DC WASA Update

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Future of Engineering & Water Quality
Into the Next Century
New York City

Acknowledgments

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Media Coverage of the Lead Issue was Intense

In 2004, there were

- **More than 230 articles in *The Washington Post* alone**
- **More than 120 stories on local television and radio stations**
- **One New Proposed Bill in Congress**
- **Numerous DC City Council and Congressional hearings**
- **At least one reference to DC's water in the TV show "The West Wing"**

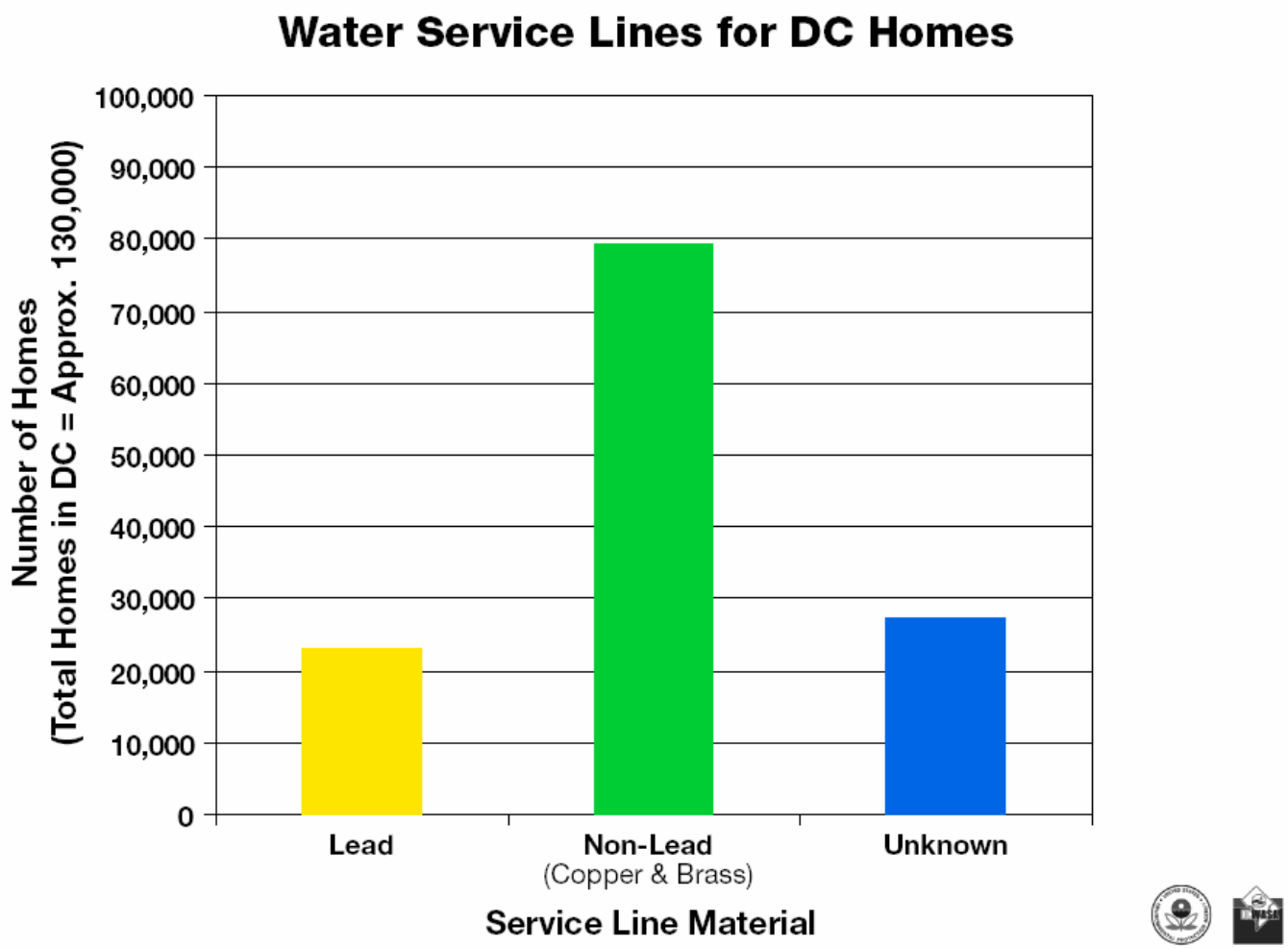
Purpose of this Presentation

- Give an overview of water quality with respect to lead
- Focus on research done to find out why lead levels increased and identify the best way to reduce them
- Provide an update on orthophosphate treatment

