U.S. Environmental Protection Agency
NDWAC LEAD AND COPPER WORKING GROUP

March 25-26, 2014

Location:
Cadmus Corporate Office
1555 Wilson Blvd. Suite 300
Arlington, VA 22209

Meeting Summary

Meeting Objectives/Desired Outcomes:

- *Review the current Lead and Copper Rule (LCR) and background for the long-term revisions.*
- *Discuss working group mission, operating procedures and proposed timeline.*
- *Discuss suggestions for additional LCR topics for the consultation process.*
- *Learn about optimal corrosion control treatment provisions in the LCR, understand and share perspectives on the issues and provide initial input on questions.*
- *Plan next steps.*

A. Welcome, Introduction, Meeting Objective and Agenda

Ms. Gail Bingham, the meeting facilitator from RESOLVE, opened the meeting by welcoming everyone to the first meeting of the National Drinking Water Advisory Committee (NDWAC) LCR Working Group (hereafter referred to as the "LCRWG" or "Group").[1]

Dr. Peter Grevatt, Office of Ground Water and Drinking Water (OGWDW) Director, welcomed everyone to the meeting. He noted that the LCRWG would be undertaking a tremendous effort and thanked everyone for their participation.

Dr. Grevatt provided background on the LCR revision process. He explained that although EPA has been working on LCR revisions for some time and has gathered information from stakeholders, the NDWAC and the public, EPA was not ready to move forward with a proposed rule because of several outstanding issues. He believes that these issues may be best addressed with input from individuals with a broad perspective.

Dr. Grevatt referred to the white paper that includes key issues EPA wants the LCRWG to address, but explained that EPA is open to additional issues not covered in the paper.[2] He read the goal of the LCR Long-Term Revisions (LTR) from the white paper as follows, "EPA's goal for the LCR-LTR is to improve the

[1] Please see Attachment A for a list of the LCRWG members and meeting presenters. Please see Attachment B for a copy of the meeting agenda. Please see Attachment C for a list of the meeting attendees.
[2] Please see Attachment D for the Lead and Copper Rule Long-term Revisions White Paper (9-30-13).

effectiveness of corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not effective." He emphasized that "equitable" is key and an especially important consideration for lead service line replacement (LSLR) requirements. In addition, Dr. Grevatt stressed the importance of establishing the right triggers to reduce lead exposure for children. He added that EPA wants the rule to have cost effective, implementable and feasible requirements.

Dr. Grevatt explained that the LCRWG will have six face-to-face meetings over the next year to gather input from a variety of stakeholders and to discuss potential changes to the rule. He noted that EPA is in process of identifying additional LCRWG members who can provide the individual consumer's perspective. He explained that the LCRWG is not a Federal Advisory Committee Act (FACA) group but is under the umbrella of a FACA group – the NDWAC. Thus, consensus, while desirable, is not a necessary outcome (i.e., the LCRWG will not develop a formal agreement in principle). He explained that the goals for today's meeting are to: establish a strong foundation for the LCRWG, identify other topics or approaches that may be considered in addition to what is in the white paper and begin discussing corrosion control treatment (CCT).

Following Dr. Grevatt's remarks, the LCRWG asked clarifying questions and discussed the information presented. In the discussion, the following points were made:

- Mr. Eric Burneson (EPA OGWDW) explained the drivers for the LCRWG schedule. Some parts of the rule are not currently working well (e.g., partial LSLR) but EPA wants to balance the need to get a new rule in place as soon as possible with receiving good input from the LCRWG. EPA wants to complete the LCRWG process within a year. There is no statutory deadline for the LCR LTR.
- An LCRWG member raised the issue of equity, asking how EPA determines if costs are equitable and if EPA considers the average or low income consumer. Dr. Grevatt responded that they will need to consider all consumers and that the LCRWG has an opportunity to provide input on this. Dr. Grevatt explained that the LCRWG will provide recommendations to NDWAC who will then make a recommendation to the EPA Administrator. EPA included NDWAC members on the LCRWG for continuity and anticipates that they will make the presentations to the full NDWAC. Ms. Bingham noted that the way in which the recommendations are presented to the NDWAC is important. She can help by documenting LCRWG recommendations, explaining pros and cons of different approaches and documenting where there is consensus.
- Mr. Burneson explained that EPA had conducted a Small Business Regulatory Enforcement Fairness Act (SBREFA) process on the recommended rule revisions that will be presented to the LCRWG. Through this process, EPA determined that the revisions may have a significant impact on small entities. EPA will make the SBREFA report available to the LCRWG.

B. Lead and Copper Rule Overview

Mr. Burneson expressed his appreciation to the workgroup for their time commitment and provided an overview of the current LCR and explained how the components for which EPA is asking input fit together. Specific topics included:

- Lead and copper health effects information.
- The goal of the LCR and the water systems to which the rule applies.
- Monitoring protocol (first-draw samples at taps that are at high risk of lead and copper contamination), the minimum number of required samples and sample frequency.
- Action levels (ALs) for lead (0.015 µg/L) and copper (1.3 mg/L) and the requirements they trigger when 10% of the samples (i.e., the 90^{th} percentile level is exceeded).
- Public education, optimal corrosion control treatment (OCCT) and LSLR requirements.

The LCRWG asked clarifying questions and provided additional feedback regarding public education (PE) and LSLR requirements.

- Public Education (PE):
  - PE materials are provided in other languages (e.g., Spanish) based on the population served by the systems.
  - PE materials highlight steps a person can take such as flushing the tap. The PE language encourages systems to work with local health authorities and for individuals to consult with their doctor.
  - PE requirements are not tied to the magnitude of an action level exceedance (ALE). They must be delivered for as long as the system has a lead ALE.
  - Renters and new homebuyers would receive PE in accordance with the timing under the LCR, which may not coincide with when they are deciding about renting or buying.
  - EPA has a fact sheet on PE requirement which will be provided to the LCRWG.
- LSLR:
  - An individual lead service line (LSL) counts as being replaced if all samples collected from that LSL are ≤ 0.015 mg/L. However, if a system is eligible to stop LSLR and has a subsequent lead ALE, the tested out line would need to be retested.
  - An LSL is the water line from the water main to the foundation of the house but not inside the home (premise plumbing).
  - EPA requested that the Science Advisory Board (SAB) review studies documenting the impact of LSLR with respect to lead exposure. Based on the data reviewed, the SAB concluded that partial lead service line replacement (PLSLR) has not been shown to reliably reduce drinking water lead levels in the short term, ranging from days to months and potentially even longer. Additionally, PLSLR is frequently associated with short-term

elevated drinking water lead levels for some period of time after replacement, suggesting the potential for harm, rather than benefit during that time period. EPA will provide this information to the LCRWG when they discuss LSLR.

C. Implementation History and Current Practice

Darrell Osterhoudt, Regulatory Affairs Manager, Association of State Drinking Water Administrators (ASDWA) presented the implementation history of the LCR and current practices. His presentation was based on a survey of States conducted by ASDWA. Other topics he presented included:

- Violation information.
  - In Fiscal Year 2013:
    - 430 systems had 557 treatment technique (TT) violations. This number exceeds the number of maximum contaminant level (MCL) violations for four other rules combined.
    - 6,813 systems had 9,491 monitoring and reporting (M/R) violations including many large systems.
  - The number of TT and M/R violations and systems with those violations declined from 2000 through 2013:
    - Decline has been steep over the last several years but has leveled off in the last 2 years.
    - Although there has been a downward trend, the number of violations and systems in violation it is still relatively high for a rule that has been in place for many years.
- Surveyed States had a long learning curve for the LCR and still face implementation challenges that include:
  - Continued education needs for owners and operators.
  - Monitoring challenges:
    - Managing a complex monitoring program that involves a unique sampling protocol and inexperienced sample collectors (homeowners).
    - Maintaining a valid number of test sites.
    - Reinstituting 6-month monitoring when a system has changed its source or treatment.
    - Seasonal monitoring for systems on a reduced monitoring frequency.
    - Delay in receiving sample results, which delays initiating action.
    - Limited sample invalidation criteria results that can yield non-representative samples.
    - Investigative sampling is discouraged because all samples must be used to calculate the 90^{th} percentile level.
  - Compliance with PE requirements especially continuing PE.

- OCCT Challenges:
  - Designating OCCT and tracking compliance because information is not always readily available.
  - Establishing optimal water quality parameters (OWQPs).
  - Managing the necessary monitoring and reporting data.
  - Knowing the impact of OWQP exceedance and appropriate action.
- Simultaneous compliance issues with other rules, usually Disinfectants and Disinfection Byproducts Rule (DBPR).
- Other Challenges:
  - Difficult to establish and maintain lead-free distribution system waiver.
  - Managing compliance when 90th percentile levels are close to the AL and fluctuate above and below the AL.
  - "Seasonal systems" with poor quality infrastructure that result in ALEs even with CCT.

