

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Drinking Water Committee Augmented for the Review of the
Effectiveness of Partial Lead Service Line Replacements (DWC Lead Panel)
Public Meeting
March 30-31, 2011**

Date and Time: Wednesday, March 30, 2011, 9:00 AM – 5:30 PM ET; Thursday, March 31, 2011, 8:30 AM – 4:00 PM

Location: The Westin Alexandria - Old Town Hotel, 400 Courthouse Square, Alexandria, VA 22314

Purpose: The purpose of the meeting was to evaluate recent studies examining the effectiveness of partial lead service line replacements in reducing lead drinking water exposures.

Participants: DWC Lead Panel (for full roster, see Attachment A)

Dr. Jeffrey K. Griffiths, Chair

Dr. George Alexeeff

Dr. Mark Benjamin

Dr. Joel Ducoste

Dr. Jeffrey Griffiths

Dr. Susan Korrick

Dr. Michael Kosnett

Dr. Bruce Lanphear

Dr. Desmond Lawler

Dr. Frank Loge

Dr. Stephen Randtke

Dr. Lynn Roberts

Dr. Stephen Rothenberg

Dr. Richard Sakaji

Ms. Janice Skadsen

Dr. Virginia Weaver

Dr. Robert Wright

Dr. Marylynn Yates

Mr. Aaron Yeow, Designated Federal Officer (DFO)

Dr. Vanessa Vu, Director, EPA Science Advisory Board Staff Office

Ms. Pamela Barr, EPA Office of Water (OW)

Mr. Eric Burneson, EPA OW

Mr. Jeffrey Kempic, EPA OW

Dr. Thomas Sinks, Centers for Disease Control and Prevention (CDC)

Other Attendees (See Attachment B)

Wednesday, March 30, 2011

Opening Remarks

Mr. Aaron Yeow, the DFO for the SAB DWC Lead Panel, opened the meeting. He noted that as required under the Federal Advisory Committee Act (FACA), the Committee's deliberations are held in public with advanced notice given in the Federal Register¹, and the meeting minutes will be made publicly available after the meeting. He noted that the Panel received five requests from the public to present oral comments², and received several written comments from the public. He also noted that the Panel members were in compliance with federal ethics regulations and conflict-of-interest laws that pertain to them. He then turned the meeting over to Dr. Vanessa Vu, the Director of the SAB Staff Office.

Dr. Vanessa Vu welcomed everyone to the public meeting of the SAB DWC Lead Panel. She thanked the members of the Panel for their participation in this meeting and for their public service. She stated that she is looking forward to the discussions and deliberations over the next few days. She then turned the meeting over to Dr. Jeffrey Griffiths, Chair of the DWC Lead Panel.

Dr. Jeffrey Griffiths welcomed everyone and indicated that the purpose of the meeting was for the Panel to evaluate the recent scientific literature to determine the effectiveness of partial lead service line replacements (PLSLRs). He reviewed the Agenda for the meeting³, and introduced Ms. Pamela Barr, from EPA's Office of Water for her remarks.

EPA Remarks and Presentation

Ms. Pamela Barr, EPA OW, indicated that EPA is in the process of revising the Lead and Copper Rule (LCR) and wants to use the best available science as they work on the regulation. When EPA developed the LCR, the thought was to get the lead out. However, the new science questions whether PLSLR is the best public health option. EPA is coming to the SAB for advice on the effectiveness of PLSLRs.

Mr. Jeffrey Kempic, EPA OW made a presentation⁴ to the Panel, giving an overview of Lead Service Line Replacements (LSLRs). He provided an overview of the LCR, requirements under LCR, an overview of the PLSLR studies supporting the 2001 minor LCR revisions, and an overview of the recent partial and full lead service line replacement (LSLR) studies.

Centers for Disease Control and Prevention (CDC) Presentation

Dr. Tom Sinks made a presentation⁵ on the association between children's blood lead levels, lead service lines, and water disinfection. He provided background on the elevated water lead levels in Washington DC, provided an overview of CDC's study, the data sources, the analytic data set, the results of the study, and strength and limitations of the study.

The Panel members had questions regarding how CDC determined which blood lead tests to keep when there were multiple tests taken. Dr. Sinks indicated that it was due to whether they

were capillary or venous tests. One panel member asked whether CDC knew for sure whether a given child was living at a home at the time of a LSLR. Dr. Sinks indicated that they did not know for sure. There were several questions surrounding the data analysis that CDC performed.

