

Lead and Copper Rule



Stakeholder Meeting on Long-term Revision Issues

**Office of Ground Water & Drinking Water,
USEPA**

November 4, 2010, Philadelphia PA

LCR: A Quick Overview

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Office of Ground Water and Drinking
Water. November 4, 2010

Lead and Copper Rule (LCR)

- National Primary Drinking Water Regulation (NPDWR) promulgated **June 7, 1991**
 - Addresses corrosion of lead and copper in drinking water
 - primarily from service lines and household plumbing
 - Maximum Contaminant Level Goals (MCLG)
 - Lead – 0 µg/L
 - Copper – 1.3 mg/L
 - Requires a treatment technique (optimized corrosion control) rather than a Maximum Contaminant Level (MCL)
 - Tap sampling results are compared to an action level
 - Lead - 15 µg/L
 - Copper - 1.3 mg/L
 - Action level for lead is a screen for optimal corrosion control as part of the treatment technique. It is based on treatment feasibility; NOT on a health threshold

Actions Triggered Under Action Level Exceedance

- If the 90th percentile of a system's lead sampling results exceed the action level, a system must:
 - Optimize corrosion control (for systems < 50,000 people)
 - Identify and install optimal corrosion control treatment
 - Comply with State-specified optimal water quality parameters
 - Public Education
 - Mandatory language for pamphlets and brochures on lead
 - Deliver materials to all bill-paying customers
 - Deliver materials to organizations that serve sensitive subpopulations (e.g., schools, pediatricians)
 - Lead Service Line Replacement
 - replace the portion of the lead service lines system owns
 - offer to replace the customer's portion of service line at cost
 - lines where samples are below action level may also be considered replaced
 - replace 7% of the lead service lines each year

LCR in Process: 2004 National Review

- Review of Data
- Review of Implementation
- Expert Workshops
 - Simultaneous Compliance
 - LCR Monitoring Protocols
 - Public Education
 - Lead Service Line Replacement
 - Lead in Schools and Childcare Facilities

2005 Drinking Water Lead Reduction Plan

- ✓ Expert Workshop on Plumbing Fittings and Fixtures (July, 2005)
- ✓ Update guidance on Lead in Drinking Water in Schools and Non-Residential Buildings (3 T's Toolkit), Jan, 2006)
- ✓ Update 1999 guidance on Simultaneous Compliance (May, 2007)
- ✓ Targeted Revisions to the Lead and Copper Rule (October, 2007)

Other “Long Term” Actions Taken

- 2006 NDWAC Recommendations for proposed changes to regulatory requirements for public education.
 - Incorporated into the October, 2008 revisions to the Lead and Copper Rule
- 2007 Revisions to NSF/ANSI Standard 61
- 2008 Stakeholder Workshop

Why are we here today?

- EPA is in the process of developing proposed revisions to the Lead and Copper Rule and identifying other actions the Agency can undertake (e.g., Guidance).
- We want your input –
 - Issues and options to address those issues
 - Working towards proposed revisions in 2012.

Lead and Copper Rule: Long-Term Revisions

A Presentation of Possible Revisions to the Tiering Criteria

Matt Robinson: Office of Ground Water and Drinking Water
November 4, 2010

Goals

- Provide information on long-term LCR issues under consideration for revision
- Receive/discuss feedback on revising lead and copper site selection criteria

Tiering Classification for CWSs

CWSs – Current Criteria

Tier I sampling sites are single family residences (SFRs):

- with copper pipes with lead solder installed after 1982 (but before the effective date of the State's lead ban) or contain lead pipes; and/or
- that are served by a lead service line.

Note: Multiple-family residences (MFRs) may count as Tier 1 sites when they comprise at least 20% of the structures served by the water system.

Tier 2 sampling sites consist of buildings, including MFRs:

- with copper pipes with lead solder installed after 1982 (but before effective date of the State's lead ban) or contain lead pipes; and/or
- that are served by a lead service line.

Tier 3 sampling sites are SFRs with copper pipes having lead solder installed before 1983.

CWSs – Possible Revised Criteria

Tier I sampling sites are single family residences (SFRs) that contain lead pipes and/or are served by a full or partial lead service line.

Note: Multiple-family residences (MFRs) may count as Tier 1 sites when they comprise at least 20% of the structures served by the water system.

Tier 2 Sampling sites consist of MFRs that are served by a lead service line in which a portion of the line has been replaced with a non-lead service line (i.e., the water system has conducted partial lead service line replacement as described in §141.84(d).

Tier 3 sampling sites are SFRs and/or MFRs with copper pipes with lead solder.

Possible Changes for Lead

- Remove date requirements
- Update tiering to reflect current variety of lead sources

Possible Modified Tiering Classification for CWSs

CWSs – Current Criteria

Tier 1 sampling sites are single family residences (SFRs):

- with copper pipes with lead solder installed after 1982 (but before the effective date of the State's lead ban) or contain lead pipes; and/or
- that are served by a lead service line.