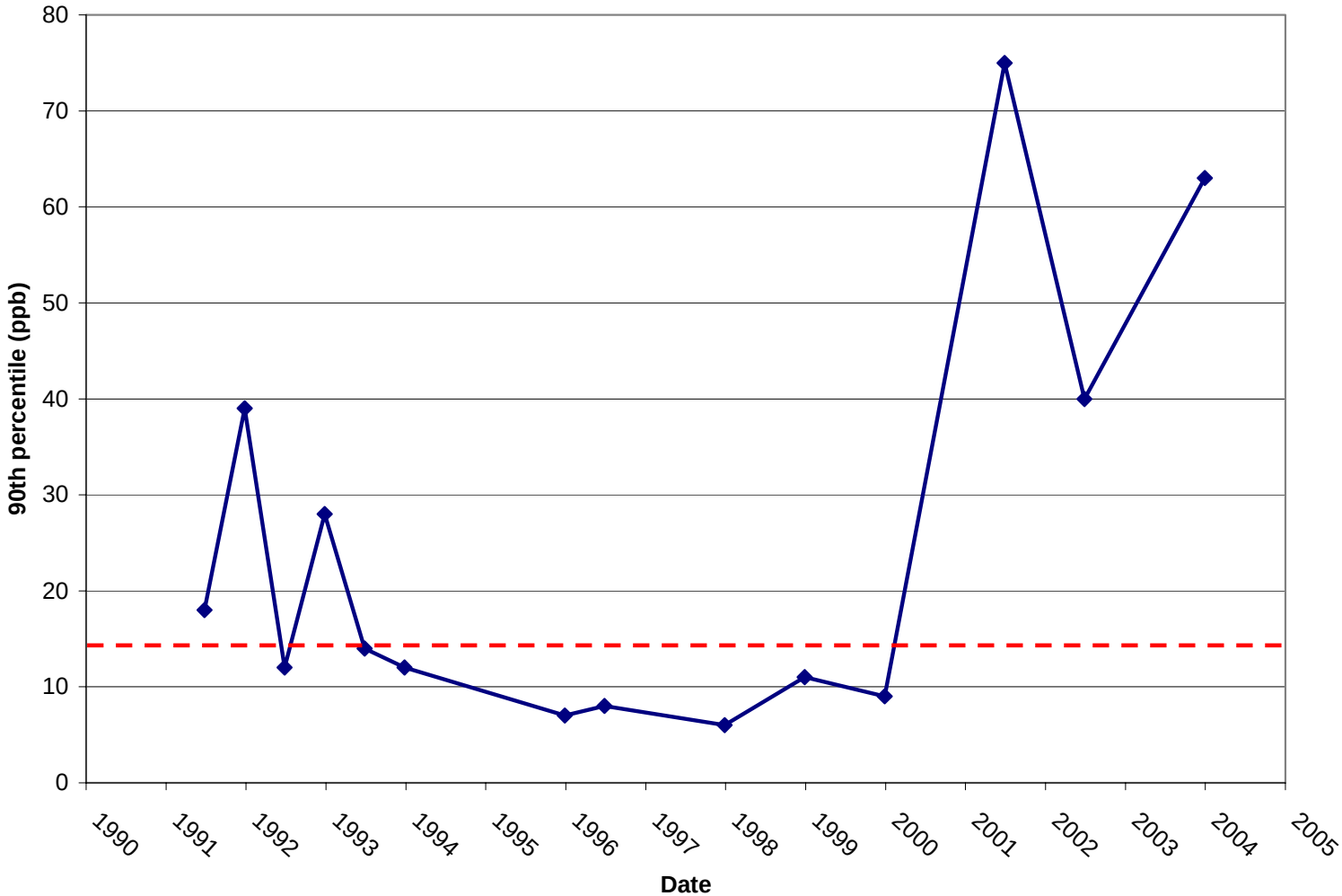
Water Treatment Processes

- Potomac River is source
- Two conventional treatment plants:
  - Dalecarlia, 115 MGD Capacity
  - McMillan, 120 MGD Capacity
- Primary disinfection using chlorine
- In November 2000, switched from chlorine to chloramines for secondary disinfection

