Designated Federal Officer
(DFO), EPA Science Advisory Board
(1400R), U.S. Environmental Protection
Agency, 1200 Pennsylvania Avenue
NW, Washington, DC 20460

May 2, 2020

Dear Dr. Thomas Armitage,

Thank you for collecting public comments for the EPA Science Advisory Board (SAB) as they review the scientific and technical basis of the Proposed Lead and Copper Rule Revisions. Please accept these comments for the record and add me to your list of speakers for the May 11 meeting.

The EPA Lead and Copper Rule is a treatment technique rule that regulates the use of corrosion control to limit the amount of lead and copper in drinking water. In November of 2019, EPA proposed a set of Lead and Copper Rule Revisions (LCRR) with the intention of improving public health protection provided by the rule. It is critical that the most recent science is used to ensure that the Lead and Copper Rule revisions are effective for reducing exposure to lead in drinking water. As EPA recognizes through its maximum contaminant level goal for lead, there is no safe level of lead drinking water. The SAB should strongly recommend to EPA that all revisions recognize and incorporate the latest science regarding the release of lead in drinking water, effectiveness of corrosion control, and the health effects of lead exposure even at low exposures.

These comments to the SAB share important science regarding three areas of the LCRR. The SAB should make strong recommendations to the EPA that the LCRR must recognize the science provided here and revise the LCR to require compliance sampling that measures lead levels in water from lead service lines, to include a ban on partial lead service line replacements, and to require new and more rigorous corrosion control studies. The following comments provide a summary of new information that should be considered and incorporated into new requirements as EPA finalizes the LCRR. I have also included my CV and the comments that I submitted to EPA on the LCRR proposal as attachments. My work on these comments is supported by the Natural Resources Defense Council.

Sincerely,

Elin Betanzo
Principal, Safe Water Engineering LLC

Attachments:

- Safe Water Engineering Comments to the EPA Science Advisory Board on the Proposed Lead and Copper Rule Revisions
- Resume, Elin Betanzo
- Detailed Safe Water Engineering LLC comments on the EPA LCRR Proposal

Safe Water Engineering Comments to the EPA Science Advisory Board on the Proposed Lead and Copper Rule Revisions

Compliance Sampling must measure lead level in water from lead service lines

The EPA LCR and the proposed LCRR requires water systems to collect the first liter of water from the tap and those sample results are compared to the lead action level. In most cases this first liter does not include water from the lead service line, which is the largest source of lead in contact with drinking water. The first liter sample can potentially show the risk of lead release from internal plumbing, but it does not capture the highest risk water in a building with a lead service line.

Research and data collected since the 1991 LCR demonstrates that first liter first draw LCR compliance samples do not represent the elevated lead levels that are detected when sequential samples are collected from lead service lines. First liter sample results are consistently lower than samples from lead service lines when sequential samples are collected. The first liter samples collected under the LCR are inadequate for identifying at risk systems and most importantly, measuring the effectiveness of corrosion control treatment. The inappropriate use of first liter samples in lead service line homes also means that the risk of lead service lines in not clearly communicated to consumers, and prevents activating triggers for public education and lead service line replacement programs.

As is made clear by a memorandum from EPA Region 5 to the Office of Water (Kaplan, 2017), the first draw water consistently contains the lowest lead level compared to subsequent samples in homes with lead service lines. The fact that the first liter sample is consistently lower than lead service line samples creates a false sense of assurance about water quality within a home. This first liter sample result is the only information we give consumers about lead levels in their home, and the results are never accompanied with an explanation that this result does not include water from the lead service line. I have seen time and time again consumers get non-detect results for lead in their first liter samples. The water systems and the consumers are convinced that there is minimal risk of lead exposure in their water. They assume that the infrequent high lead result in a first liter sample is the outlier, when in fact the rare high result in the first liter sample may actually be an indicator of elevated lead that might be measured in later lead service line samples. Entire communities rely on first liter data to reassure themselves that they "are not Flint" and they do not have a problem with lead in their water, when the actual compliance results are quite similar to first liter compliance results from Flint, Michigan.[1] When the majority of first liter samples have low or nondetectable results, there is little incentive for additional customers to investigate the true range of lead in their drinking water. As the EPA R5 memo recommends, the LCRR should require that samples be taken from lead service lines.

Further, the LCR uses the 90th percentile of lead results to measure compliance with the lead action level. This allows 10% of samples collected to contain any level of lead imaginable, and the PWS has no responsibility to address those high lead levels under the current LCR (Kaplan, 2017). In Flint, individual samples originally considered to be "outliers" that were not considered due to the 90th percentile calculation turned out to be indicators of system wide contamination (Pieper et al., 2018). The 90th

[1] See https://www.detroitnews.com/story/news/local/michigan/2019/11/17/stricter-rules-confirmation-lead-water-metro-detroit-communities/2450044001/

percentile measure continues to screen out these outliers, and we see outliers screened from study after study as if they are not relevant to typical lead exposure within a distribution system (Batterman et al., 2019)(Lewis et al., 2017). However, sequential samples paint a more informative picture of the actual lead levels that occur in homes with lead service lines and the effectiveness of corrosion control for managing lead release. It turns out that these "outliers" are frequently indicators of higher lead levels that are found more frequently when we sample the water in lead service lines.

The Michigan LCR now requires water systems with lead service lines to collect the fifth liter out of the tap in addition to the first liter required by the EPA LCR. This fifth liter sample is more likely to capture a portion of the water from the lead service line leading up to the home. The fifth liter better measures the potential range of exposure to lead in water in lead service line homes and better represents the effectiveness of corrosion control treatment for addressing multiple lead sources in plumbing. Only water systems that exceed the lead action level are triggered into a corrosion control study that will reduce the risk of lead exposure as customers wait for their lead service lines to be replaced.

When the sampling protocol does not measure the highest risk water, the water systems that need improved corrosion control to better protect their consumers are not aware of the higher lead levels and never have the opportunity to be triggered into taking protective actions. These water systems have no idea that their consumers may be exposed to elevated lead on a regular basis. The LCR sampling requirements prevent them from designing effective corrosion control to protect consumers. Experience in Michigan has demonstrated that collecting the first- and fifth-liter samples is practical and implementable. The final LCRR must include a requirement for water systems with lead service lines to collect compliance samples from the higher risk water in lead service lines.

Analysis of sequential sampling data collected in a variety of cities (Chicago, IL; Milwaukee, WI; Flint, MI) demonstrates that there is no standard liter that consistently contains the peak of lead service line concentrations. However, the data indicate that in lead service line homes, almost any liter between 2 and 10 is far more likely to detect elevated lead than the first liter sample.

Analysis of the Michigan data shows that adding a fifth liter sample to the LCR compliance sampling procedure will better represent the contribution of lead from the lead service line and better represent the effectiveness of corrosion control for managing lead release from lead service lines. While it does not always represent peak lead, it will be a significant improvement over the first liter sample. Sequential sampling data show that the first liter sample is consistently not representative of the high lead levels measured from lead service lines. This is confirmed by the data presented in the above-referenced EPA Region 5 memo and additional data to follow. The sampling protocol in the LCRR proposal does not measure the water that is most likely to exceed the action level of 15 ppb due to inadequate corrosion control treatment, and therefore the LCRR proposal is ineffective for triggering additional action at water systems with the greatest risk of lead exposure. **As written, the proposed LCRR does not require samples of the highest risk water; therefore, it will not reduce lead exposure in the water systems and homes that need it most.**

In 2019, the Michigan LCR required PWSs with lead service lines to collect the 1st and 5th liter samples out of the tap, using the highest value to calculate the 90th percentile lead level. There were 134 PWSs that reported 1st and 5th liter data as of January 2020; of these, 6 exceeded the lead action level based on first liter samples alone (4%) but 18 exceeded the lead action level when the highest of the 1st or 5th liter sample at a given sampling location was used for the 90th percentile calculation (13%). We can

contrast the data from PWSs with lead service lines to data collected at PWSs with no lead service lines. In 2019, 500 PWSs collected first liter only data (i.e., they say they do not have lead service lines) and only 8 of these, or 2% had lead action level exceedances in the first liter. While the systems with lead service lines already had twice the rate of lead action level exceedances in the first liter, it turns out that far more of the water systems with lead service lines are leaching lead at levels above the lead action level, indicating that corrosion control treatment is not optimized for reducing lead exposure.

Figure 1 shows 90th percentile data from Michigan water supplies that collected 1st and 5th liter sample data during compliance sampling in 2019 that meet or exceed EPA's proposed trigger level of 10 ppb for lead. During this compliance period, 134 PWSs collected 1st and 5th liter samples. If these systems had only collected 1st liter samples, only 10 would have exceeded the lead trigger level of 10 ppb, or 7%. When both the first- and fifth-liter samples were considered, 25% (34 of 134) of PWSs with lead service lines had lead trigger level exceedances. Table 1 summarizes this data and adds the impact of reducing the lead action level to 5 ppb.

Figure 1: Michigan 2019 LCR Compliance Data 90th percentiles

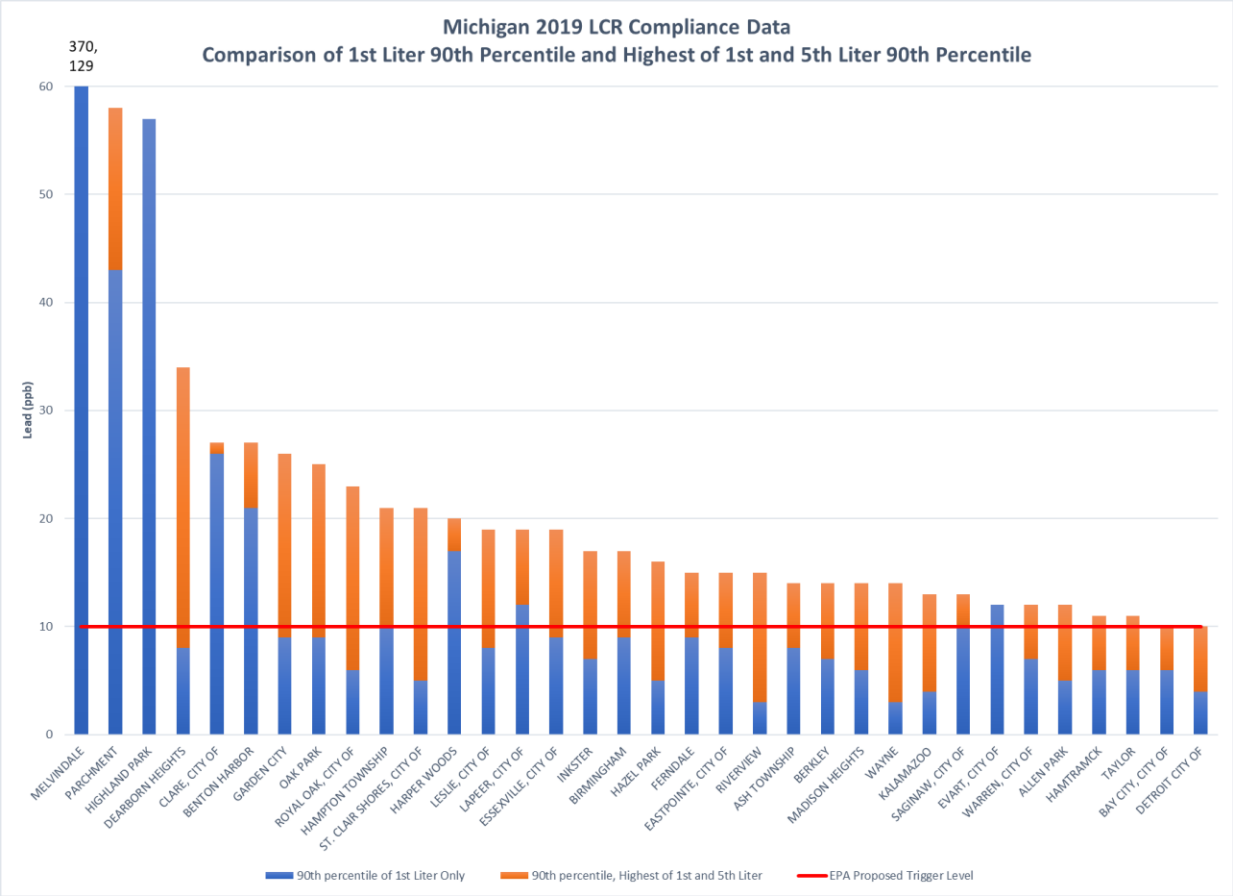


Table 1: The Number and Percentage of Michigan PWSs With Lead Service Lines Exceeding Lead Benchmarks based on 1st liter sampling alone and the highest of 1st and 5th liter sampling results using 2019 compliance sampling data.

	PWSs Exceeding level based on 1st liter samples	PWSs exceeding level based on highest of 1st and 5th liter samples
90th percentile > 15 ppb	6 (4%)	18 (13%)
90th percentile >= 10 ppb	10 (7%)	34 (25%)
90th percentile >= 5 ppb	45 (34%)	69 (51%)

A preliminary review of the Michigan sampling results shows that the 2019 data likely underrepresent the actual number of lead action level exceedances in PWSs with lead service lines for four reasons:

1. Distribution system inventories were not complete prior to 2019 sampling; the PWS may not have identified the locations of enough lead service lines for collecting compliance samples,
2. The impact of 5th liter samples was diluted by including compliance samples from sites where first liter only samples were collected,
3. PWSs submitted 1st and 5th liter sample data at sites that were not verified to have lead service lines, and
4. The actual composition of the sampled lead service lines is unreported and may not represent a full lead service line.

Michigan PWSs were required to complete a preliminary distribution system inventory and updated compliance sampling pool by January 1, 2020, a few months after the compliance samples were due. It is possible that the systems that submitted compliance data by September 30 did not verify lead service lines in their sampling pool, and therefore may have collected samples at non-lead service line sites. The wide-ranging number of first liter only samples collected at lead service line systems indicates that a lack of confirmed lead service line locations may be a major factor diluting many sampling pools. Of the 134 water systems that used the lead service line sampling protocol, 42 PWSs (31%) collected 4 or more first liter only samples. Of these systems, first liter only samples represented 18-97% of the sites where their compliance samples were collected.

It is notable that sampling sites at 10 of the 34 water systems meeting or exceeding the lead trigger level were diluted by sites where only first liter samples were collected. Even though lower risk sites were included in the sampled sites, the fifth liter results were still sufficient to drive the 90th percentile to 10 ppb or greater.