Note: Multiple-family residences (MFRs) may count as Tier 1 sites when they comprise at least 20% of the structures served by the water system.

Tier 2 sampling sites consist of buildings, including MFRs:

- with copper pipes with lead solder installed after 1982 (but before effective date of the State's lead ban) or contain lead pipes; and/or
- that are served by a lead service line.

Tier 3 sampling sites are SFRs with copper pipes having lead solder installed before 1983.

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Tier 3 sampling sites are SFRs and/or MFRs with copper pipes with lead solder.

Possible Modified Tiering Classification for NTNCWSs

Current Criteria

- Tier 1 sampling sites consist of buildings:
- with copper pipes with lead solder installed after 1982 (*but before the effective date of the State's lead ban*) or contain lead pipes; and/or
 - that are served by a lead service line.

Tier 2 sampling sites consist of buildings with copper pipes with lead solder **installed before 1983**.

Tier 3: **Not applicable.**

Possible Revised Criteria

Tier 1 sampling sites consist of buildings that **contain lead pipes** and/or are served by a lead service line.

Tier 2 sampling sites consist of buildings that are **served by a lead service line in which a portion of the line has been replaced with a non-lead service line** (i.e., the water system has conducted partial lead service line replacement as described in §141.84(d)).

Tier 3 sampling sites are buildings with copper pipes with lead solder.

Possible Changes for Copper

- Maintain lead and copper site selection criteria, but include additional sampling for new copper installations
 - Public education component, regular monitoring until passivation
- Separate site selection criteria for copper
 - Form tiering criteria for copper which reflects the behavior of copper in newer plumbing

Key Questions and Considerations

- Will changes to the sample site selection criteria necessitate an updated materials survey?
- What will be the burden to systems?
- Are tiering revisions likely to decrease exposure? Simplify, or at least not further complicate implementation?

Comments and Feedback?

Lead Service Line Replacement

Jeffrey Kempic

Targeting and Analysis Branch, SRMD,
OGWDW

November 4, 2010 Stakeholder Meeting
Philadelphia, PA

LCR Requirements

Lead Service Line Replacement

- Systems affected – systems exceeding the lead action level (AL) after installation of corrosion control treatment (CCT) are in the lead service line replacement program (LSLRP)
- Duration – 15 years or until system meets lead AL in two consecutive 6-month monitoring periods
- What is considered “replaced”?
 - Sites where lead levels from all service line samples are at or below 15 ppb
 - Physical replacement of at least the portion under the system’s control (control = ownership in 2000 LCR Minor Revisions Rule)
 - Full replacement where home owner pays for removal of the portion of the line that they own