Public Comment

Mr. Matthew Smith, Philadelphia Water Department provided an oral statement⁶. Mr. Smith was representing the views of the American Water Works Association (AWWA). He stated that in both partial and full LSLRs, the physical act of touching, banging, and cutting the service line can release both particulate lead and lead fines. He indicated that during the period immediately following replacement activity, elevated lead levels in water will most likely occur. He stated that every day water systems replace and repair their water main infrastructure as part of necessary maintenance activity. Part of this replacement includes reconnection of customer's homes to the water main and many times the mains being replaces will have lead service lines.

Mr. Ralph Scott, Parents for Nontoxic Alternatives, provided an oral statement⁷. He stated that the CDC study that examined the associated between children's blood lead levels and lead service lines (LSLs) identified serious potential health threats from PLSLR. He indicated that the limitations of the study may have led to an underestimation of the positive association between elevated blood lead levels and PLSLRs.

Dr. Yanna Lambrinidou, Parents for Nontoxic Alternatives, provided an oral statement⁸. She stated that at least two of studies identified by EPA for this evaluation are misleading. They assert benefits from PLSLRs, but are built on false assumptions and inaccurate facts. She stated that EPA played a central role in promoting and defending PLSLRs in Washington, DC, which has now been shown to have increased the likelihood of elevated blood lead levels in children. She indicated that no study has rigorously examined lead release long-term after PLSLRs, using flow rates representative of normal water use. She implored the Panel, for each of the studies in the evaluation, to consider the flow rate, whether pre-flushing occurred, and was water allowed to sit stagnant.

Dr. Steve Reiber, HDR Engineering Inc., provided an oral statement⁹. Dr. Reiber emphasized that the DC epidemiological data is not indicative of a stable distribution system with optimized corrosion control, that LCR compliance sampling is not a good way to measure lead exposure, that lead particulate accumulates in all parts of the water system, that the use of dielectric couplings are inappropriate due to homeowner safety and the electrical code, and that galvanic corrosion is irrelevant to PLSLRs.

Mr. Jeff Swertfeger, Greater Cincinnati Water Works, provided an oral statement¹⁰. He indicated that Cincinnati has an extensive lead research program and that they conducted a study examining PLSLRs side by side with full LSLRs and performing no replacements. They found that doing PLSLRs did not result in long-term benefit in lead levels, at least up to one year after the work and could result in short-term spikes in lead. They found that full LSLRs were successful in reducing lead levels. Based on the results, they stopped performing PLSLRs for the sake of removing lead lines. However, he indicated that there are times when performing PLSLRs is necessary such as main replacement and other street infrastructure work such as

sewer replacements, street realignment, and necessary repairs on mains or service branches. They found that since customers are overwhelmingly resistant to replacing their portion of the line even when given information on lead health effects, utilities have limited realistic opportunities to reduce lead exposure in these situations and must rely on best management practices and public education to reduce lead exposure.

Issue 1 – Blood Lead Levels

The Panel members indicated that Brown et al. (2011) was the only study identified that looked at blood lead levels and PLSLR. From Table 3 in Brown et al. (2011), it was noted that there was an increased odds of elevated blood lead levels related to PLSLR. There was no statistical difference in blood lead levels between homes with intact LSL and homes that had PLSLRs, so PLSLRs do not appear to decrease blood lead levels. Members noted that the study had limitations due to the type of dataset (administrative) that was used and that this limited any definitive statements regarding the associations between PLSLRs and blood lead levels. Several Panel members suggested that perhaps some of these limitations could be addressed through a reanalysis of the data.

Issue 2 – Partial Lead Service Line Replacements

The Panel members indicated that there was limited information contained in the studies. The results of pre- and post-PLSLR sampling were sporadic. Based upon the studies examined, PLSLRs do not seem to be effective, but most of the data were short-term. The members noted that a seeding effect could be occurring, where legacy lead is leeching out. The Panel noted the need for long-term data. One member indicated that the studies did not get into water chemistry, and without water chemistry information, it was hard to determine what the end result was. One member noted that none of the studies picked up on the biggest issue of concern – spikes.

Issue 3 – Comparison Between Partial and Full Lead Service Line Replacements

The Panel members stated that the studies showed that full LSLRs provided benefit, but not PLSLRs in the long term. In the short term, PLSLRs do not seem to provide benefits. The spikes in water lead levels are a great concern for PLSLR. The Panel noted, however, that none of these studies were really long term (> 1 year).

Issue 4 – Partial Lead Service Line Replacement Techniques

The members noted that there were two studies that looked at cutting techniques, but that they only looked at a small sample of pipes. The results from the studies were inconclusive. In general, the studies looking at PLSLR techniques were plagued by lack of data and small sample sizes.

