**AWOP Approaches for Corrosion Control Treatment**

**Discussion Participants:**

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* C.J. Bailey – Kentucky
* Val Bosscher – EPA Region 5
* Devin Bracey, New Jersey
* Kay Coffey – Oklahoma
* Ricardi Duvil – EPA Region 10
* Emma Inhorn – EPA Region 4, LCR Co-Lead
* Akshay Jain – Virginia, District Engineer
* Cynthia Klevens, New Hampshire
* Brett Newton – Alabama
* Brandon Onan – Michigan, LCR Unit Supervisor
* Sam Perry – USEPA Region 10
* Syed-Imteaz Rizvi, New Jersey
* Jessica Sibirsky – Massachusetts
* Kira Smith – USEPA OGWDW DWPD, LCR Compliance Co-Lead
* Leslie Smith – Oklahoma
* Matt Sylvester – Michigan, CCT Engineer
* Cathy Wunderlich – Wisconsin
* Cindy – New Hampshire, Small Systems and CCT Lead

**Discussion Notes:**

* **Lead and Copper Rule Revisions:** 
  + To address the elephant in the room, the focus of this discussion is not on the LCRR status or what will be required under the revised rule. AWOP has always encouraged public health protec­tion beyond regulatory minimums.
    - On 6/22/2021 and 6/16/2021, respectively, EPA extended the comment period for the virtual engagements to July 30, 2021 and the compliance date of the LCRR to October 16, 2024. See Federal Register notices [2021-13309](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.federalregister.gov%2Fd%2F2021-13309%3Futm_campaign%3Dpi%2Bsubscription%2Bmailing%2Blist%26utm_source%3Dfederalregister.gov%26utm_medium%3Demail&data=04%7C01%7Cbosscher.valerie%40epa.gov%7C3853b129281244e2f54008d935826c47%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637599656536222836%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=W2W2yubdcYPJFifP6cPTeDsE2uZfPC33NmgEak79bs8%3D&reserved=0) and [2021-12600](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.federalregister.gov%2Fdocuments%2F2021%2F06%2F16%2F2021-12600%2Fnational-primary-drinking-water-regulations-lead-and-copper-rule-revisions-delay-of-effective-and%3Futm_source%3Dfederalregister.gov%26utm_medium%3Demail%26utm_campaign%3Dsubscription%2Bmailing%2Blist&data=04%7C01%7Cbosscher.valerie%40epa.gov%7C3853b129281244e2f54008d935826c47%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637599656536232791%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=3Vk%2BC%2FPPaSwwEpOwzUugvVGuvKd0mh83TtkwhgAGRes%3D&reserved=0). Recordings of Public Listening Sessions (<https://www.youtube.com/channel/UC0VBG2o4x4XIfp8XilDA1wQ/live>) and Community Roundtables (<https://www.epa.gov/newsreleases/ten-communities-selected-epa-roundtable-discussions-lead-drinking-water>), as well as submitted written comments (<https://www.regulations.gov/docket/EPA-HQ-OW-2017-0300>) are also available.
    - EPA recognizes states/utilities need guidance for many aspects of the LCRR; ASDWA workgroups and states have been thinking about all of these things. Among other tasks, EPA intends to update the EPA CCT Guidance Manual, available here: <https://www.epa.gov/dwreginfo/optimal-corrosion-control-treatment-evaluation-technical-recommendations>
* **AWOP General Approach:**
  + Like other areas of water treatment (e.g., microbial, DBPs, distribution systems, HABs), we would like to develop evaluation and training tools for corrosion control treatment (CCT), includ­ing a Comprehensive Performance Evaluation (CPE) protocol and Performance-Based Training (PBT) materials. Some preliminary CCT workshops by AWOP have taken place:
    - Region 6 – August 2016 – Des Moines, Iowa (in-plant workshops)
    - Region 4 – November 2017 – Frankfort, Kentucky (in-plant workshops)
    - Region 4 – July 2018 – Cincinnati, Ohio (Mike Schock, Darren Lytle)
  + EPA Technical Support Center (TSC) is developing a proposal and budget request to submit to management that includes a multi-step process to develop CCT optimization tools, estimated timeline, and resource needs (e.g., additional FTE(s), extramural funding).