- States' Recommendations:
  - Simplify and in general add flexibility.
  - Add invalidation flexibility or allow confirmation provisions to enable verification that an ALE is due to a system problem as opposed to a single sample, especially for small systems.
  - Consider plumbing replacement as a compliance strategy.
  - Offer more flexibility in WQP monitoring to tailor to water type, source and treatment.
  - Allow alternatives to tap samples in homes to measure water corrosivity.
  - Provide more flexibility and guidance for States to determine what changes require a system that is on a reduced monitoring schedule to revert to 6-month monitoring.
  - Clarify provisions that allow systems to continue monitoring in subsequent 6-month periods after an ALE (essentially allows them to "test out" of the ALE).
  - Require regular monitoring after an ALE but before CCT is installed to continue to provide information on lead and copper levels.
  - Allow a further reduced monitoring frequency for systems consistently below the ALs (monitoring is still onerous for very small systems).
  - Better match timing of WQP testing and tap monitoring.
  - Relax strict tiering structure because CCT effectiveness determinations can be made from many types of sample sites.
  - Modify the sampling protocol to consider lead and copper separately.

- Improve education on ways customers can mitigate exposure to lead and copper. Certain kind of education is triggered by the rule but other types of information can be provided.
- Remove customer notification education requirements when lead is not over the AL because it conflicts with the way the public is usually notified of problems with their water.

During Mr. Osterhoudt's presentation, the LCRWG asked clarifying questions regarding the data presented for TT violations and M/R violations. Key discussion points are summarized below.

- Because some LCR TT violations can be for failure to meet CCT requirements for either lead or copper, the violation information would need to be considered with the original ALE to distinguish whether a system has a lead versus a copper problem. With M/R violations, it is sometimes difficult to know the underlying reason for the violation. Thus, EPA considers failure to meet monitoring or reporting requirements to be one violation.
- LCRWG members provided perspectives as to why systems incur violations:
  - TT violations: These violations are often due to failure to complete a requirement on time as opposed to failure to take action; the unique reporting requirements for lead PE and LSLR result in violations.
  - M/R violations: These violations can occur because the system received an insufficient number of samples from homeowners to meet minimum sampling requirements; most M/R violations are due to failure to monitor as opposed to reporting.
- The decline in M/R violations over the last several years may be due to less frequent monitoring – many systems are no longer required to conduct semi-annual monitoring but now qualify for reduced triennial monitoring so there are fewer opportunities for violations.

LCRWG members also asked for clarification regarding the lead-free waiver. EPA explained that this waiver most often applies to a trailer park where the water system owns all premise plumbing. The challenge is to demonstrate that all of the service lines and plumbing to the tap are lead free.

Following the presentation, Ms. Bingham asked for questions and experience from LCRWG members. The following points were made:

- Mr. Burneson provided background on why the LCR is complex. The source of contamination is not like other rules (i.e., source water contaminants that can be removed at the treatment plant). Entry of lead and copper into the water is primarily from the LSLs and premise plumbing. Each system needs to be able to modify its approach in response to elevated lead and copper and States need flexibility to make it work. EPA tried to balance this with the need for accountability. EPA chose a TT method which introduces high variability.
- Several LCRWG members and EPA discussed possible indictors of how well the current LCR has reduced exposure to lead and copper. Mr. Osterhoudt clarified that he used violation data to indicate the complexity of the rule, not to address if exposure to lead and copper is decreasing. Mr. Burneson explained that the LCR is designed to trigger action based on "sentinel" monitoring, not to assess exposure. LCRWG members pointed out that the current rule requires all samples that meet the sampling protocol (i.e., first-draw, 1-liter samples) to be included in

the 90th percentile calculation. This requirement can discourage diagnostic monitoring, which could help the systems and States understand the cause of an ALE.

- LCRWG members requested information relating exposure to lead in drinking water to blood lead levels. EPA has the Integrated Exposure Uptake Biokinetic Model (IEUBK Model) that can make this calculation. However there are complexities. First-draw samples required by the LCR represent water that has been stagnant in the pipes; actual exposure might be much lower. One member provided an illustration of the complexity of the lead exposure question. Providence, RI had a 25% decrease in blood lead levels from 2012 to 2013 related to housing issues. Another LCRWG member suggested looking at all of the data (not just the 90th percentile) to understand trends and exposures.
- Several working group members expressed the need for better information than violation history and 90th percentile levels to: 1) address changes in exposure over time; and 2) better understand the issues with the current rule.
- One LCRWG member asked if anything has been deemed unachievable in the current rule from an affordability perspective (e.g., for very small systems). Examples could be useful during the current review.
- Mr. Osterhoudt's presentation talked about simplifying the rule and providing more flexibility. The two concepts do not conflict if the choices offered by the increased flexibility are simple.
- In response to a question regarding whether lead and copper data are contradictory, Mr. Burneson replied that the CCT that is effective for lead may not be sufficient for copper. Also the current sampling protocol is biased towards lead and some of the rule changes EPA is considering would make the bias greater. One issue being explored by EPA is whether sampling sites should be different for lead and for copper. The other issue to be discussed in a future LCRWG meeting is the lack of required copper PE when the action level (AL) is exceeded.

The LCRWG offered the following:

- Consider flexibility in the timeline for installing CCT. Violations often occur during the steps to get to CCT installation. Consider a maximum time for CCT installation and let States decide the timeframe for intermediate steps.
- Consider allowing diagnostic monitoring (possibly "special" samples) that are not used for compliance to help systems understand what is happening and help the community as a whole gain a better understanding of lead and copper exposure.

Ms. Bingham asked the Group to provide policy- and decision-relevant questions when requesting data from EPA. Mr. Burneson explained that to the extent that EPA has the data, they are open to analyzing it and providing additional information to the LCRWG. EPA has already done a lot of work and evaluation, which is synthesized in the white paper. The webinars will provide information in advance of the regular LCRWG meeting and will provide a full range of views.

D. Working Group Mission, Operating Procedures and Timeline

Ms. Bingham explained that she will be discussing the draft operational protocol for the LCRWG and that Ms. Lisa Christ (EPA OGWDW) would be discussing the timeline for the LCRWG process.[3]

1. Draft Operating Protocol

Ms. Bingham walked through each section of the draft operational protocol.

Based on questions and feedback from LCRWG members, Ms. Bingham said that she would: 1) make the mission statement in the operational protocol consistent with the goal in the white paper by including the concept of equity in protecting public health from lead and copper exposure and 2) check with the FACA lawyer and Roy Simon, the EPA Designated Federal Official (DFO) for NDWAC whether the LCRWG can form a committee, as is currently stated in Section 4.l of the operational protocol.

2. Timeline

Ms. Christ explained the timeline for the LCRWG meetings and LCRWG process as follows:

- Dates on the planning timeline are tentative.
- The LCRWG will have six in-person meetings, spaced about 8 to 10 weeks apart.
- EPA will provide three technical 2- to 3-hour webinars, scheduled 1 to 2 weeks before the second, third and fourth meetings on the topic that will be discussed at the face-to-face meeting.
- The focus of the current meeting is CCT. EPA is presenting CCT first because it is the cornerstone of the rule for reducing exposure to lead and copper at the tap.
- The second topic will be site selection. EPA uses tap monitoring to assess CCT. The current criteria targets lead, but EPA is questioning whether the rule is targeting the highest lead concentration and adequately considering copper.
- The third topic will be lead sample requirements. Currently it's a first draw after stagnation, but EPA is questioning whether the rule should require other sampling regimes (e.g., for systems with LSLs to use a service line sample in lieu of a first-draw sample). In the same meeting EPA will introduce copper PE and talk about lead PE to provide context.
- The last topic is LSLR. EPA will present the latest science and talk about PLSLR and full LSLR.
- EPA will prepare primers for each of these topic areas with the intent of having a more robust face-to-face discussion by introducing technical topics in advance.

[3] Please see Attachment E for the most current version of the National Drinking Water Advisory Council Lead and Copper Working Group - Operational Protocols (5-12-14). Please see Attachment F for the most current version of the Draft Lead and Copper Rule NDWAC Working Group Process Planning Timeline (5-5-14). Note that both appendices have been revised since they were presented at the March 2014 meeting.

Ms. Bingham added that input from the first four meetings will be used to develop a straw man document, which will be discussed during the fifth meeting. EPA will revise the draft report based on input received during the fifth meeting and will seek consensus during the sixth meeting. The LCRWG will have opportunity to consider how one revision may impact other parts of the rule.

Following Ms. Christ and Ms. Bingham's remarks, the LCRWG asked clarifying questions. The following points were made:

- Mr. Burneson and Ms. Bingham explained that the NDWAC members on the LCRWG would have the lead in presenting the report to the NDWAC.
- To help ensure that appropriate presenters and experts will be available for meetings and webinars, EPA and RESOLVE will request help from workgroup members and will plan at least two meetings in advance.
- Although the material is extensive and there are a number of technical issues in each category, EPA is committed to trying to address all issues during the scheduled LCRWG meetings and webinars.
- Ms. Christ will determine if the webcasts can be recorded.
- Ms. Bingham indicated that in future meetings, she will set aside time for any necessary follow-up on discussions from the previous meeting(s).