Issue 5 – Galvanic Corrosion

The members stated that the change in electrical potential was very localized. The extent that this extends out from the junction is small. There is an interpretation that because this distance is

short, that this is negligible. There is a dispute over this. There are different measures in the literature, which are not incompatible, and tell different things. It was noted that a dielectric can stop galvanic corrosion due to the joining of two dissimilar pipes, but would not be effective for depositional corrosion.

The panel recessed for the day at 5:15 pm ET.

Thursday, March 31, 2011

The Panel was reconvened at 8:30 am ET and the Panel bore out into small groups to begin developing their consensus responses to the charge questions.

The Panel then met back together to report out their responses.

Issue 1 – The Panel acknowledged that they did not identify any other literature that examined the associations between blood lead levels and PLSLRs. The consensus conclusion from regarding Brown et al. (2011) was that there was no benefit to blood lead levels from PLSLRs. The results suggest harm (an increase in blood lead levels) from PLSLRs. However, the study design limitations preclude making definitive conclusions. Some of the limitations could be addressed by a reanalysis of the data.

Issue 3 – The Panel concluded that full LSLR were effective in optimized systems. PLSLR have not been shown to be effective, however, there is a lack of long-term data. Spike in water lead levels occur with both partial and full LSLRs, but the duration of spikes seem to be longer for PLSLRs. There is insufficient evidence for the cause of the spikes.

Issue 2 – The Panel noted that there are very few data on PLSLRs. Spikes do occur and these risks need to be considered in future LCR revisions. The Panel wanted to be careful not to overweigh any studies that had limited data when drawing their conclusions.

Issue 4 – For studies that looked at cutting techniques, there were limited data and small samples sizes, making the results inconclusive. For connection techniques, dielectrics would help with galvanic corrosion, but not depositional corrosion. The Teflon sleeves had mixed results. Flushing appeared to be effective only after 10 days, but the flow rates were not realistic for implementation. EPA's education materials need to be updated.

Issue 5 – The Panel wanted to provide background on what happens when copper and lead are put together. Galvanic corrosion changes the electrical potential of the pipe. This can increase the baseline corrosion rate. There are multiple metrics to assess galvanic corrosion – can measure changes to the electrical potential and galvanic current, and can measure the concentration of lead that is released. When tests have been conducted, the results have been variable and the results have been inconsistent from one system to the next. A dielectric may help galvanic corrosion, but will not help with depositional corrosion.

Overall Charge – The Panel concluded that the preponderance of evidence indicates that in the short-term, PLSLR have not been shown to be effective. There is not enough evidence to determine the long-term effectiveness of PLSLRs.

Dr. Griffiths discussed next steps and action items.

With the business concluded, the Designated Federal Officer adjourned the meeting at 4:00 PM ET.

Respectfully Submitted:

/Signed/

Mr. Aaron Yeow
Designated Federal Officer
EPA SAB Staff Office

Certified as Accurate:

/Signed/

Dr. Jeffrey K. Griffiths
Chair
SAB DWC Lead Review Panel

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the Panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the SAB website: <http://www.epa.gov/sab>, at the [March 30-31, 2011 SAB DWC Lead Review Panel Meeting page](#):

¹ Federal Register Notice Announcing the Meeting

² List of Public Speakers

³ Agenda for March 30-31, 2011 Public Meeting

⁴ Presentation from Jeffrey Kempic, USEPA

⁵ Presentation from Dr. Tom Sinks, Centers for Disease Control and Prevention (CDC)

⁶ Oral Statement from Matthew Smith, Philadelphia Water Department

⁷ Oral Statement from Ralph Scott, Parents for Nontoxic Alternatives

⁸ Oral Statement from Yanna Lambrinidou, Parents for Nontoxic Alternatives

⁹ Oral Statement from Steve Reiber, HDR Engineering, Inc.