A preliminary review of system specific data demonstrates that in some cases 1st and 5th liter sample data were collected at sites without confirmed lead service lines. For example, one community collected 1st and 5th liter data at the required 30 sampling sites. However, their distribution system materials inventory submitted to the state indicates that they have only 16 known lead service lines. Their samples were non-detect for lead at 20 sampling sites. The EPA R5 memo also highlights this problem of

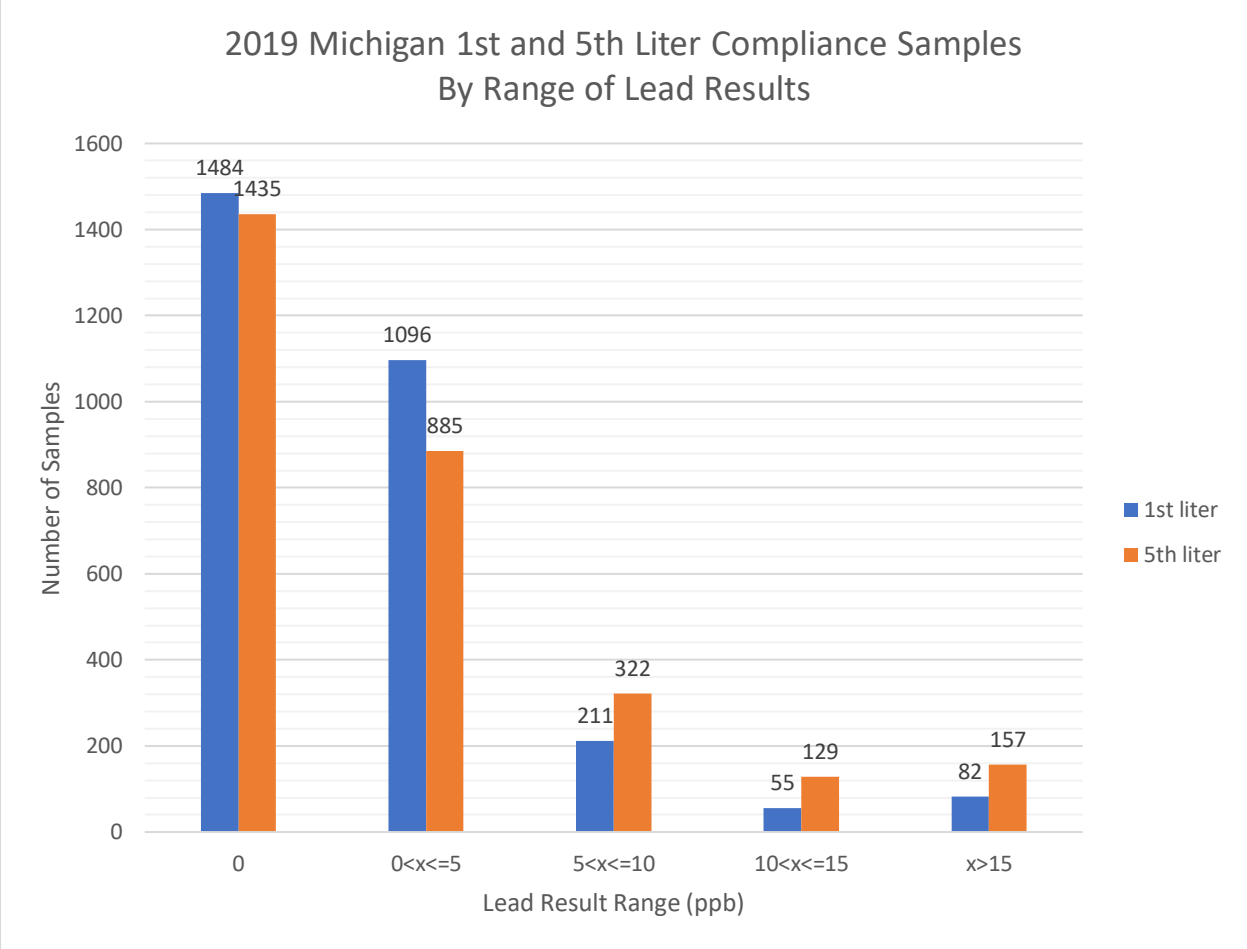
compliance sampling pools being diluted by the inclusion of homes without lead service lines and the impact it makes in the relatively small sampling set required by the LCR (Kaplan, 2019).

It is also important to note that the composition of the lead service lines was not reported for Michigan sampling sites. We do not know if samples were collected at homes with full lead service lines, partial lead service lines, or at sites with lead goosenecks or pigtails. Fifth liter sample results will vary greatly depending on the type of lead service line sampled. Once Michigan PWSs begin sampling using their updated sampling pools in 2020 there may be a higher number of water systems exceeding the lead action level, especially as more PWSs are now required to sample annually rather than every 3 years.

On a national scale, once PWSs use comprehensive verified service line inventories to select the LCR sampling pool, collecting fifth liter samples is likely to identify an even larger percentage of PWSs where corrosion control is not reducing lead levels as much as current compliance sampling indicates. This in turn means that current exposure to lead in water is likely much higher than estimated under current compliance sampling procedures.

Figure 2 shows counts of first and fifth liter samples from 2,928 sample sites in Michigan PWSs where paired 1st and 5th liter samples were collected in 2019, presented by ranges of lead results. These results show that lead results at 5 ppb and less were more frequently measured in first liter samples. Fifth liter sample results were greater than 15 ppb and 10 ppb at twice as many sites as first liter samples. While 2.8% of 1st liter samples measured lead above the action level, the 5th liter samples above the lead action level were nearly double at 5.4%. Again, **the data indicate that if corrosion control is not working to reduce lead levels, it is more likely to be identified in the 5th liter sample than the 1st liter sample of the LCRR proposal.**

Figure 2: 2019 Michigan 1st and 5th Liter Compliance Samples by Range of Lead Results



Once the LCRR is revised to require the collection of lead service line samples, the 90th percentile calculation should be revised to use the higher value of the 1st or the 5th sample to calculate the 90th percentile. This approach is reflected in the Michigan data analysis presented here.

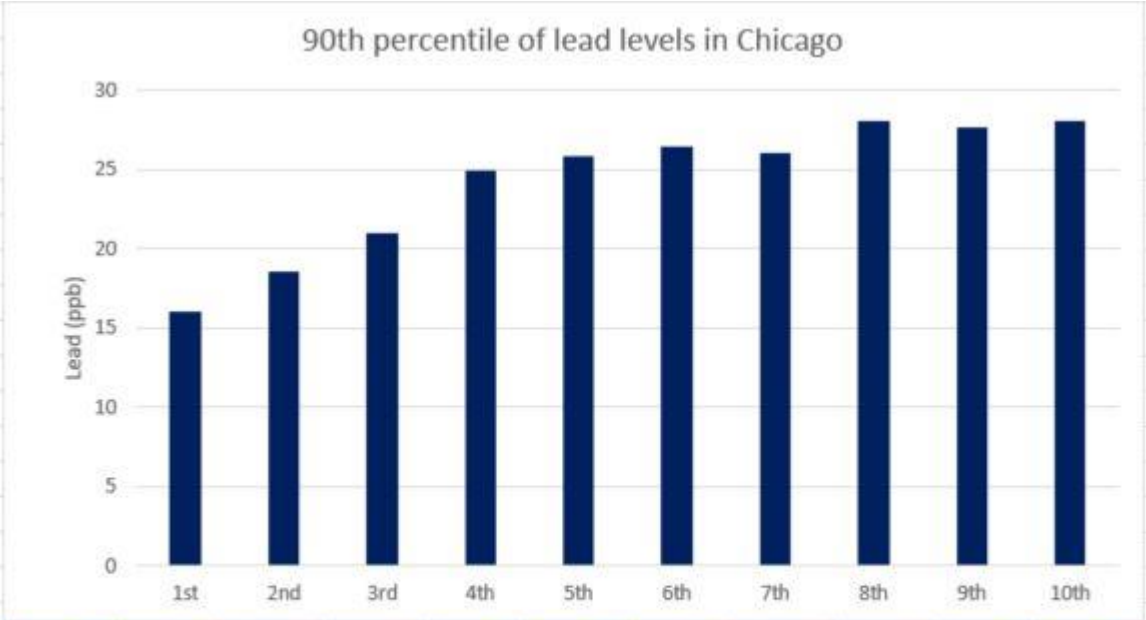
If the final LCRR requires only first liter compliance samples, only a small fraction of PWSs with high lead levels will be identified and triggered into the more protective provisions of the rule. This phenomenon is not limited just to Flint or just to Michigan. Data collected in Chicago (Del Toral et al., 2013) and Milwaukee (Lewis et al., 2017) also follow the same trends. Summary data presented in Lewis et al., 2017, show that in a variety of conditions liters 2-12 are more likely to exceed 15 ppb than the first liter samples.

The attached memo from EPA Region 5 includes analysis of Chicago data collected in 2011 that highlights several inadequacies of LCR compliance sampling procedures and interpretation within the rule. Since then, Chicago embarked on an extensive lead sampling initiative, collecting lead samples at customer request, then following up by collecting 10 liters of sequential samples where initial samples exceeded 15 ppb.[2] The customer requested data set illustrates that Chicago's compliance sampling does not represent the highest risk sampling sites nor the highest risk water.

[2] http://www.chicagowaterquality.org/home

Chicago's 2018 Consumer Confidence Report states that the lead 90th percentile was 9.1 ppb and no samples (first liter compliance samples) were over the lead action level of 15 ppb.[3] However, the Chicago customer sampling dataset for the same time period shows there are several first liter samples over 15 ppb and the 90th percentile for the first liter samples is 19 ppb. Further, the 90th percentile values for liters 2-10 only increase as shown in Figure 3. It is further notable that these samples were collected at high risk sites – the sequential samples were collected after an initial sample measured over 15 ppb - yet 90% of the first liter samples on the retest date were 19 ppb or lower. This analysis further demonstrates the importance of sampling at high risk sites and collecting samples beyond the first liter to accurately measure the extent of lead corrosion in lead service lines.

Figure 3: Chicago Customer Requested Drinking Water Sample Results by Liter

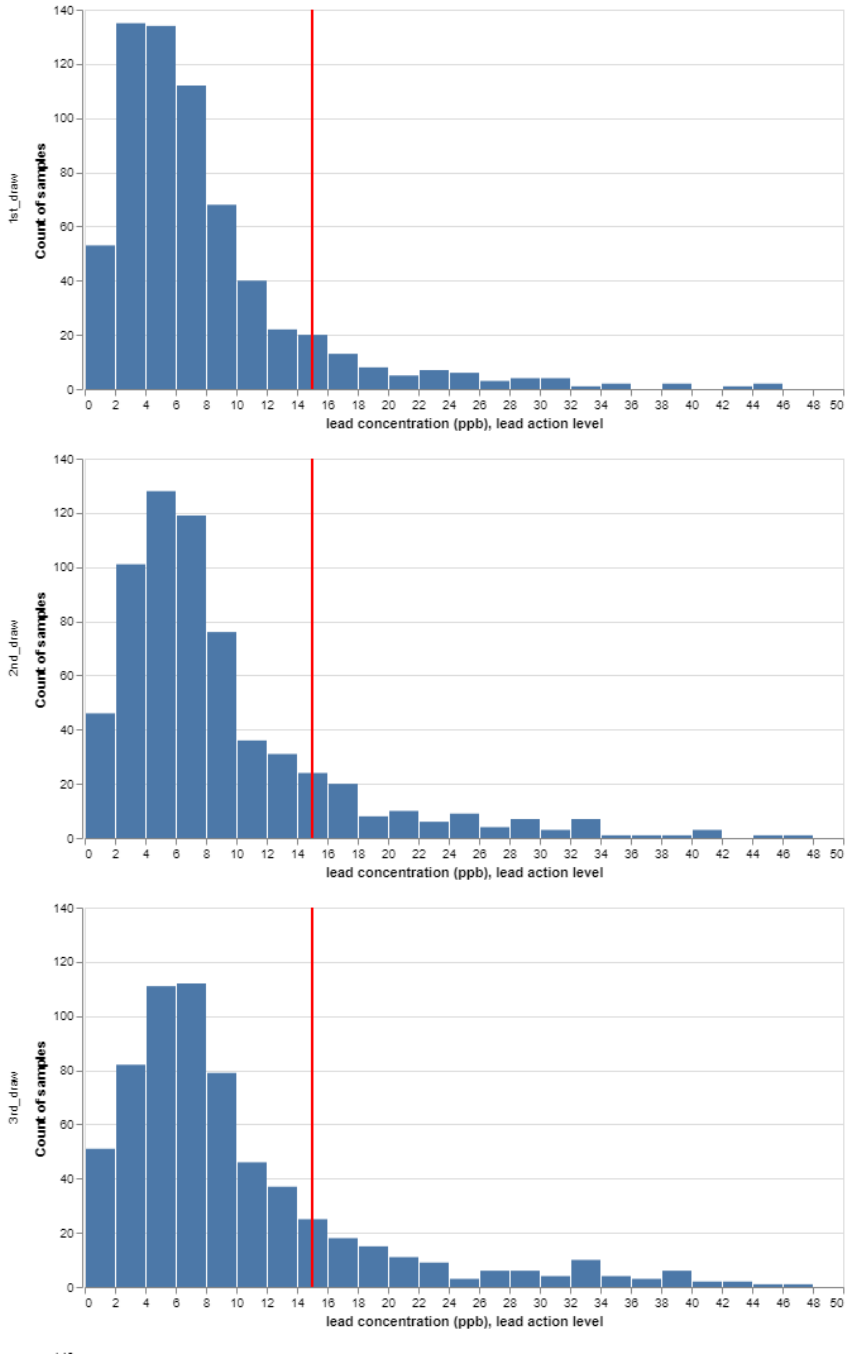


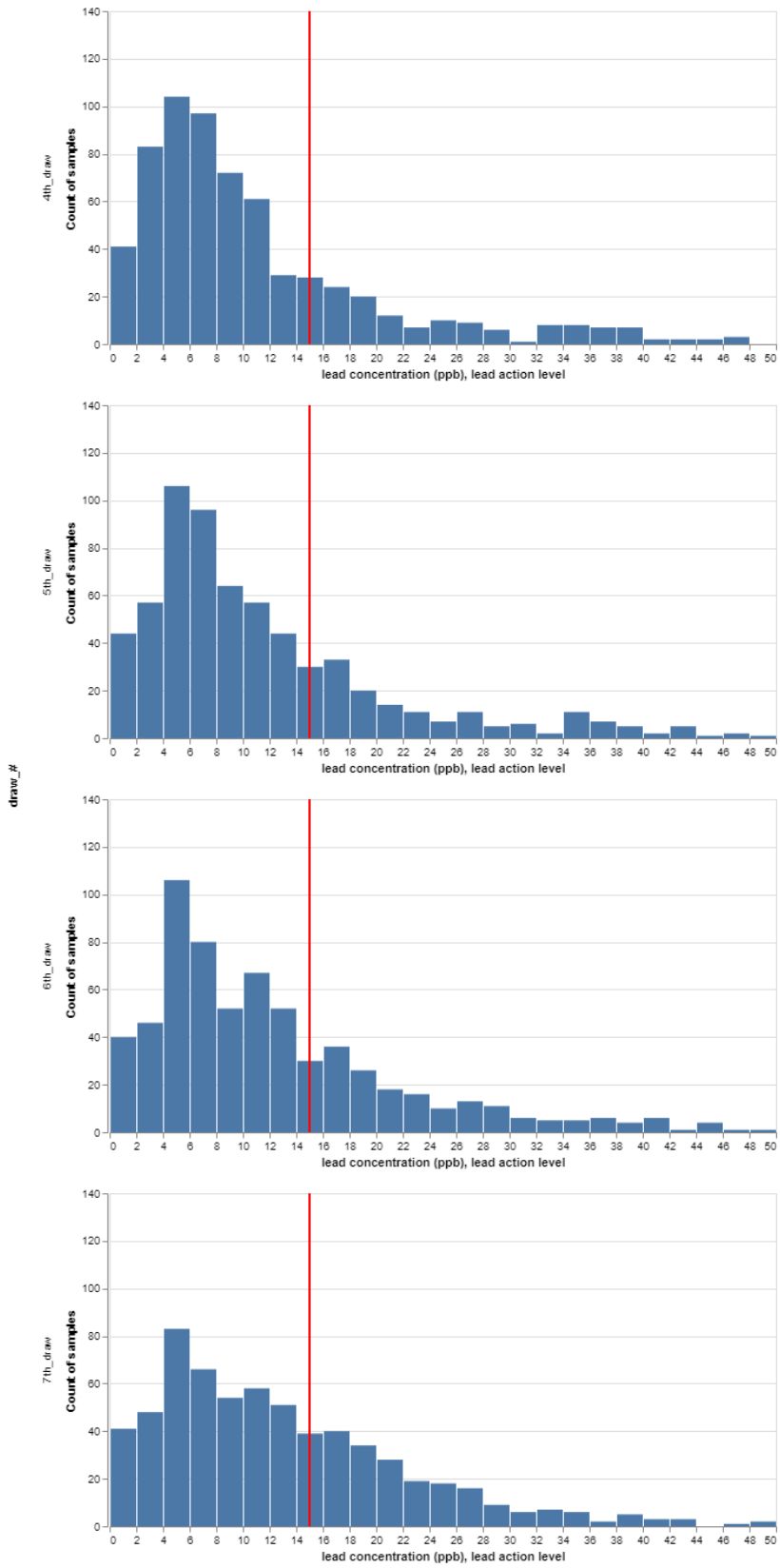
year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
2019	13.5	18	18.9	24.1	22.2	24.4	24.4	26.8	26.2	27.8
2018	19.2	16.4	23.4	24.1	28.5	27.5	26.6	28.3	27.6	25.2
2017	16.8	20.4	29.5	35.9	36.5	35.1	34.5	34.4	32.5	29.5
2016	15.5	18.1	20.7	21	21.8	24.4	23.6	25.8	26.9	26