E. Scope of Issues for LCR Work Group

Mr. Burneson highlighted the five areas for which EPA is seeking LCRWG input: (1) Sample site selection criteria, (2) lead sampling protocol, (3) PE for copper, (4) measures to ensure optimal corrosion control treatment (OCCT) and (5) LSLR. He noted that additional topics areas may be added by the LCRWG. In addition, he discussed why EPA formed a LCRWG and the structure of the LCRWG. Mr. Burneson explained that although EPA is seeking input by topic area, EPA is also asking the LCRWG to determine how recommendations for a topic area affect the rule as a whole.

Other topics he discussed included:

- EPA's goal for the Long-term Revisions, which is to "Improve the effectiveness of corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not enough."

- Sample Site Selection Criteria Issues:
  - Whether the 1991 sample site criteria are still appropriate to assess CCT.
  - Revisions EPA is considering:
    - Separate site selection criteria for systems with LSLs and those without.
    - Copper monitoring at separate sites with new copper.

        - A copper monitoring waiver for systems with water that is not aggressive to copper.

- Lead sampling protocol issues:
    - Water in a LSL is most likely to have the highest lead concentration.
    - Certain activities prior to sample collection may lower first-draw lead levels.
    - If copper and lead monitoring is bifurcated, what is the appropriate number of samples to assess lead and copper corrosion control.
- Revisions EPA is considering:
    - Modifying the sampling protocol for systems with LSLs to require a LSL sample in lieu of first-draw sample.
    - Prohibiting certain activities such as pre-flushing and aerator cleaning prior to sample collection because these practices may lower first-draw lead levels.

- Copper Public Education Issues:
    - The current rule does not include copper education requirements.
    - Copper can have short-term health effects but more significant effects for a subsection of the population.
    - EPA is considering whether copper PE materials should be provided to consumers and under what situations it would be worthwhile and appropriate.
- OCCT Issues:
    - Maintaining OCCT can be challenging when systems are facing adjustments to their treatment processes that are related to compliance with other regulations (e.g., DBPR).
    - The LCR has no direct requirement to require systems to re-optimize.
    - Revisions EPA is considering:
        - Expanding scope of the CCT study, particularly for systems with LSLs.
        - Requiring systems using orthophosphate to evaluate higher doses and those not using orthophosphate to study its use.
        - Allowing non-transient non-community water systems (NTNCWSs) serving 10,000 or fewer people the option of using point-of-use (POU) treatment units.
- Lead Service Line Replacement Issues:
    - The SAB concluded that PLSLR does not protect public health in long term and is associated with short-term increases in lead.
    - Under the current LCR, the system is only responsible for the portion of the LSL they control.
    - Revisions EPA is considering:

        - Delaying LSLR requirements until the system has re-optimized.
        - Expanding the definition of "control" to include authority to set standards for service line; to replace, repair or maintain the line; or ownership of the line.
        - Eliminating PLSLR when homeowners do not agree to pay for their portion.
        - Eliminating the "test-out" provision.
        - Requiring systems to provide residents with a NSF/ANSI 53 certified pitcher filter or some other POU device for short-term increases in lead following LSLR.
    - Things to Consider in Formulating the LCRWG Input:
        - The Safe Drinking Water Act (SDWA) requires that a TT rule be set as close to the maximum contaminant level goal (MCLG) "as is feasible".
        - Provisions in the Act also require the consideration of cost and benefits, measurements of uncertainty and anti-backsliding.

Following Mr. Burneson's presentation, Ms. Bingham asked the LCRWG if there are additional issues or clarifying questions. The following points were made.

Sample Site Selection

- In response to a request from LCRWG members, EPA will look into providing background information on changes in lead and copper source contributions over time and projections of these sources into the future. Plumbing manufacturers may be able to provide information on new materials that would contribute to lead and copper in the future.
- Mr. Burneson reiterated that lead and copper sites are not selected to assess exposure but rather to evaluate CCT effectiveness. WQP samples are collected at different locations. During a future meeting, EPA will specifically ask for input on whether WQP and LCR samples should be better coordinated.
- The LCR white paper (Attachment D) includes State input on possible rule revisions. In response to a LCRWG member's request, EPA will provide the LCRWG with the more detailed background information that the States previously sent to EPA.
- EPA has been looking into whether LCR sampling adequately captures particulate lead. Particulate lead is also a factor after PLSLR. LCRWG members asked for clarification on the goal of sample site selection with respect to particulate lead.
- Mr. Burneson clarified that "control" of LSLs is based on ownership. The water system does not control pipes on private property. The SDWA has no authority over what happens during a home renovation.
- In response to a question about whether a reduction in number of required sites for lead would trigger anti-backsliding provisions, Mr. Burneson clarified that these provisions are not for a specific change but for a whole suite of changes. It is unlikely that EPA would need to evaluate this provision for a change in number of samples. He added that EPA would verify if these

provisions could apply across multiple rules if changes to the LCR result in public health improvements in another rule.

- Regarding copper monitoring:
  - Dr. Mike Schock (EPA ORD) noted that for certain water qualities, corrosion of new copper pipe will always be a concern and for other water qualities, it will never be a concern.
  - Several members indicated that systems will have difficulty targeting new copper sites for monitoring because they do not have an easy way to learn about renovations (e.g., most do not have a connection with the building industry; the regulating entities for systems and new construction may not be in the same city or department).

The LCRWG offered the following regarding copper monitoring:

- Consider modifying the rule to set specific requirements for systems with water quality that is aggressive toward copper (initial monitoring, PE) instead of requiring continued monitoring.

Lead Sampling Protocol

- EPA will provide information on the cost of lead and copper testing and lab availability.
- Due to the important role that consumers play in monitoring and the possibility of making that responsibility more complicated, one member asked whether customers understand how to sample and if the current sampling protocol is working (e.g., Is improper sampling causing ALEs?).
- Several members agreed with EPA's suggestion to identify people with sample collection experience. One LCRWG member suggested identifying a utility employee that has direct experience with homeowners versus getting one customer's experience.
- One member stated the importance of keeping the sampling protocol simple because many systems are monitoring triennially; thus, customers either do not remember how to sample or are new.
- A few members discussed the need for the rule to allow investigative or special samples to understand why a system has an ALE or in response to a customer's request. Mr. Burneson noted the importance of adequately distinguishing between compliance and non-compliance samples so that systems are not able to "pick and choose" which samples are used for the 90th percentile calculation. One member indicated that his water system reports results of investigative samples to the State, but does not include them in compliance calculations.
- One LCRWG member requested a flow diagram of the LCR sampling protocol so that the group could determine where problems could arise (a similar procedure was used for the revised Total Coliform Rule).

Copper Public Education

To address LCRWG questions on the occurrence of copper problems, EPA will provide data on copper ALEs before the meeting on copper PE (i.e., before the third face-to-face meeting). Mr. Burneson added that EPA has more information on health effects of copper but less epidemiological data because health effects are mostly acute (gastrointestinal). He indicated that EPA would provide the available information to the LCRWG as well as lead PE materials to provide context for the copper PE discussion.

Optimal Corrosion Control Treatment

- In response to requests from an LCRWG member, EPA with assistance from States and Regions will compile a list of the most common simultaneous compliance issues that interfere with a system's ability to optimize CCT.

- One member asked for a presentation on other TT regulations to see if any successes can be applied to LCR.

- One LCRWG member asked how the rule defines optimization. Is it trying to achieve a lead level of 0 µg/L or meeting the AL of 0.015 mg/L? He explained that his utility does coupon test to help optimize versus sampling at a tap where there are many more variables. He thinks laboratory tests are more reliable for operators and would be a better way to work towards optimization.

Lead Service Line Replacement

EPA noted the following LCRWG's information requests for the future LSLR meeting:

- How water systems determine service line type.
- List of stakeholders involved in lead and copper control (so that the group can brainstorm how these stakeholders can be part of the solution).
- What systems are doing with easements when replacing LSLs.
- Information on what it takes to do a full and PLSLR, including the timeframe and costs.
- Detail from the SAB study on LSLR.

EPA will be asking the LCRWG to consider whether PLSLR requirements should be retained in the rule and whether to revise the definition of control. Mr. Burneson explained that the current definition of control is based on ownership. One LCRWG member pointed out that some replacements are not tied to the rule. Mr. Burneson provided an example of voluntary LSLR, in which a utility replaces LSLs in connection with installation of a new fiber optic cable that cuts across service lines. He noted that EPA refers to those replacements as "infrastructure" LSLR.

