

National Drinking Water Advisory Council (NDWAC)

November 17-19, 2015

Location:

Marriott Crystal City
1999 Jefferson Davis Highway
Arlington, VA 22202

FINAL MEETING SUMMARY

Meeting Objectives/Desired Outcomes:

- *Discuss and consider the Lead and Copper Rule Working Group's findings and recommendations, as well as other recommendations developed for the NDWAC's consideration.*
- *Develop NDWAC's recommendations to the Environmental Protection Agency (EPA) Administrator specific to Lead and Copper Rule Long-term Revisions.*
- *Provide an update on harmful algal blooms (HABs) and Legionella activities in the drinking water program.*

A. Opening and Welcome

Michelle Schutz, the Designated Federal Officer (DFO) for the National Drinking Water Advisory Council (NDWAC) opened the public meeting.¹ She explained that the NDWAC or "Council" is an independent expert federal advisory committee chartered under the authority of the Federal Advisory Committee Act (FACA). The NDWAC is empowered under the Safe Drinking Water Act (SDWA) and provides independent advice to the EPA Administrator on drinking water and groundwater issues. The NDWAC consists entirely of special government employees appointed to their positions by the Administrator of EPA, and thus are subject to all applicable ethics laws and implementing regulations. EPA has determined that advisors participating in this meeting have no financial conflicts of interest or appearance of a lack of impartiality under the ethics regulations² as they relate to the topics of this meeting.

Ms. Schutz explained that FACA and EPA policies require NDWAC meetings to be announced to the public in the *Federal Register* and that substantive deliberations and interactions with EPA and the public be conducted in open sessions where a DFO is present to ensure that the requirements of FACA are met. In accordance with FACA, the public will have an opportunity to provide verbal comments during the meeting if they have registered in advance of the meeting or signed-up on November 17 at the registration table. She explained that written comments can also be sent to her, which will be

¹ See Attachment A for a list of the NDWAC members and Attachment B for a list of meeting attendees.

² The ethics regulations are specified in the Code of Federal Regulations, Title 5, Part 2635.

posted on EPA's NDWAC website and provided to Council members. A meeting summary will be prepared within 60 to 90 days after the meeting. After being certified by the NDWAC Chair, the meeting summary will be posted on the NDWAC website at <http://epa.gov/ndwac>. Jill Jonas, NDWAC Chair, welcomed the public, Council members, EPA, Federal officials and members of the public. She acknowledged two new Council members, Cathy Kellon from the Geos Institute in Oregon and Mark Sanchez from the Albuquerque Bernalillo Water Utility Authority in New Mexico. She explained that EPA had asked the NDWAC to charge the Lead and Copper Rule Working Group ("LCRWG" or "Group") to advise the Council on targeted issues for the Lead and Copper Rule Long-term Revisions (LCR LTR). The LCRWG concluded its extensive deliberations and provided its final report to the Council in August of this year.³

Ms. Jonas provided a meeting overview and reviewed the agenda.⁴ She explained that the Council will spend most of this meeting hearing presentations from the LCRWG and through discussion, attempt to understand the recommendations proposed by the LCRWG and others on the LCR LTR. The Council will also hear a dissenting opinion from one of the LCRWG members and public comments before beginning its deliberations to develop its recommendations to the EPA Administrator on the LCR LTR. In addition, EPA will present its work on harmful algal blooms (HABs), Council member Caryn Mandelbaum will provide an update on the HABs situation in California and EPA will provide a presentation on *Legionella*. Ms. Jonas expressed a special thanks to Council members, Marilyn Christian and Chris Wiant, who also served on the LCRWG.⁵

Peter Grevatt, the EPA Office of Ground Water and Drinking Water (OGWDW) Director, welcomed the NDWAC members and those attending the meeting in person and by phone. He expressed his thanks to Council members for their time and work to support efforts to protect public health. He was impressed by the expertise of the individuals on the Council. He also noted that the LCRWG members provided many perspectives and that these differing perspectives are of use and benefit to EPA and the NDWAC.

B. National Drinking Water Program Update

Dr. Grevatt indicated the importance of the NDWAC's continued input and his gratitude to have both the LCRWG and NDWAC working on the LCR LTR. In addition to the LCR LTR, he provided an update on other important initiatives for which EPA is seeking input from the NDWAC which include harmful algal blooms (HABs), *Legionella* and small system issues.

A summary of his discussion on these topics, followed by questions and comments from the Council, are provided in separate subsections below. Also see Sections J and K, respectively, for the technical presentations provided by EPA during the meeting on HABs and *Legionella*.

³ *The Report of the Lead and Copper Rule Working Group To the National Drinking Water Advisory Council* is available at <http://www.epa.gov/ndwac/national-drinking-water-advisory-council-november-17-19-2015-public-meeting-materials>. Throughout this meeting summary, this document is referred to as "the report".

⁴ See Attachment C for the meeting agenda.

⁵ These Council members are also referred to in this summary as Council/LCRWG members.

1. LCR LTR

Dr. Grevatt provided background on the LCR LTR rulemaking effort. He noted that the Lead and Copper Rule (LCR) is one of the most complex federal drinking water regulations and dates back more than 20 years. Both states and the regulated community have expressed frustration regarding the rule's complexity and implementation challenges. They and customers have questioned if the rule is doing enough. He added that now is another opportunity to revise the LCR to improve public health and to enhance the implementation of the rule at the state and local level.

During the December 2013, NDWAC meeting, EPA tasked the NDWAC to form a workgroup to advise EPA on the LCR LTR. The LCRWG held seven in-person meetings, participated in multiple conference calls, and devoted tremendous time outside these meetings to provide important input to the NDWAC on key issues. He acknowledged Council members Chris Wiant and Marilyn Christian for volunteering to serve on the LCRWG and other LCRWG members who were in attendance at this meeting. He expressed his gratitude to all LCRWG members for their dedicated and tireless efforts to fully explore issues including: 1) sample site selection criteria, 2) lead sampling protocol, 3) public education (PE) for copper, 4) measures to ensure optimal corrosion control treatment (OCCT) and 5) lead service line replacement (LSLR) requirements. He added that the LCRWG discussed more than these five topics.

Dr. Grevatt noted that he has seen a number of examples that have resulted in unintended consequences, most recently the lead problems facing Flint, Michigan. Until recently, Flint obtained its water from the City of Detroit. When the city switched its source to the Flint River it encountered numerous problems, the most notable one being lead. Flint serves as an example of the ongoing problems from the estimated 10 million lead service lines (LSLs) that remain in the ground. Dr. Grevatt noted that more than 99 percent of large systems are in compliance with the LCR. During the public comments period, the Council will hear more about Flint, issues related to lead and copper in the distribution system and recommendations for strengthening the LCR. The Council will also hear a dissenting opinion from one of the LCRWG members related to some of the recommendations in the report. He encouraged the Council to listen carefully to all of the perspectives that will be shared at this meeting and to consider them during its deliberations.

2. Harmful Algal Blooms (HABs)

Dr. Grevatt stated that EPA will ask the NDWAC for additional input on HABs in light of recent significant events. In 2014, a HAB settled over the intake to Toledo, Ohio's water supply. The mayor issued a health advisory telling nearly 500,000 people that the water was unsafe to drink. This brought the issue of HABs to national attention. In the aftermath, EPA built on ongoing work by completing health advisories for microcystins (the toxin that impacted Toledo) and cylindrospermopsin. EPA also prepared a guidance document, *Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*⁶, which provided recommendations on how to monitor and/or treat for cyanotoxins and when to issue health advisories. Dr. Grevatt noted that a HAB event may last a weekend but it has a much longer lasting effect in the community.

⁶ Available at <http://www.epa.gov/sites/production/files/2015-06/documents/cyanotoxin-management-drinking-water.pdf>.

In 2015, another algal bloom formed in Lake Erie but luckily did not settle over Toledo's intake. Prior to this event, Toledo took steps to ensure their utilities were ready in case of a HAB event that included monitoring and preparation to make treatment decisions. There was another challenge in the Ohio River involving a bank-to-bank algae bloom 600 to 700 miles wide. The Ohio River is the drinking water source for more than 3 million people. The bloom resulted in one recreational advisory but no public health advisories.

The Drinking Water Protection Act, enacted on August 7, 2015, required EPA to develop a strategy related to HABs. EPA is interested in the NDWAC's input on how to successfully use source water protection in controlling HABs. Also, public water systems (PWSs) cannot solve the HAB problem alone and EPA needs the Council's ideas on other partners to involve.

3. Legionella

Dr. Grevatt explained that *Legionella* presents a significant health challenge. The Centers for Disease Control (CDC) estimates *Legionella* results in 8,000 to 18,000 hospitalizations each year, although the number of people impacted could be higher. As many as 30 percent of cases can lead to fatalities. *Legionella* relates to drinking water in an unusual way. Instead of exposure through ingestion, people are exposed from breathing *Legionella* in aerosolized water. People can become exposed from water in fountains, hot tubs, showers or cooling towers. In the South Bronx, about 12 died and others became sick from *Legionella*-contaminated water from a cooling tower. *Legionella* was identified for the first time in 1976 in Philadelphia at an American Legion's convention and many outbreaks have occurred since. *Legionella* is often associated with water in large buildings or hospitals. EPA had a webinar to discuss public comment received on EPA's literature review of *Legionella*⁷ and accepted public comment through November 23, 2015. Dr. Grevatt clarified that EPA is not looking to develop a drinking water regulation but to identify ways the drinking water program can minimize *Legionella* in the distribution system and premise plumbing.

4. Small Water Systems

Dr. Grevatt noted that more than half of the over 52,000 community water systems (CWSs), or about 28,000, serve 500 or fewer people. These small CWSs face significant managerial and financial challenges and the primacy agencies expend significant resources in overseeing these systems. Dr. Grevatt asked the Council to think about small communities of 500 or fewer and 10,000 or fewer and how to develop tools to support these communities and protect public health. He also asked the Council to think broadly about all the customers served by CWSs when considering the information presented for the LCR LTR, HABs and *Legionella*.

In closing, Dr. Grevatt reiterated his thanks to all NDWDAC members to help with the mission to provide the public with safe drinking water every day of year.

⁷ The webinar and EPA's *Draft – Technologies for Legionella Control: Scientific Literature Review* are available at <http://www.epa.gov/dwsixyearreview/documents-public-meeting-and-webinar-technologies-legionella-control-scientific>.

5. NDWAC Questions and Comments

Regarding the HAB incident in Toledo, a NDWAC member asked if any small systems had been impacted or if there was any information on the cost impact. In response, Dr. Grevatt indicated that systems of all sizes were impacted and he thought that every one of them was concerned. He suspected that they increased the frequency of monitoring and made preparations to adjust treatment. He added that it is difficult to get good estimates of cost impacts. He noted in Charleston, West Virginia, bottled water was delivered to residents. Governor Tomblin of WV estimated that the cost impact would exceed \$70 M. He explained that Charleston's impact extended beyond a boil water order – schools and businesses were closed and the use of the water was restricted to fire suppression, sanitation and freezing pipe prevention.

Ms. Jonas asked how EPA might continue to make progress on source water protection. Dr. Grevatt explained that EPA wants to find better and more cost-effective ways to use source water protection to protect against algal blooms by preventing contaminants such as nutrients from getting into the water. He noted that all states met source water assessment requirements over a decade ago but recognized that additional work needs to be done. Source water protection can be a challenge for water systems because activities that impact the source may come from agricultural, animal feedlots and publically owned treatment works that are outside the community boundaries. In addition, the reason why some algae blooms are so large is not well understood. There are a complicated set of issues, a myriad of challenges and potential far-reaching effects associated with HABs that impact human health as well as recreational-related businesses.

One Council member noted that *Legionella* occurred prior to the incident in Philadelphia. Dr. Grevatt added that *Legionella* may be misdiagnosed as pneumonia or Pontiac Fever. The CDC liaison explained that *Legionella* leads to pneumonia and Pontiac Fever has mild flu or cold-like symptoms.

C. Drinking Water Regulatory Activities

Eric Burneson, EPA Standards and Risk Management Division Director, expressed his appreciation to the Council members for their time to help EPA shape policies. He presented EPA's process for reviewing regulated and unregulated contaminants and provided an update on drinking water regulatory activities.⁸ He noted that EPA may not be asking the NDWAC for advice on all these issues, but that he wanted the Council to be aware of the regulatory process and have a sense of the other moving pieces. Following his presentation, NDWAC members provided comments and questions. A summary of the presentations and NDWAC comments and questions are provided in separate subsections below.

1. Technical Presentation

Mr. Burneson displayed a flowchart that depicted the inter-relationship among the Contaminant Candidate List (CCL), Unregulated Contaminant Monitoring Rule (UCMR), regulatory determinations, new National Drinking Water Regulations (NPDWRs) and the Six-Year Review process for existing NPDWRs. He explained each of these processes in more detail.

⁸ This presentation is available at <http://www.epa.gov/ndwac/national-drinking-water-advisory-council-november-17-19-2015-public-meeting-materials>.

a. Regulatory Analysis

Mr. Burneson explained that the regulatory analysis steps include the CCL, UCMR and regulatory determinations. EPA is required every 5 years to publish a CCL, which is a list of drinking water contaminants that are known or anticipated to occur in PWSs and are not currently subject to EPA drinking water regulations. EPA published a draft of the fourth CCL (CCL 4) in February 2015. The CCL 4 includes 100 chemical or chemical groups, and 12 microbial contaminants.⁹ EPA will consider and analyze the public's comments, revise the CCL, as appropriate, and publish a final list in 2016.

EPA published the third UCMR (UCMR 3) in May 2012. UCMR 3 monitoring to assess the occurrence of 28 chemicals that include a suite of perfluorinated chemicals and 2 viruses occurred during 2013 – 2015. UCMR data are posted quarterly to the National Contaminant Occurrence Database (NCOD).¹⁰ EPA anticipates completing its analysis of the data by mid-2016. The fourth UCMR (UCMR 4) should be proposed in late 2015 and final by January 2017. UCMR 4 monitoring will occur in January 2019 - December 2020.

CCL contaminants that do not make the preliminary determinations must remain on the CCL. EPA must make regulatory determinations for at least 5 CCL contaminants every 5 years. The Agency is in its third regulatory determinations process (RD 3). The Agency made preliminary determinations to regulate strontium, but not to regulate 1,3-dinitrobenzene; dimethoate; terbufos and terbufos sulfone because these contaminants were not found or not found at levels to be of public health concern. EPA published the preliminary RD 3 on October 20, 2014 and added manganese and nonylphenol in response to information provided by the public. EPA plans to publish the final RD3 in early 2016.

b. Rule Development/Review

Mr. Burneson explained the status of EPA's three rulemaking efforts for perchlorate, a regulation based on the Reduction of Lead in Drinking Water Act (RLDWA) of 2011 and chlorinated volatile organic compounds (cVOCs).

In 2011, EPA made a determination to regulate perchlorate. EPA sought expert review from the Science Advisory Board (SAB) on how to consider data for vulnerable populations to derive a maximum contaminant level goal (MCLG) for perchlorate. EPA is working with the Food and Drug Administration to develop the MCLG using physiologically based pharmacokinetic (PBPK) modeling. Next steps are a peer review of the scientific validity and ability to use the model to derive the MCLG.

The RLDWA was enacted on January 4, 2011 and became effective three years later. For potable use products, it reduces the allowable lead content from 8% to a weighted average of $\leq 0.25\%$ in the wetted surface material and establishes a statutory methodology for calculating the weighted average of lead. In 2013, EPA published a summary of the RLDWA and frequently asked questions (FAQs). In its FAQs, EPA stated its interpretation that fire hydrants were subject to the RLDWA. Several stakeholders disagreed. This led to a subsequent Act, the Community Fire Safety Act, which explicitly exempts fire hydrants from the RLDWA and EPA updated the FAQs according. EPA has begun an action to codify the

⁹ Additional information is available at <http://www.epa.gov/ccl/draft-contaminant-candidate-list-4-ccl-4>.

¹⁰ Refer to <http://www.epa.gov/dwucmr/national-contaminant-occurrence-database-ncod>.

lead-free requirements in the RLDWA and to add other clarifications. EPA held two stakeholder meetings and plans to propose the rule in mid-2016.

EPA is developing a proposed group cVOC standard that may include regulated and unregulated cVOCs. EPA plans to wait for the conclusion of UCMR 3 monitoring before taking more rigorous action to develop a cVOC standard. The Agency presented its approach for a group maximum contaminant level (MCL) construct to the NDWAC in the fall of 2014. EPA is continuing to look at the feasibility of analytical methods and treatment technologies.

c. Six-Year Review/Stakeholder Involvement

The SDWA requires EPA to review existing NPDWRs every 6 years. EPA has completed two Six-Year Review processes. The first resulted in a decision to revise the Total Coliform Rule. EPA plans to complete the third Six-Year Review in 2016, and for the first time will address microbial and disinfection byproducts (DBPs). EPA did not review these contaminants in prior Six-Year Reviews because they were already the subject of recent or ongoing rulemaking efforts.

Mr. Burneson discussed EPA's ongoing efforts to obtain stakeholder support to obtain additional information on cyanotoxins and *Legionella*.

- Regarding cyanotoxins:
 - EPA held a public meeting/webinar during May 2015.
 - On June 17, 2015, EPA published 10-day health advisories for microcystins and cylindrospermopsin, and a health effects support document for microcystins, cylindrospermopsin, and anatoxin a. Mr. Burneson thanked his colleagues at Health Canada for their work on these documents. Also on June 17, 2015, EPA published the document, *Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water* which serves as a companion to the health advisories.
 - In August 2015, Congress directed EPA to develop a strategic plan for assessing and managing risk associated with algal toxins in drinking water provided by PWSs. EPA solicited input from stakeholders on Sept 16, 2015 and delivered this plan to the President and Congress in November 2015.
- Regarding *Legionella*:
 - To address an information gap on *Legionella* treatment technologies, a multi-agency task force involving EPA, CDC, the Association of State Drinking Water Administrators (ASDWA) and states compiled findings from peer-reviewed literature regarding the effectiveness of treatment technologies that can control *Legionella* in premise plumbing. Mr. Burneson clarified that EPA does not advocate in this document that building owners install treatment. The document is intended to provide information to primacy agencies, affected facilities and building operators to help them select the most appropriate treatment for their situation. EPA solicited public comment on this document, and after considering these comments, will seek an independent external peer review during late 2015/early 2016. EPA plans to publish a final document in 2016.