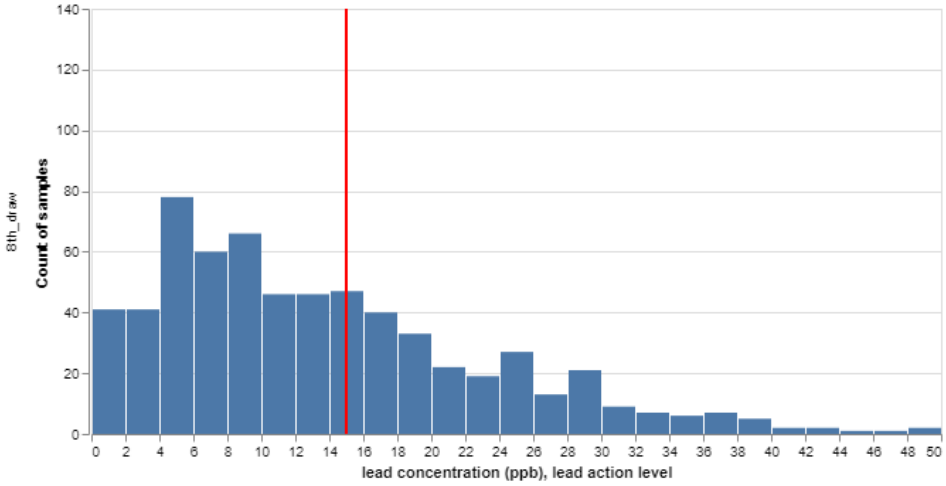
As one looks at the distribution of sample results in each sequential liter, the entire distribution of lead results moves towards higher values. In other words, the increase in 90th percentile values is not just a matter of increasing results at the highest risk sites, the sample results at all sites increase in each sequential liter. This phenomenon can be seen in the following Figure 4, where the highest count of sample results are for non-detect and very low lead samples. This curve begins to flatten in sequential liters as more and more samples have higher lead concentrations. This data analysis only includes samples between 0 and 50 ppb.

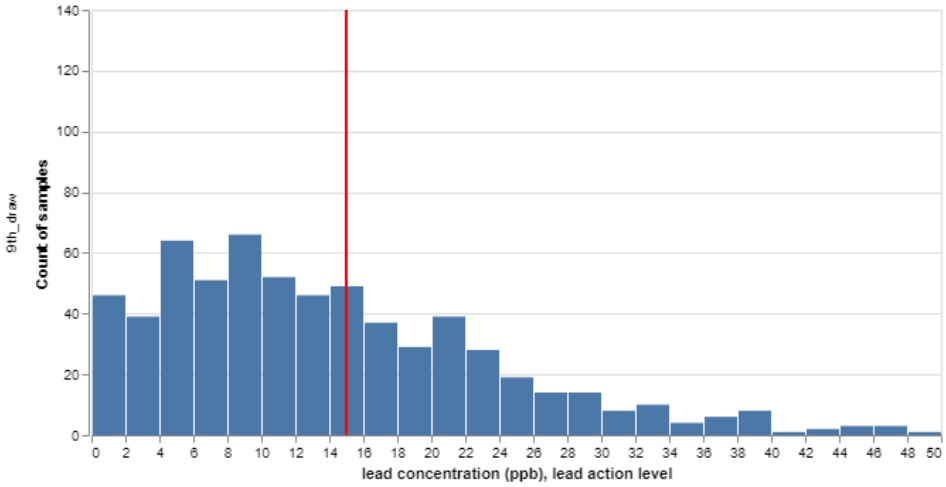
[3] https://www.chicago.gov/content/dam/city/depts/water/ConsumerConfidenceReports/ChicagoWaterQuality2018.PDF

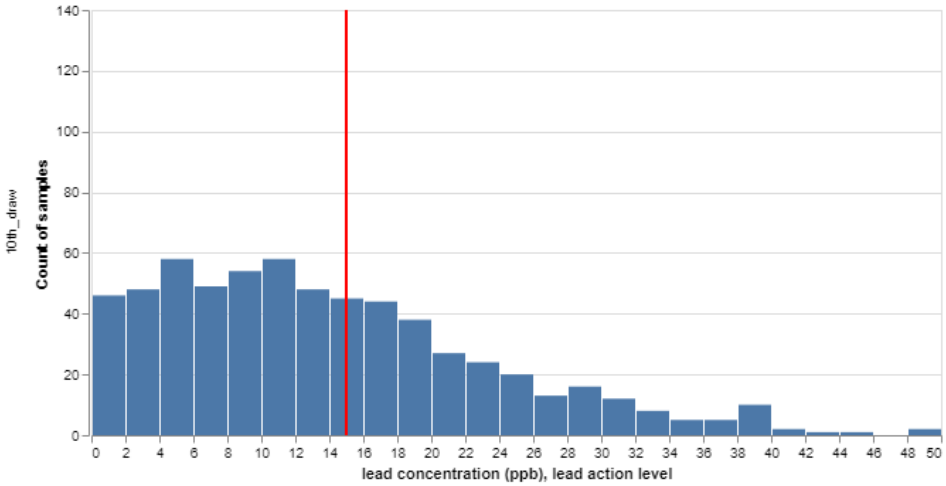
Figure 4: Number of Chicago Customer Requested Sequential Samples with a Given Lead Concentration in Sequential Sampling Liters




draw_#
4th_draw
5th_draw
6th_draw
7th_draw
Count of samples
lead concentration (ppb), lead action level







This Chicago dataset further illustrates that the first liter sample consistently has the lowest lead concentration of all sequential samples, and the first liter sample is not a reliable indicator of the higher lead levels in water collected from the lead service line. Samples taken from the lead service line in Chicago show that, although compliance samples indicate the water meets the criteria of the current

LCR, corrosion control treatment in Chicago is not effective in reducing lead below the current lead action level of 15 ppb.

This analysis of data collected through sequential sampling studies in Chicago, IL; Michigan, and Milwaukee, WI demonstrates that lead samples collected according to the LCR and proposed LCRR sampling protocol are not achieving their purpose of identifying high lead in the water and correcting it via corrosion control. This must be addressed in the final LCRR.

Ban on Partial Lead Service Line Replacements (PLSLR)

Concerns about lead release during PLSLR have been raised dating back to 1991 when the Lead and Copper Rule was promulgated (USEPA, 1991). More recent studies have documented actual lead levels following FLSLR, PLSLR, and LSL disturbance. According to EPA SAB, "Both full LSLR and PLSLR generally result in elevated lead levels for a variable period of time after replacement." The available data indicate the duration and magnitude of the elevations may be greater with PLSLR than full LSLR.

After evaluating available data for PLSLRs in 2011, the EPA SAB found that

> *"PLSLRs have 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. Available data suggest that the elevated tap water lead levels tend to then gradually stabilize over time following PLSLR, sometimes at levels below and sometimes at levels similar to those observed prior to PLSLR."*

Triantafyllidou and Edwards (2011) documented how galvanic corrosion can contribute to lead release over one year following PLSLR. This research was continued with more configurations by St. Clair et al. (2015), which found higher lead release from partial lead service lines compared to service lines that were 100% lead, and elevated lead from galvanic corrosion worsened with time. Clark et al. (2013) demonstrate that pipe connectors play a major role in determining the magnitude of galvanic corrosion following a PLSLR.

Deshommes et al. (2014) studied PLSLR and FLSLR in Montreal, Canada, a water system that does not use corrosion control. This study found that peak concentrations of lead after a PLSLR were comparable to homes with full LSLs. There is minimal benefit from the PLSLR for the cost incurred. Deshommes et al. (2016) further details the short-term release of particulate lead in water following PLSLR and quantifies the results of different flushing strategies on lead levels detected in homes.

Trueman et al. (2016) showed that PLSLR resulted in lead release that more than doubled in premise plumbing in the short term and did not reduce lead release in the long term. Elevated lead following PLSLR compared to samples collected prior to PLSLR continued 6 months after the replacement was completed.

Deshommes et al. (2014) and (2016) both demonstrate the substantial reduction in lead levels measured at the tap after FLSLR as compared to PLSLR. Trueman et al. (2016) present data comparing sequential samples collected at 45 sites with FLSLRs and 15 sites with PLSLRs. Lead levels in the homes

with FLSLR were significantly lower than pre-replacement levels, even at 3 days after replacement. However, there were still sporadic measurements of lead >15ug/L after FLSLR. Prior to FLSLR, 29% of samples had lead levels >15 ug/L and after FLSLR only 14% measured lead >15 ug/L. The paper demonstrates how elevated lead post-replacement drops sooner and more consistently compared to PLSLR.

Based on the EPA SAB's original 2011 finding that PLSLR is not an effective strategy for lead risk reduction and the following research that reaches the same conclusions, the LCRR should prohibit all partial lead service line replacements. Only an explicit ban on PLSLR will prevent the dangerous lead exposure that are known to result from PLSLR. Because there are certain emergency scenarios when a temporary PLSLR may be needed, the LCRR should provide a clear definition of emergency replacements during which temporary partial replacements are allowed. All emergency temporary partial replacements must be completed as full replacements within 30 days of the partial replacement, with mandatory filter distribution and flushing protocols.

Strengthen Corrosion Control Study requirements

As previously stated, the LCR is a corrosion control rule. The LCRR includes several improvements in 141.82, the description of corrosion control treatment requirements, that will improve the quality of corrosion control studies. Improvements that should be maintained in the final rule include:

- Eliminating the use of coupons in corrosion control studies,
- Designating more specific treatment options that must be investigated. The proposed revision specifies that orthophosphate must be studied, eliminating polyphosphate as a corrosion control option. However blended polyphosphates are still an option if they meet the required orthophosphate dose. Further revision is necessary, as discussed below.
- The concept of re-optimization is important as water quality characteristics and needs change over time. It might be helpful to add a definition of "re-optimization" in the list of definitions.

There are several aspects of corrosion control studies and treatment that should be updated in the LCRR to prevent future lead in water crises and reflect the latest research:

1. Require a study for all source water and treatment changes to identify simultaneous compliance and corrosion control issues prior to any such changes. These new provisions should include notification to all customers served by the PWS that the PWS is considering a source water or treatment change, and public notice of the results of the mandatory study.
2. EPA should conduct a series of systematic corrosion control studies in typical representative source waters across the country that states could use to extrapolate to treatment recommendations for individual small and medium size systems. A dedicated research budget of about $10 million may be able to fill this important information gap.
3. Build on the improved corrosion control treatment section in the LCRR to ensure that all corrosion control studies are designed to identify optimal corrosion control treatment and are

triggered by lead service line sample results. As proposed, the LCRR corrosion control study improvements would apply to few water systems.

The LCRR includes some important improvements to the corrosion control requirements of the LCR, but there are additional opportunities to improve the clarity and specificity of these requirements. The SAB should make the following recommendations to EPA regarding the conduct of rigorous and appropriate corrosion control studies to support decision making grounded in science:

- **States should recommend corrosion control treatment for small and medium PWSs.** The LCRR proposal, like the original LCR, instructs small and medium sized water systems without corrosion control treatment to recommend one or more of the corrosion control treatments listed in paragraph (c)(1). The state may require a study or may require additional water quality parameter sampling. Given the lack of technical, managerial, and financial capacity at many small and medium systems, I recommend flipping the language here to place this responsibility of recommending corrosion control treatment on the state, which is more likely to have corrosion control experience and expertise. This change will likely result in better decisions based on scientific expertise, along with a more efficient recommendation and review processes.

- **Good decisions require good science.** The best water quality decisions will be made when a corrosion control study is conducted by each individual water system. As currently written, the proposed rule will only result in a corrosion control study for large systems exceeding the lead trigger level or copper action level, and for small and medium systems exceeding the lead trigger level or copper action level if the state chooses to require it. Corrosion control is very specific to source water quality, treatment in place, treatment history, and the materials present in the distribution system. EPA should require all large systems, and should seriously consider requiring all small and medium water systems to complete a corrosion control study to identify optimal corrosion control treatment. Another option to provide better information for small and medium systems would be for EPA to conduct systematic corrosion control studies in typical representative source waters across the country that states could use to extrapolate to treatment recommendations for individual small and medium size systems.

- **Small and medium systems must be required to complete corrosion control study requirements.** 141.81(c) of the LCRR allows a small or medium water system to stop treatment steps when the water system meets both action levels during two consecutive 6-month monitoring periods. Starting and stopping corrosion control treatment steps results in delayed corrosion control treatment and leaves consumers unknowingly at risk of lead exposure. This strategy does not support decision making grounded in science. Small and medium systems have had reduced corrosion control treatment protection compared to large systems since 1991. If a small or medium water system is triggered into the corrosion control treatment steps due to lead sampling results, the water system must be required to follow through on the corrosion control study. Ceasing corrosion control studies and allowing small and medium systems to “re-optimize” treatment by getting under the trigger level for 2 monitoring periods without adding treatment does nothing to reduce the risk of lead exposure for at risk consumers. The impact on consumers is even higher when you consider that 10% of samples

collected can have any level of lead (and any level of lead exposure) while a water system maintains compliance with these criteria.

Several important changes to the details of the corrosion control study requirements in the LCRR will improve the quality of the studies actually completed by water systems and improve the reduction of lead in water provided by the LCRR. Many of these recommendations are already included in EPA's corrosion control guidance manual (USEPA, 2016) but are not yet incorporated into rule requirements. The SAB should strongly recommend to EPA that the LCRR should reflect the science-based recommendations included in the EPA corrosion control guidance manual.

- **A comprehensive study must be completed in advance of any source water or treatment change.** The one provision that could have prevented lead crises in Washington, DC; Flint, Michigan; Pittsburgh, PA; University Park, IL and countless other cities would have been a requirement to study any source water or treatment changes prior to implementation. This mandatory study would evaluate the impact of the changes on simultaneous compliance and corrosion control. Changes in source water and treatment are likely to increase as climate change affects the quality and quantity of our drinking water sources, and as more water systems look to consolidate operations to improve efficiencies and long-term sustainability as encouraged in the America's Water Infrastructure Act of 2018. Comprehensive water quality studies are the only way to prevent lead in water crises before they happen. Such studies can also identify whether different overall treatment approaches might be more effective at controlling contaminants of concern rather than adding treatment to address one contaminant at a time. Depending on how EPA chooses to address this issue, requirements in 141.81(b)(3)(iii), 141.86(d), and 141.90(a)(3) must be consistent with each other to solve this longstanding issue in the LCR. As it currently reads, the requirement of 141.90(a)(3) only applies to water systems on reduced monitoring because it refers to 141.86(d)(4), wherein the only reference to notifying the state is in the context of systems on reduced monitoring. 141.81(b)(3)(iii) limits applicability to water systems with optimized or re-optimized corrosion control. For clarity and simplicity, the LCRR should make one requirement to evaluate source water and treatment changes that applies to all water systems subject to the LCRR without exceptions.