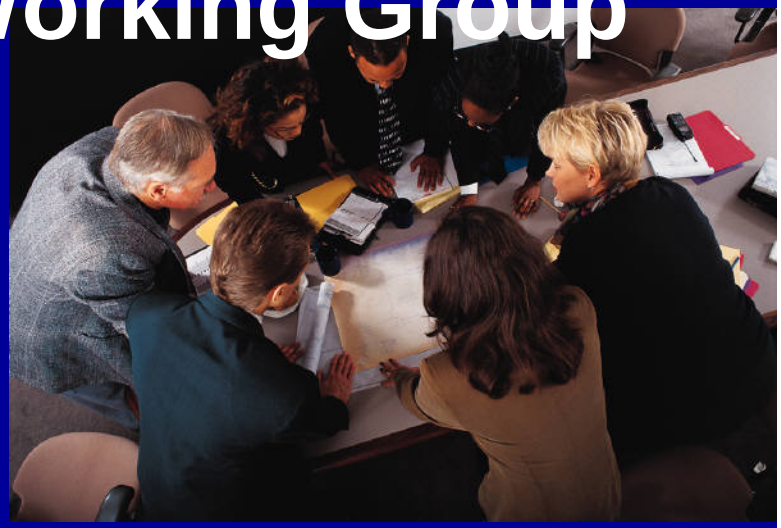
DC WASA Distribution System (cont.)