2. NDWAC Questions/Comments

NDWAC members provided the following feedback regarding Mr. Burneson's presentation:

- One Council member asked if EPA is still considering the development of a distribution system rule. Mr. Burneson explained that one area the FACA committee for the revised Total Coliform Rule (rTCR) noted was the degree to which information on distribution system issues could support additional rulemaking. Among the issues are pressure events and cleaning and inspections of elevated storage facilities. There have been activities to gather more information, for example through the Research and Information Collection Partnerships (RICP) with the Water Research Foundation (WRF). A member of the LCRWG noted that the RICP will have a report this year that identifies completed research and data gaps. Mr. Burneson added that EPA held a public stakeholder meeting on elevated storage facilities. EPA is still gathering information on inspecting and regular cleaning needs before deciding whether to proceed with a regulatory action.
- A member asked for clarification on the Administrative Procedures Act (APA). Mr. Burneson explained that it applies across all federal agencies and specifies the rulemaking process. He provided additional detail as follows:
 - SDWA also codifies some of the requirements in the APA to provide an opportunity for all affected parties to provide input and for their input to be considered by EPA.
 - SDWA specifies a number of actions that the Agency must take as it issues NPDWRs that include:
 - Development of an MCLG, which is a non-enforcement health goal and is the level of a contaminant in drinking water below which there is no known or expected risk to human health.
 - Setting an MCL as feasibly close to the MCLG. The agency looks at analytical feasibility, which is a big driver, particularly for carcinogens because the MCLG is almost always 0. Availability of treatment and analytical methods can also impact feasibility. EPA can specify a treatment instead if there is no economically feasible way to measure the contaminant. For example, when analytical methods are not available for pathogens, EPA can specify a treatment technology requirement instead. The LCR, Surface Water Treatment Rule (SWTR) and Ground Water Rule (GWR) are other examples of treatment technique rules.
 - Conducting a health risk reduction cost analysis (HERCA) that includes quantifiable and non-quantifiable health risk reduction benefits and costs to primacy agencies and to PWSs to implement the rule. HERCA evaluates avoided health risks. EPA also considers risk-risk tradeoffs. For example, the removal of microbes using disinfectants, increases the risk of DBPs. EPA must pay particular attention to health risks posed by sensitive subpopulations, i.e., those most at risk, such as pregnant women, children and the elderly. EPA must include a provision in the rule and the economic analysis must address those populations.

- A determination by the EPA Administrator if benefits justify the cost at the lowest feasible levels. If not, the Administrator can set a standard at a higher level which will be protective to human health. This was the case for arsenic. The MCLG is 0, the analytical methods and treatment evaluation supported an MCL of 3 ppb but EPA promulgated an MCL of 10 parts per billion (ppb) because the health risk reduction benefits did not justify costs at 3 ppb.
- Public comment and consideration of those comments by EPA prior to promulgating a final rule.
- Two Council members asked about the LCR revisions:
 - One asked where EPA is in the process for the LCR. Mr. Burneson explained that EPA promulgated the LCR in 1991 and modified it in 2000 and 2007. EPA is in the pre-proposal stage and is seeking NDWAC input before proposing the rule. The LCRWG provided its recommendations in its report and the NDWAC will present its recommendations to EPA. EPA will consider the NDWAC's recommendations and conduct a cost/benefit analysis before the Agency proposes the rule. Dr. Grevatt added that EPA did not ask the LCRWG to develop a cost/benefits analysis but to think about how to improve the rule. Mr. Burneson also clarified that EPA asked the LCRWG to consider what is feasible for water systems but not to conduct a cost/benefit analysis.
 - Ms. Jonas asked for EPA's projected date proposing the LCR LTR. Mr. Burneson explained that after EPA receives the Council's recommendations, it may be 1 to 2 years before the Agency proposes the rule.

Ms. Jonas expressed her appreciation to Dr. Grevatt and Mr. Burneson for their presentations and to Dr. Grevatt for his leadership in bringing such a depth of issues to the Council.

D. Lead and Copper Long Term Revisions

LCRWG members presented information on the final recommendations in the LCRWG's report to the NDWAC related to:¹¹

1. Background and considerations.
2. Lead service line replacement.
3. Public education.
4. Copper requirements.
5. Corrosion control treatment, monitoring and household action level.

Discussions pertaining to each area are provided in separate subsections below. Additional discussion topics are presented in subsection 6. Each subsection is further divided to provide a summary of each

¹¹ These presentations are available at <http://www.epa.gov/ndwac/national-drinking-water-advisory-council-november-17-19-2015-public-meeting-materials>.

technical presentation (section a) and related questions and comments provided by NDWAC members (section b).

1. Background and Considerations

a. Technical Presentation

Marilyn Christian with Harris County Public Health and Chris Wiant with Caring for Colorado provided the background and considerations of the LCRWG, respectively, in developing its report for the NDWAC. Ms. Christian explained that EPA developed a white paper on the LCR that included key issues that would benefit from input from stakeholders.¹² The LCRWG was formed under the auspices of the NDWAC and included 15 members that represented state regulators, local health departments, drinking water utilities, public interest groups and two NDWAC members – Chris Wiant and herself.

Prior to commencing the in-person meetings, EPA provided webinars to give the LCRWG background on corrosion control, sample site selection, lead sampling protocol, copper public education (PE) and LSLR. To develop recommendations, the LCRWG had seven in-person meetings, provided a webinar to the NDWAC to get feedback prior to the last meeting and had a dozen small group calls.

Ms. Christian provided a brief background on the current LCR. She explained that the rule is a treatment technique rule that requires PWSs to take actions to minimize exposure to lead. Systems serving more than 50,000 people are required to reduce corrosivity of water and to conduct water quality parameter (WQP) monitoring. Any system that exceeds the lead action level (AL) must conduct PE, implement source water monitoring and treatment if needed, and install or optimize corrosion control treatment (OCCT) for PWSs serving 50,000 or fewer people. Systems that continue to exceed the AL after treatment must replace LSLs.

Mr. Wiant explained that the LCRWG's goal was to improve public health protection and to reach consensus, but that the Group also considered the feasibility of its recommendations. In preparing the report, the Group considered that:

- There is no safe level of lead. Lead-bearing plumbing materials in contact with drinking water may pose a risk at all times, not just when the AL is exceeded. It is hard to predict where and when there may be high levels of lead.
- There is clear agreement that lead-containing materials must be removed to resolve the lead in drinking water issue.
- Lead sources are in service lines and in premise plumbing. Thus, elimination of lead materials is a shared responsibility of PWSs, consumers, property owners and the public health community. Success will require a holistic effort with cross-sector stakeholder partnerships and creative financing.
- The LCR should remain a treatment technique rule.

¹² "The LCR Long-term Revisions White Paper" is available at <http://www.epa.gov/sites/production/files/2015-11/documents/lcrwgmeetsumaxd32514.pdf>.

- Science shows issues associated with lead and copper are different.
- There are a number of variables that influence CCT effectiveness.
- The requirements need to be implementable and enforceable.
- PWS and state resources should be focused on actions that achieve the greatest health protection. The Group's focus was how to push water systems further to provide this increased protection.

Mr. Wiant provided an overview of the Group's recommendations that include:

- Fundamental changes to the LCR to:
 - Require a proactive approach to LSLR that would no longer be triggered by a lead action level exceedance (ALE).
 - Require stronger PE requirements for all systems. One reason this is important is because LSLR is a shared responsibility.
 - Establish a household action level (HAL) that would require involvement from the health department if exceeded. There will be a need to educate health departments because drinking water, unlike dust and paint, is not always considered a source of lead.
 - Separate requirements for copper and a focus on systems where water is aggressive to copper.
- Improvements to CCT and monitoring.
- Complementary critical actions that go beyond the LCR and SDWA. EPA should take a leadership role in a national effort with other partners to reduce lead in drinking water that includes, but is not limited to:
 - EPA working across all offices and with other federal agencies, such as the Housing and Urban Development (HUD) and CDC, on an integrated approach for action and education.
 - State and local policies to support LSLR and to assist homeowners (e.g. inspection/disclosure of LSL during sale of homes, building code requirements upon substantial renovation, priority to use State Revolving Fund (SRF) for LSLR).
- Enhanced cooperation among state and local health departments on childhood lead poisoning, screening and prevention that includes recognition of drinking water as a source.
- EPA/CDC and PWS efforts to educate healthcare providers and health departments about the risks of exposure of lead from drinking water. The Group recognized that not just the PWS has responsibility for education.
- Financial assistance programs for low-income customers because LSLs are often in areas where people cannot afford LSLR.
- Engaging experts in community-based risk communication to improve PE approaches.

- Additional research on issues including CCT, tap flushing and defining water aggressive to copper.
- A national clearinghouse of best practices as a resource for PWSs, states, consumers, health departments and other agencies.

b. NDWAC Questions/Comments

Several Council members expressed their appreciation to the LCRWG for their efforts and to Ms. Christian and Mr. Wiant for serving as the Council's liaisons on the LCRWG. Two members noted that they were very impressed by the LCRWG's efforts and its truly holistic approach to getting the lead out and reducing exposures.

Several had comments and questions related to lead health effects:

- A member asked about the risks of lead in drinking water relative to other contaminants. He indicated that lead is a chronic and not an acute poison. Lead health impacts are more a question of long-term exposure to low levels with particular effect on young children. It accumulates in bones and can cause acute problems but it is more the chronic storage of lead that causes long-term problems. In response:
 - The CDC liaison clarified that acute exposure is to high levels; whereas chronic exposure is to low levels.
 - Dr. Grevatt noted that lead is one of the best characterized poisons. Lead has several effects on the central nervous system of young children. There is a specific susceptibility period where even exposure for short periods of time can have permanent effect, such as a reduction in IQ points.
 - The CDC liaison indicated that "no safe level of lead" means no safe blood lead level (BLL). Also, it is important to acknowledge the sensitive populations include infants, young children, and pregnant women, which are discussed in the report to NDWAC but not in the presentation.

A Council member agreed that the view of drinking water as a lead source for those outside the program is very myopic. He explained the importance of considering ways to reduce BLLs of the poor in urban and rural settings. He added that LSLs may not always be the lead source, and asked if there needs to be a statement about where limited public dollars should be spent. In response, Mr. Wiant noted the importance of engaging other stakeholders to look at the issue of lead holistically to include drinking water and not just paint and dust. He added that evaluations of a home for lead sources need to include a drinking water sample.

A member asked about the relative source contribution (RSC) of lead in drinking water compared to other sources. In response:

- Dr. Grevatt indicated that lead is perhaps the best example of a contaminant with multimedia exposure. The effort to remove lead from gasoline was a battle and had dramatic results in the rapid reduction of BLLs across the population. Today, the principle sources are lead in paint, dust associated with paint (a number of rules that address that), soil from exterior paint or

smelting activities (with which EPA has addressed) and lead in drinking water. Typically, lead in drinking water results from leaching of lead from plumbing materials in the distribution systems versus being present in source water. EPA is considering RSC to evaluate the HAL and has not determined that level. For any given child or home, the RSC depends on the situation. For example, lead paint may not be the issue in a home. LSLs may not cause the problem in drinking water but exposure could also be from lead in soil. Some cities in the western U.S. had historic smelting activities.

- Mr. Burneson emphasized that RSC is highly variable and based on the specific circumstances. He added that EPA's website indicates the RSC of drinking water is 20 percent in general and from 40 to 60 percent for a bottle fed infant. Thus, drinking water can be a significant contributor of lead especially for vulnerable populations.
- Mr. Wiant indicated that the dynamics of the lead public health issue has changed. In the past, the health community was focused on finding children that consumed lead paint chips. This is part of the reason why water has not historically been part of the equation. Since then, the CDC level of concern has dropped from 40 to 5 µg/dL. He added that the RSC will depend on the population. The public health community needs to change its thinking on lead and where to focus resources.

A Council member noted that the resources available to health departments vary, and that small cities typically do not have well-equipped health departments. They would need resources from other agencies to help communicate with residents.

The CDC liaison asked if corrosion and CCT are the most pressing issues for lead in drinking water today or if there are other important factors.

- A LCRWG member explained that the highest lead levels are usually from particulate lead. CCT experts have told the LCRWG that CCT does effectively reduce particulate lead levels. Also, there will be always changes in water quality and treatment and physical disturbances. So to reduce risk in the long term, removing the lead materials is key so that there is less opportunity for lead to be in contact in drinking water.
- Mr. Wiant added that because lead can vary by home, there is only so much that can be done at the system level. It is not feasible for a system to monitor homes with enough frequency to be adequate. That is why PE is so important to make people understand situations where they may have high lead levels.

The CDC liaison indicated that his agency uses PE often but to be effective requires a support system. He asked whether the LCRWG considered that need. In response:

- Mr. Wiant indicated that the LCRWG understood that effective communication involves more than simply providing information. It should ensure the message is heard and the public is interested. He added that it is a challenge to build that into a regulation.
- Another LCRWG member added that the Group moved away from one-way communication in which information is provided to the consumers without providing ways for them to take action. Instead, the report recommends that PE provide information about risk of lead exposure, such

as from LSLs, and actions the consumers can take to protect themselves. For example, how customers with LSLs can participate in the LSLR program. The public has a shared responsibility under this rule.

- Another LCRWG member added that the Group struggled with the fact that not all of the science is in. Because of this and the need to provide better risk communication at the national level, the Group tried to develop recommendations that would not leave the rule as a static rule but as a dynamic process that will continue to improve and include all the latest science.

2. Lead Service Line Replacement (LSLR) Requirements

Prior to the LSLR presentation, Dr. Grevatt noted some additional considerations for the Council. He explained that EPA sought out a diverse set of perspectives for the LCRWG. The Group did a great job rolling up its sleeve to see whether it could come together and agree. EPA did not require the Group to come to consensus. There were some issues on which one member could not say she agreed and EPA supports that any LCRWG member have the opportunity to express that. The Council should consider that opinion as much as report. He asked Council members to carefully consider all of the presentations, including dissenting ones, and public comments.

Dr. Grevatt added that Mr. Burneson's presentation described the RLDWA, which prohibits water that comes out of a tap from passing through a faucet that has more than 0.25% of lead in the wetted surface. However, it is legal for water coming from a tap to first pass through 50 feet of lead. He thinks that RLDWA is important, but he wanted to emphasize the importance of the Council's work and its recommendations to EPA.

a. Technical Presentation

Steve Estes-Smargiassi, with Massachusetts Water Resources Authority, provided an overview of the LCRWG's considerations and final recommendations for the LSLR program. The LSLR is one critical part of a package with interdependent pieces. The report highlights throughout, that education and communication are key for the success of the LSLR program.

Under the current rule, a PWS is triggered into LSLR only if it has a lead ALE after installing treatment. The system must meet an annual 7 percent replacement rate. Moreover, PWSs can cease LSLR if they no longer exceed the AL for two consecutive monitoring periods. These requirements do not allow enough time for PWSs to establish an effective outreach or LSLR program and provide no incentives to design a long-term program.

Mr. Estes-Smargiassi explained that LSLs are typically divided into a public and private side. The public portion may extend from the water main in the street to the curb stop at the property line and could run 15 feet or so. The private piece is generally from the curb stop to the water meter at the house and could be 30 or 40 feet. The current rule requires a system to replace its portion and to ask customers if they want their LSLs replaced at their own expense. Systems have limited time to get private engagement. Customers may not see the need to replace their portion of the LSLs, which result in partial LSLR (PLSLR) where only the PWS's portion is replaced.

Although PLSLR was initially seen as a positive step, the SAB evaluated PLSLRs and concluded that they do not reliably reduce lead in the long-term and the disturbance associated with the replacement results

in a temporary increase in lead levels. Full LSLR may result in a temporary increase in lead levels but in general, effectively and reliably lowers lead levels in drinking water.

The LCRWG asked what should be the goal in 30 years and the answer was to remove as much lead as possible. The Group also considered a practical way to achieve that goal, which is to have an effective long-term LSLR program.

The elements of the long-term LSLR program as outlined in the report include:

- An effective PE program with targeted outreach to consumers with LSLs that would describe the risks of having a LSL and invite them to participate in the LSLR program. PWSs must conduct continued outreach on a 3-year cycle to those consumers that refused full LSR and when there is a new homeowner.
- Three-year milestones toward a long-term goal of no LSLs remaining. A system that could not meet this goal would be not be in violation, but would be required to conduct outreach activities. Table 2 at the end of the report lists elements of an outreach program for an effective LSLR program. Failure to conduct this outreach would be a violation.
- Standard operating procedures (SOPs) that PWSs would develop for:
 - Situations that would result in a disturbance to a LSL (e.g., maintenance or emergency repairs). These situations would require outreach to the customer and risk mitigation steps to deal with spikes in lead levels.
 - Coordination with other utilities (e.g., gas company, cable company) that conduct activities affecting water service lines or mains to ensure they are providing similar information to the homeowner.