  + In general, the multi-step process consists of the following:
    - Step 1: Identify relevant monitoring parameters, approaches, and optimization goals by part­nering with local water systems and states to understand/assess optimized corrosion control. A new team member would provide technical direction through assessing techniques, con­ducting literature reviews, identifying knowledge gaps, developing monitoring approaches, and identifying and developing and executing studies to help inform the corrosion control optimization program. Existing team members would guide implementation of the corrosion control program within the AWOP framework. New FTE would lead partnerships with ORD and others, e.g., Partnership for Safe Water (PSW), to enlist their help and expertise.
    - Step 2: Pilot larger scale studies and evaluations at partnering water systems with extramural support. Develop a written protocol for conducting full-scale CCT evaluations.
    - Step 3: Develop training tools for state and local partners with extramural support, in collab­oration with PSW and EPA Regional staff.
  + This general approach has been used to successfully develop evaluation and training tools in other technical areas, including chloraminated distribution systems and HAB optimization.
  + This is just one of the paths we could pursue to make progress on this important topic. The suc­cess and timeline of this approach will be contingent on committed resources (e.g., additional FTE(s), extramural funding).
* **Potential Areas for AWOP Corrosion Control Treatment Exploration and Participant Feedback:**
  + Investigative Water Quality Monitoring – beyond regulatory requirements to support process con­trol and optimization.
    - Identify relevant parameters, frequency, and locations
    - Sample collection approach
    - Establish optimization goals or targets for relevant parameters
* **Participant Feedback on Investigative Water Quality Monitoring:**
  + - Sam Perry – Start with developing optimization goals (see AWOP national goals: <https://www.asdwa.org/awop/>). Consider reasonable health-based goals as a starting point.
    - Val Bosscher – It is challenging to establish a health-based goal because no amount of lead is considered safe in drinking water. However, there have been various targets established by other entities ranging from 1 to 15 ppb.
    - Matt Alexander – What is the controlling parameter? (CCT is complicated…)
    - Kira Smith: Lead and Copper is different . It is difficult to develop a *“one size fits all”* approach for developing goals or target for systems because water quality can vary so much. The end goal is reducing Pb at the tap. Sampling/variability – Strong OWQP ranges are needed, but each sys­tem could be very different. The pH depends on whether phosphate is used.
    - Brandon Onan: A standardized dose of orthophosphate will not work for all systems. Consider not developing an *“apex goal”* for all water systems. Try to figure out how to minimize varia­bil­ity of *“control parameters”* based on the system’s control strategy. Consider basing perfor­mance relative to lead concentrations on a system-wide value (e.g., 90th percentile) because all systems will have outliers.
      * Minimizing variability for process control is a good goal. Control charts for process control parameters (e.g., OWQPs, but first get good data).
    - Kira: <https://www.waterrf.org/system/files/resource/2019-07/4286_0.pdf>
      * Region 10 noted Portland AWWA WQTC control charts; Shewhart-type control charts and functional data analysis for water quality.
      * Encourages system-level metric if Pb goal (outliers/individual homes can be problematic even in well-run systems).
    - Emma Inhorn: Provide targets for various parameters related to corrosion control treatment (e.g., pH, alkalinity, sulfate, chloride).
* **Investigative Lead/Copper Sampling Studies – additional Pb/Cu monitoring to supplement compliance monitoring:**
  + - Conduct sequential profile sampling (after stagnation) to help identify lead service lines.
    - Evaluate particulate versus dissolved lead.
    - Target vulnerable areas of the system (e.g., high water age, areas supplied by a blend of sources).
    - Additional sampling studies to consider?
* **Participant Feedback on Investigative Pb/Cu Sampling Studies:**
  + - Brandon: Sequential sampling has been valuable for Michigan in many ways.
      * It is valuable as a diagnostic tool to assess action level exceedances.
      * It also helps them with communication with the public (e.g., the sequential sampling data can be used to demonstrate that lead is limited to water in premise plumbing, not the entire distri­bution system).