History of Lead Levels in DC



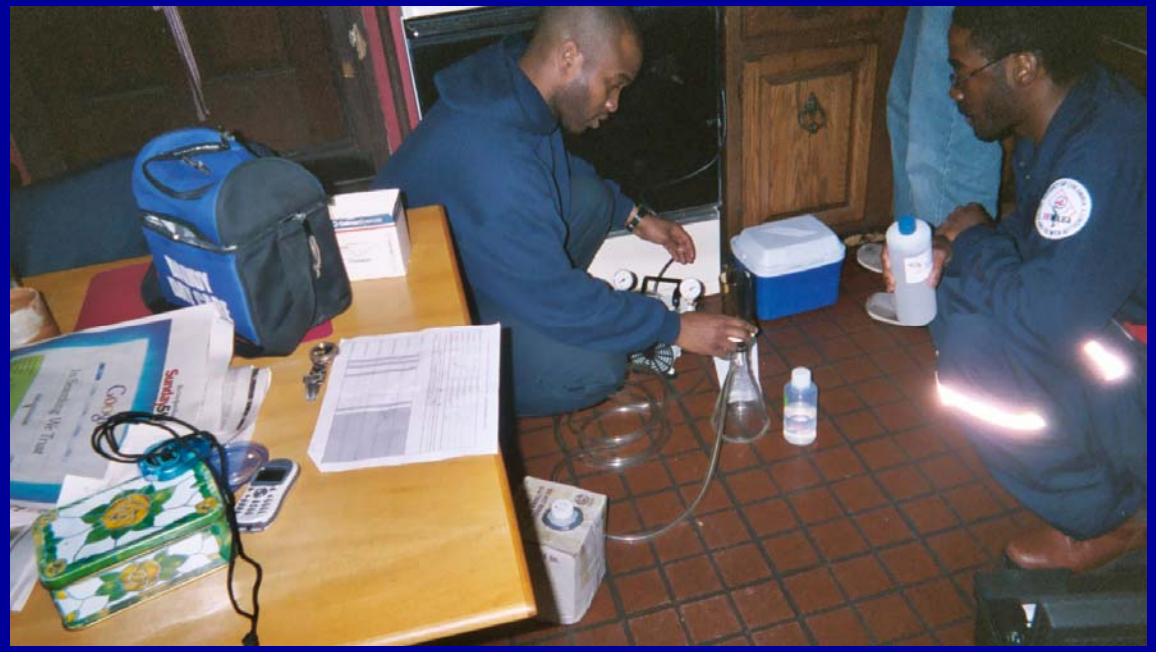
The Technical Expert Working Group



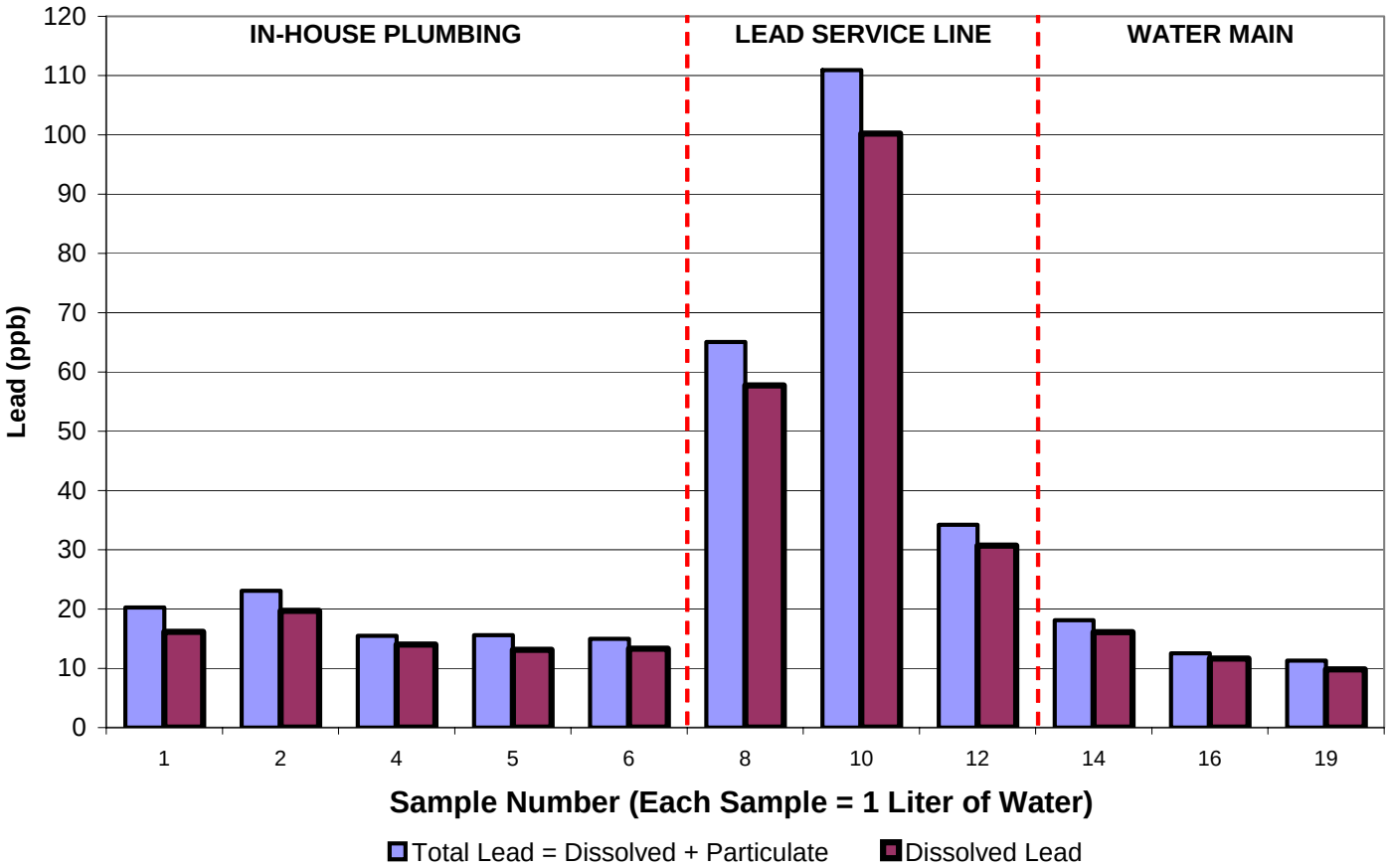
- Formed in early 2004
- Cooperative effort among:
  - WASA, Washington Aqueduct, EPA, DC Department of Health, CDC, Arlington County DPW, Falls Church DES, outside consultants
- Charge:
  - Coordinate ongoing research efforts
  - Develop a strategy to reduce lead in drinking water

Key Question: From Where is the Lead Leaching?