The benefits of the long-term LSLR approach are:

- The primary source of lead in contact with drinking water will be largely removed over time. The RLDWA lowers the maximum allowable lead in plumbing materials so LSLs are the last remaining piece.
- Reduced public health risk and CCT costs.
- An improved process for planning and replacing LSLs because it eliminates the stopping and starting of LSLs and recognizes that LSLR will happen over a long period.
- Improved awareness of the location of LSLs and partial lead service lines (PLSLs).
- Improved communication with consumers and public health partners about the risks of lead in drinking water. This will help consumer take needed action.
- Reduced risk/consequences from treatment upsets or source water changes. Unintended consequences are a concern and getting the lead out of the ground is one factor the utility manager would have to consider. A system would also be required to receive approval any time it makes a change to its treatment or source.

b. NDWAC Questions/Comments

Some NDWAC members and the CDC liaison asked for clarifications on the LCRWG's LSLR recommendations or other points made in the presentation:

- A Council member asked if the LCRWG had prioritized the recommendations on pages 13 and 14 regarding LSLR: In response:
 - One LCRWG member explained that the Group did not prioritize the list but included all the elements it considered for a successful LSLR program.
 - A Council/LCRWG member added that different water systems may not be able to conduct all activities but the various recommendations work together. The other Council/LCRWG member indicated that each influences or complements the objective to removal LSLs.
 - Mr. Estes-Smargiassi indicated that these pages provide an overview with additional detail provided later in the report. The Group essentially considered them to be equal.
- A Council member questioned how the LCRWG developed the schedule for the LSLR program in Table 1 of the report. Mr. Estes-Smargiassi explained that the current program requires an annual replacement rate of 7 percent, and decided on a slightly slower schedule of 5 percent per year (15 percent over a 3-year cycle). The 15 percent applies to the earlier 3-year cycles and decreases in later cycles, recognizing the systems may have difficulty getting some to agree to full LSLR.
- Ms. Jonas asked the Group if there was a year after which LSLs were no longer installed. In response, Mr. Estes-Smargiassi explained that the answer will vary by area. In general, after World War II, LSLs were no longer used; however, they were still installed in some places in the 1970's. Knowing if a LSL exists may not be based on a year but on good records. The bottom line for inventory is that the Group wanted the system to start right away on replacement and to improve its inventory as it went along.
- A Council/LCRWG member asked if the Council members who worked for utilities allowed new construction to be connected to a LSL. One member explained that her city would never allow a service to be connected to a LSL. Another noted that it differs by city ordinance. A third replied that in Indian Country, PWSs will connect to a LSL.
- A Council member asked if a PWS can prove it has no LSLs and therefore, would not be required to have a LSLR program. Mr. Estes-Smargiassi responded that the program may be unnecessary when the PWS or the state has good records about the service materials or the PWS exclusively serves homes built after a certain year.
- A Council member asked for clarification on the requirements for systems with no LSLs or CCT. In response, Mr. Estes-Smargiassi explained that there will be instances where LSLs were never installed or all are fully replaced. The primacy agency will need to decide what constitutes sufficient documentation from the PWS. Regarding CCT, the report includes a recommendation that systems that have non-corrosive water for lead or copper will have to continue to

demonstrate that there water quality has not changed by regularly monitoring WQPs. Systems must also collect samples when requested by homeowners.

- The CDC liaison asked for clarification regarding replacement credit. Mr. Estes-Smargiassi explained that it is a check that something had been done. The program gives a system credit if it fully removes a LSL or demonstrates that one presumed to be lead is not. A system does not receive credit for a PLSLR, and the line remains in the inventory. The Group considered enhanced credit for daycares, schools or multifamily residents.
- A Council member questioned the Group's recommendation for not giving credit for a PLSLR and if that would be a disincentive for systems to conduct LSLR. In response, a LCRWG member explained that the Group decided that any portion of a LSL remaining in the ground is a significant source of lead. PLSLR is allowed under certain circumstances, but it remains in the inventory and a system must contact that homeowner every 3 years or the new owner sooner (if applicable) until full LSLR is achieved.
- A Council member asked what type of assistance and guidance will be made available for the LSLR program. In response, Mr. Estes-Smargiassi explained that the LCRWG recommended that EPA establish a national clearinghouse that would contain information and templates that systems can use for communicating with their customers. Templates for SOPs could also be in the clearinghouse or part of EPA guidance. The Group also recognized that there are some substantial issues on ability to pay and some successes using resources for LSLR (e.g., SRF). The Group also recognized situations that fail to deal with lead in water effectively. For example, drinking water is not considered as a possible source of lead in the Healthy Homes program or by some health agencies. In addition, LSLs are not included as part of home inspections.
- A Council member was surprised that full LSLR resulted in higher lead levels after replacement. Mr. Estes-Smargiassi clarified that after full LSLR, lead levels spike and then drop to a level that is lower than pre-replacement. The temporary spike is caused by particulates and lead that has accumulated downstream of LSLs in home plumbing that are released when the LSL is disturbed. For PLSLR, the lead levels spike and then drop to a level that is about the same as pre-replacement. Some researchers indicate that any disturbance, such as digging up the street could result in a release of lead but currently that supposition has not been adequately studied.

Several members provided comments on the cost of LSLR.

- A Council member shared information about the LSLs in her city and associated costs. Her city has about 70,000 LSLs. The city has replaced 15 miles of water mains as part of its ongoing replacement program, but only 150 of the affected 1,500 lines were lead. This illustrates that sometimes the prioritization of water main replacement may not be in areas with LSLs. The estimated cost to replace the utility side of the LSL is \$3,700 and the cost to replace the private side is \$3,500 to \$5,000 (about \$8,000 - \$9,000 for full LSLR per home). She agreed with the importance of an organized approach to LSLR, but noted challenges when water main replacement and LSLs do not overlap. Mr. Estes-Smargiassi responded that the Group did not have as much detail as what she provided, but some LCRWG members discussed their utility's experiences. Those experience shaped the Group's decision not to penalize a system for not

achieving the replacement milestones but instead to require increased outreach. In addition, the Group thought it was important to start the program immediately by improving the inventory. The system gets credit for proving a service line is not lead. So some things temper that replacement pace. He could not say it was a perfect solution but a compromise.

- Another Council member explained approximately 26 percent of people in his city are below poverty level, and that many of them are located in areas with LSLs. He emphasized the clear need for significant support from the federal government. He stated that lead pipes need to be part of HUD's program but questioned how to make that happen. He added that community block grants are not an answer for his city because that funding is already spoken for. Mr. Estes-Smargiassi responded that the Group's report includes recommendations for HUD to help fund customer-owned portions of LSLs. Utilities could consider whether it is feasible to have a loan program similar to the one in Boston, where the city pays for the first \$1,000 of LSLR and provides 0 interest loan over 24 months as part of water bill. The Group recognized that some actions may not be legal in all areas, such as using public funds on private property, which is why it recommended having these measures in the rule.
- A Council/LCRWG member added that the crux of this issue is how to pay for LSLR. LSLR is not simply EPA's promulgating a rule and the PWS's following it. To be successful, all parties in the community must work together. The Council can suggest possible funding sources and possibly setting up parameters in the Six-Year Review process but the real challenge is how to make the point that LSLR needs significant funding and involves actions outside EPA's control.

3. Public Education (PE) Requirements

a. Technical Presentation

Gary Burlingame, with Philadelphia Water Department, presented the LCRWG's final recommendations for PE. He explained that the current rule relies on the consumer confidence report (CCR) to give the public general information about lead in their water. Lead is different from other contaminants because the public needs to understand that they are part of the solution. The need for education and communication is imbedded throughout the LCRWG's report. PE is a cornerstone of the report, and education must extend beyond the public to health departments and other agencies, so that people understand the risks of lead, as they do for radon or asbestos.

Mr. Burlingame also explained that:

- Both the copper control and lead control programs include education pieces. For copper the CCR is the vehicle through which the public will know if they have corrosive water, what it means to them and actions they can take to reduce their risk. For lead, CCR is only one source of information. There is education and communication in about every step of the LSLR program because consumers need to understand if they have exposure to lead, the sources and what they can do to reduce their risk.
- Customers and PWSs share responsibility for reducing exposure to lead. Therefore, a two-way communication approach is needed so consumers understand:

- The risk of lead in drinking water and the likelihood that their home contains LSLs. For example, sources can include lead in brass faucets and LSLs.
- The importance of LSLR.
- The shared responsibility nature of the LCR.
- Where to get additional information including information on how to reduce lead.
- The LCRWG suggested that EPA develop a national clearinghouse that could be a publically-available website. The clearinghouse:
 - Should include information on health risks and sources of lead exposure in drinking water, how to have water and BLL tested and limitations of these tests, specific information for homes with LSLs (e.g., flushing instructions, responsibility for LSLR). It could also include PE and other templates for PWS use.
 - Should be developed by EPA after consultation with stakeholders and experts in community-based risk communication to most effectively convey information.
 - Will provide good communication and consistent information. The CCR has limitations on what it can convey.
- The LCRWG recommended the following revisions to the LCR related to PE:
 - New customer outreach and targeted outreach to consumers with LSLs and vulnerable populations.
 - Revisions to the current CCR language to address LSLs, update health statements, clarify that CWS compliance with federal regulations is not an indication of individual household levels, indicate the role of the public to protect themselves from lead exposure and link to the national clearinghouse website.
 - Additional requirements for public access to information (e.g., HAL, WQPs, LSLR program, etc.) and better access to monitoring information through EPA's national database (SDWIS Prime).
 - Outreach to public health partners.

b. NDWAC Comments/Questions

A Council member asked if the Group considered recommending point-of-use devices (POU) following LSLR and how to handle a situation where a homeowner wants to use a filter instead of getting his/her LSL replaced. A Council/LCRWG member explained that POU devices are good as an interim step but are not a substitute for LSLR. Mr. Burlingame explained there are a number of ways that the homeowner will be continually encouraged to remove the LSL. Utilities will not receive credit toward replacement until the line is fully replaced and must continue to contact the homeowner until that is achieved. The LSL could be made known during the sale of the home. There could be ways a community finds to provide monetary support. Homeowners may also get peer or community pressure. There may be customers that are obstinate, but at some point in time the line will be replaced. Also, the clearinghouse

will include information on many ways to reduce lead including flushing, testing and which POU and point-of-entry (POE) devices can remove lead and their limitations.

A Council member asked if the LCRWG recommended audience-specific messaging and delivery mechanisms. Mr. Burlingame responded that risk communication experts will know how to best communicate to a wide audience. For those with LSLs, the education needs to help PWSs locate LSLs and inform individuals about the risk from lead. To successfully reach vulnerable populations requires working with pediatricians to educate mothers and fathers with young children. There are multiple questions that necessitate multiple means to get them answered. Work conducted by the Water Research Foundation highlights the importance of using the right terminology in messaging. For example, emerging contaminants have no meaning to most and the term, “unregulated contaminant” is misinterpreted.

The SAB liaison noted that she understood the need for a national and consistent message that federal agencies and organizations must communicate together. She asked if pamphlets and public service announcement (PSA) could be used in addition to the national clearinghouse. Three LCRWG members responded:

- Mr. Burlingame indicated at the national level, there needs to be more than a message, there needs to be buy-in from different organizations.
- Another explained that the Group did not discuss a national PSA campaign. The Group was trying to build support across and among agencies to provide leadership for lead in water, similar to what is done for lead in paint and dust. He noted that a lot of actions will need to be at the local level.
- Another indicated that the Group suggested that EPA consult with experts to determine the most effective ways to communicate.

A Council member noted concern about the frequency with which information is disseminated to the public about drinking water safety. The message the public is hearing is that drinking water is not safe and to buy bottled water.

4. Copper Requirements

a. Technical Presentation

Derrick Dennis with the State of Washington explained the Group’s approach for having separate requirements for copper and presented the following factors that drove its recommendations:

- The current LCR monitoring scheme focuses on locations where high lead levels are expected to be found. Copper is unlikely to be found at these 30+ year homes because higher copper levels generally occur at homes with new copper plumbing.
- New science indicates that high copper levels may not persist for long periods of time and are tied to the aggressiveness of water to copper.

The LCRWG recommended:

- Actions based on the aggressiveness of water to copper and not on routine in-home tap monitoring.
- EPA develop criteria to define water that is not aggressive to copper, which is based on pH and alkalinity.
- PWSs have the following four options for demonstrating whether their water is not aggressive to copper:
 - WQP monitoring.
 - One-time evaluation with tap sampling for copper at homes with new copper.
 - Pipe loop study.
 - CCT to change water chemistry.
- PWSs with non-aggressive water would continue to demonstrate that their water is not aggressive to copper either through: 1) WQP monitoring or 2) copper tap sampling at homes with new copper.
- Systems with aggressive water to copper would maintain a PE program to inform owners: 1) of new homes at the initiation of service and 2) of renovated homes or to all customers routinely.
- EPA should consider whether and under what circumstances CCT for copper should be required.
- Long-term treatment or source water changes may result in a demonstration of continued non-aggressiveness of water.

b. NDWAC Questions/Comments

NDWAC members and the CDC liaison asked the following clarifying questions:

- A NDWAC member asked for an explanation of the pipe loop study. Mr. Burlingame explained that this method allows a system to test the effects of different treatments without making changes directly in its system. The system sets up a series of copper pipes, through which it runs water containing various types of treatment (e.g., different pH levels) and measures the amount of copper that leaches from the pipe. A pipe loop study could also help the system determine the length of time for copper passivation.
- Another NDWAC member asked for clarification on the health effects of copper. In response, Mr. Burneson explained that the MCLG of 1.3 mg/L is based on acute gastrointestinal health effects. There are also sensitive populations – people with Wilson Disease in which copper accumulates in the body.
- Ms. Jonas asked how often a system would need to demonstrate its water corrosivity. In response, Mr. Dennis explained that the Group did not address timing but that information from WQP monitoring can be useful in demonstrating water corrosivity for copper.

- The CDC liaison asked if aggressive water leaches copper levels above > 1.3 mg/L. Mr. Dennis responded that levels above 1.3 mg/L would likely be seen if aggressive water is in contact with new copper. Another LCRWG member added that systems will have difficulty identifying homes that have undergone remodeling so the copper PE will inform homeowners.
- A Council member asked several questions regarding passivation. The questions and LCRWG responses are as follows:
 - How aggressiveness relates to passivation time. In response, an LCRWG member explained that passivation occurs for all metals and can occur in different ways. Passivation occurs over time. Copper in water will react and form protective layers over the copper plumbing. Different water qualities will have different passivation rates that can take weeks or years. He was uncertain if there is a way to predict passivation times.
 - If passivation is sufficient to protect public health. A LCRWG member explained that systems with corrosive water will also be required to provide PE.
 - If there is a long-term risk with eroding or disturbances that would impact passivation. An LCRWG member explained that a change in source or treatment could affect passivation. Another LCRWG added that copper has an advantage over lead in that a high concentration of copper can cause a taste or staining problems that will be detected by the consumer.

5. Corrosion Control Technology (CCT), Monitoring and Health Advisory Level (HAL)

a. Technical Presentation

Tom Neltner, with National Center for Healthy Housing, provided an overview of the recommendations in the report for improving CCT, modifying tap sampling requirements and developing a HAL. He explained that his background is with Healthy Homes and that prior to joining the LCRWG, he did not have an understanding of the significance of lead in drinking water.

Corrosion Control Treatment

Mr. Neltner explained that CCT is required for all systems serving more than 50,000 people and for smaller systems if they exceed the lead or copper AL. The Group recommended retaining CCT but with the following improvements:

- To acknowledge that the science has evolved since the rule was implemented over 20 years ago and continues to do so, EPA should release a new guidance manual every 6 years. Large systems must review the updates to guidance to determine if their CCT is based on the best science and medium/small systems must work with their primacy agencies to determine the applicability of these updates.
- EPA should provide assistance to PWSs and states.
- Systems must reassess their CCT if they change their source or treatment.
- Lead levels can be erratic and be different from home to home. WQPs may be more stable than lead levels and a more useful way to control CCT. This includes more rigorous data review, use

of control charts and process control. CCT is one piece and will not take care of the entire system, which is why PE and LSLR are also needed.

- For those not participating in CCT, the system needs to demonstrate that water quality characteristics remain in place.

Tap Sampling Requirements

Mr. Neltner explained that the current monitoring approach is not effective because:

- The sampling protocol may not capture the highest lead levels. For example, samples are first-draw samples and are not collected from LSLs.
- Customer recruitment is difficult and time consuming.
- Most systems are collecting samples every 3 years during a 4-month period and are required to collect these samples from the same location. The system does not know what is happening in the interim.
- Implications for CCT are complicated.

The recommendations in the report suggest modifying tap sampling requirements such that:

- Systems would instead use voluntary customer-initiated tap sampling and seek participation using targeted outreach to customers with LSLs and vulnerable populations, but also make tap sampling available to any customer. The Group suggested a minimum number of required samples equal to the number required for a system on reduced monitoring.
- Tap sampling results would be used to: 1) inform and empower individual households to reduce risk, 2) report to health officials when monitoring exceeds a “household action level” and 3) evaluate effectiveness of CCT and guide reassessment.
- Systems would transition to the new monitoring scheme if they have three cycles below the AL but LSLR requirements would begin immediately.
- To assess CCT effectiveness:
 - Tap sample results would be reported to primacy agencies routinely and include information on sampling protocols used. Data would be reviewed during sanitary surveys.
 - PWSs would maintain the data for review to identify trends and changes, as well as be available for public review.
 - Annually, at the request of the primacy agency, the PWS would provide a report which includes the three most current years of data.
 - If the 90th percentile level of 3 years of data exceeds the “system action level”, the PWS must assess the cause and potentially re-evaluate CCT. The system action level is the same as the current lead AL of 15 ppb.

- Source water and treatment changes would necessitate a review of the tap sampling data in consultation with the primacy agency.

Water Quality Parameters

The report includes recommendations to strengthening WQP requirements as follows:

- Tailor WQPs based on the individual PWS's CCT plan, increase the frequency of WQP monitoring for process control and ensure sites are representative of the distribution system.
- EPA should review and consider augmenting the current LCR's list of WQPs based on new science. The new information would be disseminated through EPA's CCT guidance manual.
- WQP data should support a more rigorous review process such as control charting and other techniques to fine tune operations, to reduce variability in the distribution system and to detect excursions.