    - Brandon O.: For communities with Pb action level exceedances, where is/are the source(s) of lead? Is the fifth liter sample the maximum or was it a particulate spike? Was it soluble lead from the LSL or a different Pb plumbing source? Also, over time, is corrosion control treatment changing?
    - Michigan: Also helpful for communication with the public – source of lead is plumbing, not the treated water in the main. Flushing can help reduce Pb.
* **CCT Status Component – screening tool to prioritize public water systems (PWSs) based on risk; potential criteria may include:**
  + - PWSs with relatively low pH (< 7.0)
    - PWSs with recent source or major treatment changes
    - PWSs supplied by multiple sources with significantly different water quality or seasonal water quality fluctuations
    - PWSs that use polyphosphate
    - PWSs with elevated Pb/Cu results, including LCR, school sampling, and other investigative sampling
    - Other criteria to consider?
* **Participant Feedback on CCT Status Component:**
  + - Cynthia Klevens pointed out the statement in the 2016 CCT guidance. Orthophosphate seems to be the key for CCT. Val noted references that polyphosphate has caused issues in some communities.
    - Kira Smith pointed out that polyphosphates could be for a different objective (e.g., sequestration).
    - Brandon Onan: Vendors push blended phosphate products – charge more for polyphosphate por­tion. Vendors also believe blended phosphates are superior (e.g., iron mains).
    - Michigan: Blended phosphates have been successful in some communities.
    - Michigan: Neutralized products can be available even for orthophosphate-only.
    - Kira Smith: Be careful about actual orthophosphate content.
    - Cathy Wunderlich: Acid product handling/storage concerns. A lot of Fe/Mn naturally occurring. She thinks that polyphosphate is needed for those systems; minimum poly to sequester those, but not more.
    - Kira Smith: In the 2016 OCCT guidance document, in Exhibit 4.2, there is a list of criteria that we may consider.
    - Sam Perry: Low alkalinity water sources for Pb and high chloride mass ratio should be prioritized.
    - Michigan: High chloride, even if not high CSMR; but they are typically more concerned about reduced disinfection residuals, as most systems chronically under-use chlorine in Michigan.
* **CCT Data Integrity – Verify accuracy of data used to assess CCT:**
  + - Verification of corrosion inhibitor feed rate.
    - Verification of corrosion inhibitor units (e.g., mg/L as P vs. mg/L as PO4, ortho-PO4 vs. poly-PO4)
    - Evaluate sampling and monitoring practices associated with CCT.
* **Participant Feedback on CCT Data Integrity:**
  + - See previous discussion regarding control charts for various WQPs.
    - Val: There appears to be confusion in the industry as to how phosphate is reported and recorded.
* **Other Best Practices – Additional concepts related to CCT to promote:**
  + - Tracking and/or mapping customer complaints (e.g., discolored water)
    - Data trend analysis for water quality process control
    - Distribution system optimization (i.e., maintaining adequate Cl2) and distribution system mainte­nance practices (e.g., flushing)
* **Participant Feedback on Other Best Practices:**
  + - Brandon: Consider promoting the use of a hydraulic models to identify areas of the distribution system with high water age.
    - Michigan: All CCT, even small and medium PWSs, have to do WQP monitoring.
    - Here is a link to Michigan’s state LCR revisions and associated guidance: <https://www.michigan.gov/egle/0,9429,7-135-3313_3675_3691-9677--,00.html>
* **CCT Comprehensive Performance Evaluation (CPE) – Develop a CPE protocol to conduct an in-depth evaluation of CCT at a PWS:**
  + - Develop a written protocol for a CCT CPE, like what has previously been developed in other technical areas (e.g., microbial, DS, DBP, HAB).
* **CCT Performance-Based Training (PBT) – Develop a PBT curriculum to provide CCT training for operators:**
  + - Develop agendas, presentations, and workshops on CCT-related concepts for operators.
    - Like developed in other technical areas (e.g., microbial, DS, DBP), operators will be expected to conduct CCT studies at their system using concepts introduced in the training.