- Suspected from lead service lines, but could be coming from leaded brass fixtures, lead solder, etc.
- WASA conducted **Lead Profiling** of homes with lead service lines

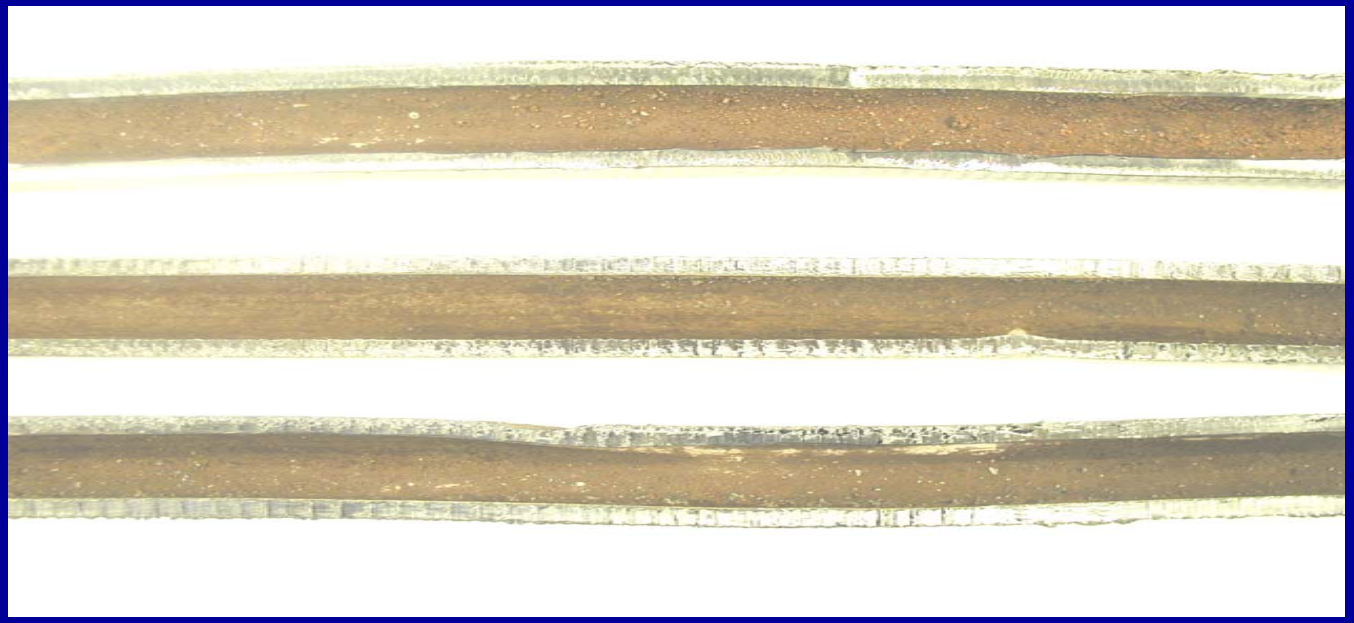


The Culprit: Lead Service Lines



Getting at the Source: LSL X-Ray Diffraction

- Done by EPA Office of Research and Development in Cincinnati



The Working Theory

Before 2000, chlorine was oxidizing the lead and keeping it on the pipes. When chlorine was replaced with chloramines in late 2000, the lead was no longer being oxidized and began dissolving very slowly into the water.

Lab Tests

Dissolved lead

Lead + Chlorine

Lead + Chloramines

Support for the Working Theory

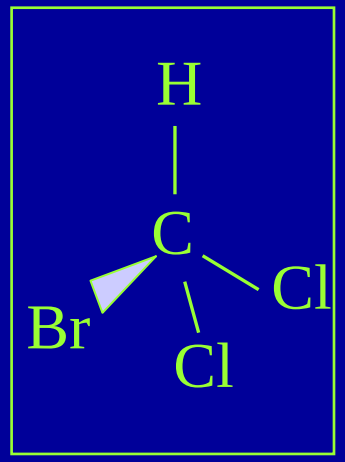
Field

- WASA initiated a “chlorine burn” in April 2004.
- Lead levels steadily decreased while system was on free chlorine

Why Not Switch Back to Free Chlorine?

- Original conversion to chloramines was done to reduce levels of disinfection byproducts

- Some disinfection byproducts have been shown to cause cancer and reproductive effects. Changing back to chlorine would increase risks for all customers and might cause DC WASA to exceed federal standards for disinfection byproducts.