Household Action Level

Mr. Neltner explained the rationale and recommendations regarding the HAL as follows:

- The current AL ("system action level") is based on the 90th percentile level of collected tap samples. It also requires a PWS to provide individual lead results to be provided to homeowners; however, homeowners may not know what to do with that information.
- The Group developed the concept of the HAL because systems could have a 90th percentile level that does not exceed the AL but have some extremely high lead levels in 10 percent of their samples.
- The HAL would be based on a lead concentration necessary to elevate BLL at or above 5 µg/dL (CDC level of concern) in a healthy, formula fed infant.
- PWS must notify the local health department of a lead tap sample result above the HAL and the health department would take whatever action it deems best. This concept is based on the Healthy Housing program. HUD requires that health departments be notified when a BLL is over a certain level. Health departments understand and have responsibility for public health and if resources permit, will take action.
- Data would be available for public review instead of only being provided to the individual whose home was tested. Otherwise, individuals spend resources trying to find the data.

b. NDWAC Questions/Comments

Some Council members had comments and questions related to monitoring as follows:

- Why the LCRWG recommended that samples no longer be collected from representative sites. Mr. Neltner indicated that the current protocol requires sampling from sites where the highest lead levels are expected and not from representative sites. CCT would not be effectively controlling for lead if it were based on representative sites.

- Data are useful for one purpose but not another. What is a bad level for a particular home? In response:
 - Mr. Neltner noted that is why the Group recommended a HAL.
 - Another LCRWG member explained that one of the flaws of the current rule is that it requires systems to sample the same homes but not to help the individuals in those homes take action to reduce their exposure to lead. The LCRWG's recommendation focus PE on those with LSLs. Thus, the sampling pool should be biased to include sites with high levels of lead due to LSLs. In addition, individual customers will have a choice regarding the type of sample (e.g., one that indicates lead contribution from a faucet or LSL, the lead content in the water used to make baby formula). The report includes recommendations for the clearinghouse to include different sampling protocols.
- A Council member asked about the connection between biasing the samples and rental properties. A LCRWG member explained that the current protocol includes a tiering structure that prioritizes locations likely to have lead plumbing and focuses on single family residences (SFRs). SFRs are targeted because the sampling protocol requires the water to remain stagnant for at least 6-hours prior to collection, which would be difficult to achieve in a multifamily residence. The LCRWG is recommending that anyone can get their water tested. This opens up the sampling pool. Multifamily housing has more lead paint but it is unclear if these structures have more lead in drinking water. Mr. Neltner explained that most lead poisoning cases on which he has worked involved children in rental properties. Currently, the rule does not prioritize sampling at these locations. He noted that the source of the lead is unaccounted for in about 30 percent of the lead poisoning cases. Not testing the drinking water of rental properties may have resulted in missing a large exposure for many people with children, many of whom tend to be on the low income side. The volunteer testing program should provide a way to get those rental properties tested.
- A Council member asked if the Group recommended a minimum and maximum for volunteer testing. A LCRWG member responded that the Group recommended a minimum of no fewer than the number of samples currently required for a system on reduced monitoring, but did not set an upper bound.

Council members provided the following feedback regarding the HAL and actions taken by health departments:

- A Council member asked if the HAL had been determined. Mr. Neltner responded that EPA is developing it and the report includes a disclaimer if the HAL is less than the current AL of 15 ppb.
- A Council member indicated that her water system already talks to customers and to health departments when lead levels are high. Mr. Neltner responded this was clear during the LCRWG deliberations and that the requirement will have little impact on many water systems. Another LCRWG member indicated although some systems currently are providing information to health departments, the Group thought in some instances the lead level may not be high enough or the information that systems are providing is insufficient to motivate customers to take action. He

added that people respond to health agencies differently than PWSs, especially when receiving health-related information.

- A Council/LCRWG member noted that there are limitations under SDWA regarding who EPA can compel to take action. EPA can require PWSs to contact health departments but has no authority over the latter. The Group's goal was to get better information to the household. The Group recognized the health departments have the expertise to make direct contact with individuals in the household and to explain the risk. They may be unable to require the removal of a LSL or paint, but health departments can do things in the interim to protect the household.
- Another asked what actions have health departments taken if a child has an elevated BLL and where do they get the funds. Mr. Neltner indicated that money for the Healthy Homes program comes from HUD Section 8 vouchers. For that program, the health department would monitor the child but the landlord would be responsible for fixing the problem. The health department has some authority in these cases. Generally, the actions are to manage lead paint in place because it is generally less risky to cover the paint than to remove it. He added that for LSLs, it would be better to replace them rather than provide filters.
- The CDC liaison asked what happens when the health department has insufficient funding. Mr. Neltner indicated that health departments have authority through the housing code to protect the child. They could require filters or order a LSL to be removed but typically they do not require this action. Some health departments may do nothing. He added that over \$100M is available for lead remediation that he believes could be expanded to include LSLR. EPA would need to work with HUD to expand the use of HUD's funding to include LSLR.
- The CDC liaison asked if there had been any success stories where the health department independently or cooperatively replaced a LSL that could serve as a model. In response,
 - Mr. Neltner was unaware of any instances in the cases he has worked across the country.
 - Another LCRWG member stated that Boston Public Health Commission (BPHC) has begun taking some action related to water. Now BPHC not only takes paint swabs but collects drinking water samples.
- Ms. Jonas asked for clarification regarding the recommendation in the second bullet on page 41 of the report, "EPA should work with CDC and HHS to ensure that the standard protocol for investigation of any child with elevated blood lead levels or of a home with lead levels above the HAL include determination of whether there is a lead service line." A Council/LCRWG explained that the LCRWG recommended that elevated BLL investigations include drinking water. The CDC liaison added his agency includes drinking water in its assessment but that the issue may be on the state or local level and that CDC can pass this information onto them.

6. Discussions on Topics Not Included in the Presentations

Some Council members asked about the relative risk of lead compared to other contaminants:

- A Council member asked about the risk of lead versus fluoride. He considers fluoride to be more of a worldwide problem. He asked how CDC distinguishes the health risk. In response:

- The CDC liaison indicated that lead affects the central nervous system, whereas fluoride affects bones and teeth. He added that the health target determines the procedure CDC will follow to communicate risk. For lead, BLL is the health level and there is no safe level. CDC found some central nervous system effects in infants and young children with a BLL of less than 3 µg/dL.
- Mr. Burneson added that fluoride has an MCLG of 4 ppm based on studies that show skeletal fluorosis. The 2006 National Academy of Science (NAS) study, *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*, looked at teeth mottling, which NAS considered the adverse endpoint, and the degree that people are being exposed to fluoride. That study will inform the Agency's decisions regarding fluoride. Lead and fluoride are not in a risk-tradeoff situation in that treatment for one does not impact the other. Thus, EPA does not evaluate one against the other.
- One of the Council/LCRWG members added that with lead, there is virtually no disagreement about the risk of lead. The issue with fluoride is that it is added to water to provide a benefit but at what point does it do harm. With fluoride there is a requirement to put fluoride in the water. Therefore, the two are not really comparable. The other Council/LCRWG member noted that at some level both fluoride and copper are beneficial and have non-zero MCLGs.
- A Council member asked where copper is on a comparative risk basis. In response, another member, who also served on the LCRWG, explained that with the exception of those with Wilson Disease, copper has acute, short-term reversible risk (i.e., gastrointestinal distress). Lead is a risk with continued exposure and there are more body systems that can be affected in the long-term.

Council members discussed the recommendations in the report related to complementary actions.

- In response to a request for clarification, a LCRWG member explained that effectively dealing with lead will require actions from many entities that are beyond the scope of SDWA. These non-regulatory actions would make the provisions in the rule more effective. For example:
 - EPA as a whole should work together to deal with all sources of lead, not just paint or dust.
 - EPA needs to solicit assistance from CDC to work with state and local health agencies to better inform health care professionals about the risk of lead from drinking water.
 - To promote LSLR, EPA or state/local authorities need to better communicate about the ability to use SRF for LSLR and to investigate the use of federal tax deduction, as was done in Massachusetts for septic system rehabilitation.
- Another member explained that the report captures possible actions that could be successful in some communities, and is not an exhaustive list. In addition to EPA actions, it lists some state or local complementary actions. Examples include revisions to local or state laws to restrict the use of copper where water is aggressive to copper and to require inspection or replacement of LSLs as a condition for selling a home. The report also lists complementary actions for PWSs.

- A Council member asked how the recommendations under PWS actions for a rate design consideration would be useful for reducing lead in drinking water. A LCRWG member explained that higher rates paid by some customers could be used to pay for the replacements of LSL for customers who could not otherwise afford them.

E. LCRWG Member's Dissenting Opinion

1. Technical Presentation

Yanna Lambrinidou, President of Parents for Nontoxic Alternatives, is one of the 15 LCRWG members. She thanked EPA for the opportunity to serve on the LCRWG and to present her dissenting opinion on the LCRWG's report to the NDWAC.

Dr. Lambrinidou believes that the Group's recommendation will weaken the LCR and reduce public health protection. She has spent 8 years working on lead in water and has extensive experience with loopholes and irregular implementation of the rule by PWSs and states. In her years of work on the issue, she encountered many consumers who have developed expertise in lead and water. They uncovered the contamination and had no choice but to take a leading role in ensuring their children's exposure stopped. She believes that despite EPA's best efforts to put together a diverse group, deliberations lacked important perspective. One-third of the LCRWG's membership represented the regulated community.

Twenty-five years ago, in its preamble to the LCR, EPA acknowledged that water could contribute from 5 to more than 50 percent of lead exposure and up to 85 percent of an infant's exposure. As other sources decline, the percent contribution from water can become even greater. The goal of the rule is to provide maximum human health protection by getting as close as possible to the lead MCLG of zero. It is well established that there is no safe level of lead for human consumption. Ingestion of lead can have irreversible effects and cause fetal deaths and miscarriages.

Twenty-five years after the promulgation of the rule, there is a better understanding of lead in drinking water. Lead particulates from plumbing materials can be released erratically and pose an immediate and acute health risk that is analogous to lead paint. Experience in cities like Washington DC and Flint demonstrate an under-detected and inadequately controlled health risk across the U.S.

Under the current rule, CCT is the main method for reducing lead levels at consumers' taps and is the responsibility of the PWS. PWSs must monitor high risk homes and treat to reduce corrosivity. The LCR requires ongoing monitoring to ensure CCT is working effectively. The CCT and monitoring are in a permanent feedback loop in which the lead levels guide the CCT and CCT guides the lead levels. PWSs serving less than 50,000 people are deemed to have optimized corrosion control if they have no ALEs. Those serving 50,000 or more people are deemed to have optimized corrosion control if they achieve the lowest possible lead levels without violating any other NPDWRs. When the system is optimized, the state sets optimal water quality parameters (OWQPs) to ensure the water remain non-aggressive. PWSs are in violation if they are outside the OWQP ranges. The rationale is that CCT that is operated within the OWQPs will keep lead levels at the tap low. CCT and monitoring are the cornerstone of rule. When more than 10 percent of targeted taps are above 15 ppb, the LCR mandates remedial measures include PE, LSLR and CCT optimization.

In summary, the LCR is a shared responsibility rule between the PWSs and the public. Systems are responsible for keeping tap lead levels low and when they have a lead ALE, for providing PE that informs consumers how to protect themselves from exposure to lead. Consumers must decide whether or not to pay for LSLR.

The LCR has four pillars: 1) tap monitoring that captures worst-case lead, 2) CCT that achieves lead minimization at consumers' taps, 3) mandated remediation following a lead ALE and 4) compliance mechanisms that correspond to consumer tap lead levels. She explained that each of these pillars are weaker than EPA intended:

- Tap monitoring does not capture the highest levels of lead in people's homes and sampling protocols miss lead (e.g., they do not account for low flow conditions). Therefore, many systems underestimate the lead levels in tap water and do not optimize CCT. A new study¹³ showed that if the LCR captured LSL water, about 50 to 70 percent of systems with LSLs would exceed the lead AL and be required to conduct LSLR. These systems serve an estimated 96 million people.
- Mike Schock, a CCT expert with EPA, stated that no system has carried out the study needed to have the lowest levels at the tap despite evidence that treatment can reduce soluble and particulate lead release.
- Regarding mandated remediation following a lead ALE:
 - EPA's June 2006 national review revealed that PE messaging is ineffective and PWSs issue the required PE to consumers less than 33 percent of the time. The same report found that the required WQP and source water monitoring was documented to have occurred in only 42 percent of the 132 instances during 2000-2004.
 - Her research on LSLR in DC indicates that the greatest impediment to homeowners' decisions to replace their side of the LSL is cost. Other reasons include the belief their water is safe based on one-time testing, no vulnerable populations in the house, fear of property damage and perception of low risk due to other precautions (e.g., bottled water, filters, flushing). Homeowners indicated that DC Water's outreach lacked clear messaging about the risks of partial and benefits of full LSLR and overemphasized logistics. Her research showed a clear racial and income difference between PLSLR and full LSLR in DC, in which more White/Caucasians opted for full LSLR. Studies have shown that PLSLR can result in increases in lead levels that can last for months or years and therefore, it is not better to remove only some of the LSL. In 2011, CDC found that children in homes with PLSR are twice as likely to have elevated BLL compared to children in homes with intact LSL.¹⁴
- OWQPs do not correspond to lead levels in water. New research has shown that many parameters other than pH and alkalinity can change corrosivity. Since 1991, only 172 systems have received violations for failure to maintain OWQPs compared to the more than 6,000 PWSs that exceeded the lead AL.

¹³ Aradis/AWWA Water Quality Technology Conference 2014 survey of LSLs.

¹⁴ Brown MJ, Raymond J, Homa D, Kennedy C, Sinks T. Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998---2006. *Environ Res.* 2011; 111(1):67-74.

Based on this information, Dr. Lambrinidou's recommendations for revising the regulation include:

- Capturing worst-case lead in LSL homes.
- Banning sampling practices that are known to miss sources of lead.
- Achieving CCT optimization based on reliable tap sampling.
- Redesigning PE based on consumer-based risk communication.
- Banning PLSLR.
- Developing a new compliance mechanism that corresponds to lead levels at consumers' taps.

Dr. Lambrinidou noted that a proactive full LSLR is the centerpiece of the LCRWG's recommendations. She agrees with this concept if it maintains the integrity of public health goals. All agree that full LSLR is the best way to reduce lead releases. However looking at the detail behind this recommendation:

- The LCRWG recommends that LSLR is part of a package. If individual parts undermine the LCR goal, then the package will do the same.
- If EPA would fix the compliance protocol for sampling by redefining Tier 1 sites to be ones with LSLs, most of these systems would be required to begin full LSLR right away and optimize CCT.
- Proactive full LSLR is ambitious, taxing and impossible for some systems. Systems with hundreds and thousands of LSLs will take decades to replace. She disagrees with the LCRWG's recommendations that systems would only be in violation if they do not make a concerted effort to fully replace LSLs and not for failure to meet their replacement goal. She questioned how a primacy agency could evaluate adequate effort. She believes the LCRWG's approach allows for delays for LSLR and leave customers unprotected. She recommended that those that cannot meet full LSLR be required to return to the existing LCR requirements.
- Regardless of the path, the four pillars need reinforcement. The LCRWG's recommendations do not fix known weaknesses in the existing rule and she believes some would result in backsliding. Her concerns are as follows:
 - Tap monitoring that that does not capture water from LSLs does not capture high-risk homes and can miss severe lead contamination. This is explained in the preamble of the original LCR. The monitoring suggested by the LCRWG will not provide the needed information to evaluate CCT effectiveness unless a PWS collects hundreds of samples. She referenced back to her discussion of the feedback loop between lead levels and CCT. The Group's proposal to provide different sampling instructions to consumers does not preclude pre-flushing prior to sample collection. She considers the LCRWG's proposal backsliding with significant risk.
 - The existing rule requires large systems to minimize lead levels at the tap and no systems have done this to date. The Group's proposal would continue to consider systems serving 50,000 or fewer to be optimized when two consecutive rounds of monitoring are at or

below the AL, even though the sampling requirements are known to miss the worst-case lead.

- The LCRWG's recommendations do not specify mandatory corrective actions following a lead ALE or require intensive PE that communicates the serious and permanent risk of LSLs. In addition, she considers as a loophole, allowing PWSs and states to determine needed corrective action. She strongly disagreed with the LCRWG's recommendations to not completely ban PLSLR.
- The recommendation to base compliance on WQPs instead of tap monitoring is inappropriate and unsupported by the science of corrosion control.

She stated that the NDWAC is in a unique position to make the vision of a proactive LSLR requirement a reality without leaving consumers inadequately protected until these LSLs are fully replaced decades from now. Proactive LSLR will benefit all because it will reduce the need for CCT, but it must be achieved without undermining the LCR's foundation and must be properly enforced. Her approach is to combine the proactive LSLR program with a requirement to return to the current rule, in which the loopholes have been fixed, if systems cannot achieve their full LSLR goals. She also stressed the importance of proper PE because the rule is a shared responsibility. However, the public does not understand they have a responsibility or their role. The public is blamed when there is a widespread problem with lead.

She showed a video she made to demonstrate what consumers know 23 years after the promulgation of the LCR. The individuals she questioned were unaware:

- About the CCR.
- A PWS can have any level of lead in 10 percent of its samples and under the LCR can state that its water is safe.
- About lead particulates and that they may not be captured in a 1-liter sample, which is the volume required under the LCR.
- Of the existence of a rule about testing drinking water in schools and daycares.
- PWSs are only required to replace the portion of the LSL they own.

She stated that the shared responsibility regime is unjust and unfair in how it is implemented today. It must be reimagined to include the public as informed and involved partners. Part of the change must include sustained partnerships between the community and the PWSs. Customers have a right to all water data. Systems should learn from communities. We would not be here today had it not been for the work of the public. The LCR systematically betrays the public's trust. She closed with a quote she adapted (shown in bold) from Rachel Carson's book, *Silent Spring*, that highlights these points.

*This is an era of specialists, each of whom sees his own problem and is unaware of or intolerant of the larger frame into which it fits. It is also an era dominated by industry, in which the right to make a dollar at whatever cost is seldom challenged. When the public protests, confronted with some obvious evidence of damaging results of **[lead in water]**, it is fed little tranquilizing pills of half truth. We urgently need an end to these false assurances, to the sugar coating of unpalatable facts. It is the public that is being asked to assume the risks that **[their water***

providers] calculate. The public must decide whether it wishes to continue on the present road, and it can do so only when in full possession of the facts. In the words of [French biologist and philosopher] Jean Rostand, ‘The obligation to endure gives us the right to know.’