- **Don't use old inadequate studies to justify future treatment decisions.** 141.82(c)(1)(ii) and 141.82(c)(2)(ii) allow a water system to rely on analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configurations. The final rule must clarify that if a water system relies on such a study, it must meet the requirements of this revised section. For example, if relying upon a previous analysis, it must include evaluation of the currently mandated study options and cannot rely solely on coupon studies. The LCRR should prevent water systems from making new decisions based on old studies that do not meet the revised requirements.

- **Corrosion control studies must include sequential samples.** All corrosion control optimization and re-optimization studies in systems with lead service lines must evaluate corrosion control effectiveness using sequential samples that measure water collected from lead service lines, not

just first liter samples as compliance samples are collected in the LCRR proposal. Effective corrosion control treatment for reducing lead release from lead service lines cannot be evaluated via first liter samples that do not represent corrosion of the lead service line. As demonstrated previously in these comments, first liter samples are inadequate for measuring lead release and assessing corrosion control effectiveness in lead service lines. Any partial-system test must include sampling of the 1-10th liters out of the tap at lead service line locations. This requirement should be added to the final rule in all sections describing corrosion control study requirements.

- **Clarify orthophosphate and polyphosphate dose requirements.** The final rule must be clear that water systems must analyze straight orthophosphate at doses of 1 and 3 mg/L and not polyphosphate blends. This appears to be in the intention of the rule, but as written, a water system could test these doses using a polyphosphate blend. Polyphosphate blends can be evaluated in addition to the straight orthophosphate if the water system chooses, but it should not be mandatory. Under the re-optimization study options, add a requirement for systems that currently use a polyphosphate or a polyphosphate blend to evaluate a scenario that drops the polyphosphate dose to 10% or less (i.e., 90% orthophosphate).

- **PbO_2 should be considered a corrosion control technique.** For systems that use chlorine for secondary disinfection, the final rule should add evaluation of existing PbO_2 scale as a corrosion control option since PbO_2 can be highly effective for binding lead (Giammar et al., 2010). If modifications to existing treatment can bring lead levels below the action level even though they don't include addition of a "corrosion inhibitor," they should be evaluated alongside orthophosphate. For example, DBP pre-cursor removal that allows higher chlorine and higher pH to maintain PbO_2 scale while maintaining compliance with DBP MCLs should be considered a corrosion control option.

- **Measure the right water quality parameters.** The role of water quality parameters (WQPs), both in the context of corrosion control studies and as part of ongoing monitoring, are to help ensure the effectiveness of corrosion control treatment. As such, mandatory WQPs that are measured as part of a study in 141.82 must include the water quality factors that affect release of lead and copper as listed in the EPA Optimal Corrosion Control Guidance Manual. To make this fundamental construct of the LCR effective, these WQPs must be part of mandatory sampling in a corrosion control study:

    - Dissolved inorganic carbon (DIC)
    - Hardness (calcium and magnesium)
    - Dissolved oxygen
    - Oxidation-reduction potential
    - Ammonia, chloride, and sulfate
    - Natural organic matter (NOM)
    - Iron, aluminum, and manganese.

- The WQPs monitored under 141.87 are not by themselves sufficient indicators or predictors of lead release – this is evidenced by a lack of correlation between WQP violations and lead action level exceedances (Kaplan, 2019). This list of WQPs should also be updated to include the most

relevant water quality factors that affect release of lead and copper from EPA's guidance manual. Data driven decision making will be possible when the relevant data are collected. Once the additional WQPs are added to the monitoring requirements of 141.87 it will be important to remove the provisions that allow a water system to go on reduced monitoring for WQPs, or not measure WQPs at all as in the case of some small and medium systems. The LCR intends to use WQPs as an early warning of potential lead issues; reducing sampling frequency to every three years completely defeats this purpose. If both lead and copper compliance sampling AND WQP sampling are reduced to every 3 years, the water system has no information available to identify if a water quality change is resulting in unknown lead release in certain sections or throughout the distribution system. This means a child could be exposed to unidentified high lead concentrations for 3 entire years of the most important formative years of their life without any information to allow an intervention.

- **Corrosion control for lead service lines may not have same effectiveness for lead in plumbing.** It is important to note that lead exists in most of our plumbing, even brand-new plumbing that meets the new definition of "lead-free" since 2014. The most effective corrosion control treatment to address galvanic corrosion can be different from the effective corrosion control treatment for reducing lead leaching from lead service lines. If the final LCRR includes a requirement to remove all the lead pipes and provide POU treatment at the highest risk homes, water systems can optimize corrosion control treatment to address household plumbing sources of lead and provide more health protection to all consumers because water systems will no longer have to design corrosion control treatment for lead service lines. In this way, the existence of lead service lines may have the unintended consequence of increasing the risk of lead exposure in homes that have other sources of lead in solder and brass fittings and fixtures but no lead service lines.

- **Communicate with the public in advance of major changes.** The final rule should include a requirement to hold a public meeting to discuss treatment changes and make corrosion control studies and recommendations available for public review. All the materials of the LCR assert that management of lead is a shared responsibility due to lead containing materials inside customer homes. Consumers should have the ability to review such studies because they have impact on water quality within consumer homes. Consumers should at a minimum be able to verify that the water system completed their requirements per the LCR.

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Elin Betanzo, PE

Elin created Safe Water Engineering, LLC in 2017 to improve access to safe drinking water through engineering and policy consulting after helping to uncover the Flint Water Crisis. Elin has nearly 20 years of experience working on environmental and water policy issues, including writing and implementing federal and state water regulations, assisting water utilities with regulatory compliance, distribution system water quality, and harmful algal blooms.

Expertise:
Safe Drinking Water Act; Federal and Michigan Lead and Copper Rules; Distribution System Water Quality; Hydraulic Modeling; Harmful Algal Blooms

Education
- MS, Environmental Engineering, Virginia Polytechnic Institute and State University, 2004
- BS, Environmental Science, Carnegie Mellon University, 1999
- BFA, Piano Performance, Carnegie Mellon University, 1998

Professional Associations
- American Water Works Association – Distribution System Water Quality Committee Member

Total Years of Experience
19

Office Location
Royal Oak, Michigan

PROJECT EXPERIENCE

Detroit Water and Sewerage Department; Minimizing Lead in Drinking Water Program; Detroit, Michigan

Lead Engineer. Provide oversight and technical support to develop and implement a proactive strategy for addressing and minimizing lead in drinking water that can serve as a national model for protecting public health. This scope of work ongoing oversight, implementation, and refinement of full lead service line replacement standard operating procedures; compliance assistance with the federal and Michigan Lead and Copper Rules; water quality data analysis; development of a GIS collector application and comprehensive service line inventory; public education; and coordination with the Great Lakes Water Authority Water Quality Group.

Metro Consulting Associates/City of Highland Park; Highland Park, Michigan

Technical Advisor. Provide technical advice to Highland Park regarding implementation, and refinement of full lead service line replacement standard operating procedures; compliance assistance with the federal and Michigan Lead and Copper Rules; and water quality sampling and data analysis.

University of Michigan; Supporting Implementation of Michigan's Revised Lead and Copper Rule; Ann Arbor, Michigan

Co-Principal Investigator. This project partners technical experts, faculty, and students from the University of Michigan Schools of Public Health, Engineering, and Public Policy to support implementation of the revised Michigan Lead and Copper Rule. Scope includes providing a historical and technical context for the development of the Lead and Copper Rule; Prepare public communications products regarding lead service lines and household plumbing, service line replacements, and Lead and Copper Rule compliance; oversee development of technical SOPs, guidance and template documents; coordinate with MDEQ on the development of materials designed to support MDEQ roll out of the revised Michigan LCR.

Natural Resources Defense Council; Chicago, Illinois

Technical Advisor. Advise the Natural Resources Defense Council as it works to address safe drinking water in the state of Michigan. This includes reviewing implementation of the Michigan Lead and Copper Rule, addressing lead in school drinking water in Michigan, and preparing comments on the EPA Lead and Copper Rule Revision proposal.

Michigan Environmental Council; Drinking Water Policy Support; Lansing, Michigan

Technical Advisor. Advise the Michigan Environmental Council as they add drinking water issues to their portfolio of environmental issues they cover and track for the state. Reviewed drinking water program implementation at the Michigan Department of Environmental Quality; assisted with public comments on the Michigan Lead and Copper Rule.

The Joyce Foundation; Opportunities for Addressing Lead in Drinking Water; Chicago, Illinois

Author. Prepared a series of issue briefs that describe challenges, data gaps, and opportunities for reducing the risk of exposure to lead in drinking water and for increasing community involvement in decisions affecting drinking water. Each of the issue briefs includes an explanation of the issue and its relevance to drinking water and public health protection; strategies that can be used to address the issue challenges, data gaps, and opportunities; organizations working in the issue area and specific organizations or geographic areas that might be ready to initiate work in the issue area; any particular cautions the Joyce Foundation should be aware of as it begins to fund work in the identified issue areas; and references and resources.

Northeast-Midwest Institute; Safe Drinking Water Research and Policy Program; Washington, DC

Director. Focused on solving imminent, critical issues regarding revision of the Lead and Copper Rule while building a regional and national awareness of the need for solving drinking water issues. Through the development of scientific, non-partisan, and independent research and policy analysis, used objective data findings to inform and provide technical assistance and education to policy-makers and the U.S. Environmental Protection Agency to support local and regional drinking water policy improvements.

Washington Suburban Sanitary Commission; Water Planning; Laurel, Maryland

Water Planning Unit Coordinator. Led creation of a master modeling platform including development and integration of data sources and modeling activities across diverse departments, model data management, and data sharing. Modeled and analyzed hydraulic performance of distribution system consisting of over 5,000 miles of pipe for master planning and day to day operations, including interpretation of hydraulic, GIS, metering, billing, and SCADA data to solve problems. Project Manager for consultant services as well as project team advisor for elevated tank, pipeline, and valve/vault design, and construction contracts. Forecasted future water demands based on water use trends, population growth, land use, and unit consumption.

United States Environmental Protection Agency; Office of Ground Water and Drinking Water; Washington, DC

National Tribal Drinking Water Coordinator. Oversaw implementation of the Safe Drinking Water Act (SDWA), including National Primary Drinking Water Regulations, for EPA's national Tribal drinking water program. Identified and addressed infrastructure funding and technical challenges affecting Tribal public water systems. Developed Tribal Operator Certification Program. Led interagency workgroup with USDA, HHS, DOI, HUD, and tribal representatives to improve access to safe drinking water on Tribal lands.

United States Environmental Protection Agency; Office of Ground Water and Drinking Water; Washington, DC

Project Manager and Engineer. Project Manager and Technical Lead for the Initial Distribution System Evaluation Guidance Manual for the Stage 2 DBP Rule, including stakeholder review process. Led national workgroup of EPA regions and state regulators to plan implementation of the Stage 2 DBP Rule. Analyzed drinking water contaminant occurrence, health effects, risk assessment, treatment, and costs to support and develop drinking water regulations. Reviewed and edited technical papers supporting rule development, including state of the science reports and contaminant occurrence for distribution system and total coliform issues and managed stakeholder review process.

Safe Water Engineering Detailed Comments on the Lead and Copper Rule Revisions Proposal

The following comments go through the proposal section by section, offering recommendations and rationale for specific revisions.

Definitions

- *Lead service line* means a service line made of lead, or any portion made of lead, from the discharge of the corporation fitting to the building plumbing at the first shut-off valve inside the building, or 18 inches inside the building, whichever is shorter. ~~which connects the water main to the building inlet~~. A lead service line may be owned by the water system, run under private property, ~~owned by the property owner,~~ or both. For the purposes of this subpart, a galvanized service line is considered a lead service line if it ever was or is currently downstream of any lead service line or service line of unknown material. ~~If the only lead piping serving the home or building is~~ A lead gooseneck, lead pigtail, or lead connector ~~, and it is not a galvanized service line that~~ is considered ~~an LSL the service line is not~~ a lead service line.
    - The definition of a lead service line in the LCRR represents a weakening of requirements issued under the Safe Drinking Water Act. The 1991 LCR defined a Lead Service Line as "a service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line." If a CWS is allowed to use an inspection inside the house to identify the material of a service line, then the section of pipe inside the house must also count as part of the service line. A lead service line removal would still be a partial lead service line removal causing a risk of increased lead exposure in the home if the portion of the lead service line inside the house is not also removed at the same time.
- Pitcher filter definition "means the pitcher and filtration cartridge ~~insert for water pitchers~~ that removes lead in drinking water, and that is certified to remove lead in accordance with NSF/ANSI standard 53 and remove particulates in accordance with NSF/ANSI standard 42.
    - The definition must be specific about the standard that must be met.
- Wide mouth bottles – "At least 55 mm wide, required to be used for lead and copper tap sampling collection ~~to optimize capturing accurate lead measurements~~."
    - Implies this is the only important thing for "capturing accurate lead measurements." This statement is not necessary for a clear enforceable definition of "wide mouth bottles." Collecting lead service line samples is far more important for "capturing accurate lead measurements" and should be included in the final LCR revision.
- The definition for "Trigger Level" should be removed from the final LCRR.
    - The introduction of a trigger level increases the implementation complexity of the LCRR above and beyond what is already acknowledged as the most complex of all EPA drinking water regulations. The cost and confusion of adding and implementing this new definition will outweigh any benefit it might provide. It will be far simpler to lower the Action Level, resulting in improved public health protection.

Trigger level vs action level

The lead action level is a pivotal number in the LCR. It is not a measure of public health protection because the safe level of lead in water is 0 ppb. Rather, the lead action level is related to corrosion control efficacy. Although corrosion control might not be optimal even when lead levels are below 15 ppb, lead levels exceeding the lead action level are indicative of such significant lack of efficacy that additional safeguards should be taken, as a matter of course, to protect public health. Thus, when a water system exceeds the lead action level they are triggered into additional steps – corrosion control studies, more frequent sampling, public education, and lead service line replacement. The LCRR proposal acknowledges that the current level of 15 ppb is not triggering enough water systems into additional action by creating a trigger level of 10 ppb that performs a lot like the action level. The final LCRR should reduce the action level to 5 ppb so that the protective requirements apply to a larger universe of regulated water systems. Lowering the action level will create a more protective requirement and reduce the complexity that the trigger level would have introduced. This change should be coupled with the collection of lead service line samples to more accurately measure the effectiveness of corrosion control in the highest risk water. As described later in these comments.

Corrosion Control Requirements

As stated previously, the LCRR includes some important improvements to the corrosion control requirements of the LCR, but there are additional opportunities to improve the clarity and specificity of these requirements. First, the new lead trigger level adds an unnecessary level of complexity that will undermine the public health protection intended in the final rule. The applicability of the corrosion control requirements should be based solely on the action level, and reducing the action level to 5 ppb. As a policy and technical expert solely focused on reviewing and submitting comments on the LCRR, I spent hours trying to decipher the requirements based on the lead trigger and lead action levels. Due to complexity and errors throughout the proposal language I was unable to understand how the action level and trigger level will work in practice. Every water system that must comply with these requirements is also complying with the full set of National Primary Drinking Water Regulations and day to day operations. Every state that has primacy for the Public Water System Supervision program is also enforcing every other regulation, and enforcing them at hundreds of public water systems. If an expert working full time on the LCRR alone cannot make sense of the requirements, these cannot be enforced in a meaningful way in the context of other responsibilities. The LCRR will be far more efficient and will generate more protective health outcomes by merely reducing the lead action level and eliminating the complexity that was added to section 141.81.