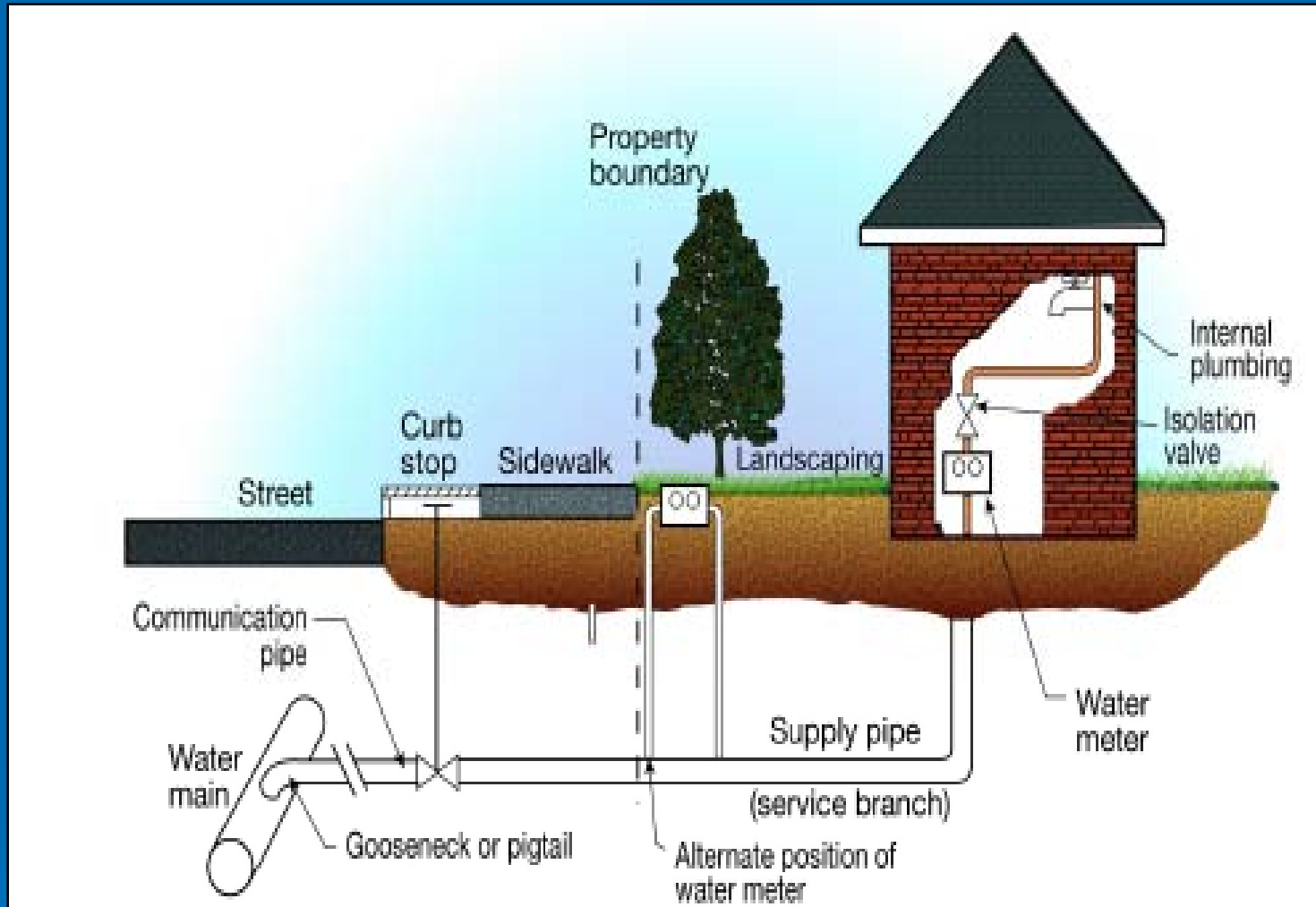
1991 LCR

Definition of “Control”

- Water system was required to replace the entire service line unless it could demonstrate that it controls less than the entire service line
- “Control” included:
 - Authority to set standards for construction, repair, or maintenance of the line
 - Authority to replace, repair, or maintain the service line
 - Ownership of the line
- Provision was remanded by Court
 - Basis – Notice and Comment
 - Court did not rule on legality of the definition of control

LCR Requirements: Partial Lead Service Line Replacement

- Notify residents at least 45 days prior to partial replacement
 - Provide information on possibility of elevated short-term lead levels
 - Measures to minimize exposure
- After partial LSL replacement at a site
 - Collect sample representative of water in the partially-replaced LSL within 72 hours after replacement
 - Report results to owner and residents within 3 business days
- Sample is not intended to assess the effectiveness of the partial LSL replacement
 - Intended to reinforce pre-replacement notification
 - Sample would most likely come from remaining lead portion of line
 - Can be long gap between sample collection and receipt of results



60-67 ft total (utility 20-27 ft.) (Weston and EES 1990)

55 ft total (utility 25 ft.) (older areas)

68 ft total (utility 27 ft.) (newer areas) (AwwaRF 2008)

Partial Lead Service Line Replacement Studies

➤ Limitations

- Many studies are voluntary replacements - not directly comparable to LCR
 - System meets lead AL
 - Many of the sites may meet AL
 - Lead levels likely to be lower at sites, which may limit reductions
- Sampling Protocols
 - Many use first draw samples
 - Very few use long-term profile sampling to fully examine impact of partial LSL on lead levels

PLSL Studies for 2001 LCR Minor Revisions Rule

➤ Case Studies

- Glasgow, Scotland – one site
 - First Draw and Random Daytime Draw samples
 - Very long service line – 10 meters replaced from 36 meter line
 - Lead levels >> Lead AL
 - Samples taken over 2-week period before replacement and one week, two months and four months after partial replacement
 - Average concentration at four months is 25% lower than before replacement
 - Lead levels still > AL

PLSL Studies for 2001 LCR Minor Revisions Rule

➤ Case Studies

- Newport News – 1987 – nine sites
 - Samples collected at meter
 - Study predates LCR
 - Some sites $> AL$, others $< AL$
 - Samples taken – before replacement, just after replacement and two weeks after replacement
 - Lead levels at all sites two weeks after replacement \leq before replacement

PLSL Studies for 2001 LCR Minor Revisions Rule

➤ Case Studies

- Oakwood, OH – four sites
 - Multiple service line samples – 250 mL
 - Lead levels at sites < AL
 - Samples taken before replacement and over a 2-week period appr. 6 weeks after replacement
 - Lead levels at 3 of 4 sites were below the before replacement levels by second week of sampling
 - Fourth site only tested once at beginning of sampling period – slightly higher lead 8 ppb vs. 6 ppb