2. NDWAC Comments/Questions

Council members provided the following feedback:

- One Council member asked Dr. Lambrinidou for information on the cost of full LSLR and any alternative that would push people toward full LSLR. Dr. Lambrinidou explained that the cost was \$500 to \$7,000 for private replacement based on her experience in DC. Her colleague, Ralph Scott, evaluated the percent increase for DC Water to conduct a full LSLR instead of a PLSLR. He found the increase to be small when work is already being done.
- Another member thought the LCRWG was moving toward a PSLR ban. In response:
 - A LCRWG member read the following recommendation from page 14 of the report, “Requirements that provide strong encouragement for full LSL replacements, with the understanding that there may be justifiable exceptions and that those exceptions would occur only after the efforts outlined in the recommendations below on the part of the PWS to work with customers to complete a full LSL replacement.” He explained that LCRWG recommendations push toward full LSLR but acknowledge there are circumstances outside the PWSs control where PLSLR makes sense along with other risk reduction measure. These circumstances may include “emergency repairs where property owners have refused to participate in a full LSL replacement; during a main replacement project; or when a sufficiently high percentage of property owners participate in an area-wide LSL replacement project”.
 - Dr. Lambrinidou explained that there is a vast difference between banning LSLR and the recommendation in the report that creates the potential for loopholes. There are very legitimate reasons why homeowners refuse. Creating general permission to conduct PLSLR enters dangerous territory.
- A member asked what should be done during a water main replacement if a customer refuses permission for the PWS to enter the house (e.g., turn off the water). Dr. Lambrinidou responded that improvements in PE would result in a dramatic increase in customers’ willingness to replace their LSLs. Over 50 percent of those she interviewed who refused full LSLR indicated that they probably would have opted for it had they understood the risks of PLSLR and benefits of full LSLR. She did not think the majority of consumers will refuse when they understand the health of their children are threatened. The rule should not be revised based on those that have this knowledge and still refuse full LSLR.

F. Public Comments

Prior to starting their deliberations, the Council members heard public comments from eight individuals. These comments are summarized below:

1. Congressman Dan Kildee

Congressman Kildee from the 5th District of Michigan, expressed his appreciation for the opportunity to provide public comment. He discussed the situation in Flint in which he blamed a failure of government authorities to protect the citizens of Flint from lead in drinking water. He noted that water and the health of his community is the single most important issue now to Flint residents. He stated that the situation would not have come to light had it not been for the efforts of LeeAnne Walters, Mona Hanna Attisha and Marc Edwards. He added that Dr. Attisha found elevated BLL in children but that these data were dismissed by those who were responsible for providing safe water. He noted that Senator Ananich was an important part of the efforts. After months, the State of Michigan finally acknowledged that federal drinking water regulations were not followed. EPA has responsibility ultimately for ensuring these standards are followed. The revised LCR must provide greater transparency to improve public health. People must know why the State of Michigan failed to follow the drinking water rule. EPA is conducting an audit of Michigan's drinking water program. Dr. Edwards and Dr. Attisha are testifying today on needed changes. The situation in Flint occurred because the Michigan Department of Environmental Quality (MI DEQ) did not require significant monitoring and modeling before allowing the city to change drinking water sources from the Great Lakes to the Flint River. The current LCR did not require the city to add CCT. MI DEQ suggested pre-flushing prior to collecting samples. His interest is making sure that state and federal officials notify the public of this health risk.

2. LeeAnne Walters

LeeAnne Walters, Co-founder of Water You Fighting For, explained that her family and others in her town were getting sick. She was told that her water was safe although lead levels from drinking water samples were 104 ppb, 397 and 707 ppb. These levels were blamed on many things. Thirty samples were collected from her home and included levels of 2,500 ppb, with the highest being 13,000 ppb. Her son had lead poisoning. With the cooperation on the citizens of Flint, the city and MI DEQ and Marc Edwards, 300 sample bottles were sent out and 277 were returned in a 3-week period. People will want to be involved if they understand the need for testing. All testing data need to be available and people should not have to submit Freedom of Information Act (FOIA) requests to find out these results. Parents should not be the ones who are responsible for protecting their children from unsafe drinking water. After the high lead levels in DC, EPA should have immediately closed loopholes. This could have prevented the situation in Flint. PE is only done in 1/3 of the situations. When surveyed about tap sampling procedures, only 10 states accurately follow the protocol, 21 did not respond and 19 have similar loopholes that allow pre-flushing and use of small-mouth bottles. She started a petition on line for EPA not to adopt the LCRWG proposal. Lead poisoning in Flint occurred because EPA did not close these loopholes. The sampling protocols need to be on line to stop PWSs that are not complying.

3. Senator Jim Ananich, Michigan State Senator - 27th District

Senator Ananich, Michigan State Senator of the 27th District, expressed his thanks to LeeAnne Walters and Congressman Kildee. He is here as an elected official, life-long resident of Flint, and new father. The fear, anger and mistrust in Flint is real and justified because the LCR as currently implemented failed the citizens of Flint. The rule was used as a shield to protect officials from revealing problems and at a minimum should have highlighted the faults with pre-flushing and sampling methods. The rule has inadequate requirements for new sources. The standard should not be the minimum but should instead

be how to best protect public health so no one is at risk from lead poisoning. Implementation needs to be fixed at the local and state level. The Council's recommendations could make the difference between safe water and decades of problems to come. Do not let what happened in Flint in which people used the path of least resistance but instead recommend changes that protect all.

4. Marc Edwards, Virginia Tech

Marc Edwards, Virginia Tech, stated that in the 25 years since the LCR was promulgated, he recognized several deficiencies. These are that samples are not collected from LSLs, additional sampling practices miss lead in water (e.g., pre-stagnation flushing) and the highest risk sites are not included in the sampling pool. These are key to lead poisoning cases with which he has worked. He is troubled by the fact that parents are the ones figuring out that their drinking water is the problem. They are told that federal standards are being met. Similar undiscovered cases of lead issues in drinking water could be occurring across the country. EPA has not been deserving of public trust. When the LCRWG was formed, one member termed another's proposal to finally meet the intent of the rule 25 years late and prevent these deficiencies as "LCR on steroids". It is openly acknowledged that close to 60 percent of the systems with LSLs would not meet the lead AL if the 90th percentile level was based on LSL samples. The customers served by these systems would be told their water is not safe, would be educated, and these utilities for the first time would be required to install OCCT. No city in the U.S. has installed OCCT. He applauded the LCRWG's goal of full LSLR, but noted that this can only be done after the original intent of the rule is met and utilities are finally meeting the lead AL after closing the loopholes. Without these changes, children will be left in harm's way for the foreseeable future.

5. Mona Hanna Attisha

Mona Hanna Attisha, Program Director at Hurley Children's Hospital at Michigan State University College explained that she is a pediatrician with a background in environmental health. Dr. Attisha talked about one of her patients who lives with a single mom and receives formula from the Women, Infants, and Children (WIC) program. At her 12 month check-up, her patient had a BLL of 6 µg/dL. Pediatricians are concerned about any BLL – the level of concern is now 5 µg/dL. Dr. Attisha emphasized that lead poisoning has a disproportional impact on low income children. CDC has stated in its report that there no measurable BLL is safe and the health effects are irreversible. Her patient will likely have a decrease in IQ because of her BLL (an increase in BLL from 1 - 4 µg/dL equates to a 4-point drop in IQ). Dr. Attisha urged the Council to think about what lead poisoning has done in this country. Lead had been linked to attention deficit hyperactivity disorder (ADHD), delinquent behaviors and increased arrests. Other possible health effects are hemolytic. Lead exposure also has epigenetic effects as shown by Wayne State University researchers who discovered evidence that lead exposure in mothers can affect future generations. The medical public health community is not used to dealing with lead exposure from water. It impacts a very different population, i.e., formula-fed infants. She looked at BLL in Flint before and after the source water change and found that higher BLLs matched up to water with higher lead levels. In one Ward where the lead levels were the highest, the percent of children with high BLL tripled. This city already has every disparity. The medical community underestimates risk because they do not screen for BLL and Flint has low breast feeding rates, so more are formula fed. Now the community is traumatized by preventable population-wide exposure to lead and a loss of trust in the government. The current LCR failed Flint with its loopholes for monitoring. The rule needs stronger PE so that the public

will understand that lead in plumbing can harm fetuses. What happened to her 12-month old patient will happen to an entire generation of lead-exposed Flint children. She explained that the Council has an incredible opportunity to strengthen the LCR and ensure the situation in Flint does not happen again.

6. Jennifer Chavez, Earth Justice

Jennifer Chavez from Earth Justice explained that as Dr. Lambrinidou emphasized, LSLs are a grave health hazard to infants and children and are not being replaced. PLSLR are perpetuated under the current LCR. She applauded the recommendation for full LSLR but some recommendations in the report undermine that goal and some represent a step backward. She did not support the recommendations to provide options for addressing obstacles for full LSLR. PLSLRs occur because so many cannot afford replacements. She urged control be based on the requirement for PWSs to replace the full length of the LSL under their control (e.g., have the authority to repair, replace and maintain). This would minimize PLSLRs and would make funding options more workable. She asked if it is fair to put the onus on an overburdened population to pay for their replacement or to come up with a funding mechanism for all to come together and solve the public health crisis. The LCRWG cites restrictions of legal obstacles. She is not aware of these obstacles. She asked EPA not to regulate to the lowest common denominator and to give serious consideration for a control-based requirement. Even if EPA continues with an ownership-based decision, she does not support giving credit to systems for improving their inventory or providing exceptions for PLSLR. She added that those that do not have control over what they own are at risk and she considers the list of exceptions for PLSLR to be dangerous.

7. Paul Schwartz, Water Alliance

Paul Schwartz, Water Alliance lives in Ward 4 in DC. He used to believe that Americans were persuaded by the strong use of information but he thinks that this may no longer be true. He thanked EPA for giving him the opportunity to serve as an alternate on the LCRWG and to Dr. Lambrinidou for her leadership in demanding that the public have a seat on the LCRWG. He thanked Robert Scott who chose to take on the issue of lead in water and lost his job. He quoted a passage from Section 49 of Pope Francis' "Encyclical on the Environment" that discusses the issue of environmental justice and that too often many of the professional communications and centers of power are too far removed from the poor to consider their issues. This can lead to a "numbing of conscience" which neglect reality. True ecological approaches always become a social approach unless it integrates the question of justice on debates on environment. Mr. Schwartz asked when considering the cry of earth and cry of poor to ask the question from a Neil Young song, "My conscious does not bother me, does it bother you?"

8. France Lemieux, Health Canada

France Lemieux of Health Canada provided comments related to PE and WQPs. She indicated that PE should consider that the contribution of lead from drinking water has probably increased relative to other sources and that this message may not be getting out to the public health community. She was part of the team that conducted a study in Montreal that looked at the impact of dust, paint, and water

on BLL.¹⁵ Drinking water lead levels were quite low but had an impact on BLL. She expressed the need to educate the public health community and to better education the public. Currently, PWSs that meet the AL state that their water is safe. PWSs need to look beyond the 90th percentile level to individual lead levels. The LCR is on a system level. The LCRWG's recommend WQPs as a trigger for a violation. WQPs are useful as a measure for CCT but not a surrogate for tap monitoring. If the ultimate goal is to minimize lead levels at the tap, the control should still be lead levels at the tap. She sees this as the biggest challenge.

G. Council Deliberations

Before the Council started its deliberations, Ms. Jonas explained that although the Council's recommendations will be stronger if the members speak as a group that is not a requirement. The letter to the Administrator can include dissenting opinions or the Council can choose not to address a certain area in its recommendations. Ms. Jonas reminded the Council members that they can move the report forward in its entirety with amendments attached, or with additional emphasis or clarification. She asked the Council to consider the level of detail it wants to get into and to consider that the LCRWG spent 1-1/2 years getting into the details.

Ms. Jonas also summarized the recommendations from the report and where applicable, from Dr. Lambrinidou's dissenting opinion prior to the Council's deliberations on:

1. LSLR
2. PE
3. Copper
4. CCT, Monitoring, and HAL

The Council's deliberation and discussion on each of these topics is provided in separate subsections below.

1. Lead Service Line Replacement

As part of the Council's deliberations, a Council/LCRWG member provided some general comments. He noted that all of the public comments and other opinions are relevant because they are things that the LCRWG considered. Under the current LCR there is an incentive to do PLSLR. The recommendations removed this incentive. Also under the current rule, LSLR is only triggered by an ALE. Now full LSLR is triggered period. In that sense he believes the LCRWG was responsive to the LSL issue. The Group wanted to ban PLSR but recognized that it may be necessary in some situations, e.g., fix a break in the line. The LCRWG recommended measures that would require a system to try everything to get homeowners to replace their portion of the LSL. The Group recognized that the regulation is only as

¹⁵ Levallois, P., St-Laurent, J., Gauvin, D., Courteau, M., Prévost, M., Campagna, C., Lemieux, F., Nour, S., D'Amour, M., and Rasmussen, P.E. 2013. The impact of drinking water, indoor dust and paint on blood lead levels of children aged 1–5 years in Montréal (Québec, Canada). *Journal of Exposure Science & Epidemiology*. 24(2): 185-191. <http://www.nature.com/jes/journal/v24/n2/full/jes2012129a.html>.

good as implementation. The situation in Flint was not due to a failure in the regulation but a failure to comply with the requirements. The regulations should not be designed with an expectation of failures in compliance. The LCRWG recommended mandated full LSLR over time in a way that they believe it can be achieved.

A Council member stated that complementary critical actions beyond SDWA and PWSs are needed to replace the estimated 10 million LSLs. If there truly is no safe level of lead, then all LSLs must be replaced. The issue of LSLR is not confined to SDWA. At an estimated cost of \$5,000 per replacement, the total replacement cost will be \$50 billion. The Council and EPA needs to consider how America is going to pay for LSLR. LSLR is a true environmental justice issue and ways to find funding and approaches to deal with those in poverty are really the basis of the Council's actions. For example, how to prioritize SRF for LSLR and to provide grants to homeowners who have LSLs. In addition, without cooperation from HUD, he did not see how the proactive LSLR could work. There need to be more tools to acknowledge the health crisis posed by LSLs. Another Council member agreed with the importance of complementary actions. Another indicated that one of the most important complementary actions is to get the public health community that deals with elevated BLL to acknowledge lead in drinking water. That would provide another source of samples in addition to volunteer testing. EPA has a large role in this.

Council members had extensive discussions about ways to credit systems for LSLR, in particular PLSLR. One Council member indicated that no PLSLR credit sends a message that systems should leave LSLs in the ground. She explained that a planned maintenance and capital project in which the system's portion is only replaced will make the situation worse for some period of time. On the other hand, ignoring the LSL entirely and paving over the road does not make sense from an economic standpoint and leaves the disturbed full LSL in the ground. She thought systems should be given credit for their investment in replacing their portion. She suggested encouraging EPA to come up with a solution, such as providing ½-point credit for PLSLRs. She did not think systems would reach out to customer if they did not receive credit.

Additional comments were as follows:

- One of the Council/LCRWG members indicated that the report includes situations, such as emergency replacements where PLSLR may be appropriate. The LCRWG thought at a minimum, the system should replace its portion of the LSL but if it results in PLSLR, should not receive credit and must continue to provide education to the homeowner. Another Council member responded that the education requirement becomes an exponential increase in administrative burden. For example, if the system only fully replaces 1 of 100 LSLs, it must go back and educate the 99 homes.
- Another Council/LCRWG member indicated that the LCRWG did not want to provide incentives for PLSLR and to have no further responsibility to homeowners. He agreed there is some value to get the PWS's portion replaced. The challenge is how to build into the regulatory language a situation where a system has dug up the ground to replace its portion but its legitimate efforts to get the homeowner's part replaced have been unsuccessful. He explained that a system does not receive credit for PLSLR, but receives credit that is equivalent to the completed activities. If a

system is spending resources for larger capital resources but could not achieve full LSLR, they would receive credit for their efforts to educate customers on the importance of LSLR.

- Another Council member agreed that a utility should replace its piece when doing maintenance because the line is already being disturbed and it is more economical to replace it at that point, but she did not know how to credit that effort.
- The CDC liaison stated if systems have a planned activity during the year, they should include an education component for customers. People need to know how hard utilities work. Most people that are opposed to replacement will ultimately want to participate. CDC's 2012 Morbidity and Mortality Report indicated that the cost to treat new patients who have elevated BLL for exposure to lead in drinking water is \$14 to \$220 per patient. If these exposures can be avoided, the health departments can save money. He stressed the need to strategize ways to have funds to address lead in drinking water.
- Another Council member did not support crediting PLSLR because utilities should understand that the goal is to get the entire LSL replaced and PWSs should not get credit until that is done. The CDC liaison agreed with no credit for PLSLR because the science has shown PLSLR provides no benefits. He indicated that LSLR is a good example where PWSs, customers, primacy agencies and health department should work through the issue of lead and deal with it comprehensively. The ultimate goal is to protect public health.
- The SAB liaison underscored that findings from the 2011 SAB report that PLSLR is not effective and may make the lead issue worse. She suggested that the Council's recommendations bring attention to the SAB's report and highlight the need for PE grounded in science. The public should be made aware of lead, LSLs and that PLSLR is ineffective and may increase the risk of exposure to lead.
- Another Council member suggested giving a system more points for full LSLR.
- A Council/LCRWG member proposed an idea where the PWS would need to demonstrate a different level of effort with a homeowner to receive credit for a PLSLR but he did not want to take away incentives for full LSLR.
- Ms. Jonas asked if the clearinghouse could include standardized information that could be used to demonstrate that the system made an effort toward full LSLR but did not receive customer agreement. In response, a Council/LCRWG member indicated that the clearinghouse could advertise the availability of funding for homeowners that elect to replace their LSL.
- A Council member indicated that "efforts versus outcome" is very important. However, it is EPA's role to determine how much effort is required by systems, how to count it and the specific regulatory language that addresses these issues. This question goes together with EPA's effort to work with other agencies. The more effort to make LSLR paramount, the better the outcome.
- A Council member suggested focusing on how LSLR information is provided to the public instead of how to credit systems for replacements. She suggested providing tools to allow reporting replacement rates by ownership so that customers can better understand a system's LSLR progress. She thought it could help address consumers' confidence if they could understand that

the system has actively been replacing the portion under its control, how many consumers have been contacted and how many have resulted in full LSLRs.