141.81(c) allows a small or medium water system to stop treatment steps when the water system meets both action levels during two consecutive 6-month monitoring periods. Starting and stopping corrosion control treatment steps results in delayed corrosion control treatment and leaves consumers unknowingly at risk of lead exposure. Small and medium systems have had reduced corrosion control treatment protection compared to large systems since 1991. If a small or medium water system is triggered into the corrosion control treatment steps due to lead sampling results, the water system must be required to follow through on the corrosion control study. The only alternatives offered should be the Small Water System Compliance Flexibility options proposed in section 141.93. Ceasing corrosion

control studies and allowing small and medium systems to "re-optimize" treatment by getting under the trigger level for 2 monitoring periods without adding treatment does nothing to reduce the risk of lead exposure for at risk consumers. The impact on consumers is even higher when you consider that 10% of samples collected can have any level of lead (and any level of lead exposure) while a water system maintains compliance with these criteria.

The LCRR includes several improvements in 141.82, the description of corrosion control treatment requirements, that will improve the quality of corrosion control studies. Improvements that should be maintained in the final rule include:

- Eliminating the use of coupons in corrosion control studies,
- Designating more specific treatment options that must be investigated. The proposed revision specifies that orthophosphate must be studied, eliminating polyphosphate as a corrosion control option. However blended polyphosphates are still an option if they meet the required orthophosphate dose. Further revision is necessary, as discussed below.
- The concept of re-optimization is important as water quality characteristics and needs change over time. It might be helpful to add a definition of "re-optimization" in the list of definitions.
- Giving EPA the clear authority to review state treatment decisions and revise as appropriate.

Please consider the following suggestions to continue improving this section of the rule. The applicable requirements appear in several places in the rule so the specific sections are not noted:

- The LCRR proposal, like the original LCR, instructs small and medium sized water systems without corrosion control treatment to recommend one or more of the corrosion control treatments listed in paragraph (c)(1). The state may require a study or may require additional water quality parameter sampling. Given the lack of technical, managerial, and financial capacity at many small and medium systems, I recommend flipping the language here to place this responsibility of recommending corrosion control treatment on the state, which is more likely to have corrosion control experience and expertise. This change may result in more efficient recommendation and review processes.
- The best water quality decisions will be made when a corrosion control study is conducted by each individual water system. As currently written, the proposed rule will only result in a corrosion control study for large systems exceeding the lead trigger level or copper action level, and for small and medium systems exceeding the lead trigger level or copper action level if the state chooses to require it. Corrosion control is very specific to source water quality, treatment in place, treatment history, and the materials present in the distribution system. EPA should require all large systems, and should seriously consider requiring all small and medium water systems to complete a corrosion control study to identify optimal corrosion control treatment. Another option to provide better information for small and medium systems would be for EPA to conduct systematic corrosion control studies in typical representative source waters across the country that states could use to extrapolate to treatment recommendations for individual small and medium size systems.
- Small and medium systems can "re-optimize" and avoid corrosion control treatment just by getting under the trigger level for 2 monitoring periods without adding treatment. This does nothing to provide lead reduction for at risk consumers. If a small or medium water system

exceeds the lead action level, they should be taking real action to reduce risk of lead exposure through improved corrosion control treatment or filters that must be maintained as long as sources of lead continue to be present in service lines and household plumbing.

- As noted previously, the schedules in the proposal for CCT studies, installation of treatment, and monitoring for WQPs are based on both the trigger and action level. This structure is complicated and will result confusion during implementation. It will be more effective to just lower the action level and simplify the process.

Changes needed to corrosion control study requirements (the applicable requirements appear in several places in the rule so the specific sections are not noted):

- The final rule must be clear that water systems must analyze straight orthophosphate at doses of 1 and 3 mg/L and not polyphosphate blends. This appears to be in the intention of the rule, but as written, a water system could test these doses using a polyphosphate blend. Polyphosphate blends can be evaluated in addition to the straight orthophosphate if the water system chooses, but it should not be mandatory.
- For systems that use chlorine for secondary disinfection, the final rule should add evaluation of existing PbO_2 scale as a corrosion control option since PbO_2 can be highly effective for binding lead.[1] If modifications to existing treatment can bring lead levels below the action level even though they don't include addition of a "corrosion inhibitor," they should be evaluated alongside orthophosphate. For example, DBP pre-cursor removal that allows higher chlorine and higher pH to maintain PbO_2 scale while maintaining compliance with DBP MCLs should be considered a corrosion control option.
- Under the re-optimization study options, add a requirement for systems that currently use a polyphosphate or a polyphosphate blend to evaluate a scenario that drops the polyphosphate dose to 10% or less (i.e., 90% orthophosphate).
- 141.82(c)(1)(ii) and 141.82(c)(2)(ii) allow a water system to rely on analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configurations. The final rule must clarify that if a water system relies on such a study, it must meet the requirements of this revised section. For example, if relying upon a previous analysis, it must include evaluation of the currently mandated study options and cannot rely solely on coupon studies. The LCRR should prevent water systems from making new decisions based on old studies that do not meet the revised requirements.
- All corrosion control optimization and re-optimization studies in systems with lead service lines must evaluate corrosion control effectiveness using sequential samples that measure water collected from lead service lines, not just first liter samples as compliance samples are collected in the LCRR proposal. Effective corrosion control treatment for reducing lead release from lead service lines cannot be evaluated via first liter samples that do not represent corrosion of the lead service line. As demonstrated later in these comments, first liter samples are inadequate for measuring lead release and assessing corrosion control effectiveness in lead service lines. Any partial-system test must include sampling of the 1-10th liters out of the tap at lead service

[1] Giammar et al. (2010) Water Quality Effects on Dissolution Rates of Lead Corrosion Products. Water Research Foundation Project.

line locations. This requirement should be added to the final rule in all sections describing corrosion control study requirements.

- The role of water quality parameters (WQPs), both in the context of corrosion control studies and as part of ongoing monitoring, are to help ensure the effectiveness of corrosion control treatment. As such, mandatory WQPs that are measured as part of a study in 141.82 must include the water quality factors that affect release of lead and copper as listed in the EPA Optimal Corrosion Control Guidance Manual. To make this fundamental construct of the LCR effective, these WQPs must be part of mandatory sampling in a corrosion control study:
    - Dissolved inorganic carbon (DIC)
    - Hardness (calcium and magnesium)
    - Dissolved oxygen
    - Oxidation-reduction potential
    - Ammonia, chloride, and sulfate
    - Natural organic matter (NOM)
    - Iron, aluminum, and manganese.
- The WQPs monitored under 141.87 are not by themselves sufficient indicators or predictors of lead release – this is evidenced by a lack of correlation between WQP violations and lead action level exceedances.[2] This list of WQPs should also be updated to include the most relevant water quality factors that affect release of lead and copper from EPA's guidance manual. Data driven decision making will be possible when the relevant data are collected. Once the additional WQPs are added to the monitoring requirements of 141.87 it will be important to remove the provisions that allow a water system to go on reduced monitoring for WQPs, or not measure WQPs at all as in the case of some small and medium systems.[1] The LCR intends to use WQPs as an early warning of potential lead issues; reducing sampling frequency to every three years completely defeats this purpose. If both lead and copper compliance sampling AND WQP sampling are reduced to every 3 years, the water system has no information available to identify if a water quality change is resulting in unknown lead release in certain sections or throughout the distribution system. This means a child could be exposed to unidentified high lead concentrations for 3 entire years of the most important formative years of their life without any information to allow an intervention.
- The final rule should include a requirement to hold a public meeting to discuss treatment changes and make corrosion control studies and recommendations available for public review. All the materials of the LCR assert that management of lead is a shared responsibility due to lead containing materials inside customer homes. Consumers should have the ability to review such studies because they have impact on water quality within consumer homes. Consumers should at a minimum be able to verify that the water system completed their requirements per the LCR.
- It is important to note that lead exists in most of our plumbing, even brand new plumbing that meets the new definition of "lead-free" since 2014. The most effective corrosion control treatment to address galvanic corrosion can be different from the effective corrosion control treatment for reducing lead leaching from lead service lines. If the final LCRR includes a

[2] Kaplan, Robert A. Memorandum: Region 5's Experience in Implementation of the Lead and Copper Rule. December 29, 2017.

requirement to remove all the lead pipes and provide POU treatment at the highest risk homes, water systems can optimize corrosion control treatment to address household plumbing sources of lead and provide more health protection to all consumers because water systems will no longer have to design corrosion control treatment for lead service lines. In this way, the existence of lead service lines may have the unintended consequence of increasing the risk of lead exposure in homes that have other sources of lead in solder and brass fittings and fixtures but no lead service lines.

Find and Fix

The proposed Find and Fix provisions of the proposed LCRR in 141.82(j) essentially creates a localized corrosion control study using flawed WQPs to investigate individual samples over the lead action level. The study described will not identify the needed interventions in individual homes with high lead levels. This new requirement creates busy work for a water system that would be better invested in a system wide thorough corrosion control study. As an alternative to this proposal, please consider implementing a corrosion control study according to the requirements of 141.87 any time an individual sample is over the lead action level.

The Find-and-fix provisions do not provide any immediate risk reduction to consumers in the home with an individual sample over the lead action level. 141.87(j)(2) requires follow up sampling at any tap-sample site that exceeds the action level within 30 days of receiving the sample results, but it does not specify the sampling protocol to be used. Different sampling protocols provide different information, and these nuances are typically not shared with consumers in the home. Inappropriate sampling protocols are frequently used to make the appearance that the elevated lead level was a one-time limited occurrence. Unclear sampling requirements and varying sampling protocols can create scenarios in which consumers think they are not at risk of lead exposure and continue to drink water from a high-risk location. EPA should specify in the final LCRR that any investigatory sampling should be at least as representative of water as compliance sampling. Ideally investigatory follow-up sampling would collect additional data, including sequential one-liter samples representing water from the tap to the water main, and analysis for additional metals that can help identify the source of lead in the original sample.

The appropriate response to a compliance sample over the lead action level, which is not a level protective of public health, is immediate intervention including provision of POU devices and lead service line replacement. As such, the “find-and-fix” provisions of the final LCRR should be:

Step 1: Provide a POU device that is certified to NSF/ANSI standard 53 or 58 for lead reduction.

Step 2: Identify whether the property is served by a lead service line. If so, remove the lead service line.

Step 3: If a lead service line is not present, take additional sequential samples to identify the source of the lead and investigate lead levels in similar properties. Make all sampling data available to consumers and print in their bill and consumer confidence report how they can access the data.

Step 4: Complete a corrosion control study to identify optimized corrosion control treatment for the water system.

Requirements regarding source water and treatment changes

The one provision that could have prevented lead crises in Washington, DC; Flint, Michigan; Pittsburgh, PA; University Park, IL and countless other cities would have been a requirement to study any source water or treatment changes prior to implementation. This mandatory study would evaluate the impact of the changes on simultaneous compliance and corrosion control. Changes in source water and treatment are likely to increase as climate change affects the quality and quantity of our drinking water sources, and as more water systems look to consolidate operations to improve efficiencies and long-term sustainability as encouraged in the America's Water Infrastructure Act of 2018.

Comprehensive water quality studies are the only way to prevent lead in water crises before they happen. Such studies can also identify whether different overall treatment approaches might be more effective at controlling contaminants of concern rather than adding treatment to address one contaminant at a time. Depending on how EPA chooses to address this issue, requirements in 141.81(b)(3)(iii), 141.86(d)[3], and 141.90(a)(3) must be consistent with each other to solve this longstanding issue in the LCR. As it currently reads, the requirement of 141.90(a)(3) only applies to water systems on reduced monitoring because it refers to 141.86(d)(4), wherein the only reference to notifying the state is in the context of systems on reduced monitoring. 141.81(b)(3)(iii) limits applicability to water systems with optimized or re-optimized corrosion control. For clarity and simplicity, the LCRR should make one requirement to evaluate source water and treatment changes that applies to all water systems subject to the LCRR without exceptions. A new section in 141.86(d)(4) should be added, 141.81(b)(3)(iii) and 141.86(d)[4] should be deleted, and 141.90(a)(3) revised as follows:

141.86(d)(new)

Any water system subject to Subpart I shall notify the State in writing in accordance with § 141.90(a)(3) of any upcoming long-term change in treatment or addition of a new source as described in that section. The water system must evaluate the source water and or treatment change in consultation with the State and submit the evaluation study to the state. The State must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. This evaluation must include a new corrosion control study per 141.82(c) to evaluate the impact of the potential changes on corrosion control effectiveness and the water system must maintain optimal corrosion control treatment during the source water and/or treatment change. The study must also evaluate the impact on simultaneous compliance with all national primary drinking water regulations. The State may require the system to resume sampling in accordance with paragraph (d)(3) of this section and collect the number of samples specified for standard monitoring under paragraph (c) of this section.

141.90(a)(3): At a time specified by the State, or if no specific time is designated by the State, then as early as possible prior to the addition of a new source or any long-term change in water treatment, a water system shall submit written documentation to the State describing the change or addition

[3] Please note that the numbering in section 141.86(d) appears to be incorrect. The language on p. 61763 second column paragraph (iii) appears to be numbered either 141.86(d)(3)(iii) or 141.86(d)(4)(vi)(B)(3)(iii)

referred to in § 141.86(d)(4)(new). The State must consult with the water system in the preparation of a study evaluating the source water and/or treatment change, and review and approve the addition of a new source or long-term change in treatment before it is implemented by the water system. Examples of long-term treatment changes include the addition of a new treatment process or modification of an existing treatment process. Examples of modifications include adding ozone, switching secondary disinfectants, switching coagulants (e.g., alum to ferric chloride), and switching corrosion inhibitor products (e.g., orthophosphate to blended phosphate). Long-term changes can include dose changes to existing chemicals if the water system is planning long-term changes to its finished water pH or residual inhibitor concentration. Long-term treatment changes would not include chemical dose fluctuations associated with daily raw water quality changes.

Service Line Inventory Requirements

According to the preamble, there are between 6.1 and 9.3 million lead service lines serving homes and businesses across the country. It is critical for our water systems to finally have an accurate number of lead pipes so they can develop effective replacement plans. The inventory requirements of the LCRR are a strong step in the right direction. The final LCRR should require a comprehensive, *verified and complete* distribution system materials inventory where all service line materials are identified and there is a mandatory deadline for identifying all service lines of unknown material. EPA needs to set the floor for defining what constitutes a verified service line.

The definition of a lead service line is critical to the accuracy of the service line inventory requirement by the final LCRR. As noted above, the proposed definition of a lead service lines represents a decrease in public health protection and will result in many lead pigtails and goosenecks remaining in service with no clear requirements for removal. This is contrary to the requirement of the SDWA in section 1412(b)(9) that any revision of a national primary drinking water regulation "shall maintain, or provide for greater, protection of the health of persons." Our current sampling data do not represent the lead contribution from these shorter pipe segments since compliance sampling protocols do not include sequential samples. Therefore, the lead contribution from these pipes is not well known. It is critical for public health protection to categorize these lead components as lead service lines so they will be removed through lead service line replacement programs. The only way we are going to eliminate lead in drinking water is to eliminate the lead from contact with drinking water. The least expensive time to eliminate the lead is when any and all lead components of a service line are exposed and work is being completed on the line. It is a waste of resources to not define these components as lead service lines and require the removal of lead goosenecks, lead pigtails, and lead connectors.