Bromodichloromethane

Finding the Best Treatment to Reduce Lead Leaching

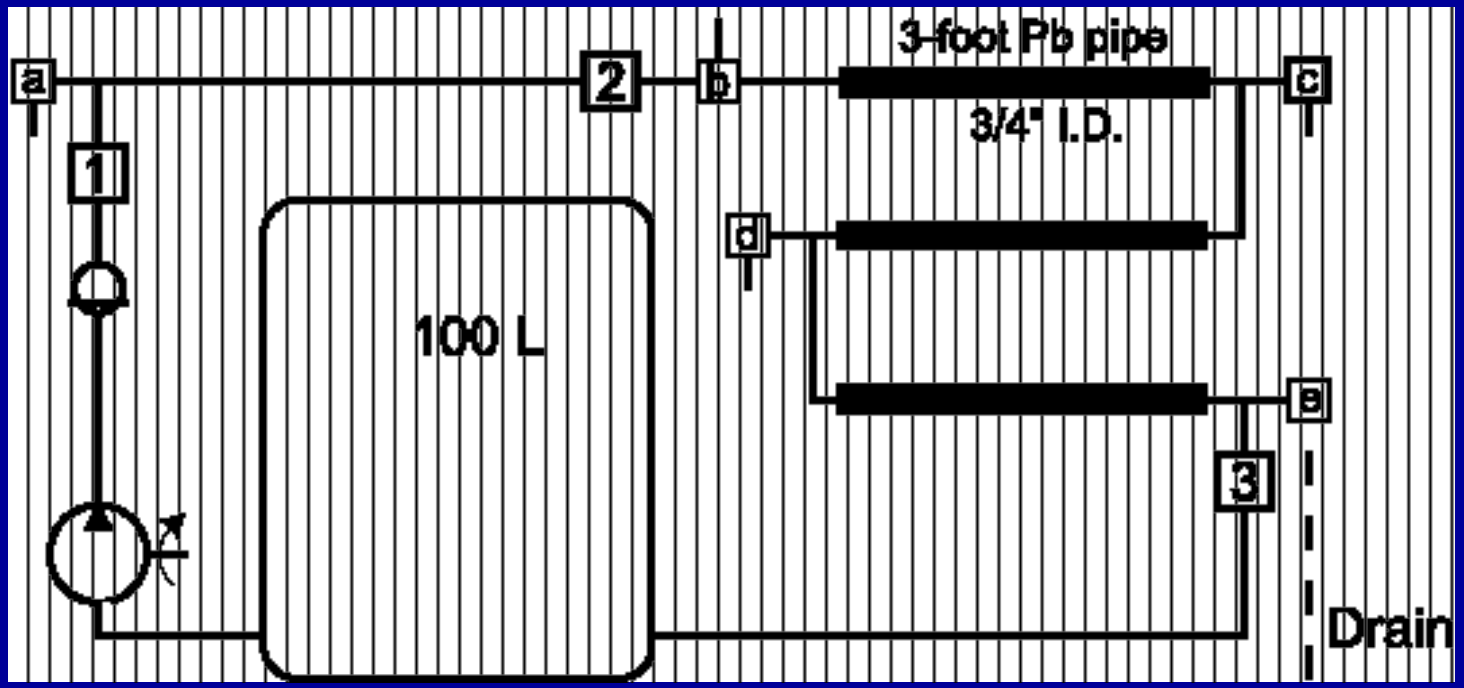
Combination of tools:

- Desktop studies
- Computer models
- Pipe loop testing

Desktop Corrosion Control Study

- Completed in April 2004
- RECOMMENDATION
  - Add **orthophosphate** for corrosion control