A Council member asked if there are incentive programs to cover the cost of replacing the private portion of the LSL. Some high poverty areas cannot afford LSLRs. In those instances, should the Council suggest that the water system absorb almost all of the costs or pass them onto other customers? His experience has shown that government funding can be delayed even when a health issue is identified. In response:

- Ms. Jonas explained that the LCRWG recommended that EPA work with other federal groups. The responsibility for LSLR is at all levels -- federal, state, system and homeowners. The LCRWG is recommending flexibility in how to incentivize this.
- Another Council member has found that even though the public may resist federal or state mandates, communities ultimately find a way to comply. He also stressed the importance of providing funding for low income people. His community paid to correct the flooding caused by combined sewer overflows by putting the expense on people's water bills and allowing residents to take a tax write-off. He asked if there could be write-offs or tax credits for low-income people to pay for LSLR. He provided another example in which his community began charging for trash service. Even though they initially resisted, people eventually accepted this change which was necessary for the betterment of the community and to protect public health. He thought the poor and disenfranchised are done a disservice if they do not receive full LSLR even if they do not understand the reason is to protect them. PSLR is not going to help them. He stressed the importance of the Council's LSLR recommendations because the next opportunity to revisit this issue would not be until the next Six-Year review.

EPA and the Council discussed whether a rule should specify a LSLR replacement rate and other possible measures. Specific comments included:

- A Council member noted that the LCRWG is recommending full LSLR on a timeline of 15 percent every 3 years for 3 cycles and more time for systems to replace the remaining 55 percent because these would be the hardest ones to achieve full LSLR. She also understands the dissenting opinion that credit should not be given for trying to meet the goal but not achieving it. She asked what measures can be used to ensure PWSs are meeting the goals and are doing so in a way that reduces the amount of lead in drinking water. In response:
 - Dr. Grevatt indicated that if EPA writes a rule that includes a required replacement rate, the Agency must understand how the LSLR will be funded. It will be a problem if EPA requires a rate that can only be met with some alternative source of funding or using existing funding in a different way (e.g., the SRF). A fixed percentage will also impact communities of different socioeconomic status differently and there needs to be a way for systems to comply.
 - Mr. Burneson explained that the current rule has a specified annual percentage of 7 percent that applies to the PWS's portion. The LCRWG is recommending replacement beyond the portion owned by the PWS. Compliance is based on actions approved by the state that will be taken by the PWS to try to achieve full LSLR.

- A Council/LCRWG member explained that there are many barriers to full LSLR and agreed that a rule should not specify LSLR requirements that will fail. To get homeowners to replace their portion requires adequate effort by the PWS and funding mechanisms.
- A member indicated that a PWSs could be held to meeting the goal for the public replacement but not the private side. She asked if there can be a “narrative standard” as opposed to a percentage. A Council/LCRWG member responded that a PWS does not receive credit for PLSLR and thus, PLSLR could not be used to meet the replacement goals. He stated that the LCRWG stayed more at the conceptual level regarding its LSLR recommendations and that EPA will need to work through the details.
- A Council member agreed that the rule should include something other than percent replacement. About 15 percent of utilities are privately held and funding consideration must also be given to these systems. He thought that many of the issues with Flint, Michigan were centered on administration and compliance monitoring costs. He thought the rule was not the problem but implementation and follow-up and was unsure how to strengthen those pieces.
- Another Council member indicated that money is needed not just for LSLR but for everything between the source and tap. As an example, at the recommended pace of LSLR, her city would spend \$13M per year to replace the utility side only. Her entire budget is \$20 million. She recommends something other than straight percentages as a means for systems to show progress.

The Council discussed ways to move the system forward to meet its replacement goals. A Council member indicated that having a system revert back to the existing rule if it did not meet its replacement goal would not move the system forward. Instead, it would put the system back at a 7 percent replacement rate that would likely be achieved through PLSLRs. Another member indicated that Table 2 on the last page of the report provides a way for the system to continue to move forward if they do not meet their LSLR goals. However, the report does not specify how many activities have to be completed in each of the three areas of resident engagement, system policies and other. A Council member pointed out that Table 2 is a concept piece and not a finished product.

The Council and EPA also discussed the definition of control:

- A Council member asked EPA for the definition of control regarding what a utility owns. He added that control determines what PWSs can and cannot do on private property. Mr. Burneson responded that page 18 of the report states that, “The LCRWG also discussed but did not agree that the definition of control as ownership should be changed in the revised LCR.” Since the 2000 revisions, control is based on ownership. A system only controls what it owns. He added that the LCRWG did not provide recommendations on the definition of control.
- A Council member thought the report did a good job of recognizing the different laws across the country regarding ownership and control. In her city, private ownership extends all way to the water main.

A member questioned the footnote on page 13 of the report that would require “pigtailed, goosenecks, and other fittings which is connected to a lead service line” to be removed and the availability of data to indicate their locations.

- A LCRWG member explained that pigtailed that connect the utility to the homeowner’s side could be pure lead and are of concern because they can release lead. Some communities, such as Portland, Oregon, have inventoried them. The report includes a recommendation for systems to replace these connections when they find them.
- A Council member referred to page 15 of the report that states they are to “be replaced when they are encountered during excavations”. Systems are not required to actively look for them. Another Council member added that the report also indicates that systems should remove them if they have information on their location.

A Council member asked whether the system or homeowner has the liability if lead levels increase after LSLR. As a PWS manager, his board would want to protect the integrity of the water system. Would the system disconnect service to areas that refuse full LSLR? A Council/LCRWG member explained that the LCRWG recognized that revised rule cannot have a system replace a LSL without further responsibility to the homeowner. The LCRWG also acknowledged that people do not understand the issues of lead in water and have difficulty affording the replacement. A core piece is providing incentives to homeowners.

Based on their deliberations, the Council unanimously agreed to include the following recommendations pertaining to LSLR in their letter to the EPA Administrator:

- The necessity for complementary critical actions to achieve the objectives of the rule.
- The Council is accepting the LCRWG’s recommendations regarding LSLR with the following enhancements:
 - A statement that the driving factor for improving public health protection is full LSLR and an acknowledgment that time is needed to replace all LSLs and steps are needed to protect individuals in the interim.
 - A recommendation that EPA develop a way to provide credit for a concerted effort to remove full LSLR when only partial is achievable at that time (i.e., some type of credit for PLSLR).
 - A recommendation that EPA consider alternatives to a set percentage to demonstrate replacement progress.
 - A recognition of the shared responsibility nature of the rule from the homeowner through federal agencies and the need for EPA leadership.
 - A recognition that environmental justice is critical and affects both public and private utilities.
 - Suggested incentives for LSLR, such as a tax write-up as an incentive, even if it cannot be a part of SDWA.

- An emphasis on providing tools to allow reporting LSLR progress by ownership but to retain the current definition of control.
- An acknowledgment that the Council heard and reflected on public comment and a dissenting opinion during its deliberations and that some of these comments fall outside the purview of SDWA. An acknowledgment of those activities that were described as loopholes by these speakers.

2. Public Education (PE)

Prior to the Council's deliberations, a Council/LCRWG members provided additional context regarding the LCRWG's PE recommendations. He explained that the LCRWG discussed PE extensively throughout their deliberations. The shortcomings of the CCR resulted in the Group's idea of the clearinghouse, understanding that all people may not get information this way but that health departments would have it as a resource. The LCRWG agreed on general concepts and discussed how to use contemporary risk communication efforts, but recognized that additional detail is needed on the best methods to provide the messaging. Also, the LCRWG discussed what data are valuable to the public and privacy issues associated with that information.

The Council made the following points during their deliberations on PE:

- A Council member supported the report, national clearinghouse and the need for input from risk communication experts.
- Another agreed that the clearinghouse would provide needed transparency. She questioned how information can be reported in an effective way so residents can understand the information. A Council/LCRWG member explained that the report includes recommendations that risk communication experts develop the templates and information sheets. The monitoring data would be made available in EPA's database, SDWIS Prime.
- A Council member asked if PSAs convey information about changes in lead sampling data over time and would be tailored to explain to residents whether the lead in their homes is a problem over time. A Council/LCRWG member explained that one of the challenges with data are what it represents. The LCRWG talked about bringing experts together to assess the meaning of the data and how to explain it. The LCRWG recommended different sampling protocols to address customers' information needs. The report does not provide detail on exactly what should be reported.
- A Council member noted that the public generally does not know they receive a CCR or understand it. PE should take into account concrete incentives for LSLs. The two should be closely tied together. The CDC liaison agreed that the CCR is not read. He added that the CDC has a department of communication and public relation people who are very good at disseminating messages and not causing panic. These materials include information about vulnerable populations that for lead include infants, young children and pregnant women.
- A Council member noted that the CCR, media and PE are important tools that are sometimes taken for granted. He indicated that need for a holistic strategy that is more than just something in writing. His town put coupons in the CCR to promote a festival, with the hope that people

would hold onto their CCRs longer. He added that tobacco education did not happen overnight; therefore, the strategy should be broad based and not just rely on traditional means. Another Council member noted any PE piece must inform consumers on actions they can take to protect themselves and agreed it should be delivered by several media avenues including social media.

- The SAB Liaison stressed the importance of addressing consumer confidence. She served on the expert panel for Washington Aqueduct after the lead issue in DC and indicated that the public had no confidence in the water official. Consumers need some level of confidence in drinking water but eroding that confidence could create a significant health situation. A Council member agreed that the situation in Flint and DC goes a long way to eroding public confidence in drinking water.

Based on its deliberations, the Council unanimously agreed to include the following PE recommendations in its letter to the EPA Administrator:

- Overall support for the LCRWG's recommendations on PE including the national clearinghouse, updating the CCR and targeted outreach to those with LSLs and vulnerable populations.
- Areas of emphasis or enhancement that include:
 - The importance of using various avenues to deliver the message and that the current CCR approach is not effective.
 - The need for consumer-centered risk communication that is assessable nationally, tied to incentives, and focuses on vulnerable populations.
 - The need to address consumer confidence.
 - The need to educate consumers on the sources of lead that typically for drinking water are from the infrastructure and not the water's source.
 - The need to inform consumers about actions they can take to minimize lead exposure.
 - The need to involve many other groups to properly get the message out that lead is a problem, it is more common than once thought and water is one of the sources.

3. Copper Requirements

During the Council's deliberations on copper, a member noted that the report recommends identifying systems with corrosive water but does not specify at what point CCT is needed. She indicated the desire to control copper and prevent backsliding but questioned whether CCT for copper is the best use of resources given all of the other activities in the LCRWG's recommendations. Ms. Jonas asked if the Council's recommendations should indicate that with limited resources the focus should be on lead in drinking water. A Council/LCRWG member explained that the LCRWG's approach for controlling copper to focus on only those waters that are corrosive to copper does provide this focus. The current sampling regime is not sampling at the right places to get this information.

Based on its deliberations, the Council agreed unanimously to support the LCRWG's recommendations to establish separate requirements for copper and to focus on water qualities that are aggressive to copper.

4. CCT, Monitoring and HAL

Dr. Grevatt asked Council members to think about CCT and monitoring in conjunction with LSLR. He stated that even with is a reliable source of funding to meet the LSLR goals, these LSLs will be in the ground for a long time and he asked the Council to consider measures to protect public in the interim. He noted that LCRWG members considered this issue but that may not have come through in their presentations. Later during the meeting, Dr. Grevatt explained that in the aftermath of Flint, he wrote of memo of clarification to EPA's Division Director that when a system serving more than 50,000 people changes its source, it must optimize CCT¹⁶. EPA does not want any ambiguity on that point.

A Council/LCRWG member provided some additional context for the LCRWG's CCT and monitoring recommendations. The LCRWG considered CCT to be an important part of the revised rule. Because the science of corrosion is evolving, the LCRWG recommended that EPA update its CCT guidance every 6 years and that systems evaluate their CCT plans against any new information in the guidance. He stated that Dr. Lambrinidou's recommended making CCT more definitive. A question remains whether PWSs really are optimized but he believes that additional research is needed to understand the relationship between lead at the tap, WQPs and CCT. He explained that the real dilemma is how monitoring should be conducted to identify risk, determine if CCT works and answer the question of whether the water is safe. He explained that the LCRWG's monitoring recommendations do not include details on number of samples, the location and frequency.

A Council member supported the LCRWG's recommendations and thought the recommendations for CCT, monitoring and HAL integrated well with those for LSLR and PE.

Regarding monitoring, Council members provided comments on anticipated customer participation in the testing program, whether volunteer testing and WQPs would provide adequate information, the dissenting opinion, the need for a new sampling plan and small systems as follows:

- Council members discussed whether the volunteer testing program could result in an unmanageable or insufficient number of customer-requested lead samples. Specific comments included the following:
 - A Council member indicated that the number of requests for tap sampling will increase if consumers are well educated on the importance of these samples and in cases where a city is having a lead crisis. He added that the greater the customer engagement in tap sampling, the better the chances of eliminating LSLs.
 - A LCRWG member explained that the Group decided on a minimum that must be met during a 3-year window. It recommended that the minimum correspond to number of samples currently required for reduced monitoring. A system could do more aggressive

¹⁶ This November 3, 2015 memo, *Lead and Copper Rule Requirements for Optimal Corrosion Control for Large Drinking Water Systems*, is available at <http://www.epa.gov/dwreginfo/memo-addressing-lead-and-copper-rule-requirements-optimal-corrosion-control-treatment>.

outreach it has not reached 1/3 of its target in the first year. The Group did not think that in general, systems would be inundated with requests. New York City's Department of Environmental Protection (NYC DEP) has a volunteer testing program and associated educational campaign. NYC DEP does not have an unmanageably number of people requesting samples.

- A Council member indicated that this issue needs more thought than just supposition. In response, an LCRWG member explained that the Group could not figure out a way to estimate the number of requests and did not want to set a maximum and turn customers away.
- Ms. Jonas noted that as long as a system has made progress over a certain time, there should be some recognition that a system may not be able to satisfy all customer requests.
- A Council member asked if the LCRWG discussed whether systems could count on having adequate information from the volunteer tap testing and enhanced WQP testing programs. In response:
 - A LCRWG member indicated that the Group talked about the current protocol in which systems typically monitor in a 4-month window every 3 years. The Group recommended a more continuous stream of information for a wider group of sites because it would provide systems with more information. The change will also allow systems to detect problems earlier because they will be receiving data every month versus every 3 years.
 - Others agreed that volunteer tap monitoring information would provide more meaningful data. Specifically, one Council member thought that the volunteer tap monitoring would cost less. A Council/NDWAC member added that the current rule limits monitoring to selected homes and the sample results only reflect what was going on at that home. The goal of the new approach is to make tap sampling real, actionable data for individuals.
- Council members discussed the dissenting opinion that disagreed with the report's recommendation to rely on WQPs and move away from standardized tap sampling. In response:
 - A Council/NDWAC member clarified that the LCRWG recognized the importance of tap monitoring and thought that voluntary sampling would provide consumers with a better understanding of risk and allow them to take more proactive action. A LCRWG member agreed that the Group's recommendations are not to abandon tap sampling but to replace it with a new regime. Page 33 of the report provides a bulleted list to assess the effectiveness of CCT. Tap monitoring will still be used to help assess CCT effectiveness.
 - A Council member indicated the importance of having the public understand why the new tap and enhanced WQP monitoring approach is an improvement over the current rule.
 - A Council member suggested encouraging EPA to close the science gap in sampling. She suggested that EPA identify specific sampling options and specify what type of information each sampling option provides.

- A Council member asked if the new monitoring approach would require a system to develop a new sampling plan. In response:
 - Mr. Burneson explained that the existing and new monitoring schemes are different. The current rule has a tiering structure that targets single family homes with LSLs or lead solder. Multi-family homes are Tier 2. The current rule requires the collection of a 1-liter sample and a minimum 6-hour stagnation period. The LCRWG is recommending no tiering criteria but instead, a system would provide its customers with educational materials to motivate them to ask for sampling. In addition, there is no one specified sampling protocol but examples would be in the clearinghouse that could include the current protocol.
 - A LCRWG member added that the report also discusses criteria for moving to the new monitoring requirements.
 - Another LCRWG member noted that the report explains that targeted PE to customers with LSLs would increase the number of samples from LSL homes.
 - A LCRWG member explained that the purpose of sampling is threefold: 1) to provide information on which people can take action, 2) provide information on which public health agencies can act and 3) provide information for CCT assessments. Under the current rule, systems are discouraged from conducting extra sampling because these results could be included in the 90th percentile calculation. Therefore, most PWSs currently do not offer customer sampling.
- A Council member commented that many of the LCRWG's recommendations are geared toward larger systems with LSLs. In more rural areas, there are concerns about systems with lead from other sources. Also, there are many small systems that have operators that can only handle a very standardized approach. Her small system operators finally understand what they should be doing under the current rule. There should be some consideration for small systems that have never exceeded the AL that could include a more streamlined and definitive approach and possibly standardized routine sampling as opposed to requiring WQP monitoring. In response, a Council/LCRWG member explained that the report includes a recommendation that small system can stay with the existing protocol. In addition, small systems will CCT already are conducting WQP monitoring. The question is what sampling and WQP requirements could be for those small systems without CCT. Nothing in the report conflicts with allowing the systems to have a checklist protocol.