The preamble correctly describes the long-lasting impacts of having no requirements for service line inventories. It is essential that the resulting inventory is a comprehensive inventory that identifies all service line materials, even non-lead materials. In addition to description in the preamble, inventories are an essential step to creating an effective and efficient lead service line replacement program.

"EPA recommends but does not require that water systems update the inventory as new information becomes available." Section 141.84(4) requires water systems to update their inventories annually as lead service lines are replaced and unknown service lines are verified. Water system resources,

regardless of service line material, will be used most efficiently if they update and maintain their infrastructure inventories as they go, rather than going back and filling in missing or old data at a later date. EPA should make the maintenance of an up-to-date service line inventory, including materials of all non-lead service lines, a mandatory requirement for all water systems. Incomplete service line inventories will result in increased expense to the water system at a later date and will reduce the efficiency of all asset management programs, which are strongly encouraged under the America's Water Infrastructure Act of 2018.

The preamble is not clear that the Michigan Distribution System Materials Inventory requires water systems to identify the materials of all service lines. The Michigan LCR requires all water supplies to have an inventory of all distribution system materials. The inventory must identify the material of every service line from the water main to 18" inside the house, whether made of lead, galvanized steel, copper, or plastic pipe. It is not sufficient to merely identify lead, non-lead, and unknown service lines. Otherwise we will be stuck doing this inventory all over again in the future when we realize there are issues with other material types. Given the easy access to electronic reporting in the field these days, there is no reason to not require ongoing maintenance of asset inventories.

The Preamble states that the rule will treat all unknown service lines as lead. This creates an incentive to accurately identify these service lines to reduce other implementation burden. It is proper to treat unknown service lines as lead service lines for the purpose of customer protection and water system planning. However, there are places in the proposed rule language where this intention was not carried through as reflected in detailed comments below. The LCRR should not create incentives for categorizing lead service lines as unknown service lines. There are several instances in the proposed rule where the language must be clarified to place ongoing inventory and public notification requirements on both water systems with lead service lines and water systems with unknown service lines. These include:

- 141.84(a)(5) Service lines categorized as unknown count as lead for LSLR.
- 141.84(a)(5)(iii) states that a lead categorized pipe later determined to be non-lead does not count toward replacements. I believe this creates an incentive to categorize suspected lead pipes as unknown pipes because an unknown will count for LSLR but an incorrectly identified LSL will not count for LSLR.
- 141.84 (a)(3)(ii) – as this requirement is written, the broad definition for unknown service lines creates an incentive for water systems to categorize non-lead services as unknown because this will allow them to get to 3% LSLR rate faster by just properly categorizing service lines in their inventory without actually replacing a single pipe.
- 141.85(e) (1) does not require annual notification of homes in systems with only service lines of unknown material.
- 141.85(e)(3) requires notice to consumers with lead service lines, but only customers with service lines of unknown materials.

The following changes are highly recommended for the inventory requirements:

- 141.84 (a)(2)(iii), add GIS and asset inventory to the list

- 141.84(a)(2)(iv) Any resource required by the state to assess service line materials for structures built prior to 1989
    - This requirement is unclear as written. If this means that the state can require a water system to use any specific information resource to populate their service line inventory, then this is a good requirement. However, this intent must be made clear in the rule language.
- 141.84 (a)(3) states that only the initial inventory must include all service lines regardless of ownership status.
    - Revise to: "The initial inventory and all inventory updates must include all service lines connected to the public water distribution system regardless of ownership status. Each service line ~~Service lines~~ shall be categorized in the following manner:
    - (i) each service line must have at least one record, and each service line may require up to 4 records identifying the material at the water main connection (gooseneck), public side of the curb box, private side of the curb box, and inside the building.
- 141.84 (a)(3)(ii) "Record all non-lead materials for the water system portion and customer portion ~~Non-lead~~ where both the water system portion and customer portion are non-lead"
    - For all asset management purposes it is critical for all water systems to maintain a current, complete inventory of all service line materials. We don't want to create any scenario where they will have to go through this effort again to identify non-lead portions.
- 141.84 (a)(4) specifies that inventories must be updated on an annual basis.
    - The LCRR must specify a date by which all unknown service lines must be identified by their actual material. A suggestion would be 5 years after the initial inventory is submitted. In addition, water systems with unknown service lines should submit a plan for identifying material of all service lines.
- 141.84(a)(5)(i)
    - If an unknown service line can be demonstrated to be non-lead via records and not physical examination, then it should never have been unknown in the first place. It looks like this provision belongs in number (3) above, defining how the initial inventory should be developed.
- 141.84(a)(5)(iii) a lead categorized pipe later determined to be non-lead does not count toward replacements.
    - This incentives categorization of lead pipes as unknown and would exclude them from the compliance sampling pool.
- 141.84(a)(6) The USEPA shall designate acceptable methods to determine the service line material of unknown lines.
    - The USEPA must set a national floor for the acceptable rigor of a service line inventory.
    - Likewise, in 141.84(b) the water system shall report basis of inventory. For Preliminary Distribution System Materials Inventories, Michigan required PWSs to describe the records they used to develop their initial estimates of lead, unknown, and non-lead service lines.[4] The rule requires PWSs to submit their verification methodology along

[4] https://www.michigan.gov/documents/deq/deq-dwmad-cws-tsu-Preliminary_DSMI_Reporting_Form_652501_7.pdf

with their Complete Distribution System Materials Inventory in a form and manner specified by the department. The Michigan Department of Environment, Great Lakes, and Energy has not yet released their guidance for this requirement, but in conversations they say that minimum verification recommendations will provided that vary based on the quality of paper records and consistency with field data. The materials inventory shall include all materials in the service lines, including the portion on private property, and PWSs must conduct a comprehensive update of its materials inventory every 5 years. EPA should take a similar approach, establishing a common verification baseline for service line inventory quality for all PWSs across the country. **Leaving determination of acceptable methods for service line verification up to states will result in extensive duplicative work and inconsistent public health protection from state to state.**

- 141.84(a)(7) All water systems ~~with lead service lines~~ must make its inventory publicly accessible. A notification that the inventory is available for review must be included in the annual Consumer Confidence Report and in customer billing statements.
    - The service line inventories required as part of the LCRR must be comprehensive service line inventories for all PWSs. Customers of PWSs with no LSLs must also have access to their PWS service line inventory so they can know the material of their own service line and see the documentation the PWS used to confirm that there are no LSLs in the entire distribution system.
- 141.84(a) (7) (i) The inventory must include a location identifier, such as a street, intersection, or landmark, served by each ~~lead~~ service line.
    - The inventory must be a comprehensive inventory
- 141.85(e) (1) All water systems with lead service lines or service lines of unknown material must provide notification to all consumers with a lead service line or a service line of unknown material informing them they have a lead service line or a service line of unknown material.
    - As written, this requirement would not apply to any water system that categorized all potential lead service lines as unknown service lines and must be revised to achieve the public health protection goal that all unknown service lines are treated as lead service lines until confirmed otherwise.
- 141.85(e)(3) (2) Consumers ~~Customers~~ with a service line of unknown material.
    - Section 141.85(e)(1) says that consumers get the notice for both LSLs and unknown lines. But (e)(3) states that only customers receive notice of a service line of unknown material. If unknown service lines are to be treated as lead service lines, all consumers in a building with an unknown service line should receive the mandatory notice of service line material.
- 141.85(e)(2)
    - The requirement that water systems notify residents of lead or unknown service lines within 30 days of submitting their initial inventory is appropriate and protective of public health.
    - EPA can also require written same day notification of a lead service line any time maintenance work is completed on a service line and lead material is confirmed.
- 141.85(e)(3) Content. (i) Consumers with a confirmed lead service line. The notice must include a statement that the consumer's service line is lead, an explanation of the health effects of lead, steps consumers can take to reduce exposure to lead in drinking water, information about opportunities to replace lead service lines and information about programs that provide

innovative financing solutions to assist consumers with replacement of their portion of a lead service line, and a statement that the water system is required to replace its portion of a lead service line when the consumer notifies them they are replacing their ~~owned~~ portion of the lead service line that runs under private property.

  - If the final LCRR requires all lead service lines to be replaced as recommended elsewhere in these comments, this language should be revised to reflect those new requirements. If the LSLR requirements are not strengthened in the final LCRR, this provision should add the following: "The notice must also explain that the water system is required to replace its portion of a lead service line when the consumer notifies them they are replacing the portion of the lead service line that runs under private property, and describe opportunities for replacing the lead service line at the time of verification if a lead service line is confirmed."
  - The consumer notice should facilitate the LSLR process for the customer so they do not have to come back again for lead service lines replacement if a lead line is confirmed.

- 141.85(e)(4) The notice must be provided to the property owner and all persons served by a lead service line or service line of unknown material, either by mail or by another method approved by the primacy agency.

Lead Service Line Replacement Requirements

Full (or complete) lead service line replacement reduces the risk of lead exposure by removing the largest source of lead affecting drinking water in homes and buildings. The LCRR needs to create a proactive mandate to replace all lead service lines that is not dependent on trigger level or lead action level exceedances. As such, 141.84(b) should establish requirements for all water systems with lead or unknown service lines. The core contents of the lead service line replacement programs must define the minimum requirements for a lead service line replacement program. These requirements, established at the federal level, will minimize implementation burden on both state primacy agencies and water systems. The LCRR should not require custom procedures, strategies, and goals for each water system or state. EPA should establish nationwide requirements for these programs, that could be based on the AWWA lead service line replacement standard, and would ensure a basic level of public health protection afforded to all customers, consistency across water systems, and the flexibility of individual water systems to add additional components to their programs.

The LSLR requirements of the final LCRR should be rewritten to accommodate the following provisions:

1. There must be a requirement to remove all lead service lines by a date certain regardless of lead levels measured in water. I suggest that all systems must replace all LSLs within 10 years. Systems with more than 50,000 LSLs can be granted an alternative schedule approved by the state. If we had started FLSLR with the 1991 LCR, we would be done by now.
2. Customer initiated LSLR should have public side replacement at the same time, not staggered (e.g., PLSLR) as allowed by proposed rule. If that's inconvenient for water systems, then PWS needs to establish the LSLR schedule, not private citizens.
3. The State should be able to accelerate the LSLR rate after a trigger or action level exceedance as they want to.

4. The 3% replacement rate triggered after a lead action level exceedance reduces protection provided by the LCR and is not sufficient for removing all the lead service lines.
5. Any PWS should not be able to stop LSLR once they start and regardless of whether future lead results are below the lead action level.
6. The LCRR proposal allows water systems to do no LSLR if they can convince residents to refuse replacement. This loophole must be removed from the final rule.

If this section of the rule is not completely overhauled in the final LCRR, the following corrections, clarifications, and recommendations are offered:

- 141.84(b) (i) All water systems with lead service lines in their distribution system shall, by [date], submit a lead service line replacement plan and lead service line inventory to the primacy agency described in paragraph (a) of this section. The lead service line replacement plan must include the following elements: (1) System wide schedule for replacing all LSLRs. (2) Communications plan to inform consumers of the FLSLR program and encourage cooperation. (3) Communication plan to inform consumers and other utilities of potential increases to lead levels in drinking water due to lead service line disturbances. (4) Procedures for coordinating the full lead service line replacement and delivering required consumer notices. (5) A funding strategy for conducting lead service line replacements. (6) A POU device training, tracking, and maintenance plan.
    - (ii) The state must approve the lead service line replacement plan within 6 months following submission of the lead service line replacement plan.
    - EPA and the state must define the core contents of the minimum lead service line replacement program and these requirements must be provided in the rule language. This will greatly reduce the implementation burden because water systems will not need to invent this on their own and states will receive consistent inventories that facilitate review. This requirement as written will result in inconsistent public health protection, wide variation across lead service line replacement programs, and significant oversight burden for primacy agencies as they develop custom plans with every water system.
    - 141.84(f)(8) refers to State approval of the lead service line replacement goal rate in 141.84(b) that is not specified in that section. These edits provide for EPA and the state setting a national lead service line replacement rate and mandatory state review and approval of all lead service line replacement plans. This will substantially reduce implementation burden on states and improve clarity and expectations for water systems. It will allow water systems to implement their lead service line replacement plans with the confidence of primacy agency approval.
- 141.84(c) provides a separate list of requirements for replacing lead goosenecks, pigtails, or connectors.
    - This complexity is unnecessary and adds to implementation burden for state primacy agencies and water systems. To simplify the rule, all lead goosenecks, pigtails, and connectors should be defined as lead service lines and be subject to service line inventory and replacement requirements throughout the LCRR.

- 141.84(d)(3) A water system must replace any portion of the lead service line it owns when it is notified that the customer will replace ~~has replaced~~ any ~~customer-owned~~ portion of the lead service line that runs under private property.
    - Item 4 below appears to apply when a customer has already replaced the lead service line, whereas (3) appears to describe the situation when the replacement is planned.
- 141.84(d)(4) When a water system is notified by the customer that he or she has replaced the ~~customer-owned~~ portion of the lead service line that runs under private property ~~and that replacement has occurred within the previous 3 months~~, the water system must replace its portion within 45 days from the day of their notification. The water system must provide notification and risk mitigation measures in accordance with (d)(1)(i)–(iv) of this section. ~~(5) When a water system is notified by the customer that he or she has replaced the customer-owned portion and the replacement has occurred more than three months in the past, the water system is not required to complete the lead service line replacement of the system-owned portion.~~
    - As written, customer-initiated lead service line replacement is the primary mechanism of lead service line replacement encouraged in the LCRR. If customer funded proactive lead service line replacement is the only default lead service line replacement in the revised rule, this should apply to all customer-initiated replacements and not just those completed within the last 3 months. Ideally, water systems will design this program so that the entire LSL can be replaced at the same time. As should be obvious, depending upon customers to initiate lead service line replacement will create a serious environmental injustice, whereby wealthier often white customers who can afford to initiate the process are at the front of the line for replacement, whereas lower-income families and renters will often never see their lead service lines fully replaced under the proposed rule. This is another reason it is critical that the final rule include a comprehensive requirement that all lead service lines be replaced by a date certain, we recommend within 10 years.
- 141.84(e) Requirements for conducting full lead service line replacement. (1) Any water system that conducts a full lead service line replacement (e.g., replace all portions of the lead service line ~~both the portion of a lead service line owned by the customer and by the water system~~) must provide notice to the owner of the property served by the lead service line, or the owner's authorized agent, as well as ~~non-owned~~ non-owner resident(s) served by the lead service line prior to turning the water back on in the house and within 24 hours of the replacement.
    - Not all water systems have divided ownership of service lines. It is not necessary to carry this assumption throughout the document. Also, a correction.
- 141.84(e)(i)….In instances where multi-family dwellings are served by the lead service line to be replaced, the water system shall contact each dwelling individually to notify them of the replacement. This information can be delivered at the same time as the filter as described in 141.84(e)(iii). In addition, the water system may elect to post the information at a conspicuous location. ~~may elect to post the information at a conspicuous location instead of providing individual notification to all residents.~~
    - The requirement as written in the proposal does not provide equal protection to residents of multiple family dwellings.
- ~~141.84(e)(iv) The water system must take a follow up tap sample between three months and six months after completion of any partial lead service line replacement.~~

- It appears this requirement does not belong in the section "Requirements for conducting full lead service line replacement." It is already provided in the previous section on partial lead service line replacement.

