
  - Corrosion control treatment with orthophosphate started April 1987.

# LCR Corrosion Optimization Plan 1994

Based upon Lab/pilot scale coupon studies and some system wide coupon insert studies.

- Ideal pipe loop – solenoid driven to simulate home water use.
  - Used to simulate corrosion conditions within a “typical” copper pipe system soldered with 50/50 lead tin solder.
  - Evaluate treatment changes on home plumbing

# LCR Corrosion Optimization Plan 1994

- Ideal pipe loop – results and conclusions
  - Indicated passivation of the coupons from the standpoint of metal release.
  - Move toward a more optimized orthophosphate dose
  - Move toward optimized pH

# Champlain Water District Corrosion Control History

## – Summary:

- CWD's source water is more "Great Lakes" than "New England"
- CWD's charter set out the role as "compliance agent" and "operations central" for its member served municipal systems
- CWD has long, successful experience using corrosion inhibitor for lead (and copper) corrosion control (from 1984 to the present).
- CWD has successfully integrated other treatment objectives in its quest for optimal lead (and copper) passivation and corrosion control chemistry.

# Champlain Water District Corrosion Control History

## Metals release pilot:

- Based upon Ideal Pipe Loop concept
- Use solenoid driven system to simulate home water use/materials contact times for 50 50 lead tin and brass (8 % leaded).
- Collect “first draw” 1 liter grab samples
- Continue to track passivation impact on home plumbing metal release overtime.

# Corrosion Control Planning for Secondary Disinfectant Change

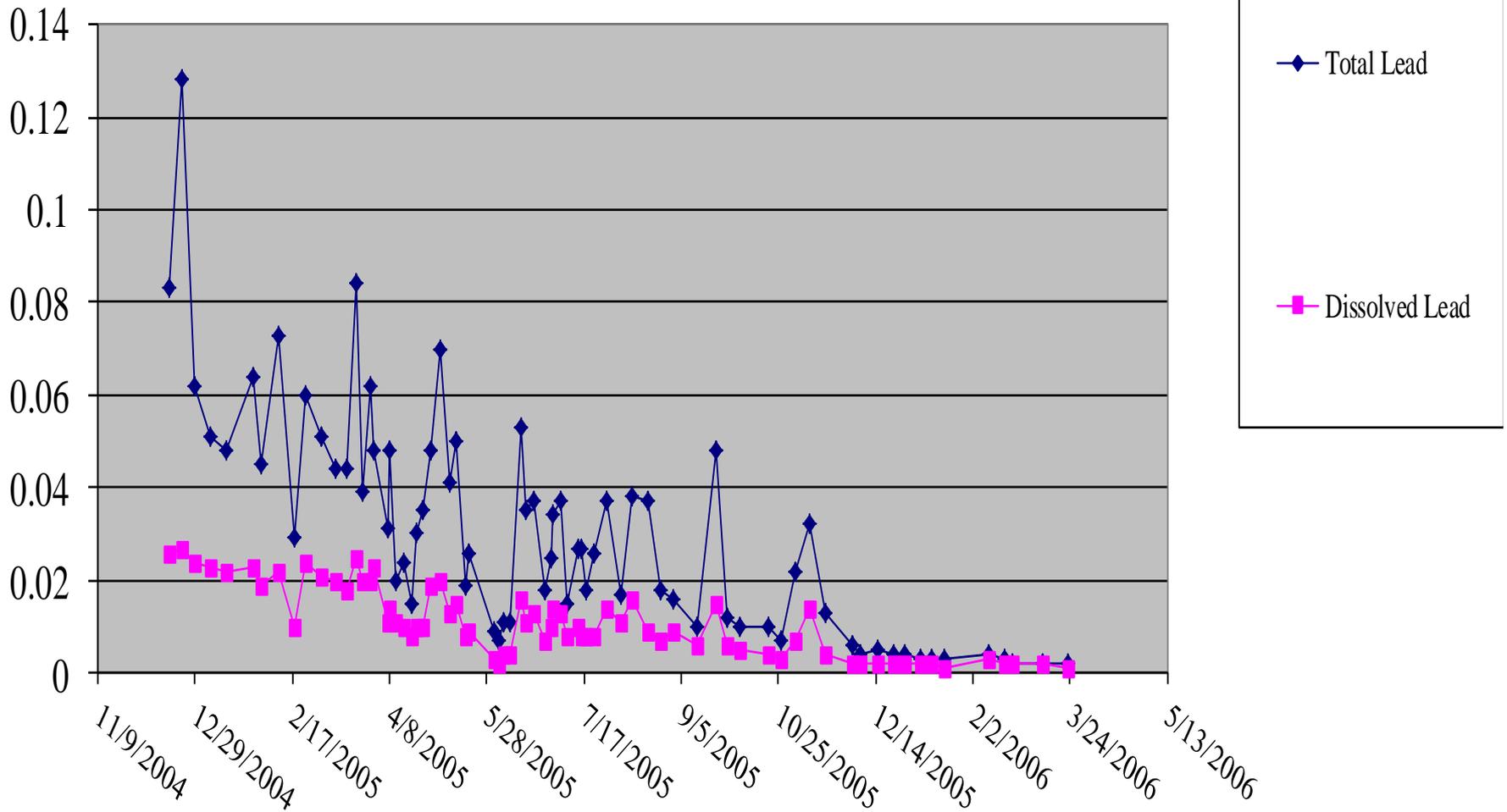


# Corrosion Control Planning for Secondary Disinfectant Change

## Metals release pilot:

- Pilot scale allows you to set conditions that may exist within consumer's home plumbing that may be difficult to sample full scale.

# Lead Release 50/50 coupons



# Corrosion Control Planning for Secondary Disinfectant Change

## Metals release pilot results:

- As experienced during ideal pipe loop study, metals release baseline established after passivation period.
- Used to ensure treatment changes do not impact home plumbing.

# Conclusion

- Champlain Water District continues to implement an optimization plan to develop a detailed understanding of potential metals release.
- This plan is built upon CWD's previous work that was started back in 1984 and carried through to the present:
  - The Corrosion Control Optimization plan
  - Treatment facility optimization under the Partnership for Safe Water program.
  - Distribution system optimization through retention time management.
- These optimization activities continued to be implemented using a complementary framework.



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