Regarding HAL, a Council member stated that the NDWAC needs to know the value of the HAL to understand the impact and asked about EPA's status on developing this value. She added that the number of households that will be above the HAL will be dependent on where and when a tap sample is collected. Mr. Burneson explained that EPA is in the process of evaluating whether there are models to estimate this level. The analysis would need to go through an internal and external review process and is something that would be part of the proposal process and subject to review. The LCRWG recommended that EPA identify a concentration in water that would result in a BLL of 5 or more µg/dL. There are models that predict BLL from lead exposure, such as the Integrated Exposure Uptake Biokinetic (IEUBK) model. No model provides a simple answer but gives a probability distribution that requires scientific interpretations. If the NDWAC recommends that EPA develop the HAL, the Agency will work to select

the most appropriate model and model inputs. The Council member indicated that those inputs are geared toward the most vulnerable populations. She recommended zeroing out other routes of exposure and basing it solely on drinking water. A Council/LCRWG member added that part of the reason to develop a HAL is to make sure action is taken on high outliers. Presumably, EPA can develop a number that makes sense. The CDC liaison indicated the importance of considering vulnerable populations in developing the HAL because different concentrations will have different impacts on children and pregnant women. Levels of lead of 10 ppb in water results in increases of 5 µg/dL BLL in children.

Based on their deliberations, Council members decided to unanimously recommend the following in their letter to the Administrator:

- Overall the Council supports forwarding to the EPA Administrator the LCRWG's recommendations to:
 - Strengthen CCT by retaining the current rule requirements to re-assess CCT if changes to source water or treatment are planned and adding a requirement to review updates to EPA guidance to determine if new scientific information warrants changes.
 - Modify monitoring requirements to provide for consumer-requested tap samples for lead and to use results to inform consumers on actions they can take to reduce the risks in their homes, to inform the appropriate public health agency when results are above a designated HAL and to assess the effectiveness of CCT and/or other reasons for elevated lead results.
 - Tailor WQPs to the specific CCT plan for each system and increase the frequency of WQP monitoring for process control.
 - Establish a health-based, HAL that triggers a report to the consumer and to the applicable health agency for follow-up.
- The letter to the Administrator will also include the following enhancements:
 - Small systems with and without CCT need a practical protocol for WQP and tap sampling.
 - It is important for EPA to determine the HAL.
 - EPA needs to close the science gap and provide guidance such that customers are collecting samples to produce desired results for customers and utilities. The SAB liaison indicated that the 2011 SAB report recognized that differing sampling protocols can impact the 90th percentile lead levels.

The Council also discussed and unanimously agreed to include the following broader recommendations of the LCRWG for EPA to:

- Establish appropriate compliance and enforcement mechanisms in the regulation.
- Take a leadership role in educating, motivating and supporting the work of other EPA offices, federal, state and local agencies, and to add other stakeholders and that these actions are critical to the success of the LCR LTR.

H. Development of Initial Draft Letter to the Administrator

Based on Council deliberations, Ms. Jonas developed an initial draft of the NDWAC's letter to the EPA Administrator and read it to the Council. She asked Council members to provide feedback on information that needs to be added and suggested wording changes. She explained that the Council would have an opportunity after the meeting to make additional non-substantive changes.

The letter included the following points:

- The LCR LTRs provide an important opportunity for the removal of sources of lead in contact with drinking water and the reduction of exposure to lead from drinking water.
- There is no safe BLL. Thus revisions to the LCR alone are not sufficient. A comprehensive shared responsibility exists between federal, state and local government, public and private utilities and customers. With other partners, EPA should lead a comprehensive collaborative national effort to reduce lead in drinking water.
- The Council valued and incorporated all comments and opinions received in its deliberations and recommendations.
- The recommendations are an integrated package, rather than a menu of choices from which some recommendations can be selected and combined with others. The recommendations include targeting resources available to PWSs for the greatest public health value.
- The driving proactive principle is to improve public health protection by removing full LSLs from contact with drinking water to the greatest degree possible and minimizing the risks of exposure to the remaining sources of lead in the meantime.
- Priority for LSLR should be given to sensitive subpopulations and environmental justice.
- PWSs' control of LSL means ownership.
- The Council unanimously agreed with the recommendations in the LCRWG's report with additional enhancements and considerations that include:
 - Creating a national clearinghouse of information and templates for PWSs, tailoring the CCR, engaging the health community to understand contribution of water to overall exposure to lead, and adding targeted outreach and remedies to consumers with LSLs.
 - Improving consumer confidence in drinking water.
 - Requiring CCT re-evaluation if changes to source water or treatment are planned.
 - Creating a standardized tap sampling protocol and methodology for smaller PWSs and that there is a gap for systems without CCT.
 - Enhancing tap sampling data.
 - Emphasizing some PWSs flexibility on LSLR percentage goals.
 - Investigating the idea/need for a maximum number of customer-requested samples.

- Establishing a health-based, HAL that triggers a report to the consumer and to the applicable health agency for follow up.
- Separating the requirements for copper from those for lead and focusing new requirements where water is corrosive to copper.
- Establishing appropriate compliance and enforcement mechanisms.

Many Council members complemented Ms. Jonas on capturing the Council's position. Some provided substantive comments as follows:

- Explicitly list HUD as one of the partners with which EPA should lead a comprehensive national effort to reduce lead in drinking water. Without HUD these program will not get done.
- Indicate that the removal of all LSLs will require significant financial resources and time.
- Indicate that it is essential to have in place a robust effort of consumer education and engagement to assure ongoing protection from exposure to lead in drinking water.
- State that prior to adoption of the new rule, the highest level of compliance with the existing rule must occur.
- Clarify that the Council valued and incorporated all public comments received in its deliberations and recommendations.
- Indicate that the full economic ramifications of the possible LCR LTRs are not yet quantified and accordingly were not a significant part of the Council's deliberations.
- Provide more emphasis on environmental justice, sensitive subpopulations and the need for government support to low-income populations, and add examples of sensitive subpopulations.
- Add that the LCR LTRs should proactively engage residents in opportunities to remove lead through the removal of lead in drinking water.
- Clarify what is meant by "Enhancing tap sampling data" to indicate that it means closing the science gaps and providing guidance in sampling methodologies and techniques to ensure samples provide the desired results.
- Expand on the recommendation for EPA to investigate the need for a maximum number of customer-requested samples so that it includes the idea of establishing criteria for satisfying the minimum number of samples.
- Consider adding a recommendation for EPA to consider alternative ways to demonstrate steady pace improvement in LSLR in addition to percentage targets.
- Acknowledge Table 2 in the report, which discusses ways to engage private citizens, but clarify it provides examples and needs to be further developed by EPA.

I. LCR LTRs Wrap-up and Next Steps

Ms. Jonas stated that the Council has consensus on the draft letter except for non-substantive editorial changes. The next step is for Michelle Schutz to send the letter to each member. Members will have a chance to send their non-substantive changes to her. If there are substantive changes suggested, the Council will need to take a different approach. Ms. Schutz will verify the FACA requirements before sending out the letter to the Council members for their further non-substantive editing.

Ms. Jonas thanked the Council members for their respective discourse. She noted that the Council has a significant opportunity to move forward the tremendous amount of work that has been going on for a year and half to improve a complex regulation. She was hopeful the Council could finalize the letter to the Administrator within the next several weeks.

Dr. Grevatt thanked the full Council and acknowledged the two members, Marilyn Christian and Chris Wiant, for serving on both the full Council and the LCRWG. He thought that the Council appreciated the importance of the issue of lead in drinking water and the complexity of the LCR, and added that this is the beginning of the regulatory process. He thanked Ms. Jonas for her superb leadership and that the Council's process exceeded his expectations.

Ms. Jonas added her thanks to her fellow Council members, the two Council liaisons, Mr. Wiant and Ms. Christian and all members of the LCRWG for its exceptional effort and to the Cadmus Group for its support.

J. Harmful Algal Blooms (HABs)

Ms. Jonas explained that, EPA is seeking the Council's recommendations on two key areas related to HABs:

- First, how would EPA best work with states, drinking water utilities and other partners to implement effective source water protection practices that can reduce the formation of HABs in source water?
- And, what other support do drinking water utilities need to address challenges with HABs?

She asked if other Council members in addition to Sarah Pillsbury, Howard Neukrug and Caryn Mandelbaum wanted to work on the HAB questions posed by EPA. She asked volunteers to notify Ms. Schutz.

1. Technical Presentation

Ryan Albert with EPA (section a) and Council member Carrie Mandelbaum (section b) provided technical presentations on HABs. A summary of their presentations is provided below.

a. *Ryan Albert*

Ryan Albert provided an update on EPA's work related to HABs.¹⁷ Key points from his presentation included:

- Cyanobacteria or blue-green algae occur naturally in surface water and when they rapidly multiply can cause HABs. Light, temperature, nutrient, weather and other factors affect bloom formation. Some species produce cyanotoxins that can be harmful to humans and animals. The most common ones are microcystins, cylindrospermopsin and anatoxin-a.
- The prevalence and duration of HABs in freshwater is rapidly increasing in the U.S. and worldwide, causing adverse health effect to animals and humans, as well as economic losses (e.g., closure of large fisheries in California, increased cost to treat potable water). Drinking water quality concerns include taste and odor problems.
- Recent examples of HABs occurred in Toledo, Ohio (population ~ 500,000) in August 2014 and in the Ohio River in the Summer/Fall of 2015. The one in the Ohio River spanned ~700 miles.
- EPA placed cyanobacteria and cyanotoxins on CCL 1, 2, 3, and the draft 4. EPA held public meetings on cyanotoxins in drinking water in May and September 2015.
- In June 2015, EPA simultaneously released 10-day health advisories (HAs) and recommendations in the *Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water*.¹⁸
 - The microcystin HA specifies a level of 0.3 µg/L and 1.6 µg/L for bottle-fed infants/pre-school children and school-aged children/adults, respectively. The cylindrospermopsin HA specifies 0.7 µg/L and 3 µg/L for bottle-fed infants/pre-school children and school-aged children/adults, respectively.
 - EPA's recommendation document for PWSs:
 - Provides source water protection tools, examples of system-specific cyanotoxin vulnerability assessments and cyanotoxin management plans.
 - Describes five potential management steps that recommend increasing actions based on source water vulnerability and the detection of cyanotoxins in raw or finished water.
 - Specifies three levels of communication, treatment actions and monitoring from systems at Step 5 based on the microcystin levels detected in finished water.
- Source water protection is key to reducing HABs but is a significant challenge. Key efforts include source water collaboration, drinking water mapping applications for protecting source water (DWMAPs), and Clean Water Act-SDWA Coordination Toolkit.

¹⁷ Available at <http://www.epa.gov/ndwac/national-drinking-water-advisory-council-november-17-19-2015-public-meeting-materials>.

¹⁸ Available at <http://www.epa.gov/sites/production/files/2015-06/documents/cyanotoxin-management-drinking-water.pdf>.

- H.R. 212, the Drinking Water Protection Act, signed on August 7, 2015, amends Section 1459 of SDWA and requires EPA to develop and submit a strategic plan for assessing and managing risks associated with algal toxins in drinking water provided by PWSs.
- The Strategic Plan:
 - Includes steps and a timeline to assess: human health effects, list of algal toxins, whether to publish additional health advisories, treatment options, analytical and monitoring approaches, causes of HABs, feasible source water protection practices and collaboration/outreach.
 - Identifies gaps and assembles published information from each federal agency that has examined algal toxins or addressed public health concerns related to HABs.
 - Was developed by various EPA offices and regions, and federal partners from an interagency working group.
 - Was delivered to the Senate and President on November 18, 2015.

b. Caryn Mandelbaum

Caryn Mandelbaum with Environment Now explained HAB occurrences in California and the state's efforts to address them. Key points from her presentation included:

- Human health effects from Cyanotoxins include rashes and headaches.
- Cyanotoxins are growing exponentially. Their occurrence and impacts include:
 - Movement into brackish and saltwater. Testing of the Pinto Lake in the fall of 2007 confirmed an extensive bloom with high microcystin production. In 2010, cyanotoxins were linked to the deaths of several sea lions.
 - Detection in 26 different water bodies in California (lakes and rivers) and movement into coastal areas based on testing in 2014 and 2015. Cyanotoxins are causing drinking water and/or agricultural impacts. California is the most populous state with the 9th largest economy, and leading state for dairy, fruit and nuts.
 - Intensified concentrations along the coasts based on more current research. The heat of droughts and water stagnation is responsible for the movement into waterways. The largest bloom occurred in the Delta where the two largest rivers converge and provide water for 3 million acres of irrigated farmland and for about 25 million people. As a result, crab fisheries have closed that represent a \$60 to \$70 million industry.
- A new report finds five principle drivers as determinants of blooms: 1) water temperature, 2) water column clarity, 3) long residence time of water column (i.e., lack of flow), 4) availability of nitrogen and phosphorus in non-limiting amounts and 5) salinity regime controls.

- Improved data collection has resulted from:
 - Partnerships with universities. Scripps College developed the Southern California Coastal Ocean Observing System and has been monitoring the presence of ten different HABs in seven different coastal areas.
 - A collaborative effort funded through the Klamath Hydroelectric Settlement Agreement that involve the Yurok Tribe, Karuk Tribe, PacifiCorp and U.S. Bureau of Reclamation. These organizations developed a collaborative sampling schedule for monitoring during the bloom season from Copco Reservoir to the Estuary. Based on this settlement agreement, PacifiCorp will support the website and information gathering effort. These efforts are helping three Native American tribes whose fishing livelihoods were impacted by HABs.
- California has looked at various types of treatments and source controls:
 - Treatments are in the experimental phase and include ultrasound buoys that break up the algae (costly); mixing systems and flushing water bodies; phoslock that is dropped into the water column and creates a crust by binding to phosphorus and algaecide (disadvantage is that it killed off both good and bad algae).
 - Source controls include limiting nutrient discharges; maintaining native vegetation along the shore; minimizing soil erosion; reducing the amount of fertilizer; using only phosphate-free fertilizer and detergents in dishwashing machines and shade balls that are made of a high polyethylene resin.
- To address HABs, assistance is needed:
 - To improve communication among regulators and health officials. For example, establishing a clearinghouse with an interactive blog that would allow states to share databases to monitor incidents and the scale of blooms, and to facilitate collaboration among public health, and ambient water and drinking water staff.
 - To establish lines of communication between county departments and drinking water agencies.
 - From CDC and EPA for expedited PSAs and health advisories. Needed PSAs include how to improve land use management to minimize nitrogen and phosphorus runoff and actions to take if humans and pets come into contact with HABs.

2. NDWAC Comments/Questions

Council members and the CDC liaison provided the following feedback:

- A Council member stated that the introduction of non-native fish in reservoirs affect the nutrient levels. To address the issue, some managers are increasing storage capacity before the height of the HAB season but she indicated that getting at the source of the problem will provide more ecosystem benefits.

- The CDC liaison asked if EPA conducted a cost assessment of the treatment options. In response, Mr. Burneson indicated that EPA’s recommendations document does not include an evaluation of costs but focuses on immediate modifications to existing conventional treatment processes. The document also includes a section on more comprehensive long-term treatment.
- The CDC liaison worked with a professor at Berkeley who developed algal growth within a controlled environment. The work focused on ratio of nitrogen and phosphorus to control the sources of nutrients. He asked if Ms. Mandelbaum’s research considered these ratios. Ms. Mandelbaum indicated that she did not conduct the research but that California’s recent report indicates nitrogen and phosphorus are both drivers but did not consider the ratios. She expressed interest in the Berkeley research because California is considering using reclaimed water due to its drought conditions. A Council/LCRWG member added that Colorado has also worked with ratios of phosphorus and chlorophyll.

K. Legionella

This section includes EPA’s technical presentation on *Legionella*, (section 1), related questions and comments provided by NDWAC members (section 2) and the NDWAC’s input on other potential partners and the state’s role (section 3).

1. Technical Presentation

César Cordero, with EPA, provided background on *Legionella*, an overview of the draft *Legionella* document, different control technologies and preventative/remediation steps and EPA’s next steps. Key points from his presentation are provided below:¹⁹

Background

- *Legionella* bacteria are usually found in aquatic systems. They can colonize biofilms in premise plumbing and infect protozoa. The biofilm and protozoa protect *Legionella* bacteria and makes the bacteria more resistant to disinfectants. Infection usually occurs through inhalation or aspiration of contaminated droplets (e.g., shower heads, faucets, and hot tubs).
- Legionellosis is the infection and can occur as Legionnaire’s Disease (pneumonia-like or flu-like symptoms) or Pontiac Fever. CDC estimates that 8,000 to 18,000 hospitalizations annually in the U.S. are due to Legionellosis, with up to a 30 percent fatality rate. Hospitalization costs for Legionnaire’s Disease are estimated at \$433 M/year based on 18,000 hospitalizations.
- The waterborne disease outbreaks reported in 2009-2013 in CDC’s Morbidity and Mortality Weekly Report indicated that 40 out 65 (62 percent) were caused by *Legionella*, of which 32 out 40 (80 percent) were linked to deficiencies in premise plumbing.

¹⁹ Available at <http://www.epa.gov/ndwac/national-drinking-water-advisory-council-november-17-19-2015-public-meeting-materials>.

- EPA's SWTR sets MCLGs of zero for *Giardia*, viruses and *Legionella*. Systems must comply with treatment requirements to remove or inactivate *Giardia* and viruses. Such measures should also kill *Legionella* because they are less resistant to disinfection.
- Premise plumbing conditions such as water heating, long residence time and low disinfectant residual areas can lead to *Legionella* proliferation.

Technical Legionella Document

EPA published a technical *Legionella* document on October 21, 2014. EPA took public comment on the document through November 23, 2015, and held a public meeting on November 9, 2015. This document:

- Was developed in response to requests from states and the Veterans Health Administration.
- Evaluates the effectiveness of treatment technologies for controlling *Legionella* in large buildings, such as hotels and hospitals.
- Will support public health protection by providing a breadth of information to allow states and building managers to make science-based risk management decisions on treating and controlling *Legionella*.
- Contains peer reviewed literature on technologies to control *Legionella* in premise plumbing.
- Was a collaborative effort in the data compilation, write-up and review of the draft document that involved ASDWA, CDC as reviewer and several EPA offices.
- Does not include recommendations for any particular technology or the addition/installation of treatment.

