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The Authoritative Resource on Safe Water SM

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Aaron Yeow
Science Advisory Board (1400R)
U.S. Environmental Protection Agency
1300 Pennsylvania Avenue N.W.
Washington, DC 20004

RE: Review of Technical Studies Examining the Effectiveness of Partial Lead Service Line Replacements

Dear Mr. Yeow,

The American Water Works Association (AWWA) continues to be very interested in the Science Advisory Board (SAB) Drinking Water Committee evaluation of current scientific data to determine whether partial lead service line replacements are effective in reducing lead levels in drinking water. This issue is important to AWWA's members. It will directly impact those that operate water systems with older distribution systems with some lead service lines. AWWA appreciates the work of the committee as we strongly believe that risk-management decisions should be based upon sound science. AWWA has historically and presently encourages both:

1. Removing lead from contact with drinking water through normal operation and maintenance within the home and throughout the water system and
2. Replacing the entire lead service line through collaboration between the water system and its customer.

We welcome the advice of committee to help address the issues surrounding full- and partial-lead service line replacement.

Having reviewed the preliminary draft of the committee report we understand the committee is concluding that there are not enough data to describe the impact of

full- or partial- lead service line replacement practices on lead exposure in affected structures. Moreover, the Committee has identified a number of areas where more research is needed to support sound, risk-management policy decisions.

AWWA agrees additional data is needed. Toward this end AWWA and the Water Research Foundation are collecting data, supporting new research, and encouraging sharing of information on this topic within the drinking water community. AWWA sees these ongoing activities as being as essential as the previous research and technology-transfer activities supported by the drinking water community already cited by the committee.

The committee's calls for more research underscore the difficulties posed by the current situation where policy recommendations are based upon available data that are incomplete and potentially misleading. The unavailability (or lack of in-depth analysis) of data on causal factors may be leading to misattribution of observed high lead levels to partial lead service line replacement. Given the available data, AWWA recommends that the committee review its recommendations, and reframe those that are premature, based upon the available data, as succinct, actionable research suggestions. For example, research needs emerging from the report include:

1. An epidemiological study(ies) to assess the impact on blood lead levels resulting from partial lead service line replacements compared to having a lead service line that is not replaced.
2. Pilot and field studies to determine what is the <u>most effective and implementable approach</u> to testing how much lead a service line contribute to lead in water at the tap before and after replacement considering (1) how to sample water present in the service line, (2) when should sampling be conducted after a service line has been replaced (full- or partial-), and (3) information generally available to the homeowner and water system personnel.
3. Field studies to evaluate both the size and duration of lead release associated with partial and full lead service line replacement over a well characterized collection of water qualities and lead service line replacement practices (e.g., flushing, etc.).
4. Pilot studies to determine which mechanisms of lead release to drinking water at the tap are sufficiently large to warrant tailoring risk management strategies to address them, and what risk management strategies are most effective.

This type of targeted research would provide the appropriate information for rule development and improve on the analysis to-date that underlies current practice.

Based on the committee's discussion at its March meeting and the draft report, AWWA solicited additional information from its members and found several items that may be of assistance to the committee. These items are attached in Appendix A. Also, in reading the report, AWWA members were struck by the discussion of field work involved in service line replacement. If it would be of value to the committee, AWWA would be glad to provide experts in water system field construction and repair to more clearly explain and answer questions regarding field practices and materials relevant to service line replacement.

If you have any questions regarding this correspondence or if AWWA can be of assistance in some other way please contact me or Steve Via at (202) 326-6130 or svia@awwa.org.

Best regards,

Thomas W. Curtis
Deputy Executive Director

cc: Jeffrey Griffiths, Chair Drinking Water Committee
Cynthia Dougherty, Director, OW/OGWDW

Appendix A
Technical Support to Assist the Science Advisory Board Drinking Water Committee Review of Technical Studies Examining the Effectiveness of Partial Lead Service Line Replacements

Clarification of the Report Recommendations

In finalizing the committee's report, several opportunities exist to more clearly articulate the committee's findings. The following are relevant examples.

Four Potential Sources of Lead

In lead service line replacement there are four mechanisms/sources of lead release: (1) galvanic corrosion, (2) disruption of scales, (3) residual scales, and (4) remaining lead surface area. These mechanisms are relevant to three distinct plumbing segments: the replaced service line, any remaining service line, and plumbing within the structure. It would be useful if the committee could describe its assessment of the data on the effect of lead service line replacement activities (both full and partial) within each of these categories. For example, both full and partial lead service line replacement would disrupt existing scales and have similar implications for residual scale, but there are significant differences in the impact on galvanic corrosion and the remaining lead surface area.