Recent PLSL Studies

- GCWW (Swertfeger et al, 2006)
 - 21 Sites – 5 no replacement, 5 PLSL, 6 PLSL w/Teflon sleeve, 5 full replacement
 - First draw (FD), 3-min flush, 10-min flush samples of 750 mL
 - Most before replacement samples > lead AL; pH adjusted from 8.5 to 8.8 prior to post-replacement sampling
 - Samples taken before replacement, week after replacement and monthly for a year
 - FD lead levels below pre-replacement levels within one month
 - Similar trend in 3-min flush samples taken at PLSL site in Figure 2 of article
 - Steady state average FD lead data: No replacement > PLSLR > PLSLR w/sleeve > FLSLR
 - FD lead levels at no replacement sites lower after pH adjusted from 8.5 to 8.8

Recent PLSL Studies

➤ AwwaRF 2008

- Two sites – different utilities
- First draw and profile sampling – sequential samples
- One site $>$ AL, one site $<$ AL before replacement
- Samples taken before, 1, 2, and 3 days after replacement and 1 and 2 months after replacement
- Table 3.10 shows
 - Site $>$ AL, 1st liter lead 2 months after replacement $>$ before replacement, but still below AL
 - Site $<$ AL, 1st liter lead 2 months after replacement $<$ before replacement, but still above AL
 - Both sites, total lead based on all samples from profile showed a small reduction in total lead after two months

Recent PLSL Studies

- Guelph, Ontario, Canada (Muytwyk et al, 2009)
 - 2 sites
 - Profile sampling - 8 sequential 1-liter samples after 30-min stagnation
 - Sites > AL, no corrosion control at utility
 - Samples taken before replacement and after replacement at:
 - 1, 2, and 3 days
 - 1, 2, 3, 4 weeks
 - 2 and 3 month
 - Quarterly up to one year
 - Site 3
 - Spikes above before replacement levels up to week 4
 - Small reduction in maximum of first two liters after 1 year
 - Site 5
 - All samples below before replacement levels
 - Very large reduction in maximum of first two liters after 1 year

Recent PLSL Studies

➤ DC WASA (HDR Study – 2009)

- Four sites have both pre and post-replacement samples from PLSL sites – all have some galvanized interior plumbing
- Profile sampling
- Samples taken before replacement and
 - 1 day after replacement
 - 2, 4, and 8 weeks after replacement
- Results
 - G1: Some Pre-LSL samples $>$ AL; 8 weeks results all $<$ AL and PLSL $<$ Pre-LSL
 - G2 : All in-house & service line Pre-LSL samples $>$ AL; 8 weeks results PLSL $>$ Pre-LSL in lead portion & PLSL $<$ Pre-LSL in new copper portion
 - G3: Site $<$ AL; 8 weeks results all $<$ AL; and PLSL $<$ Pre-LSL
 - M1: Some Pre-LSL $>$ AL; 8 weeks results all $<$ AL; and PLSL \leq Pre-LSL

Centers for Disease Control Statements on Partial LSLR

- September 4, 2009 Letter to DC WASA
 - Examined blood lead level (BLL) data from 1999 – 2006
 - Risk of elevated BLLs > 10 ug/dL at partial LSL replacement sites is four times higher than sites **without a LSL**
 - Risk assessors perspective
 - Risk managers perspective not addressed – how partial LSLs compare to undisturbed LSLs
- January 12, 2010 Letter to Lead Program Managers
 - Preliminary results suggest that children at PLSLR sites are more likely to have elevated BLLs than children at sites with undisturbed LSLs or sites without LSLs
- June 25, 2010 Morbidity and Mortality Weekly Report (MMWR)
 - Preliminary results suggest that partial LSL replacement does not decrease and might increase BLLs

Risk Management Challenges

- There are no water lead data for sites
- Blood lead sample timing
 - Partial LSL replacement occurred AFTER the spike in lead levels following treatment changes in November 2000 – few LSL replaced before 2004
 - Depending upon the age of the child when tested, there could be considerable exposure to elevated lead levels while line was undisturbed prior to partial LSL replacement
 - May be hard to distinguish if elevated BLLs are from chloramines w/o orthophosphate period or partial LSL replacement or both
- Multiple treatment regimes in the 1999 – 2006 timeframe: high free chlorine, chloramines, chloramines plus orthophosphate transition, chloramines plus orthophosphate

PLSLR Data Summary

➤ Water Lead Data

- Most from voluntary programs
- Limited profile sampling
- Some sites > Lead AL
- Case studies generally show sites at or below pre-replacement lead levels within 8 weeks or less