- 141.84(e)(iii) This provision should require provision of on-faucet filters certified for lead removal.
  - Experience in Newark showed that the majority of pitcher filters were not being used and maintained correctly. Only if an on-faucet filter cannot be properly installed and maintained should pitcher filters be provided.
- 141.84(f)(1) ~~Within six months following completion~~ At the same time a water system submits their ~~of the~~ initial inventory ~~invention~~, pursuant to paragraph (a) of this section…
  - 141.84(b) requires the goal to be set in the water system's LSLR plan, which is due the same date as the initial inventory. This requirement applies to all water systems with lead service lines, not just those serving over 10,000 persons. It is possible that this should read that the state must approve the goal rate within 6 months of the LSLR plan submission.
- 141.84(f)(5) The water system must provide notification regarding the lead service line replacement requirement to customers with lead service lines as required in 141.85(f).
  - Edited for clarification. Otherwise this appears to reference the LSL notification requirements of 141.84(e).
- ~~141.84(f)(6) Any water system that fails to meet its lead service line replacement goal must: (i) conduct public outreach activities pursuant to 141.85(g) until either the water system meets its replacement goal, or tap sampling shows the 90th percentile of lead is below the trigger level for two consecutive monitoring periods.~~
  - This provision declares that not meeting a lead service line replacement goal is approved compliance and it is a suitable compliance strategy for a water system to make no effort toward replacing lead service lines. The voluntary "mandatory" LSLR goal does not represent public health protection. It is all talk with no action.
- 141.84(f)(6)(ii) Recommence its goal-based lead service line replacement program pursuant to this paragraph if the 90th percentile lead value anytime thereafter exceeds the lead trigger level.
  - This provision should become item (f)(7). It should apply regardless of whether the water system previously failed to meet its lead service line replacement goal.
- 141.84(f)(7) The first year of lead service line replacement shall begin on the first day following the end of the monitoring period in which the lead trigger ~~action~~ level was exceeded.
  - This section is about exceeding the trigger level, not the action level. However, as recommended earlier, the trigger level should be removed from the final rule. The final rule must be reviewed for consistency and correctness depending on what the final requirements are determined to be.
- 141.84(f)(8) Pursuant to the procedures in § 142.19, the EPA Regional Administrator may review the lead service line replacement plan ~~goal rate determination made~~ approved by a State under paragraph § 141.84(b) of this section and issue a Federal goal-based lead service line replacement rate determination where the Regional Administrator finds that a higher goal-based lead service line replacement rate is feasible for a water system.
  - Refers to a replacement goal rate determination made by a state under paragraph 141.84(b) of this section. However, no such provision is presented there. These comments suggest that EPA set a national goal rate, and that the state must approve a water system's lead service line replacement plan that includes the EPA established replacement goal rate. The

state or the Regional Administrator should have the ability to require a faster replacement rate than established in the federal rule.

- 141.84(g) Water systems must annually replace three percent of the initial number of lead service lines ~~in the inventory, including~~ plus the number service lines of unknown material in the inventory of 141.84(a) at time of the action level exceedance.
    - As noted above, we urge that the rule be modified to require that 10 percent of all lead service lines be replaced per year, irrespective of whether the action level or trigger level is exceeded.
    - The provision's reduction of protection, cutting the current rule's requirement of replacing 7 percent of lead service lines to 3 percent, is a reduction public health protection that is contrary to the SDWA anti-backsliding provision in section 1412(b)(9). For example, a water system that exceeds the current action level for lead for 14 years would currently be required to replace all of its lead service lines under the existing rule, whereas under the proposal such a system would have more than 33 years to do so.
    - Assuming for the sake of argument that EPA will not be changing these underlying provisions, I noted that as written, the proposed requirement did not clearly include the requirement to treat unknown service lines as lead service lines as described in the preamble. This proposed edit clarifies the rule language.
- 141.84(g)(4) Water systems must conduct notification to customers with lead service lines as required in § 141.85~~(f)~~ (e)and (i).
    - Paragraph f refers to goal-based replacement after a lead trigger level exceedance and does not include language regarding mandatory lead service line replacement that is required after a lead action level exceedance. A new section, suggested here as (i) must be added to describe the notification requirements for mandatory lead service line replacement following a lead action level exceedance.
- 141.84(g)(6) A water system may cease mandatory lead service line replacement when its lead 90th percentile level, calculated under § 141.80(c)(4), is at or below the lead action level during each of four consecutive monitoring periods. If first draw tap samples collected in any such system hereafter exceed the lead action level, the system shall recommence mandatory lead service line replacement.
    - Assuming for now that the agency does not adopt a comprehensive replacement requirement for all lead service lines for all systems, I support this provision that requires water systems with any individual first draw tap sample that exceeds the lead action level to recommence mandatory lead service line replacement, rather than waiting for the 90th percentile of first draw tap samples to exceed the lead action level.
- ~~141.84(g)(7) The water system may cease mandatory lead service line replacement if it obtains refusal to conduct full lead service line replacement from every customer in its distribution area served by a lead service line on the customer's portion. If the water system exceeds the action level again, it must reach out to any customers served by a lead service line where there has been a change in residents with an offer to replace the customer-owned portion. The water system is not required to bear the cost of replacement of the customer-owned lead service line.~~ A water system is still subject to all full lead service line replacement requirements, even if customers are unable to bear the cost of replacement of the lead service line that runs under private property. The water

system must apply for grants, issue a bond, raise water rates, or find other third-party funding to pay for the cost of replacement of the lead service line that runs under private property.

  - This provision gives a water system the option to inflate the cost of lead service line replacement, convince all customers with lead service lines that the cost of lead service line replacement is unaffordable, get their agreement that they are not willing or are unable to pay for lead service line replacement, and avoid all lead service line replacement requirements. I note, for example, that systems have claimed LSLR costs of as much as $38,000 per service line in Michigan[5], an absurdly inflated cost estimate. This option should not be provided in the Lead and Copper Rule. It does not protect public health, and it makes access to safe drinking water dependent on individual's ability to pay for lead service line replacement.
  - In order to achieve primary prevention of exposure to lead in drinking water via removal of lead service lines, water systems must be required to secure funding to replace lead service lines for all customers.

- 141.84(g)(9) should reference monitoring described in paragraph g, not paragraph f.

Public Education 141.85

Beyond the health effects language, the LCRR proposal makes no modifications to the contents of public education, but many improvements are needed. The health effects of lead in 141.85(a)(1)(ii) should be revised as follows:

> Exposure to lead, even at low levels, can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems. Pregnant women have increased prenatal risk, and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy.

It is important to be clear that even low levels of lead have serious health effects. This detail is important when consumers see their public education and lead sampling results presented in the context of the 15 ppb action level that is not protective of public health.[6] Further, evidence of adult health effects from lead exposure is not limited to recent findings. The health effects information should not indicate that this is new.

Regarding the contents of Public Education (PE), please take a look at Michigan's revised public education requirements. The public education requirements leave many opportunities to be vague about the sources and risk of lead exposure. Below is a list of specific issues associated with the current public education requirements that were addressed in the Michigan rule:

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[5] See https://www.mlive.com/news/jackson/2020/02/demands-in-consumers-energy-lawsuit-with-city-are-an-absurdity-mayor-says.html

[6] Kaplan, Robert A. Memorandum: Region 5's Experience in Implementation of the Lead and Copper Rule. December 29, 2017.

- The LCR allows public education materials to be combined with other municipal communications. Frequently this means that the important information on a consumer's responsibility to protect themselves is buried in a standard publication and the average consumer would not know to seek out that information. The Michigan LCR requires PE materials to be printed in a standalone publication. Alternatively, if it is included in a community publication, the first page of the publication must include in highly visible print "[PWS] has exceeded the action level for lead in drinking water. See page [insert page] for important information about your drinking water."
- The current PE language is not clear at all that a water system has exceeded the action level. The average consumer is not presented with clear information. Michigan requires PE to now include "[PWS] has exceeded the action level for lead"
- 141.85(a)(1)(iii)(C) encourages the water system to discuss other important sources of lead exposure. This is confusing when the entire purpose of the PE is to explain to the consumer how to reduce their exposure to lead in water. Michigan has revised this to the following: "Although other sources of lead exposure exist, such as lead paint, and lead contaminated dust, [PWS] is contacting you to reduce your risk of exposure to lead in drinking water. If you have questions about other sources of lead exposure, please contact [health department].
- The PE must include a requirement to report the PWS's 90th percentile, the range of sample results, and the number of samples included in the 90th percentile calculation.
- 141.85(a)(1)(iii)(B) should clarify that lead service lines are the largest source of lead in drinking water when present, but lead solder, home/building plumbing, and fittings and fixtures may also contain lead.
- Most consumers do not realize that lead release in drinking water is highly variable and that a single low or non-detect sample does not mean there is no risk of lead exposure within a home. As in Michigan, the PE should "explain the unpredictability of lead release, the limits of 1-time tests, and the high lead content of some lead particulates."
- PE should be very clear about how to identify a filter that is certified to reduce lead.
- Due to many PWSs downplaying the significance of lead compliance sampling results, Michigan added a requirement that the PE "cannot state or imply that the identified risk is limited to a single property." Given the small number of compliance samples required under the LCR, this representative sampling is intended to represent potential lead exposure at all homes with similar risk factors.
- PE must be clear about how to identify "lead-free" plumbing fixtures. Most consumers do not understand the current definition of "lead-free" plumbing that allows up to 0.25% lead by weight in materials intended for drinking water use and any lead content for materials not intended for drinking water use.
- 141.86(i) requires a PWS to make all the results of tap water monitoring used to make the 90th percentile calculation available to the public. Public Education materials must instruct consumers on how to access that information.

As noted previously, the requirements for annual notification of homes with lead service lines or service lines of unknown material should be retained in the final rule. It is important to make the correction that all water systems must issue notification of unknown service lines, not just those that also have lead service lines.

The notification of exceedance of a lead trigger level and the related outreach activities for failure to meet the LSLR goal will generate additional work while giving a PWS a regulatory pathway to not comply

with the voluntary "mandatory" goal established after a lead trigger level exceedance. As stated previously, the entire construct of the trigger level should be removed from the final rule and the action level lowered instead.

- 141.85(g) Outreach activities for failure to meet the lead service line replacement goal. (1) In the first year that a water system that does not meet its annual lead service line replacement goal as required under § 141.84(f),
    - The activities listed under 141.85(g) are good ideas for outreach, but they are no equivalent of public health protection provided by actual lead service line replacement. Unfortunately, as written, the rule allows these activities as a substitute for meeting the lead service line replacement goals established in 141. 84(b). These outreach activities should be implemented as part of the proactive mandatory lead service line replacement program recommended in these comments.
- 141.85(h) Public education to local and State health agencies. (1) All water systems shall provide public education materials that meet the content requirements of paragraph (a)(1) of this section along with an informational notice that encourages distribution to all the organization's potentially affected customers or community water system's users.
    - This new section creates mandatory annual public education requirements for local and State health agencies. As such, this information must include context for what the local and State health agencies are expected to do with the information.

Sampling 141.86

The composition of a lead service line affects the quantity of lead measured in compliance samples. Even though all of the following should be defined as lead service lines in the final rule for purposes of lead service line replacement, tier 1 sample sites should rank LSLs in the following priority order:

1. full lead service lines,
2. partial lead service lines,
3. lead goosenecks or pigtails
4. galvanized steel service lines

The final LCRR will provide much more reliable sampling at high risk sites if EPA establishes minimum requirements for service line inventory quality as requested earlier in these comments. If 141.86(a)(2) allows a PWS to identify service line material based on inspection inside the building as proposed, this means that the section of pipe is in fact part of the service line. It must be included in the definition of a service line and it must be removed during a full lead service line replacement. The LCRR clarifies that a service line of unknown material cannot be used as a tier 1 sampling site. Likewise, the LCRR should include a requirement that the PWS must identify the material of enough unknown service lines to identify the minimum number of tier 1 sample sites by the date the new compliance monitoring requirements become effective, even if this means they must identify the material of all unknown

service lines. 141.86(a)(10) should be clarified such that a PWS cannot sample at tier 3 or tier 4 sites if they have unknown service lines.

The complications presented by the lead action level and lead trigger level make the sampling provisions extremely hard to follow. The final LCRR should include only the action level, which will simplify this section of the rule. However, the final LCRR should not allow monitoring less frequently than annually. The ability to reduce sampling to every third year means that unidentified lead issues could continue for 3 years before being recognized, allowing a 3-year cohort of babies to be exposed to lead during their most critical development. Only water systems with no lead service lines and optimal corrosion control should be eligible for reduced sampling.

141.86(h) instructs a PWS to collect follow-up samples at any site that exceeds the action level within 30 days of receiving sample results. They can use any sample volume or collection procedure. This instruction will generate confusing and misleading data, and it includes no requirements for explaining the significance of sample collection procedures to the consumer when they receive their sample results. This provision should be removed from the final LCRR.

141.86(i) Requires public availability of all data in 90th percentile calculation. This provision should be retained in the final rule, but should require all sampling results to be public, and the PWS must notify the public that the data are available. This should be accomplished through customer bills, consumer notice of lead results, and annual consumer confidence reports.

Lead Service Line Samples

EPA requests comments on whether water systems with lead service lines should be required to collect tap samples that are representative of water that was in contact with lead service lines during the 6-hour stagnation period.

The EPA LCR and the proposed LCRR requires water systems to collect the first liter of water from the tap; this first liter typically does not include water from the lead service line, which is the largest source of lead in contact with drinking water. The first liter sample can potentially show the risk of lead release from internal plumbing, but it does not capture the highest risk water in a building with a lead service line. As is made clear by the attached memorandum from EPA Region 5 to the Office of Water, the first draw water consistently contains the lowest level of lead compared to subsequent samples when a home has a lead service line. The fact that the first liter sample is consistently lower than lead service line samples creates a false sense of assurance about water quality within a home. This first liter sample result is the only information we give consumers about lead levels in their home, and the results are never accompanied with an explanation that this result does not include water from the lead service line. I have seen time and time again consumers get non-detect results for lead in their first liter samples. The water systems and the consumers are convinced that there is minimal risk of lead exposure in their water. They assume that the infrequent high lead result in a particular home is the outlier, when in fact that high result may actually be the hint that they need that elevated lead might be measured in later lead service line samples. Entire communities rely on first liter data to reassure themselves that they “are not Flint” and they do not have a problem with lead in their water, when the

actual compliance results are quite similar to first liter compliance results from Flint, Michigan.[7] When the majority of first liter samples have low or nondetectable results, there is little incentive for additional customers to get their water tested.

As that memo recommends, EPA must revise the LCR to require that samples be taken from the lead service line. I recommend a 5th liter draw and possibly a 10th liter draw, in addition to first draw, with action triggered by the highest sample result, as discussed below.

Further, the LCR uses the 90th percentile of lead results to measure compliance with the lead action level. This allows 10% of samples collected to contain any level of lead imaginable, and the PWS has had no responsibility to address those high lead levels under the current LCR.[8] In Flint, individual samples originally considered to be "outliers" turned out to be indicators of system wide contamination.[9] The 90th percentile measure continues to screen out these outliers, and we see outliers screened from study after study as if they are not relevant to typical lead exposure within a distribution system.[10,11] However, sequential samples paint a more informative picture of the actual lead levels that occur in homes with lead service lines and the effectiveness of corrosion control for managing lead release. It turns out that these "outliers" are frequently indicators of higher lead levels that might be found more frequently if we sampled the water in lead service lines.

The Michigan LCR now requires water systems with lead service lines to collect the fifth liter out of the tap in addition to the first liter required by the EPA LCR. This sample is more likely to capture a portion of the water from the lead service line leading up to the home. The fifth liter better measures the potential range of exposure to lead in water in lead service line homes and better represents the effectiveness of corrosion control treatment for addressing multiple lead sources in plumbing. Only water systems that exceed the lead action level are triggered into a corrosion control study that will reduce the risk of lead exposure as customers wait for their lead service lines to be replaced. When the sampling protocol does not measure the highest risk water, the systems that need improved corrosion control to better protect their consumers are not aware of the higher lead levels and never have the opportunity to be triggered into taking protective actions. Experience in Michigan has demonstrated that collecting the first- and fifth-liter samples is practical and implementable. The final LCRR must include a requirement for water systems with lead service lines to collect samples from the higher risk water in lead service lines.