A matrix approach to summarizing the role of these mechanisms/sources might also provide an opportunity to objectively: evaluate the strength of the available data associated with each mechanism/source; the pros and cons of the available data associated with each mechanism/source; the committee's degree of certainty in its conclusion based upon the available data; and the relative magnitude of the potential exposure likely to be associated with a particular mechanism/source based upon the available data. This type of approach would allow the committee to present a transparent and objective weight of evidence appraisal of the state of the available science.

It also provides a framework for addressing aspects of the committee preliminary draft that are not clear, such as:

1. Impacts of bulk water characteristics on lead release following lead service line replacement (e.g., whether optimized corrosion control exists, disinfectant type in use, etc.).
2. Distinguishing short-term effects for which practical remediation is possible long-term effects of partial- and full- lead service line replacement.

Consistency within the Report

The cover letter and report are not always internally consistent. Several areas where the report and cover letter diverge from consistency include:

1. The cover letter does not offer a clear understanding of the Lead and Copper Rule requirements, which is demonstrated elsewhere in the report.
2. The cover letter does not communicate the severity of the limitations in the Brown et al. data as shared by the study co-author at the committee's meeting and subsequently summarized in the committee report.
3. The cover letter and report text communicate different levels of uncertainty regarding the importance of galvanic corrosion, following lead service line replacement.

Accurate Reflection of the Lead and Copper Rule Requirements

The report would be clearer if the document accurately summarized the requirements of the Lead and Copper Rule. For example, Page 5 of the draft report indicates that water systems are "required to replace only the portion of the lead service line (the portion it owns)". This is an incomplete summary of the action required of the water system. Section 141.84 reads as follows:

> *(d)* ***A water system shall replace that portion of the lead service line that it owns. In cases where the system does not own the entire lead service line, the system shall notify the owner of the line, or the owner's authorized agent, that the system will replace the portion of the service line that it owns and shall offer to replace the owner's portion of the line****. A system is not required to bear the cost of replacing the privately-owned portion of the line, nor is it required to replace the privately-owned portion where the owner chooses not to pay the cost of replacing the privately-owned portion of the line, or where replacing the privately-owned portion would be precluded by State, local or common law.* ***A water system that does not replace the entire length of the service line also shall complete the following tasks.***
>
> *(1) At least 45 days prior to commencing with the partial replacement of a lead service line, the water system shall* ***provide notice to the resident(s) of all buildings served by the line explaining that they may experience a temporary increase of lead levels in their drinking water, along with guidance on measures consumers can take to minimize their exposure to lead****. … In addition, the water system shall inform the resident(s) served by the line that the system will, at the system's expense,* ***collect a sample from each partially-replaced lead service line that is representative of the water in the service line for analysis of lead content****, as prescribed under §141.86(b)(3), within 72 hours after the completion of the partial replacement of*

the service line. ***The system shall collect the sample and report the results of the analysis to the owner and the resident(s) served by the line within three business days of receiving the results****. Mailed notices post-marked within three business days of receiving the results shall be considered "on time."*

(2) ***The water system shall provide the information required by paragraph (d)(1) of this section to the residents of individual dwellings*** *by mail or by other methods approved by the State. …"* **[emphasis added]**

Available Data

Reduction of Elevated Lead Levels After Service Line Replacement

Pages B-20 – B-29 of Sandvig et al (2008) supplied to the Committee by the Water Research Foundation provides a useful summary of the impacts of flushing on reducing observed lead levels following lead service line replacement. This section of the report includes detailed tables and graphs illustrating significant reduction in lead release after partial-lead service line replacement achieved through a relatively brief period (1 hour) of flushing. This detailed data set could inform the Committee's observations regarding standard operating procedures for lead service line replacement.

Post-Stabilization Lead Levels

A persistent question during the committee discussions, and in the report text, is whether there is a reduction in lead levels after partial lead service line replacement. Much of the data underlying the committee discussion came from systems that were in the midst of implementing optimized corrosion control. One system that is studied in several of the papers cited by the committee and, which was discussed at length by the committee, was DC Water. The following table illustrates lead release associated with lead service line replacement, both full- and partial-, as DC Water moved from initial system stabilization into ongoing maintenance of stable optimized corrosion control treatment (as approved by EPA Region 3).

Table 1 shows a comparison of homes that had partial replacements in 2006, which were sampled in 2008, to homes with full lead service lines and homes with full replacements over 5 years as the water system progressed to fully stabilized optimized corrosion control treatment conditions. Table 1 includes both first and second draw samples. The second draw sample was taken once the water reaching the sample tap turned cold. Based on DC Water's experience this was the most practical approach to capture a single sample that is representative of water in the service line.