Interconnection Issues

Mr. Burneson asked the LCRWG to identify interconnecting issues as they work through the various topics. The LCRWG offered the following:

- One member asked about the availability of data on the effectiveness of corrosion control in managing lead release from LSLs. Dr. Schock replied that he had at least 12 to 20 studies and would provide these to the LCRWG. Because lead levels are expected to be higher from LSL samples, the LCRWG member questioned whether CCT techniques would be adequate to bring lead levels at or below the AL for systems with LSLs if EPA revises the rule to require LSL samples to be used in the 90th percentile calculation in lieu of first-draw tap samples.
- One member stated that the LCR is trying to accomplish two goals with one sampling protocol. The rule is designed to be TT rule to optimize CCT based on first-flush samples at sites where high levels of lead and copper are expected. However, the same sampling protocol is being used to address risk but is inadequate to make that assessment. He suggested that the LCRWG more fully discuss this point at future meetings to ensure that they have the same understanding of the goals of the LCR.

F. Public Comments

Yanna Lambrinidou, Parents for Non-Toxic Alternatives and Paul Schwartz, Water Alliance, provided the Group with a white paper and co-presented PowerPoint slides documenting their concerns with EPA's process for revising the LCR. Specific points presented by Dr. Lambrinidou included:

- Consumers are not only instruments towards compliance but also resources for information. Consumers' lead research has influenced the list of potential revisions.
- Concern about the knowledge and commitment of the LCRWG and lack of public participation.
- Request that NDWAC recommendations are science- and fact-based and take into account that the LCR is a public health rule and not a CCT rule.
- LCR is a shared responsibility rule that makes consumers partially responsible for rule implementation (e.g., water sampling, PE understanding and private side LSLR).
- From its inception, LCR has been shaped by utility concerns about cost and liability. As a result, most consumers do not know that they are partially responsible for lead in water.
- Since full LSLR is not required, replacement by homeowner is only a choice but financially infeasible.
- Systems and State/Federal Agencies have a culture of secrecy surrounding public data, which makes obtaining these data time-consuming.

- Studies in Chicago and DC show that lead can still be present and cause harm even if systems are optimized because systems routinely miss worst- case scenarios for the following reasons:
    - The current sampling protocol allows up to 50% of samples to have no LSLs
    - First draw sampling misses water from the LSLs
    - Some systems instruct residents to flush prior to sampling.
    - The 90th percentile essentially allows systems to discard the worst 10%.

Mr. Schwartz made the following points:

- Stressed that lead places the public at risk. Studies in DC show that lead in water places fetuses and young children at risk.
- DC was not an aberrant case. Levels of lead in DC water are not much difference from samples in Chicago and one anonymous city for which he has studies.
- Where is the public?
    - The public has played a leading role in identifying needed changes to the LCR that include sample selection, sample protocol and LSLR.
    - Without effort by concerned citizens, the revisions being considered would be much narrower in scope and depth and less likely to guide us to revised rule that is protective of public health.
    - Due to the public's work, there is mounting evidence that lead and water is more prevalent than often assumed and is a significantly greater contributor to children's total blood lead levels that usually acknowledged.
    - The public should be represented on the LCRWG.
- Request to the LCRWG to:
    - Have true public representation on the LCRWG.
    - Confirm the accuracy of information provided by EPA experts like Mike Schock and Miguel Del Toral. They have expertise, transparency, responsiveness and trust.
    - Remember this is a public health rule.

Mr. Burneson thanked Dr. Lambrinidou and Mr. Schwartz for their presentation. He noted that EPA is interested in trying to achieve diverse perspectives including consumer group input and will be meeting with Dr. Lambrinidou and Mr. Schwartz to talk about their request for grassroots representation on the LCRWG. One member agreed with the need for additional grassroots representation and asked EPA to consider adding the two to the LCRWG. He asked if Dr. Lambrinidou and Mr. Schwartz could provide

input during the meeting. Ms. Bingham clarified that although she cannot ask them to provide input beyond the public comment session, LCRWG members can invite people from other organizations to make comments at any time during the meetings.

G. LCR and OCCT Background and Perspective

Brian D'Amico (EPA OGWDW) presented background on the existing LCR requirements with emphasis on CCT requirements and highlighted the regulatory revisions being considered by EPA as follows:

- Require a previously optimized system to re-optimize if they exceed the lead AL before requiring LSLR. Re-optimization may include:
    - Mandatory system-wide CCT study for systems with LSLs that evaluates the variability of water throughout the distribution system.
    - Targeting key parameters that are known to affect or limit the effectiveness of CCT (e.g., pH and alkalinity).
    - Required study of orthophosphate for systems using only pH and alkalinity adjustment. For those using already using orthophosphate, require study of higher orthophosphate dosages.
    - Required analysis of calcium carbonate precipitation as a possible limitation but not as a possible option for OCCT.
    - State discretion for more time prior to setting OWQPs.
    - Regular monitoring during the re-optimization process to provide additional information.
    - Allowing NTNCWSs serving 10,000 or fewer people to use POUs in lieu of CCT.
- Require systems to evaluate a more holistic approach to CCT as part of system-wide assessment, including identification of physical and chemical constraints associated with a particular option.
- Remove calcium carbonate precipitation as a necessary CCT option for the following reasons:
    - Difficult to precipitate uniform scale.
    - Excessive buildup can impact carrying capacity of the system.
- Require more stringent OWQPs:
    - Existing OWQPs may be set too wide to truly be an optimal range for CCT.
    - More rigorous study and more extensive monitoring may result in tighter OWQP ranges.

Mr. D'Amico ended his presentation with six OCCT discussion questions for the LCRWG to consider. These questions and related discussion are provided in Section K of these notes.

The LCRWG asked clarifying questions and discussed the information presented. During the discussion, the following points were made:

- The current LCR requires systems to conduct a study that is used to identify the most effective CCT. Some study components are specified in the rule. EPA has developed implementation guidance for systems and States that provides additional information. EPA is considering more explicit requirements to make the study more robust and revising the time frame for completing steps.
- The current rule requires systems and States to look at constraints first, then work the corrosion control processes into the constraints. Instead, Mr. Jeff Kempic (EPA OGWDW) noted that EPA is considering requiring systems to use a more holistic approach to assessing OCCT by looking at treatment changes that could also reduce disinfection by-products (DBPs), for example and do a better job at both.
- Some systems with LSLs and CCT may reliably be under the AL but have a lead ALE that triggers them into LSLR. One area EPA is considering is whether systems should have an opportunity to re-optimize CCT before replacing LSLs.
- The LCRWG requested data on how many water systems are required to do LSLR because their CCT is not effective. These data might help answer their question, are there many systems for which CCT doesn't work? Mr. Burneson indicated that EPA has looked at ALEs, but that it might be more informative to look at individual systems with multiple ALEs to answer this question.

H. The New Science of OCCT

Dr. Schock (EPA Office of Research and Development) provided an in-depth presentation on the current knowledge of OCCT for lead and copper. Some points from his presentation are provided below.

- Main Points: A New View of OCCT.
    - OCCT includes both pure corrosion and control of metal release (what causes unhealthy exposures). It is really metal release that we care about.
    - OCCT is much more than adjusting pH or adding phosphate. System-wide optimization is needed, which requires addressing all direct and indirect factors causing metal release from the plant through the distribution system.
    - The nature of pipe scales reflecting past treatment history dictates the direction and level of success of OCCT approaches.
    - Metal solubility is a guide to OCCT conditions, but it is only part of the story.
    - Pipe scales take years to decades to transform, but progress can be undone in hours to days by treatment fluctuations or mistakes.
    - Lead pipes will remain a major health threat as long as they remain.

- Dissolved Inorganic Carbon (DIC) is very important. It is the sum of all carbonate species in water and is not dependent on pH.
- Corrosion and metal removal/deposition starts with oxidation.
  - Many treatment processes create oxidation.
  - Oxidation changes the valence state of the metal, making it more or less soluble.
  - Oxidation can speed up the rate at which metal concentration moves toward equilibrium.
  - Higher oxidation means shorter stagnation time to get to uniformity.
- Types of corrosion of concern:
  - Uniform corrosion, which is usually the focus of treatment.
  - Non-uniform corrosion, such as pinhole leaks.
  - Galvanic corrosion can occur during the coupling of different materials in context of partial or full LSLR. It can be prevented by proper joint construction, but scale disturbance cannot be prevented.
- Systems make many changes that can directly affect lead/copper and/or metals release, such as alum carry-over, softening and granular activated carbon (GAC) for DBP removal.
- Factors governing lead levels in samples include:
  - Sampling protocol.
  - Intrinsic lead solubility of lead surface material.
  - Rate of dissolution.
  - Length of contact with lead source.
  - Nature of lead release (dissolved or particulate).
- No corrosion indices or surrogate pipe rigs can take the place of directly monitoring lead release.
- pH-DIC-Alkalinity adjustment for control of Pb(II):
  - True minimization of lead solubility occurs at pH >9.
  - Only works in “soft” waters. Sufficient DIC is necessary to form protective scale, but too much re-solubilizes lead.
  - Formation of Pb(II) carbonate or hydroxycarbonate is much faster than the formation of Pb(II) orthophosphate films.
- Orthophosphate for control of Pb(II):
  - Needs clean carbonate or hydroxycarbonate scale surface to be effective.
  - More effective at low DIC and pH is less critical at low DIC. There is a point of diminishing returns for high DIC water.