➤ Blood Lead Data

- Unknown at this time
- Have to resolve the risk management challenges

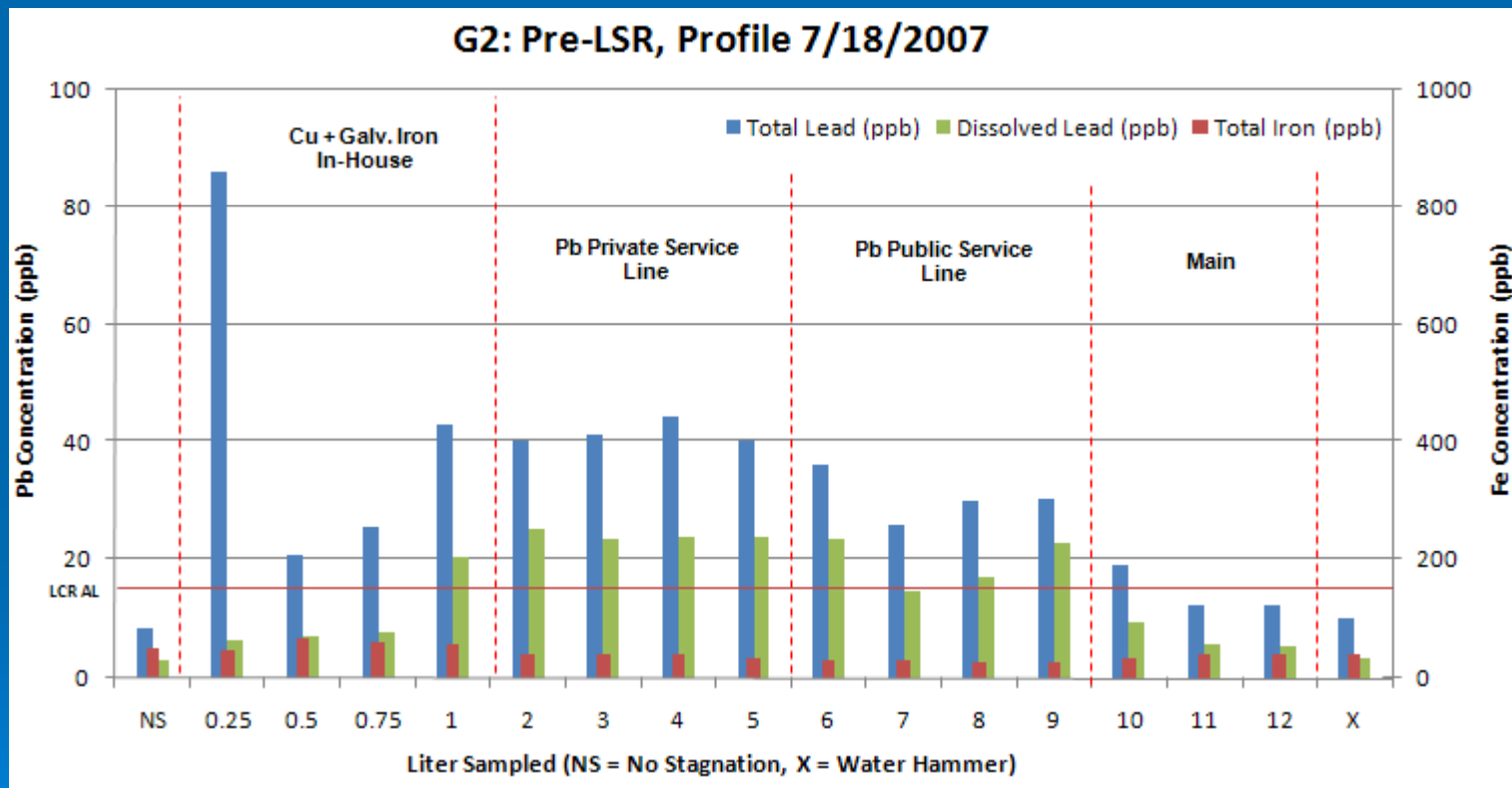
PLSL versus Undisturbed LSLs

- One of the concerns with partial LSL replacement is that consumers may be exposed to spikes of elevated lead levels for some duration
- Could this also happen in undisturbed lead service lines, even when corrosion control has been optimized and levels are below the action level?
- What are the implications in systems where corrosion control treatment has not brought the system under the lead action level?
 - Systems required to conduct a lead service line replacement program under the current LCR