Table 1. DC Water – Observed lead levels after replacement

Monitoring Data Set	Stable OCCT[1]	Characterization of Service Line	Sample Size (n)	90th percentile (µg/L)	Median (µg/L)	Mean (µg/L)
First Draw (ppb lead)						
LCR 2006-2007	Yes	Full Lead Service Line – not replaced	320	11.2	3.4	8.6
		Partially Replaced Lead Service Line - 1-3 years after replacement	104	12	3	6
March 2008 – Special Study	Yes	Partially Replaced Lead Service Line - 2 years after replacement	75	11.9	2.1	4.9
		Copper[2] - Full LSLR - 2 years after replacement	35	3.82	0.7	1.3
LCR 2009-2010[3]	Yes	Full Lead Service Line – not replaced	293	8.0	2.2	3.8
		Partially Replaced Lead Service Line – 2-4 years after replacement	113	4.2	1.1	2.6
Second Draw (ppb lead)						
LCR 2006-2007	Yes	Full Lead Service Line – not replaced	320	14.8	3	6.8
		Partially Replaced Lead Service Line - 1-3 years after replacement	104	10.4	3	7
March 2008 – Special Study	Yes	Partially Replaced Lead Service Line - 2 years after replacement	75	16.2	2.4	5.5
		Copper[2] - Full LSLR 2 years after replacement	35	1.33	0	0.9
LCR 2009-2010[3]	Yes	Full Lead Service Line – not replaced	274	11.3	2.7	5.4
		Partially Replaced Lead Service Line – 2-4 years after replacement	105	3.6	1.0	1.8

Note –
[1] "Stable OCCT" reflects compliance with LCR OCCT water quality parameters requirements and maintaining lead and copper levels below the respective action levels.
[2] "Copper service" indicates that the home had a full service line replacement.
[3] These are 1st and 2nd draw samples under stagnation periods of at least 6 hours or more.
NA, not available
Source – DC Water

DC Water also monitored lead levels in 2009 – 2010 as a component of fine-tuning its OCCT program. A compilation of data illustrates that observed lead levels at

taps, after full- and partial-lead service line replacements, were lower in 2009 than previously measured. This data could be interpreted as evidence of the benefit of effective OCCT as well as the long-term benefit of removing lead from contact with drinking water.

DC Water is collecting lead levels 5 – 8 months after the replacement as an element of ongoing service line replacement activity. Data for 25 lead service line replacements are available to-date and are reflected in Table 2. The information presented here is an initial tabulation of observations and data continues to be accrued. To date, only one observation following either full or partial lead service line replacement has exceeded 10 µg/L (value was 11.5 in a second draw sample following a partial-replacement), and values range from 0.24 to 2.19 µg/L and 0.25 to 11.5 µg/L (second highest value was 1.92 µg/L) for second draw samples following full- and partial-lead service lines respectively.

Table 2 – DC Water, Lead Observations Collected 5-8 Months After Replacement

Type of Lead Service Replacement	Count (n)	Median (µg/L)		Average (µg/L)	
		1st Draw	2nd Draw	1st Draw	2nd Draw
Full	18	1.1	0.5	2.3	0.6
Partial	7	0.9	0.5	1.6	2.2

Source – DC Water

Role of Service Line in Electrical Grounding

AWWA contacted the National Fire Protection Association (NFPA) staff responsible for the National Electrical Code (NEC) as described in NFPA 70. NFPA staff confirmed that NFPA 70 is, for all intents and purposes, the basis for most state and local electrical codes in the United States. Responsible NFPA staff provided the following information that is pertinent to the committee's discussion.

The current edition of NFPA 70 (e.g., NFPA 70 (2011)) was adopted with the full knowledge and intention to allow existing structures with grounding to service lines to continue to rely on that grounding method to protect homeowners from shock hazard in the structure. Those involved in the NFPA process understood that older structures (e.g., including older housing stock that also has lead service lines) tend to rely solely on grounding to the service line. Moreover, NFPA recognizes that local electric codes and code inspectors require adherence to this provision regardless of installation of other grounding devices.[1] NFPA 70 is revised on a regular schedule with the next revision scheduled for 2014. It is possible to seek an

[1] Available examples include communities in District of Columbia, Maryland, North Carolina, and Oregon.

amendment to NFPA 70 that would remove the grounding to the service line from the code. Such an amendment would require submittal of a proposal with justification by November 2012. A revision such as this, once implemented at the state and local level, would provide a stronger basis for the views expressed by the committee that this NFPA 70 grounding strategy was not relevant to service line construction activity.