- Treatment effectiveness is proportional to dosage. Dosage needed for best results is also based on carbonate and alkalinity in the water.

- Blended phosphates: Creates a barrier film which contains many other compounds. Can lower lead levels but not by the same mechanism as orthophosphate, which forms crystals.
- PbO_2 formation:
  - Only a few systems have pure PbO_2 scale. It is associated with low oxidant demand, clean water, consistently high disinfectant level and either chlorine or possibly chlorine dioxide.
  - It can be inhibited if there is a high phosphate concentration.
  - So far, there is no evidence that PbO_2 forms on brass.
  - Data from two studies, Newport RI and Cincinnati OH, demonstrated effectiveness in the field. Can result in very low lead levels, in the single part per billion (ppb) levels for LSLs. Some higher lead levels for brass components.
- Factors governing copper levels in water:
  - Age of copper plumbing at the site.
  - Intrinsic copper solubility of surface material.
    - Opposite of lead and iron; the more oxidized form is more soluble.
    - Dramatic effects of DIC/alkalinity and pH.
  - Rate of oxidation and dissolution is different, takes a lot longer.
  - Copper release tends to be more soluble.
  - No copper corrosion in anoxic waters.
- Copper solubility and pH adjustment:
  - Dramatic effects of bicarbonate on new copper plumbing.
    - If pH > 7.5 no problems if DIC <35.
    - If DIC < 5 no problem if pH > 7
    - If DIC > 35-40, scaling and buffering prevents sufficient pH adjustments to solve the problem.
  - Example of aging in high alkalinity ground water. Over the years, copper is reduced.
- Effect of pH and orthophosphate at DIC of 14 mg/L:
  - Poorly crystalline Cu(II) orthophosphate solid forms at low pH.
  - Improves short-term copper solubility if pH is approximately >8.
  - Amount of orthophosphate needed to control copper increases with higher DIC or alkalinity.

- No evidence in the field that blended phosphates or polyphosphates are as or more effective at copper reduction.
- Phosphates slow or stop the aging process at all pH levels.

- EPA pipe scale research post-1989:
  - Lead pipe scales are 0.1 – 0.8 mm thick. Only some scales are simple.
  - Chemical reactions take place in the depths and on the surface depending on physical structure of the scale and treatment history going back decades.
  - Effects of corrosion control can take years to decades.
  - A large number of non-lead components exist in scale including iron, manganese (can be > 10%), aluminum and calcium.
    - Interfere with OCCT approaches.
    - Cause lead deposits in customer's plumbing.
    - Result in broad variety of coatings on LSLs.
  - One system used unidirectional flushing to clean their system and removed scales, which alone reduced lead to below the AL.
- Summary points on OCCT:
  - CCT is intertwined with all treatments affecting distribution system water chemistry.
  - A large list of water quality factors affects OCCT.
  - Water chemistry and scale formation is complex and varies among and within a system. Information from other systems may help, but each should conduct a system-specific study.
  - New studies must be performed well in advance of future treatment or operational changes that could impact lead or copper release.
- To assure the control of lead, how many WQPs need to be included, how precisely must they be defined and how frequently do they need to be monitored.

After the presentation, the LCRWG asked clarifying questions and discussed the information presented. During the discussion, the following points were made:

- What we know about the science of OCCT compared to 10 or 15 years ago is substantially different for copper and somewhat different for lead. In particular, we now know that Pb(IV) is the least soluble form of lead and minimizes the release of lead into drinking water. In addition, the science has shown that manganese and iron interfere with scale formation and post-deposit mechanisms are very important factors in controlling the lead at the customer's tap.
- The most important factors governing lead levels at the customer's tap are the characteristics/components of LSL scales and lead accumulation in pipe scales within homes with LSLs. Dr. Schock explained that the best way to understand changes in scales over time and

whether they are unstable is to examine exhumed LSLs. Some information can be obtained by observing color and the physical nature of the scale (e.g., manganese appears as a gelatinous compound), but true scale analysis requires X-ray diffraction. Currently, very few labs can do X-ray diffraction of pipe scales, although the number would increase with greater demand. Profile monitoring, which involves collecting a series of sequential samples to represent various sections of the plumbing (e.g., LSL and premise plumbing) has been underused in understanding the types of scale present. For example, a low lead level result from a LSL sample for a system with aggressive water would indicate the presence of Pb(IV) scale. Dr. Schock also noted that pipe scale composition is variable in a system due to local variations in water quality.

- There was an extensive discussion of particulate vs. dissolved lead. Dr. Schock explained that there are two sources of particulate lead: post-deposit materials that shear off and part of the lead scale itself (e.g., that can be released during PSLR). Analysis of particulate lead is not a rule requirement but water systems can filter samples to figure out the particulate portion. Particulate lead that mobilizes to the consumer's tap is primarily bound to other metals. Whether the form impacts exposure has not been well studied in drinking water.
- The LCRWG and EPA discussed the effects of velocity on lead release. On one hand, high velocities can sheer off material. Dr. Schock noted that studies have observed lead in water at high water velocities, but then it is not present in subsequent samples. One LCRWG member noted that in situations with lead gooseneck, sloughing of lead at high velocities through those angles can occur irrespective of corrosion control. On the other hand, Dr. Schock noted that phosphate will not be well distributed with low water use, which results in improper scale formation.
- One LCRWG member asked if a flushing program or pipe cleaning and lining could be effective for corrosion control. Dr. Schock explained that the United Kingdom uses phosphate and unidirectional flushing and main cleaning to further improve disinfection and to lower red water (i.e., remove iron and manganese). Because of these steps, orthophosphate may work better because it is more available to react with lead.

Based on this discussion, the LCRWG offered the following:

- Consider lead monitoring and analysis to distinguish between particulate and soluble lead.
- Consider requiring exhumed LSLs to be examined to better understand the reason for lead ALEs.
- Consider a flushing program as a treatment option.

I. Utility Implementation Perspective

Mr. Dave Cornwell, EE&T, presented a utility' perspective on OCCT, which included historical and current iron corrosion control practices, considerations when selecting CCT, constraints that impact OCCT, case studies and controlling water quality parameters (WQPs). Some points from his presentation are provided below:

- Utilities embrace and support OCCT as the central treatment technique in LCR.

- Historical Corrosion Management:
  - Iron and copper corrosion have been a problem for long time.
  - Treatment that is effective for lead (orthophosphate) is not effective for iron (polyphosphate/high pH is effective) and vice versa.
  - Raising the pH to control copper corrosion works well in high DIC waters.
- There is no test to define optimized corrosion control.
- Historical data on 90th percentile lead levels for 1992-1993 vs. 2000-2004 for systems serving > 50K indicate that fewer systems exceed the lead AL in 2000-2004.
- Massachusetts Water Resources Authority (MWRA) data indicate that the percentage of low lead concentration samples has increased over time, which indicates:
  - Lead reduction takes years of monitoring and adjusting.
  - Forming scales takes years, which is why we cannot do a test in the lab.
- Lead corrosion control strategies:
  - Survey of 130 American Water Works Association (AWWA) member responses: 40% use alkalinity and pH adjustment and 37% use a phosphate inhibitor (zinc orthophosphate, orthophosphate or polyphosphates).
  - AWWA survey in 10 States shows regionalization in CCT selection (e.g., 90% of systems in New England States use pH adjustment; 70% of systems in Pennsylvania use phosphates).
- Utility considerations
  - Feasibility: alkalinity adjustments may require very large doses.
  - Impacts of phosphorus discharges (AWWA is developing a paper with impacts, will be available shortly).
  - The price of phosphates has spiked, demand has increased and there may be a shortage in the future.
  - Balance water quality goals, such as reliable disinfectant residual, DBP control and biofilm control.
  - Impact on other operations such as formation of precipitates, inadvertent release of sequestered metals and undesirable corrosion of non-target materials.
- Balancing multiple regulations.
  - Optimizing for one regulation will sometimes conflict with optimizing for another.
  - For example, for lead corrosion control the optimal pH range for orthophosphate is lower than the optimal range for chloramination that will avoid the formation of dichloramines.

