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)

PARTNERSHIP FOR SAFE WATER
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
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

PARTNERSHIP FOR SAFE WATER
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:

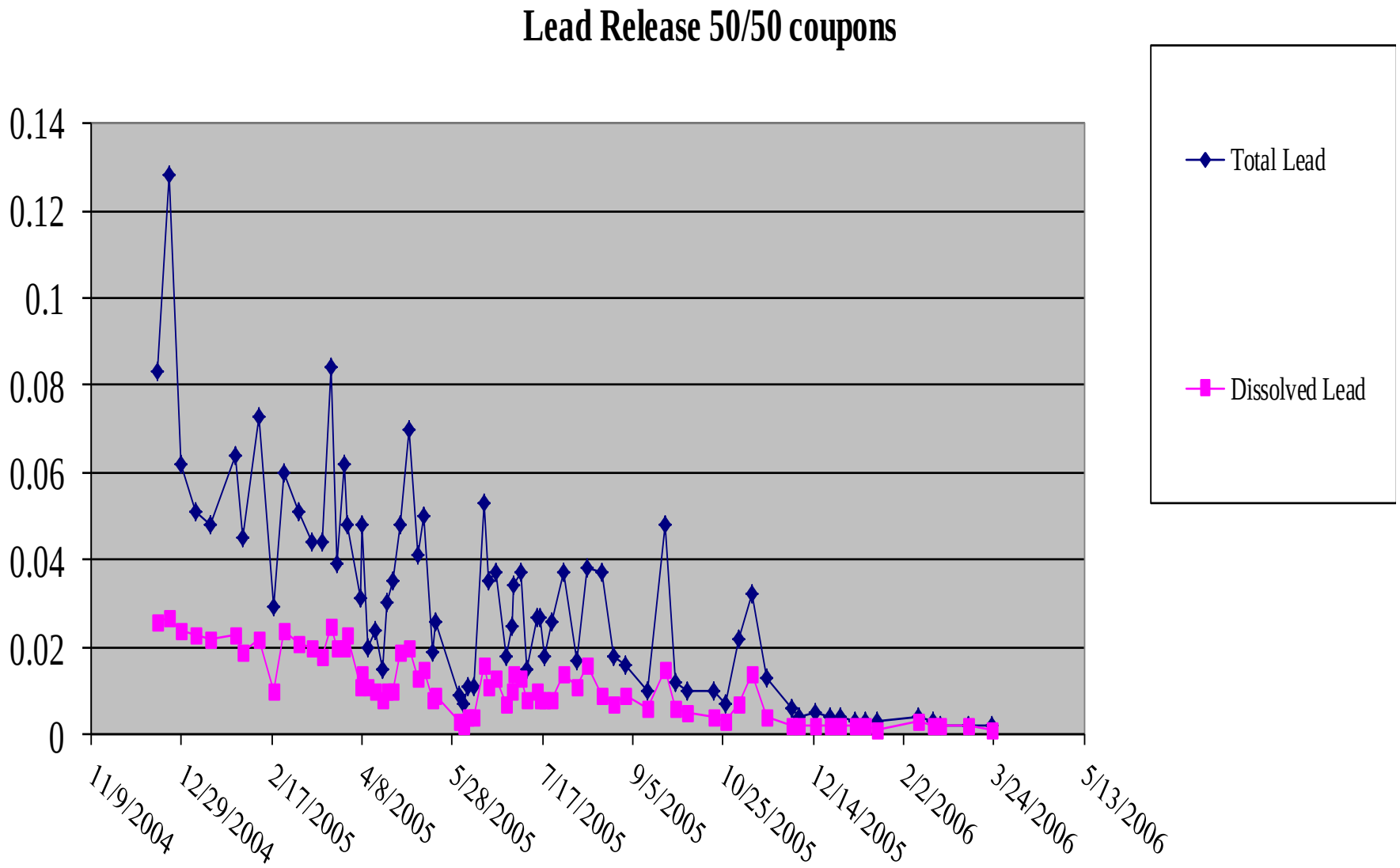
- Based upon Ideal Pipe Loop concept
- Use solenoid driven system to simulate home water use/materials contact times for 50 50 lead tin and brass (8 % leaded).
- Collect “first draw” 1 liter grab samples
- Continue to track passivation impact on home plumbing metal release overtime.

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
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
11/9/2004
12/29/2004
2/17/2005
4/8/2005
5/28/2005
7/17/2005
9/5/2005
10/25/2005
12/14/2005
2/2/2006
3/24/2006
5/13/2006
Total Lead
Dissolved Lead

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 though retention time management.
- These optimization activities continued to be implemented using a complementary framework.

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MASSACHUSETTS WATER RESOURCES AUTHORITY
2011 WINNER
BREWSTER WATER DEPARTMENT
2012 WINNER
MASSACHUSETTS WATER RESOURCES AUTHORITY
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2015