* **Additional Prepared Questions That Were Not Discussed:**
* There are already a lot of organizations working on CCT training and assistance for public water systems (AWWA, ASDWA, consultants).
  + How will an AWOP effort be different?
  + What gaps will it fill or what needs will it address?
  + Any specific suggestions on what an AWOP corrosion control effort should address?
* In addition to the multi-step process previously described, what other approaches could EPA TSC pursue to make progress on CCT optimization?
* Both familiarity with AWOP and expertise in corrosion are needed to pursue this approach, but EPA TSC currently lacks expertise in corrosion control. The hiring process can be time consuming, and adding an additional team member is not certain. What other approaches could be pursued in the near-term?
* Potential discussion/*chat* input to capture feedback on the technical approaches listed above.

**Information Shared in *MS Teams* *Chat:***

* Revised LCR: <https://www.epa.gov/ground-water-and-drinking-water/revised-lead-and-copper-rule>
* EPA CCT Guidance Manual: <https://www.epa.gov/dwreginfo/optimal-corrosion-control-treatment-evaluation-technical-recommendations>
* On 6/22/2021 and 6/16/2021, respectively, EPA extended the comment period for the virtual engage­ments to July 30, 2021 and the compliance date of the LCRR to October 16. 2024. See Federal Regis­ter notices [2021-13309](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.federalregister.gov%2Fd%2F2021-13309%3Futm_campaign%3Dpi%2Bsubscription%2Bmailing%2Blist%26utm_source%3Dfederalregister.gov%26utm_medium%3Demail&data=04%7C01%7Cbosscher.valerie%40epa.gov%7C3853b129281244e2f54008d935826c47%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637599656536222836%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=W2W2yubdcYPJFifP6cPTeDsE2uZfPC33NmgEak79bs8%3D&reserved=0) and [2021-12600](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.federalregister.gov%2Fdocuments%2F2021%2F06%2F16%2F2021-12600%2Fnational-primary-drinking-water-regulations-lead-and-copper-rule-revisions-delay-of-effective-and%3Futm_source%3Dfederalregister.gov%26utm_medium%3Demail%26utm_campaign%3Dsubscription%2Bmailing%2Blist&data=04%7C01%7Cbosscher.valerie%40epa.gov%7C3853b129281244e2f54008d935826c47%7C88b378b367484867acf976aacbeca6a7%7C0%7C0%7C637599656536232791%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=3Vk%2BC%2FPPaSwwEpOwzUugvVGuvKd0mh83TtkwhgAGRes%3D&reserved=0). Recordings of Public Listening Sessions (<https://www.youtube.com/channel/UC0VBG2o4x4XIfp8XilDA1wQ/live>) and Community Roundtables (<https://www.epa.gov/newsreleases/ten-communities-selected-epa-roundtable-discussions-lead-drinking-water>), as well as submitted written comments (<https://www.regulations.gov/docket/EPA-HQ-OW-2017-0300>) are also available.
* AWOP – National Goals at <https://www.asdwa.org/awop/>:
* Brandon's point – There was a presentation on control charges at the Portland AWWA WQTC. Sorry, I can't recall the details.
* Key phrase: Shewhart-type control charts and functional data analysis for water quality.
* <https://www.waterrf.org/system/files/resource/2019-07/4286_0.pdf>
* Exhibit 4.2 in 2016 OCCT Manual:. Recommended Checklist to Support Determination of the Need for a CCT Study.
* Virginia also uses the OCCT guidance and Exhibit 4.2 for doing Desktop Evaluations.
* The chemical manufacturers push blended phosphates, and they try to use these as dual pur­pose... sequestration and CCT simultaneously.
* I would note high chloride... not necessarily just high CSMR.
* What is the rough time period that we used 50/50 Lead - Tin solder? Approximately1960 to 1986?
* Not sure when it started. It was supposed to be phased out from use in plumbing in 1986, but a pro­fessor of mine in college found 50:50 lead-Tin in an independent plumbing store in 1992.
* It depends on when a particular state adopted and implemented the SDWA 1986 lead ban.