- Lessons Learned:
    - Achieving optimized corrosion control is complicated by many factors and site-specific conditions.
    - Changes in corrosion control takes years to equilibrate in the distribution system.
    - Models/diagrams can provide general guidance but are not sufficient basis to set OCCT.
    - Pipe loop studies are expensive, limited in scope and cannot indicate how low the lead will go.
    - Microbiological conditions are seldom considered by either desktop or pilot studies.
- A comparison of WQPs measured in home vs. the distributed water show large differences, indicating that interactions in premise plumbing have a large impact on water quality.
- Lessons Learned/Conclusions
    - Achieving optimized corrosion control is complicated by many factors beyond lead and copper solubility and by site-specific conditions.
    - Changes in corrosion control takes years to equilibrate in the distribution system and once OCCT is established, care should be exercised in making changes.
    - Models/diagrams can provide general guidance but are not sufficient basis to set OCCT.
    - Pipe loop studies are expensive, limited in scope and cannot indicate what lead level can be achieved with CCT.
    - Microbiological conditions are seldom considered by either desktop or pilot studies.
    - OWQPs ranges are often set widely so that the systems do not incur a TT violation. A "control chart" approach that groups data into statistical groups WQP control charts might be more effective.
    - Action after exceeding an AL should begin with evaluating actual practice against the OCCT strategy rather than re-evaluating OCCT strategy.

After the presentation, the group discussed whether the sampling method (e.g., the collection of a sample from a LSL in lieu of a first-flush sample or recommending a 10 minute pre-flush prior to stagnation) would affect a system's approach to CCT. Mr. Cornwell replied that in many cases samples from a LSL would result in higher lead levels and that lead and copper sampling results are imperfect and fluctuate; however, changes in sample method would not impact how we think about OCCT.

J. State Implementation Perspective

Ms. Stacy Jones, Indiana Department of Environmental Management, presented the State's perspective on OCCT. She explained the requirements for optimizing CCT in the current rule, noting that the current rule provides three definitions for optimization. She also discussed the required timeframe for completing CCT steps, which varies for different size systems.

Additional points Ms. Jones raised during her presentation included the following:

- Indiana does not have the resources to set OWQPs for small and medium systems.
- The LCR is the only rule where systems stop monitoring when there is an ALE (i.e., monitoring is not required when a system is going through the mandatory CCT evaluation steps). Thus, a system can go 5 years without monitoring.
- The frequency with which systems miss their deadlines for the various CCT steps varies by size and complexity of the system and can also be due to a State's missing its deadline.
- How OWQPs are selected and set:
    - Varies by State but most either set ranges and minimum levels for at least pH and phosphate
    - In most cases, ranges are set based on what a system can/could meet during sampling in which they were below the AL.
- Tracking OWQP data is very difficult.
- How Purdue and Notre Dame addressed their lead ALEs. Although these systems are community water systems (CWSs), they are more similar to NTNCWSs.
    - Purdue had a lead ALE of about 35 ppb during July-Dec 1992:
        - They chose an orthophosphate blend, which was successful but when they lowered it to a maintenance dose, they re-exceeded during triennial monitoring in 2006.
        - They no longer exceed after increasing their dosage.
    - Notre Dame had a lead ALE of 16 ppb during Jan – June 1993:
        - All locations that tested high for lead were from newly installed fixtures.
        - The treatment recommendation was to replace all new fixtures, but if this was unsuccessful, install orthophosphate within the timeframe specified by the rule.
        - Fixture replacement was successful and they have remained under the AL since.

- Conclusions/Recommendations:
    - The LCR is very complex and CCT requirements are difficult to understand and implement.
    - For a lot of systems that are similar to or are NTNCWSs, faucet replacement may be an easier option than treatment.
    - Consider defining "optimized" using an enforceable target for large systems.
    - Have systems that don't meet the optimization definition to conduct additional analysis to determine a holistic compliance recommendation that considers all rules and allow them time for implementation. Some options could include:
        - Targeted service line replacement.
        - Increased phosphate feed rates.

After the presentation, the LCRWG asked clarifying questions and discussed the information presented. In the discussion, the following points were made:

- Ms. Jones explained that her State currently has no good way to manage and use WQP data. The Safe Drinking Water Information System – State version (SDWIS/State) cannot accommodate the information, the forms submitted by the system provide limited data and managing and reviewing the large amounts of individual sample results from the system is prohibitive.
- LCR revisions need to be implementable by the systems and appropriately overseen by the State to have a positive impact on public health. States have limited resources. Ms. Jones thought that about half the States may have one or two full-time people devoted to the LCR; other States do not have a full-time person overseeing the LCR. Most systems are medium and small systems that do not have the resources to do all of the CCT steps. They often hire an engineer or get help from the State. In addition, not all States have personnel who are comfortable giving treatment recommendations.
- More flexibility in the CCT timeline would allow more sampling to be conducted.
- A single high sample for a system that collects five samples can result in an ALE, which triggers CCT and additional requirements. In some instances, the exceedance is due to improper sampling (e.g., from an unoccupied building). The current rule does not establish a maximum stagnation time; thus, these samples cannot be invalidated but must be used in the 90th percentile calculation.
- Systems serving 50,000 or fewer can elect to continue monitoring after an ALE and can discontinue CCT steps if they have no ALEs during two consecutive monitoring periods. The system is also required to submit a recommendation within 6 months of the ALE. Thus, if the ALE was not based on a true problem in the system, the system may have wasted time and resources and the State may end up with a recommendation that they will never use.

Based on this discussion, the LCRWG offered the following:

- Allow for more flexibility in the timing of CCT steps.

K. Additional LCRWG Input on Discussion Topics

EPA displayed the list of OCCT discussion questions from Brian D'Amico's earlier presentation (see Section G. of these notes):

- How can LCR requirements be structured to encourage optimal corrosion control treatment and retain enforceability?
- How can existing monitoring requirements (lead/copper tap monitoring plus water quality parameter monitoring) be strengthened while retaining implementability?
- What is the most effective way for reducing lead exposure?
- What are the challenges to optimizing corrosion control treatment?
- What are some of the lessons learned from implementing corrosion control treatment?
- What specific alternatives to the use of orthophosphate as a corrosion inhibitor exist in the market place and what are the health, economic and implementation considerations of their use?

Ms. Bingham asked the LCRWG to provide input to EPA. Major discussion points are summarized below.

Overarching Comments

- It is important to make best use of research and to form academic partnerships to fill data gaps that need to be addressed in order to determine the best long-term solutions. One member requested a list of on-going research. Another suggested identifying and focusing on the areas with the biggest potential risk reduction for the rule revision effort.
- It is important to understand where we are on the risk curve. The data presented during the meeting shows that the existing LCR has come a long way in reducing lead and copper in drinking water. We may be as low as we can go without spending a large effort with respect to controlling dissolved lead, but we may be higher on the risk curve for particulate lead. Also, the residual risk for LSL systems may be high. If the Group could identify the highest residual risk they could better focus their time.
- The Group needs to understand the problems with the current requirements across the various system size categories.
- There are several reasons why a system may have an ALE after having effective CCT (and thus would need to re-optimize), including: Budget issues (stopped maintaining CCT or buying the needed chemicals); CCT equipment failure; treatment adjustment had unforeseen consequences.

- Optimization is a challenge. The regulatory definitions for optimization are clear for large systems but are different for medium and small systems and are less clear. One member believes that systems are encouraged by the public to optimize CCT. However, systems are very wary of making a "tweak" to the treatment that could inadvertently increase lead or copper levels and cause an ALE.
- The 90th percentile level ignores the highest 10% and maybe optimization should be tied to a higher percentile (e.g., the 98 percentile).
- Each time the Group considers a revision, we need to consider if it is implementable.

Suggestions Related to CCT

- New information on CCT needs to be incorporated into the revised rule.
- Consider different treatment approaches for NTNCWSs (e.g., removing the source of lead).
- There is a particulate lead component to OCCT that is not well handled. Consider adding system flushing as a treatment technology to address the particulate lead issue.
- Consider iron and manganese removal as corrosion control strategies. Dr. Schock noted that reducing iron, manganese and aluminum reduces lead scavengers.
- Treatment solutions are system specific, but States don't have the resources and may not have the in-house expertise. Consider ways to help States and systems make appropriate decisions that could include:
  - A "cookbook" approach, particularly for small systems.
  - Developing a "toolbox" options (as is done for other rules) that would allow States to more easily identify appropriate CCT solutions.
  - Preparing a guidance document that includes new science on OCCT and flowcharts (including iron and manganese control) to help States and systems select appropriate CCT as well as make re-optimization decisions, when needed.
  - Developing a "brain trust" of CCT experts that would serve as resources for systems.
  - Developing a list of factors that would indicate when a system needs to examine (i.e., perform x-ray diffraction) pipe scales. Although this should not be a hard and fast rule.

Questions and Suggestions on Allowing Systems to Re-Optimize Prior to LSLR

- One member asked if the public would view re-optimization as giving systems "an off-ramp" instead of addressing the need to remove LSLs.
- Another member questioned whether public health is better protected by starting LSLR earlier instead of waiting approximately 6 years until after re-optimization is completed (especially if the system continues to have an ALE after re-optimization). Although the re-optimization step may be useful, members voiced some uncertainty regarding this step and degree that it will provide information that leads to significant improvement (i.e., there is no clear number or benchmark on corrosion control). The group discussed the possibility of proceeding with re-optimization and LSLR simultaneously.