Pipe Loop Testing:
1. Stagnation Loop Tests



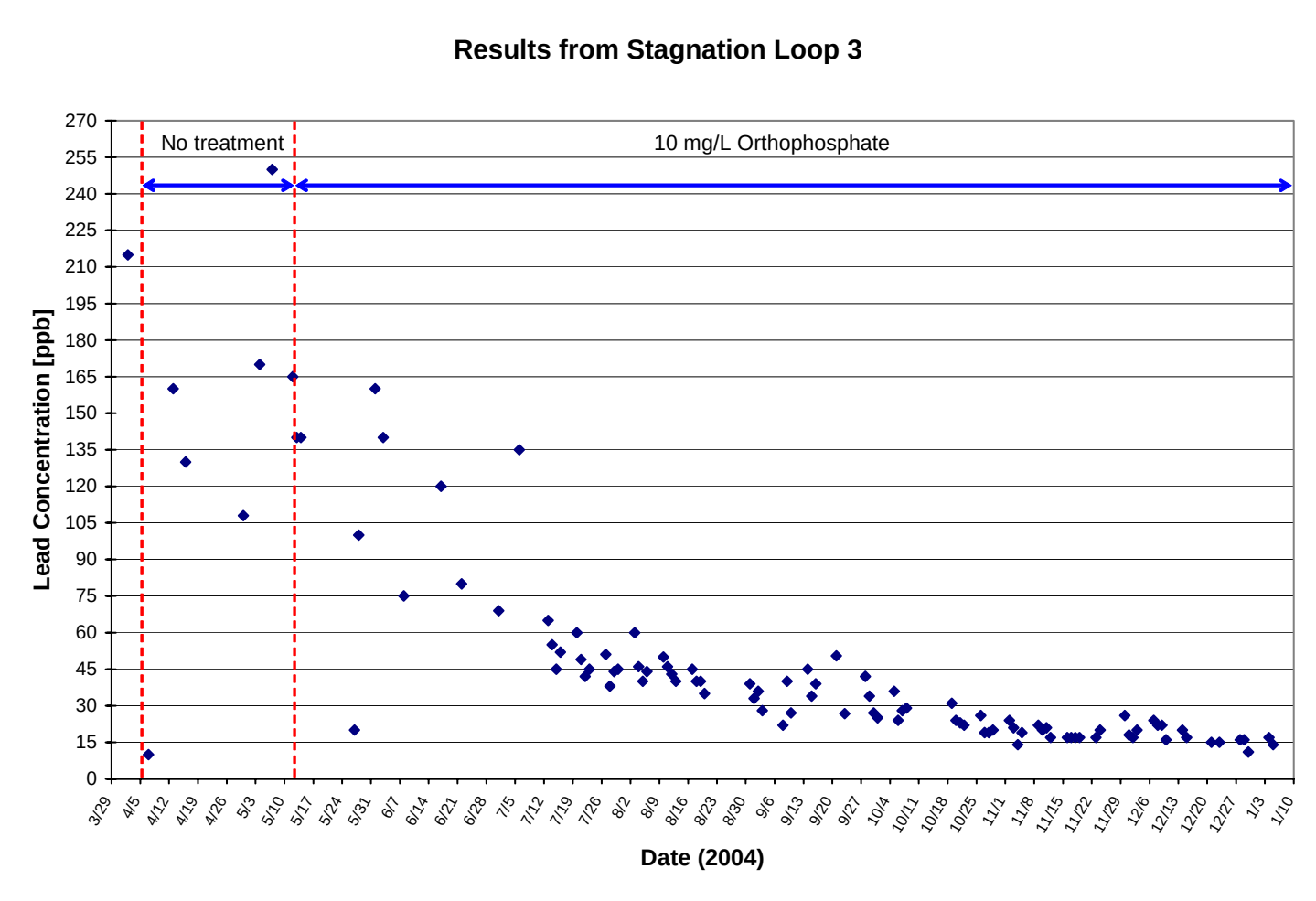
- **Six loops** constructed to test different corrosion control strategies (pH adjustment, orthophosphate, polyphosphate).
- Strategies were tested with different disinfectants (e.g., low and high chloramine level, free chlorine)

Pipe Loop Testing:
2. Electrochemistry Loop Tests

- Six loops constructed, chemical regimes similar to stagnation loop tests
- Tracks metals release and corrosion rate (mils/year) for different chemical regimes