Control Technologies and Preventative/Remediation Steps

The technical document evaluates six control technologies using chlorine, monochloramine, chlorine dioxide, copper-silver ionization, ultraviolet (UV) disinfection and ozone. For each, Mr. Cortez summarized key findings from the literature as follows:

- Chlorine effectiveness varied across studies due to the different conditions used (e.g., varying temperature and pH). Its effectiveness is dependent on maintaining a chlorine residual and increases at higher temperatures. Chlorine is not effective when *Legionella* are present in biofilms or in amoeba. Potential WQP impacts include DBPs and taste, odor and corrosion.
- Monochloramine inactivation widely varied under varying water quality conditions. Its efficacy increase with increased temperature. Several studies indicate chloramine is more effective than chlorine at penetrating biofilms. Potential water quality issues include disinfection byproduct (DBP) formation, nitrification and corrosion.
- Laboratory and pilot scale testing showed chlorine dioxide effectiveness at low doses of < 1 mg/L. It is effective against *Legionella* shielded in amoeba and has had successful applications in hospitals. Its efficacy increases with higher water temperature. Potential water quality issues include formation of chlorite and chlorate, taste, odor and corrosion.

- Laboratory studies on the use of copper-silver ionization (CSI) indicate that copper ions at 0.4 mg/L and silver ions at 0.04 mg/L can reduce the cultivability of *Legionella*. Literature indicates successful application in building water systems including hospitals. It is not effective against *Legionella* when shielded by biofilms or amoebas and some strains are resistant to copper and silver. Potential water quality issues include high copper concentrations and corrosion.
- Studies show UV disinfection to be effective at decreasing and in some cases, eliminating *Legionella* from building water systems at low doses of 40 mJ/cm². However, it is only effective on the water flowing through the reactor, necessitating supplemental treatment if *Legionella* is already present in building water systems. Some UV reactors may not be tolerant of high temperatures (e.g., > 35°C/ 95°F) or certain chemical disinfectants. Also, iron, manganese, calcium and magnesium may affect the quartz lamp sleeves decreasing UV output.
- Studies showed a wide range of inactivation for ozone. It decomposes quickly, especially at high temperatures. Thus, it is difficult to maintain a residual and secondary disinfection may be needed. The studies do not provide a clear understanding of how biofilms and the inclusion of *Legionella* in amoeba impacts ozone's effectiveness. Potential water quality issues include the formation of DBPs and corrosion.

The technical document also evaluates other control technologies that include:

- Emergency disinfection technologies that are not intended for drinking water use and include:
 - Superheat and flush disinfection, which uses high temperatures of 71-77°C to flush each outlet for a minimum of 30 minutes. It has been shown to be effective in hospital outbreaks but will not provide long-term control unless combined with supplemental disinfection.
 - Shock hypochlorination, which involves injecting elevated chlorine concentrations of 20 to 50 ppm for a specific contact time. Success has been mixed. *Legionella* can be protected within *Acanthamoeba*, which can survive chlorine concentrations of 50 ppm.
- Point of use (POU) Filtration, which requires a pore size of ≤ 0.2 µm to be effective. A study with spiked water indicated that over time, POU filtration no longer removed *Legionella*, possibly because the pathogen stuck to the charcoal.

The technical document also discusses preventative and remediation strategies involving a multi-barrier approaches that include water safety plans, water management plans, Hazard Analysis and Critical Control Points program (HACCP.) Several studies showed a multi-barrier approach was effective.

EPA's Next Steps:

- At the November 9, 2015, public meeting, EPA provided a similar overview as the one presented at this meeting to approximately 200 people who participated by phone or in person. Some supported the draft *Legionella* document as first step. One participant was more critical of the document and thought that EPA should exclude reference to the HACCP program.
- In November/December 2015, EPA will evaluate and revise the document based on public comments.

- In January 2016, EPA plans to send out the document for an external peer review.
- In the spring of 2016, EPA plans to publish the final document after considering the comments received from the independent peer review.

2. NDWAC Comments/Questions

NDWAC members and the CDC liaison provided the following input on the *Legionella* presentation:

- A Council member questioned why someone would want to exclude reference to the HACCP program. In response, a Council member explained that the terminology was adopted by NSF International who offers training on this program. EPA's document includes steps that are similar to NSF's program. Mr. Burneson added that the commenter thought including it implies that EPA is endorsing a certain certification program.
- The CDC liaison asked whether *Legionella* propagation can occur in biofilm in the absence of protozoa. Mr. Cordero indicated that he was unsure.
- A Council member asked about the jurisdiction between a PWS and building manager if the building owner decides to treat the water. In response:
 - Mr. Cordero explained that EPA's document indicates that the primacy agency will make the ultimate determination and refers to regulatory language in 40 CFR §141.3.
 - Mr. Burneson added that SDWA has provisions that define a PWS and provides some exemptions for a facility that distributes water but does not treat or sell water. EPA refers these facilities to primacy agencies.
- A Council member asked if the movement of *Legionella* through carbon is due to break through or its absorption onto the carbon. Mr. Cordero indicated that he would have to review the specific study to answer that question but that EPA's draft document discusses the importance of maintenance and following manufacturer's recommendations.

3. Other Potential Partners and the State's Role

Dr. Grevatt indicated that all three topics presented at this meeting, LCR, HABs and *Legionella* involve many partners working together. He asked the Council for their input on how EPA might reach out to other partners and other important ones. He indicated that CDC has an important role. He added that the *Legionella* issue is challenging because it occurs in the premise plumbing that is not the responsibility of the PWS and many problems with *Legionella* tie to improper building maintenance. However, the PWS has responsibility for the quality of the water as it leaves the plant. In addition, drinking water is the vehicle for *Legionella* but usually the route of exposure is through inhalation. He asked for Council members' thoughts on the role of the state, for example, when there is a secondary treatment system added.

Regarding involvement from other partners:

- A Council member asked whether EPA had involved those connected to hospitals and hotels. Mr. Cordero explained that EPA involved several regional and headquarter offices, eight states,

and CDC in the development of the draft *Legionella* document. In addition, CDC has recommended other agencies. Dr. Grevatt added that EPA had a webinar in which a number of national organizations attended. EPA received comments from the Veterans Administration on the draft document and expects to receive public comments from some of these other organizations.

- A Council/LCRWG member suggested the Joint Commission because it accredits hospitals and health care institute and is connected to health care facilities across the country.
- The CDC liaison explained that state health departments are important because they know how to solve outbreaks. Many resorts have hot tubs so he recommended including recreational facilities and hotel owners, as well as state health departments because they have primacy for the drinking water program.

Regarding the states' role:

- A member indicated that New Hampshire and Pennsylvania are further along in taking a more active role in the *Legionella* issue. She learned that 1,200 facilities are doing a secondary treatment system that translates to the same number of new water systems depending on the interpretation. Primacy agencies are clearly trying to decide with whom to partner, and to regulate and educate around these issues.

Regarding the PWS' role:

- A Council member did not understand how PWSs could help in solving the problem and thought they would be reluctant to cross the public-private line and consult with facility personnel. Dr. Grevatt explained that PWSs must adhere to drinking water regulations but once the water has left, the water becomes the responsibility of others on what needs to be done. Drinking water is the means by which pathogens are delivered but individuals are exposed through inhalation and not from drinking the water.
- Mr. Burneson explained that EPA's document is a focused technical document to fill a niche. Before there was no document that compared the treatment technologies or addressed issues such as whether buildings need secondary treatment. EPA is seeking information on how individual facilities address *Legionella* and whether or not there should be a partnership with PWSs. In addition, what should EPA's role be in facilitating the conversation after this document is published?

Dr. Grevatt concluded that there are big questions on what happens next. There are already questions coming out of webinar that should or could be done regarding state primacy and other partners that should be involved. EPA's document will not lead to the eradication of *Legionella* in buildings but it will be useful to those installing secondary treatment.

L. MEETING CLOSING REMARKS

Oh behalf of Ms. Jonas, Mr. Wiant closed the meeting by providing his thanks to the Council, to Cadmus for its continued support during all of the LCRWG meetings and the NDWAC meeting. He also expressed

his appreciation to Gail Bingham from RESOLVE, who served as the LCRWG meeting facilitator. He noted that she has the creativity to draw the right conversation at right time and from the right person.

Dr. Grevatt again expressed his thanks to Jill Jonas for Chairing the NDWAC, Caryn Mandelbaum for her contributions as a Council member, and to Chris Wiant and Marilyn Christian for their participation on both the LCRWG and NDWAC. He appreciated how quickly the NDWAC worked through the draft letter and how helpful it will be to get this letter quickly to work through the details with the internal EPA Workgroup. He thanked Michelle Schutz for putting together a great meeting and to Cadmus for its support. He hoped the Council recognized how valuable its service is to EPA.

List of Attachments

- Attachment A – List of National Drinking Water Advisory Council Members and Liaisons
- Attachment B – List of Attendees
- Attachment C – Final Meeting Agenda

ATTACHMENT A
National Drinking Water Advisory Council Meeting

List of NDWAC Members and Liaisons

November 17 - 19, 2015

National Drinking Water Advisory Council (NDWAC) Members
Jill Jonas (Chair): Director, Bureau of Drinking Water and Groundwater, Wisconsin Dept. of Natural Resources
William Alley, Ph. D.: Director of Science and Technology, National Ground Water Association
Jeanne-Marie Bruno: General Manager/Senior Vice-President, Park Water Company
Marilyn Christian: Manager, Environmental Health Programs, Harris County Public Health ¹
The Honorable Hilliard L. Hampton II: Former Mayor of Inkster, Michigan
Cathy P. Kellon: Green Infrastructure Program Director, Geos Institute
Carrie M. Lewis: Superintendent, Milwaukee Water Works
Caryn Mandelbaum, Esq: Staff Attorney, Environment Now
Wilmer Melton, III: Director of Public Works, City of Kannapolis ²
James McCauley: Manager, Lower Brule Rural Water System
Randy A. Moore: President, Iowa American Water
Howard Neukrug: Water Commissioner, City of Philadelphia
Sarah Pillsbury, P.G.: Administrator, Drinking Water and Groundwater Bureau, New Hampshire Department of Environmental Services
Mark S. Sanchez: Executive Director, Albuquerque Bernalillo County Water Utility
Chris Wiant: President & CEO, Caring for Colorado ¹
Liaisons
Kimberly Jones, Science Advisory Board
Max Zarate-Bermudez, Centers for Disease Control

¹ These NDWAC members also served on the Lead and Copper Rule Working Group (LCRWG).

² This Council member could not attend the meeting.

ATTACHMENT B

National Drinking Water Advisory Council Meeting

List of Attendees

November 17 - 19, 2015

First Name	Last Name	Affiliation
Ryan	Albert	EPA
William	Alley	National Ground Water Association/NDWAC
Jim	Ananich ¹	Michigan State Senate - 27 th District
Lindsey	Arndt	Dept of Navy
John	Arnett	Copper & Brass Fabricators Council
Mona Hanna	Attisha ¹	City of Flint
Victoria	Banks	EPA
Scott	Biernat	Association of Metropolitan Water Agencies
Pat	Bradley	City of Richmond, VA
Jean-Marie	Bruno	Park Water Company/NDWAC
Charles	Brunton	EPA
Melissa	Burke	Detroit News
Gary	Burlingame	Philadelphia Water Dept./LCRWG
Eric	Burneson	EPA
Jennifer	Chavez ¹	Earth Justice
Lisa	Christ	EPA
Marilyn	Christian	Harris County Public Health/NDWAC/LCRWG
César	Cordero	EPA
Leslie	Darman	EPA
Cathy	Davis	EPA
Derrick	Dennis	Association of State Drinking Water Administrators/LCRWG
Laura	Dufresne	The Cadmus Group, Inc.
Marc	Edwards ¹	Virginia Tech
Jerry	Ellis	EPA
Stephen	Estes-Smargiassi	AWWA/MWRA/LCRWG
Chris	Fultz	EPA
Sean	Garcia	AWWA
Jessica	Georges	EPA
Michael	Goldberg	EPA
Iris	Goodman	EPA
Ashley	Greene	EPA
Peter	Grevatt	EPA
Hilliard	Hampton	NDWAC
Anne	Jaffe Murray	The Cadmus Group, Inc.

First Name	Last Name	Affiliation
Jill	Jonas	WI Dept of Natural Resources/NDWAC
Kimberly	Jones	Science Advisory Board Liaison
Cathy	Kellon	Geos Institute/NDWAC
Jeff	Kempic	EPA
Dan	Kildee ¹	Congress - 5 th District of Michigan
Andy	Kireta Jr.	Copper Development Association
Yanna	Lambrinidou	Parents for Nontoxic Alternatives/LCRWG
Krystal	Lattany	Senator Stabenow - Michigan
Jennifer	Lee	National Resources Defense Council
France	Lemieux ¹	Health Canada
Carrie	Lewis	Milwaukee Water Works/NDWAC
Dave	Lipsky	NYC DEP/Bureau of Water Supply
Caryn	Mandelbaum	Environment Now/NDWAC
James	McCauley	Lower Brule Rural Water/NDWAC
Tracy	Mehan	AWWA
Suril	Mehta	EPA
Randy	Moore	Iowa American Water/NDWAC
Tom	Neltner	Environmental Defense Fund/LCRWG
Howard	Neukrug	City of Philadelphia/NDWAC
Amanda	Palleschi	Inside EPA
Sarah	Pillsbury	New Hampshire Department of Environmental Services/NDWAC
Mitchell	Rivard	Congressman Dan Kildee - 5 th District of Michigan
Mark	Sanchez	Albuquerque Bernalillo County Utility/NDWAC
Michelle	Schutz	EPA, Designated Federal Officer
Paul	Schwartz ¹	Water Alliance
Lisa	Seville	NBC News
Nicole	Shao	EPA
Thomas	Speth	EPA
Jim	Taft	Association of State Drinking Water Administrators
Lynn	Thorp	Clean Water Action/LCRWG
Steve	Via	American Water Works Association
Edward	Viveiros	EPA
Christina	Waddington	EPA
LeeAnne	Walters ¹	City of Flint
Pat	Ware	Bloomberg BNA
Crystal	Wheaden	WSSC
Chris	Wiant	Caring for Colorado Foundation
Chang	Zhang	Stanford

¹These attendees provided public comment.

ATTACHMENT C

National Drinking Water Advisory Council Meeting

Agenda

Day 1: Tuesday – November 17, 2015

8:30 - 9:00	Registration	-
9:00 - 9:45	Opening and Welcome Introductions Review Agenda	Michelle Schutz , Designated Federal Officer (DFO) Jill Jonas , Wisconsin Bureau of Drinking Water and Groundwater, Council Chair Peter Grevatt , EPA, Office of Ground Water and Drinking Water (OGWDW) Director
9:45 - 10:15	National Drinking Water Program Update Purpose: To provide an overview of the National Drinking Water Program priorities for the year ahead	Peter Grevatt
10:15 - 11:00	Drinking Water Regulatory Development Activities Purpose: To provide an update on current drinking water regulatory-related activities	Eric Burneson , EPA, Standards and Risk Management Division (SRMD) Director, OGWDW
11:00 - 11:45	Lead and Copper Rule (LCR) Long Term Revisions Purpose: To provide the background and considerations of the Working Group as they developed their Report to the NDWAC	Marilyn Christian , Harris County Public Health and Environmental Services Chris Wiant , Caring for Colorado Foundation
11:45 - 1:00	Lunch	On Your Own
1:00 - 1:45	Lead Service Line Replacement Requirements Questions and Comments	Stephen Estes-Smargiassi , American Water Works Association Council Led by Jill Jonas
1:45 - 2:15	Public Education Requirements Questions and Comments	Gary Burlingame , Philadelphia Water Department Council Led by Jill Jonas
2:15 - 2:45	Copper Requirements Questions and Comments	Derrick Dennis , Washington Department of Health Council Led by Jill Jonas
2:45 - 3:15	Break	-
3:15 - 3:45	LCR Questions and Comments	Council Led by Jill Jonas
3:45 - 4:15	Closing Remarks	Jill Jonas Peter Grevatt Michelle Schutz

Day 2: Wednesday – November 18, 2015

8:00 - 8:15	Opening and Recap	Jill Jonas
8:15 - 8:45	Corrosion Control Treatment, Monitoring and Household Action Level Questions and Comments	Tom Neltner, Environmental Defense Fund Council Led by Jill Jonas
8:45 - 9:30	LCR Workgroup Other Comments	Led by Michelle Schutz
9:30 - 10:15	Public Comments	Led by Michelle Schutz
10:15 - 10:30	Break	-
10:30 - 11:15	Council Deliberations - Lead Service Line Replacement Requirements	Council Led by Jill Jonas
11:15 - 11:45	Council Deliberations - Public Education Requirements	Council Led by Jill Jonas
11:45 - 12:15	Council Deliberations – Copper Requirements	Council Led by Jill Jonas
12:15 - 1:15	Lunch	On Your Own
1:15 - 1:45	Council Deliberations - Corrosion Control Treatment, Monitoring and Household Action Level	Council Led by Jill Jonas
1:45 - 3:00	LCR - Council Deliberations	Council Led by Jill Jonas
3:00 - 3:30	Break	-
3:30 - 4:30	Recap Recommendations	Council Led by Jill Jonas
4:30 - 5:00	Harmful Algal Blooms (HABs) Purpose: To provide an update on HAB activities in the drinking water program and answer questions from the Council	Ryan Albert, OGWDW

Day 3: Thursday, November 19, 2015

8:00 - 8:15	Opening	Jill Jonas
8:15 - 10:00	LCR - Council Final Deliberations and Conclusion of Recommendations to Administrator	Led by Jill Jonas
10:00 - 10:30	Break	-
10:30 - 11:00	Legionella Purpose: To provide brief update and answer questions from the Council	OGWDW
11:00 - 11:30	Closing Remarks	Jill Jonas Peter Grevatt