¹⁰ Oral Statement from Jeff Swertfeger, Greater Cincinnati Water Works

ATTACHMENT A - ROSTER

U.S. Environmental Protection Agency Science Advisory Board Drinking Water Committee Augmented for the Review of the Effectiveness of Partial Lead Service Line Replacements

CHAIR

Dr. Jeffrey K. Griffiths, Associate Professor, Department of Public Health and Community Medicine, School of Medicine, Tufts University, Boston, MA

MEMBERS

Dr. George Alexeeff, Deputy Director for Scientific Affairs, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Oakland, CA

Dr. Mark Benjamin, Professor, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

Dr. Joel Ducoste, Professor, Department of Civil, Construction, and Environmental Engineering, College of Engineering, North Carolina State University, Raleigh, NC, United States

Dr. Susan Korrick, Assistant Professor of Medicine, Department of Medicine, Brigham and Women's Hospital, Channing Laboratory, Harvard Medical School, Boston, MA

Dr. Michael Kosnett, Associate Clinical Professor, Division of Clinical Pharmacology and Toxicology, Department of Medicine, University of Colorado Health Sciences Center, Denver, CO

Dr. Bruce Lanphear, Professor, Children's Environmental Health, Faculty of Health Sciences, Simon Fraser University, Vancouver, BC, Canada

Dr. Desmond F. Lawler, Bob R. Dorsey Professor of Engineering, Department of Civil, Architectural and Environmental Engineering, University of Texas, Austin, TX

Dr. Frank Loge, Professor, Department of Civil and Environmental Engineering, University of California-Davis, Davis, CA

Dr. Stephen Randtke, Professor, Department of Civil, Environmental, and Architectural Engineering, University of Kansas, Lawrence, KS

Dr. A. Lynn Roberts, Professor, Department of Geography and Environmental Engineering , Johns Hopkins University , Baltimore, MD

Dr. Stephen Rothenberg, Senior Investigator, Environmental Health, Center for Study of Population Health, National Institute of Public Health, Cuernavaca, , Mexico

Dr. Richard Sakaji, Manager, Planning and Analysis for Water Quality, East Bay Municipal Utility District, Oakland, CA

Ms. Janice Skadsen, Environmental Scientist, CDM, Ann Arbor, MI

Dr. Virginia Weaver, Associate Professor, Departments of Environmental Health Sciences & Medicine, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Dr. Robert Wright, Associate Professor, Pediatrics, Division of Environmental Health, Harvard School of Public Health, Harvard School of Public Health, Boston, MA

Dr. Marylynn Yates, Professor of Environmental Microbiology, Department of Environmental Sciences, University of California-Riverside, Riverside, CA

SCIENCE ADVISORY BOARD STAFF

Mr. Aaron Yeow, Designated Federal Officer, U.S. Environmental Protection Agency, Washington, DC

**ATTACHMENT B – Other Attendees
SAB DWC Lead Panel Public Meeting**

March 30, 2011

Name	Affiliation
Blank, Valerie	EPA
Boyd, Glen*	The Cadmus Group
Clark, Mary*	EPA
Deltoral, Miguel*	EPA
DeMarco, Carol	EPA
Edwards, Marc*	Virginia Tech
Ellis, Jerry	EPA
Giani, Rich	DC Water
Gledhill, Jonathan	Policy Navigation Group
Harris, Jamie	EPA
Lambrinidou, Yanna	Parents for Nontoxic Alternatives
Martinson, Erica	InsideEPA
Mehta, Suril	EPA
Pekk, JR	Washingtonian
Poindexter, Van	National Rural Water Association
Robinson, Matt	EPA
Reiber, Steve	HDR Engineering Inc.
Ross, Mary	EPA
Saiyid, Amena	BNA
Schock, Michael*	EPA
Scott, Ralph	Parents for Nontoxic Alternatives
Shao, Nicole	EPA
Smith, Lameka	EPA
Smith, Matthew	Philadelphia Water Department
Souweine, Kathleen	EPA
St-Denis, Francine	EPA
Swertfeger, Jeff	Cincinnati Water Works
Thomas, Ed	National Rural Water Association
Via, Steve	American Water Works Association (AWWA)
Wall, David	DC Water
Welter, Greg	O'Brien & Gere

*Participated via teleconference

March 31, 2011

Name	Affiliation
Boyd, Glen*	The Cadmus Group
Brown, Erica	Association of Metropolitan Water Agencies
Clark, Mary*	EPA
Deltoral, Miguel*	EPA
Edwards, Marc*	Virginia Tech
Ellis, Jerry	EPA
Giani, Rich	DC Water
Harris, Jamie	EPA
Lambrinidou, Yanna	Parents for Nontoxic Alternatives
Osterhoudt, Darrell	Association of State Drinking Water Administrators
Saiyid, Amena	BNA
Schock, Michael*	EPA
Scott, Ralph	Parents for Nontoxic Alternatives
Shao, Nicole	EPA
Smith, Matthew	Philadelphia Water Department
St-Denis, Francine	EPA
Welter, Greg	O'Brien & Gere

*Participated via teleconference