Pipe Loop Testing: Results

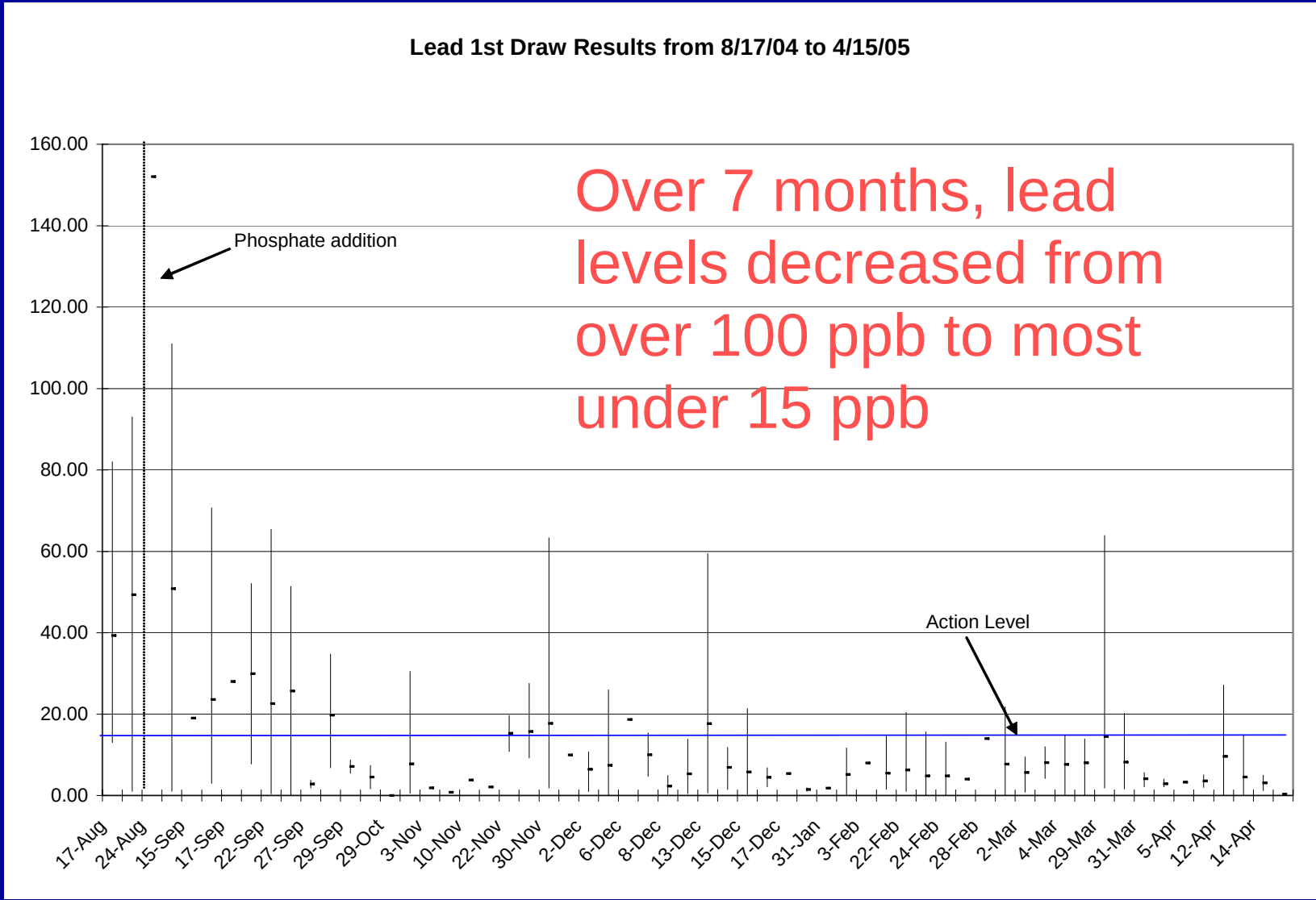
- Orthophosphate reduced lead leaching in 3 separate loops
- Treatment expected to take time to work



Implementation of New Treatment

- June 2004: Partial system application to evaluate potential for red water, bacteriological growth
  - *RESULTS: low incidence of problems*
- June through August 2004: Outreach to DC residents
- August 2004: Full Scale treatment begins, target residual orthophosphate level = 3.0 mg/L.

Impact of Orthophosphate Treatment



Over 7 months, lead levels decreased from over 100 ppb to most under 15 ppb

Provided by Rich Giani, DCWASA

Public Health Concerns

–Blood Lead level of concern:

–Adults - 25 ug/dL

–Pregnant mothers and children under six – 10 ug/dL

–99% of population tested (5331 people) had blood lead levels below concerned lead levels

–Most people with elevated levels did NOT have a lead service line

Continuing Research

- Continuing studies using recirculation pipe loops
- New flow through pipe loop studies to refine treatment
- Additional LSL scale work using X-ray diffraction
- New studies to evaluate:
  - Impact of galvanic corrosion on lead release
  - pH management strategies
  - Comparison of orthophosphate and zinc orthophosphate

For More Information:

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- www.epa.gov/dclead

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