- One member requested clarification regarding re-optimization requirements that would be tailored to systems with and without LSLs. Mr. Kempic and Mr. Miguel Del Toral (EPA Region 5) explained that for LSL systems, a revised sampling protocol that would use LSL samples in lieu of tap samples is expected to result in more ALEs and higher 90th percentile levels and trigger more systems into LSLR and/or re-optimization. There may be limitations to treatment (e.g., cannot raise pH due to a simultaneous compliance issue), which will require systems to use a more holistic approach and look at the entire treatment train.
- One member suggested including a requirement in the rule for systems to re-optimize CCT on a regular basis (every 5 to 10 years) and to supplement this requirement with new guidance on an ongoing basis.
- One LCRWG member asked how many systems will be required to re-optimize.

Questions and Suggestions on Requiring Systems to Evaluate Orthophosphate as Part of Re-optimization

- Members noted the need to consider with orthophosphate, the issues of availability and cost and impact on wastewater treatment.
- The assessment for systems that do not use orthophosphate will be more difficult than for those that would be evaluating higher dosages. The former may be able to use pipe loop studies to assess its effectiveness as opposed to testing this in an active part of the system but need to be careful that changes in treatment would not disrupt scales. The latter could possibly conduct a partial system test, as was done in Washington, DC to test higher phosphate levels.
- Dr. Schock noted that there is a research gap on using high pH along with orthophosphate treatment. The United Kingdom and EPA have done preliminary research, which show slightly lower lead release at pH > 8.5 when phosphate is present. However, major changes in treatment can cause major scale changes that could take some time to come back to equilibrium. Therefore the system would need to use some method such as pipe loops before making changes.

Questions and Suggestions Related to Optimal Water Quality Parameters

The LCRWG discussed problems with the use and storage of OWQP data. Hindrances with the use of these data included: SDWIS/State does not allow the individual WQP data to be stored and analyzed; the forms provided by the system are not useful and are limited to how many samples are collected and if the system has any excursions; and the States do not have the resources to review all individual sample results. In addition, States often set large operating ranges, which does not promote OCCT.

The LCRWG offered the following regarding OWQPs:

- Have some enforceable WQPs that apply 100% of time and some that would be more flexible, similar to the turbidity requirements. This would encourage States to set tighter OWQP ranges without risking non-compliance.

- Provide a way for States to store and graph data so it can be used for a compliance and process control tool.
- Consider requiring better data collection for systems; a subset may be used for States for oversight and for EPA. Consider how it should be displayed.
- Have EPA provide guidance to small systems on how they can collect and use WQP data.

Feedback Related to Point-of Use (POU) Devices for NTNCWSs

Ms. Christ indicated that EPA is considering whether a POU would be a better option for lead control than treatment in schools and other NTNCWSs. Mr. Burneson noted that SDWA allows for the use of POU devices for the treatment of a maximum contaminant level (MCL) rule and that the system is responsible for maintenance.

The LCRWG provided the following points:

- For schools and other NTNCWSs, consider plumbing replacement as opposed to treatment. However for schools, POU may not work because they may have too many outlets.
- Ideally replacing lead sources is preferable in schools instead of using a "band-aid approach" that relies on a POU device or bottled water.
- Some POU devices in Seattle schools were plumbed with brass elbows, which provided a source of lead.

A public participant noted that about 8 years of research indicate that bacteria that grow in filters after disinfection is not of a health concern but that systems should still conduct ongoing maintenance. He added that about 15 States have approved the use of POU for other contaminants.

L. Closing Remarks, Next Steps and Action Items

Ms. Bingham asked the LCRWG to provide some closing remarks. The Group stated the following:

- The importance of simplifying the rule.
- The need for flexibility because systems have unique requirements.
- Revisit the CCT deadlines and steps so States can more easily work with systems.
- Consider simultaneous compliance issues.
- Clarify what is meant by optimization in the rule.
- Balance allowing systems to re-optimize treatment against the benefits of requiring systems to remove the source of lead, particularly LSLR.
- Provide a toolbox to help the systems with CCT and re-optimization.
- Consider how customers can be part of the solution and not a barrier.

- Think about how to best take advantage of new science for OCCT.
- PE should include particulate lead. Also engage not only customers but other agencies to help with PE efforts specific to LSLs.

Mr. Burneson noted the progress that had been made at the first meeting and expressed his appreciation for the expertise provided during the meeting.

Dr. Grevatt thanked the LCRWG members, meeting participants, those that provided public comment and the facilitator. Dr. Grevatt was impressed with the discussion and tenor of the meeting and hopes that people have an understanding of the rule's complexity and why EPA has reached out to the workgroup. He emphasized the importance of having the LCRWG understand what are new issues and new perspectives and what requires more detail. He added that some of the topics have been considered carefully previously.

The next two meeting dates are May 29-30 and September 18-19 and also will be held in the Cadmus corporate office in Arlington, VA.

The following table contains action items from the meeting:

Action Items from the NDWAC LCR Working Group Meeting
March 25-26, 2014

Row	Action Item	Responsibility[1]
1	Identify additional NDWAC LCRWG members.	EPA/RESOLVE
2	Create e-mail distribution list based on meeting attendees and distribute copies of the slides	RESOLVE
3	Send meeting calendar request to LCRWG.	RESOLVE
4	Determine if webcasts can be recorded.	EPA
5	Send "doodle" to LCRWG members regarding availability for upcoming webinars (week of May 12)[2]	RESOLVE
6	Distribute meeting summary	CADMUS/EPA/RESOLVE
7	Include time in future meeting agendas to address follow-up questions or outstanding issues from the previous meetings.	EPA/RESOLVE
8	Determine whether definition of backsliding on public health is specific to one rule or can apply across multiple rules.	EPA
9	Revise the mission statement in the Charge and Operational Protocols Document to: 1. Make it consistent with the goal stated in the white paper 2. Eliminate language the LCRWG can form a committee (after consulting the FACA lawyer and Roy Simon).	EPA/RESOLVE
10	If available, provide additional, existing background materials to LCRWG: 1. SBREFA recommendations to EPA. 2. Background information that informed the white paper. 3. Public education fact sheet based on the Short-Term Revisions and other lead public education materials. 4. Copper health effects information. 5. Studies that evaluate CCT effectiveness in managing lead release from LSLs. 6. CDC study on blood lead levels. 7. Lead level trends for some MA systems	EPA (1-4 & 6); EPA - Mike Schock (5); Steve Estes-Smargiassi (7)

Row	Action Item	Responsibility[1]
11	Assess availability of other requested information/conduct analysis as needed. 1. National statistics on lead and copper ALEs to answer if there are systems for which CCT is not working? It will be important to distinguish systems that have exceeded the action level for lead versus exceeding the action level for copper. Of those systems that have exceeded action levels, how many have implemented other optimization requirements (or made adjustments in OCCT as required by primacy agencies?) 2. Source contribution of lead in homes and distribution systems and how they have changed over time. 3. Cost of lead and copper testing and lab availability and how they may vary geographically. 4. Description of LSLR process including steps, timing and costs of partial and full LSLR. 5. Information from IEUBK model on impact of blood lead level on infants consuming lead at 15 µg/L. 6. List of real-world simultaneous compliance issues that occur most often. 7. Presentation on other treatment technique regulations to see if any successes can be applied to LCR. 8. Prospective studies that associate LSL and CCT with human body burden. 9. Flow diagram of sampling protocol that identifies where problems can occur. 10. List of stakeholders that are involved with lead and copper control (e.g., plumbing equipment manufacturers, building industry, public health agencies, water systems, regulatory agencies). 11. Primer on the history of the rule to the present. 12. List of on-going research projects. 13. How many systems have been required to begin a lead service line replacement program. 14. How many large, medium and small systems are estimated to be required to re-optimize (i.e., how many will exceed the lead/copper action level) under new rule?	EPA (All); Input from plumbing manufacturers (2); Input from Regions/States (6)

Acronyms: µg/L = micrograms per liter; AL = action level; ALE = action level exceedance; CCT = corrosion control treatment; FACA = Federal Advisory Committee Act; IEUBK model = Integrated Exposure Uptake Biokinetic model; LCR = Lead and Copper Rule; LCRWG = LCR Working Group; LSL = lead service line; LSLR = lead service line replacement; NDWAC = National Drinking Water Advisory Council; PLSR = partial lead service line replacement; SBREFA = Small Business Regulatory Enforcement Fairness Act.

Notes:

[1] Unless otherwise stated, EPA refers to the Standards and Risk Management Division (SRMD).

[2] Webinar will also include LSLR procedure.