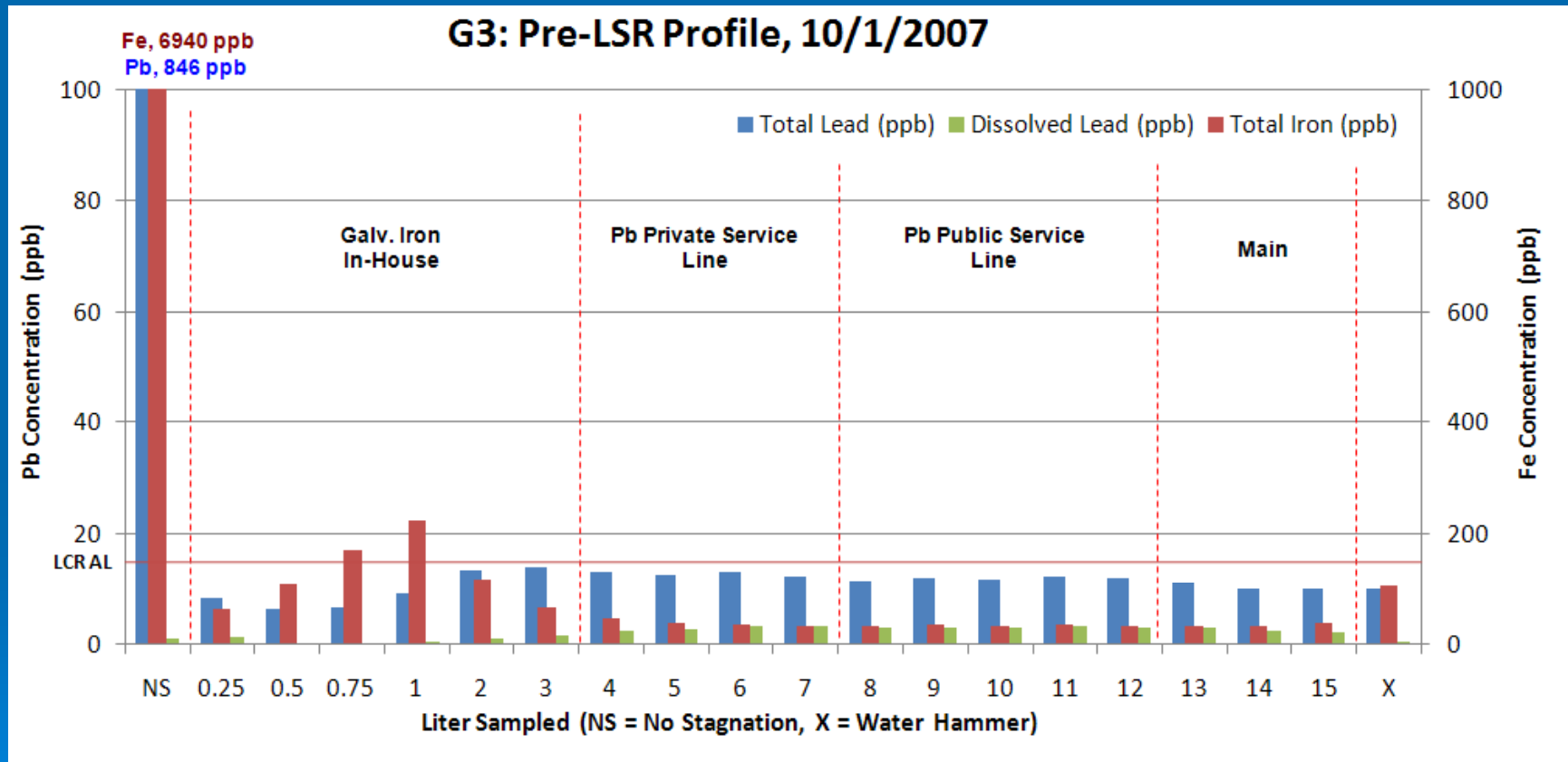
Lead Released from Galvanized Piping – Washington, DC

- Study Conducted by HDR Engineering
- Focused on sites with lead service lines and internal galvanized plumbing because of recurring instances of elevated concentrations of lead and iron in tap monitoring
- Key Conclusions:
 - Galvanized iron plumbing can serve as a sink/source for lead
 - Lead-rich corrosion scale on galvanized plumbing (rust) can be a lead source in drinking water after initial sources have been removed (LSL, even after full LSLR)
- Key Recommendation:
 - Full replacement of LSL and interior galvanized plumbing is the most desirable option
 - Use of certified filters to remove lead at the tap is also an acceptable alternative

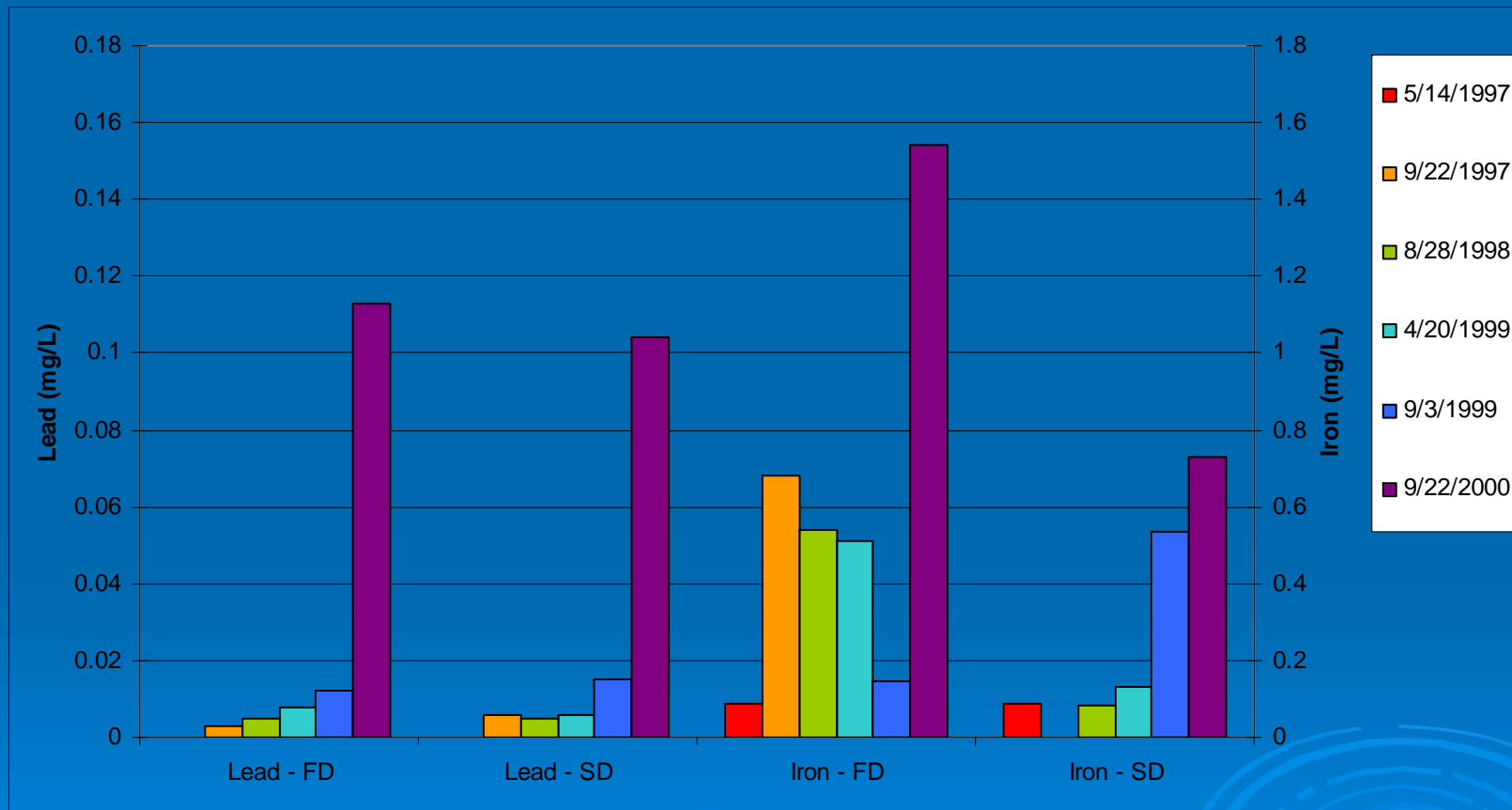
Site G2 – HDR Study Orthophosphate Optimization



Site G3 – HDR Study Orthophosphate Optimization



Site 52 – LCR Tap Results Pb(IV) Optimization



Lead Spikes at Sites with Undisturbed LSLs

- Sites G2, G3, and 52
 - Lead spikes or elevated levels can be observed at undisturbed LSLs even with optimal corrosion control – OPO4 & Pb(IV)
 - LSLs are source for lead-rich corrosion scale in old galvanized plumbing
- GCWW Data
 - pH 8.5 for initial sample collection (later adjusted to 8.8)
 - 16 of the 21 sites had first draw lead above the AL with high of 58 ppb
 - Even after pH adjustment to 8.8, first draw samples from one of the five undisturbed LSLs was often above the AL with a high over 30 ppb
- Systems above the action level (FD) are likely to have more LSL sites where such spikes could occur and the magnitude of the spikes could be higher

Partial Lead Service Line Replacement Issues

- Possible Actions for Current Mandatory LSLR:
 - Retain existing language on partial LSL replacement
 - Retain existing language on partial LSL replacement and collect profile sampling data where mandatory partial LSL replacement is occurring
 - Eliminate partial LSL replacement
 - Require full LSL replacement
 - revise definition of “control” – currently equals ownership
 - procedural remand of definition in 1991 rule
 - Provide alternative action when action level is exceeded:
 - Lining of lead service lines (currently collecting data on effectiveness and possible ORD Infrastructure STAR grant)
 - Point-of-Use treatment devices

Partial Lead Service Line Replacement Issues

- Voluntary partial LSL replacement
 - Not covered by the rule at all
 - Existing data do show short-term increases, so an action level exceedance would be a possibility
 - Should there be notification and sampling requirements for these instances?
 - Would such requirements be legal under the Safe Drinking Water Act?
 - How would these requirements be imposed and enforced when the systems are in compliance with the rule?

Comments and Feedback?