List of Attachments

- Attachment A – List of Lead and Copper Rule Working Group Members and Meeting Presenters
- Attachment B – Meeting Agenda
- Attachment C – List of Attendees
- Attachment D – Lead and Copper Rule Long-term Revisions White Paper (9-30-13)
- Attachment E – National Drinking Water Advisory Council Lead and Copper Working Group - Operational Protocols (5-12-14)
- Attachment F – Draft Lead and Copper Rule NDWAC Working Group Process Planning Timeline (5-5-14)

ATTACHMENT A

First NDWAC Lead and Copper Working Group Meeting
List of Lead and Copper Rule Working Group Members and Meeting Presenters

March 25-26, 2014

NDWAC LCR Working Group[1]
Christina Baker: Deputy Public Counsel, Office of the Public Counsel, State of Missouri
Gary Burlingame: Laboratory Director, Philadelphia Water Department
Marilyn Christian: Manager, Environmental Health Programs, Harris County Public Health
Matthew Corson: Manager, Environmental Compliance, American Water
Derrick Dennis: Water Quality Unit Supervision, Office of Drinking Water, State of Washington
Stephen Estes-Smargiassi: Director of Planning, Massachusetts Water Resources Authority
Thomas G. Neltner: Senior Attorney, Natural Resources Defense Council
John Sasur Jr.: Three Rivers Fire District (MA)
Robert C. Steidel: Director Department of Public Utilities, City of Richmond Virginia[2]
June Swallow: Chief, Division of Water Quality, Rhode Island Department of Health
Lynn Thorp: National Campaigns Director, Clean Water Action
Chris Wiant: President, Caring for Colorado
Nse Obot Witherspoon: Executive Director, Children's Environmental Health Network
EPA Office of Ground Water and Drinking Water
Peter Grevatt: Director, Office of Ground Water and Drinking Water
Eric Burneson: Acting Division Director, Standards and Risk Management Division
Lisa Christ: Acting Branch Chief, Targeting and Analysis Branch
Brian D'Amico
EPA Office of Research and Development: Mike Schock
Non-EPA Presenters
Darrell Osterhoudt: Regulatory Affairs Manager, Association of State Drinking Water Administrators (ASDWA)
David Cornwell: EE&T, Inc.
Stacy Jones: Regulatory Implementation Specialist, Indiana Department of Environmental Management
Public Commenters
Yanna Lambrinidou: Parents for Non-toxic Alternatives
Paul Schwartz: Water Alliance
Meeting Facilitator: Gail Bingham, RESOLVE

[1] Leon Bethunel, Director, Director of Office of Environmental Health, Boston Public Health Commission and Hilliard Hampton III, Mayor of Inkster (MI) could not attend.

[2] Was unable to attend the second day of the meeting.

ATTACHMENT B

U.S. Environmental Protection Agency

NDWAC LEAD AND COPPER WORKING GROUP

The Cadmus Group, Inc.
1555 Wilson Blvd., Suite 300 | Arlington, VA 22209
703.247.6161

March 25-26, 2014

Agenda

Meeting Objectives/Desired Outcomes:

- **Review the current Lead and Copper Rule (LCR) and background for the long-term revisions;**
- **Discuss working group mission, operating procedures and proposed timeline;**
- **Discuss suggestions for additional LCR topics for the consultation process;**
- **Learn about optimal corrosion control treatment provisions in the LCR, understand and share perspectives on the issues and provide initial input on questions; and**
- **Plan next steps.**

Tuesday March 25th, 2014

8:45-9:00 Informal gathering

9:00-9:45 Welcome, Introductions, Meeting Objectives and Agenda, Materials and Logistics

Advance materials: Proposed agenda

Welcome: Peter Grevatt, Director, Office of Groundwater and Drinking Water
Introductions: Gail Bingham, *facilitator*

9:45-12:00 w/break Presentation and Discussion: Overview of the Lead and Copper Rule
Objectives: Review the current LCR and background for the long-term revisions.

Advance materials: LCR Quick Reference Guide

Overview Presentations [60 min]

- *LCR Overview (Eric Burneson, Director Standards and Risk Management Division)*
- *Implementation history and current practice (Darrell Osterhoudt, Association of State Drinking Water Administrators)*

Questions and Discussion [60 min]

12:00-1:30 LUNCH *[on your own]*

1:30-2:30 Discussion: NDWAC LCR Working Group
Objectives: Discuss working group mission, operating procedures and timeline.

Advance materials: Charge and Operating Procedures; Timeline

2:30-4:15 w/break Presentation and Discussion: Scope of Issues for LCR Work Group
Objectives: Review issues on which EPA has asked for input and members' suggestions.

Advance materials: LCR NDWAC Whitepaper

Overview Presentation [20-30 min]

- *Key Questions for Consideration (Eric Burneson, Director Standards and Risk Management Division)*

Questions and Discussion [75 min]

4:15-4:45 Public Comment

4:45-5:00 Wrap-up

5:00 ADJOURN FOR THE DAY

Wednesday March 26th, 2014

8:45-9:00 Informal gathering

9:00-9:15 Review Day Two Agenda
Objective: Reflections from Day One and confirm agenda for today.

9:15-12:00 *w/break* Presentations: Optimal Corrosion Control Treatment
Objectives: Learn about optimal corrosion control treatment (OCCT) provisions in the LCR; understand and share perspectives on the issues.

Advance materials: Optimal Corrosion Control Primer

Overview Presentations [80 min]

- *LCR and OCCT background and perspective (Brian D'Amico, USEPA Office of Ground Water and Drinking Water)*
- *Science/Research (Mike Schock, USEPA Office of Research and Development)*
- *Utility implementation perspective (Dave Cornwell, PhD. EE&T Inc.)*
- *State implementation perspective (Stacy Jones, State of Indiana)*

Clarification Questions [60 min]

12:00-1:15 LUNCH *[on your own]*

1:15-1:45 Public Comment

1:45-3:45 *w/break* Discussion: Optimal Corrosion Control Treatment
Objectives: Provide initial input on questions posed in the white paper. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- *How can LCR requirements be structured to encourage optimal corrosion control treatment and retain enforceability?*
- *How can existing monitoring requirements be strengthened while retaining implementability? What is the most effective way for reducing lead exposure?*
- *What are the challenges to optimizing corrosion control treatment?*
- *What are some of the lessons learned from implementing corrosion control treatment?*

3:45-4:00 Wrap up and Next Steps

4:00 ADJOURN MEETING

ATTACHMENT C

First NDWAC Lead and Copper Working Group Meeting
List of Attendees

March 25-26, 2014

First Name	Last Name	Affiliation
Becky	Allenbach*	Environmental Protection Agency
John	Arnett	Copper & Brass Fabricators Council
Aaron	Bell**	Environmental Protection Agency
Laura	Beven*	Inside EPA
Scott	Biernat	Association of Metropolitan Water Agencies
Dave	Carley	Cadmus
David	Carrillo*	Air Force
Rachel	Carson*	Environmental Protection Agency
David	Clark*	Rural Community Assistance Partnership
Leslie	Darman	Environmental Protection Agency
Joanne	Dea	Environmental Protection Agency
Miguel	Del Toral	Environmental Protection Agency
Carol	DeMarco King	Environmental Protection Agency
Laura	Dufresne	Cadmus
Jerry	Ellis	Environmental Protection Agency
Alex	Gorzalski**	Washington Aqueduct
Erik	Helm	Environmental Protection Agency
Christine	Hoover	PA Office of Consumer Advocate/National Association of State Utility Consumer Advocates
Anne	Jaffe Murray	Cadmus
Mike	Keagan**	National Rural Water Association
Jeff	Kempic	Environmental Protection Agency
Andy	Kireta Jr.	Copper Development Association
France	Lemieux	Health Canada
Frank	Letkiewicz	Cadmus
Dave	Lipsky	New York City Dept. of Environment
Lindsay	McCormick**	Environmental Protection Agency
Suril	Mehta*	Environmental Protection Agency
Amanda	Palleschi**	Inside EPA
Lisa	Ragain	Metropolitan Washington Council of Governments
Regu	Regunathan	Water Quality Association
George	Rizzo**	Environmental Protection Agency
Matt	Robinson	Environmental Protection Agency
Maureen	Schmelling**	DC Water
Michelle	Schultz	Environmental Protection Agency
Roy	Simon	Environmental Protection Agency

First Name	Last Name	Affiliation
Lameka	Smith	Environmental Protection Agency
Anne	Spiesman**	Washington Aqueduct
Francine	St. Denis	Environmental Protection Agency
Jim	Taft*	Association of State Drinking Water Administrators
Steve	Via	American Water Works Association
Pat	Ware*	Bloomberg, Bureau of National Affairs
Robert	Weed	Copper Development Association
Daniel	Wilson	North Carolina Rural Water Association

*Attended March 25, 2014 session only.

**Attended March 26, 2014 session only.