National Primary Drinking Water Regulations for Lead and Copper: Long-Term Revisions

A presentation on options for lead
testing in drinking water in schools
and child care facilities

Francine St. Denis Ph.D.: EPA's Office of Ground Water and
Drinking Water
November 4, 2010

Regulatory Authority for Controlling Lead Levels in Drinking Water

- THE LEAD BAN (1986): A requirement that only lead-free materials be used in new plumbing and in plumbing repairs.
- THE LEAD CONTAMINATION CONTROL ACT (LCCA) (1988): The LCCA further amended the SDWA. The LCCA is aimed at the identification and reduction of lead in drinking water at schools and child care facilities. *However, implementation and enforcement of the LCCA has been at each state's discretion. School monitoring and compliance has varied widely.*
 - **There is NO federal law requiring schools or child care centers to test drinking water for lead**
- THE LEAD AND COPPER RULE (1991): A regulation by EPA to minimize the corrosivity and amount of lead and copper in water supplied by public water systems.

Lead in Schools and Child Care Facilities

Drinking Water Background

- All schools were subject to the 1988 Lead Contamination Control Act
 - Required removal of lead-lined water coolers in schools and child cares
 - Required EPA to develop guidance and a testing protocol
 - Created voluntary school and child care facility monitoring program
 - Required schools which monitor to make their results publicly available
- On December 7, 2004, the EPA convened a meeting on the topic of Lead in Drinking Water in Schools and Child Care Facilities.
- EPA developed a lead action plan which included a commitment to undertake efforts to reduce lead in drinking water in schools and child care facilities.

Lead in Schools and Child Care Facilities Drinking Water Background Continued

- EPA requested information from states on the following:
 - Existence of programs to monitor for lead in schools and child care facilities; and,
 - How EPA could support voluntary efforts to monitor.
 - A summary of responses is posted on EPA website
- States largely focus on schools and child care facilities that have their own water supply and are thus regulated under the Lead and Copper Rule.
 - Some states have programs that look beyond public water systems

Universe of Schools & Child Care Facilities



**~90,000 public schools
receive water from a public
water supplier**



**~7,677 schools/child care
centers that are regulated as
a public water supplier**



~325,000 licensed child care facilities

EPA's Lead Action Level for Schools and Child Care Facilities

- Public Water System Testing = 15 ppb action level
 - Under the Lead and Copper Rule for public water systems, a lead action level for the 90th percentile of 15 parts per billion (ppb) is established for 1 liter samples taken by public water systems at high-risk residences. The sample was designed to evaluate corrosion control effectiveness.
- Voluntary Testing at Schools & Child Care Centers = 20 ppb AL
 - EPA recommends that schools and child care facilities collect 250 mL first-draw samples from water fountains and faucets, and that the water fountains and/or faucets be taken out of service if the lead level exceeds 20 ppb. The sample was designed to pinpoint specific fountains and faucets that require remediation (e.g., water cooler replacement).

Issues Related to Lead Testing in Schools and Child Care Facilities

- Non-Transient Non-Community Water Systems do not have a separate sampling protocol, despite the different plumbing configurations as compared to single family residences.
- If a requirement to test in schools and child care facilities that are served by a public water systems was added to the Lead and Copper Rule, how would sampling be conducted.
- Sampling under the 3Ts guidance for schools and child care facilities has a different sampling protocol and goal of sampling than the Lead and Copper Rule.
- Sampling time frame (June – Sept) for systems on reduced monitoring is typically when schools are closed, significantly reducing the available time for a water system to collect a sample from a school facility that is served by a community water systems.

Possible Changes to Lead and Copper Rule

- Modify the Lead and Copper Rule to include sampling protocol for non-residential buildings.
- Require all community water systems to sample a specific number of schools and child care facilities in the compliance monitoring period as a part of compliance sampling and included in the 90th percentile calculation; or
- Modify the Lead and Copper Rule to include a separate sampling protocol where all community water systems must sample a specific number of schools and child care facilities in the compliance monitoring period. These samples are not included in calculating the 90th %; or

Possible Changes to Lead and Copper Rule Continued

- Modify section 141.84 to include additional actions for systems that exceed an action level for lead or copper.
 - Provide specialized public education to schools and child care facilities within service area.
 - Require the public water system to offer to collect samples from schools and child care facilities in the affected areas.

Key Questions and Considerations

- How would one justify sampling only a percentage of schools within the public water system , or a percentage of taps within a school since the 3Ts guidance encourages sampling all taps.
- Are there other locations we should be targeting (i.e., hospitals)?
- 3Ts focuses on testing for lead in schools and child care facilities; however, copper is an acute contaminant. Should we be sampling for copper in schools and child care facilities as well?
- Should we specify, if all schools or child care facilities will not be tested, that the schools or licensed child care facilities to be tested should be in an underserved communities or Environmental Justice areas?

Key Questions and Considerations Continued

- Additional cost for a public water system that exceeds action level, if the public water system has schools and child care facilities in its service area.
- Additional cost for a public water system with schools and child care facilities to test schools and child care facilities in its service area but which are not a part of compliance sampling.
- Additional costs for schools and child care facilities to address problem outlets, conduct expanded testing programs, and manage communications.

Comments and Feedback?