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[7] See https://www.detroitnews.com/story/news/local/michigan/2019/11/17/stricter-rules-confirmation-lead-water-metro-detroit-communities/2450044001/

[8] Kaplan, Robert A. Memorandum: Region 5's Experience in Implementation of the Lead and Copper Rule. December 29, 2017.

[9] Kelsey J. Pieper, Rebekah Martin, Min Tang, LeeAnne Walters, Jeffrey Parks, Siddhartha Roy, Christina Devine, and Marc A. Edwards. Evaluating Water Lead Levels During the Flint Water Crisis. Environmental Science & Technology 2018 52 (15), 8124-8132 DOI: 10.1021/acs.est.8b00791

[10] Batterman, Stuart A, Steven McGinnis, Angela DeDolph, and Elizabeth Richter. 2019. "Evaluation of Changes in Lead Levels in Drinking Water Due to Replacement of Water Mains: A Comprehensive Study in Chicago, Illinois." Environmental Science & Technology, acs.est.9b02590. https://doi.org/10.1021/acs.est.9b02590.

[11] Lewis, Carrie M. et al. 2017. "Lead Water Service Lines: Extensive Sampling and Field Protocol Protect Public Health," Journal American Water Works Association. January: 109:1 p. 34–41.

For a variety of reasons 5th liter sampling is logistically more implementable than collecting water from later samples (e.g., liters 6-10). Collecting additional samples requires additional sampling bottles for collecting water without interrupting the flow of water. Collecting the first- and fifth-liter sample requires the use of 3-5 sample bottles, two 1-L bottles for the first and fifth samples, and either one 3 L container or three additional 1-L bottles to be able to identify the fifth liter. It's easy to explain the 1st and 5th liter sampling collection procedure to residents with one hand – you raise your fingers to demonstrate that you have 5 bottles, keep the thumb and the pinky, and discard the three samples in the middle. The more liters you collect, the harder it is to keep track of the samples to be maintained for analysis. If you use a single container to measure the volume leading up to the service line sample, the larger the volume, the more difficult it will be for the average resident to fill, lift, and exchange the sample bottle to fill the target volume. Use of a one-gallon container (3.79 L) would be the maximum volume EPA should expect an average resident to lift while fulfilling compliance sampling procedures.

Analysis of sequential sampling data collected in a variety of cities (Chicago, IL; Milwaukee, WI; Flint, MI) demonstrates that there is no standard liter that consistently contains the peak of lead service line concentrations. It will be necessary to strike a balance between capturing lead from the lead service line and keeping the sampling procedure manageable for those who collect samples. Because the LCR requires a minimum of 6 hours of no water use prior to sampling, early morning is a popular time for sample collection. Many, if not most, PWSs rely on customers to collect LCR compliance samples due to inconvenient sampling times. These recommendations for keeping sample collection procedures reasonable for the average citizen are provided with this consideration in mind.

The following analysis shows that adding a fifth liter sample to the LCR compliance sampling procedure will better represent the contribution of lead from the lead service line and better represent the effectiveness of corrosion control for managing lead release from lead service lines. While it does not always represent peak lead, it will be a significant improvement over the first liter sample. Sequential sampling data show that the first liter sample is consistently not representative of the high lead levels measured from lead service lines. This is confirmed by the data presented in the above-referenced EPA Region 5 memo and additional data to follow. The sampling protocol in the LCRR proposal does not measure the water that is most likely to exceed the action level of 15 ppb due to inadequate corrosion control treatment, and therefore the LCRR proposal is ineffective for triggering additional action at water systems with the greatest risk of lead exposure. **As written, the proposed LCRR will not sample the highest risk water, therefore it will not reduce lead exposure in the water systems and homes that need it most. This should be resolved in the final LCRR.**

In 2019, the Michigan LCR required PWSs with lead service lines to collect the 1st and 5th liter samples out of the tap to calculate the 90th percentile lead level. There were 134 PWSs that reported 1st and 5th liter data as of January 2020; of these, 6 exceeded the lead action level based on first liter samples alone (4%) but 18 exceeded the lead action level when the highest of the 1st or 5th liter sample at a given sampling location was used for the 90th percentile calculation (13%). We can contrast the data from PWSs with lead service lines to data collected at PWSs with no lead service lines. In 2019, 500 PWSs collected first liter only data and only 8 of these, or 2% had lead action level exceedances. While the systems with lead service lines already had twice the rate of lead action level exceedances, it turns out that far more of the water systems with lead service lines are leaching lead at levels above the lead action level, indicating that corrosion control treatment is not optimized for reducing lead exposure.

Figure 1 shows 90th percentile data from Michigan water supplies that collected 1st and 5th liter sample data during compliance sampling in 2019 that meet or exceed EPA's proposed trigger level of 10 ppb for lead. During this compliance period, 134 PWSs collected 1st and 5th liter samples. If these systems had only collected 1st liter samples, only 10 would have exceeded the lead trigger level of 10 ppb, or 7%. When both the first- and fifth-liter samples were considered, 25% (34 of 134) of PWSs with lead service lines had lead trigger level exceedances. Table 1 summarizes this data and adds the impact of reducing the lead action level to 5 ppb.

Figure 1: Michigan 2019 LCR Compliance Data 90th percentiles

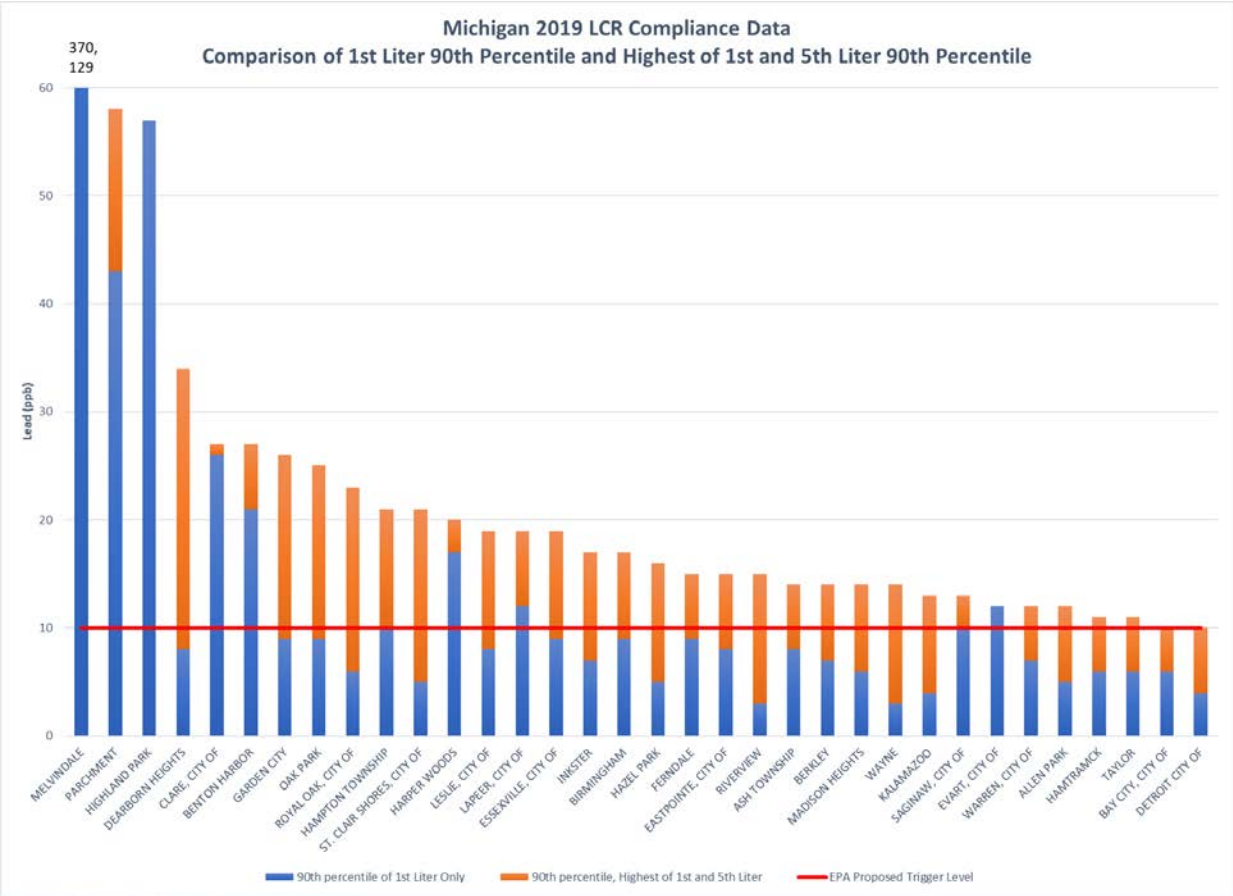


Table 1: The Number and Percentage of Michigan PWSs With Lead Service Lines Exceeding Lead Benchmarks based on 1st liter sampling alone and the highest of 1st and 5th liter sampling results using 2019 compliance sampling data.

	PWSs Exceeding level based on 1st liter samples	PWSs exceeding level based on highest of 1st and 5th liter samples
90th percentile > 15 ppb	6 (4%)	18 (13%)
90th percentile >= 10 ppb	10 (7%)	34 (25%)
90th percentile >= 5 ppb	45 (34%)	69 (51%)

A preliminary review of the Michigan sampling results shows that the 2019 data likely underrepresent the actual number of lead action level exceedances in PWSs with lead service lines for four reasons:

1. Distribution system inventories were not complete prior to 2019 sampling,
2. The impact of 5th liter samples was diluted by sample sites where first liter only samples were collected,
3. PWSs submitted 1st and 5th liter sample data at sites that were not verified to have lead service lines, and
4. The actual composition of the sampled lead service lines is unreported and may not represent a full lead service line.

Michigan PWSs were required to complete a preliminary distribution system inventory and updated compliance sampling pool by January 1, 2020, a few months after the compliance samples were due. It is possible that the systems that submitted compliance data by September 30 did not verify lead service lines in their sampling pool, and therefore may have collected samples at non-lead service line sites. The wide-ranging number of first liter only samples collected at lead service line systems indicates that a lack of confirmed lead service line locations may be a major factor diluting many sampling pools. Of the 134 water systems that used the lead service line sampling protocol, 42 PWSs (31%) collected 4 or more first liter only samples. Of these systems, first liter only samples represented 18-97% of the sites where their compliance samples were collected.

It is notable that sampling pools at 10 of the 34 water systems meeting or exceeding the lead trigger level were diluted by sites where only first liter samples were collected. Even though lower risk sites were included in the sampling pool, the fifth liter results were still sufficient to drive the 90th percentile to 10 ppb or greater.

A preliminary review of system specific data demonstrates that in some cases 1st and 5th liter sample data were collected at sites without confirmed lead service lines. For example, one community collected 1st and 5th liter data at the required 30 sampling sites. However, their distribution system materials inventory states that they have only 16 known lead service lines. Their samples were non-detect for lead at 20 sampling sites. The EPA R5 memo also highlights this problem of compliance sampling pools being

diluted by the inclusion of homes without lead service lines and the impact it makes in the relatively small sampling set required by the LCR.[12]

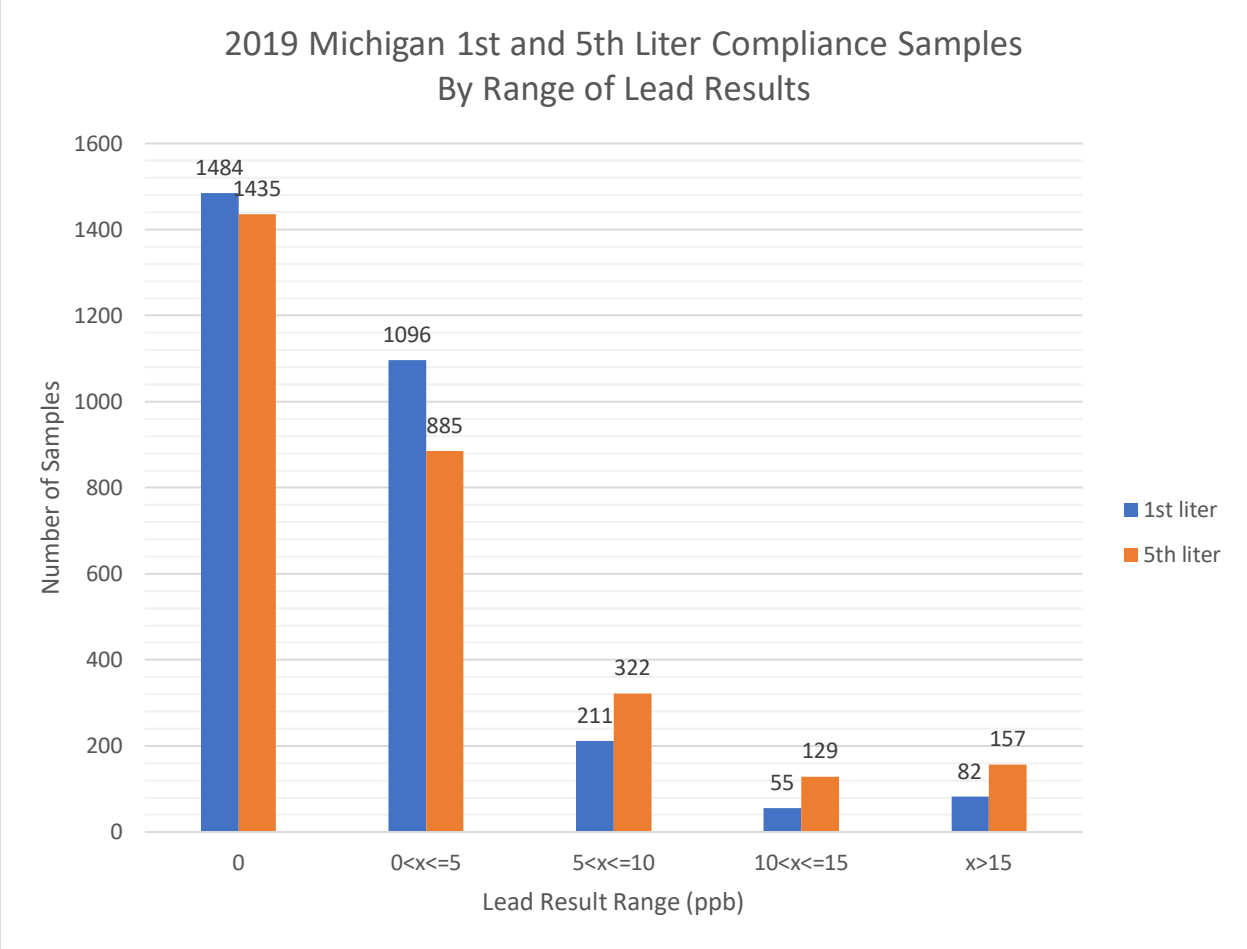
It is also important to note that the composition of the lead service lines was not reported. We do not know if samples were collected at homes with full lead service lines, partial lead service lines, or at sites with lead goosenecks or pigtails. Fifth liter sample results will vary greatly depending on the type of lead service line sampled. Once Michigan PWSs begin sampling using their updated sampling pools in 2020 there may be a higher number of water systems exceeding the lead action level.

On a national scale, once PWSs use comprehensive verified service line inventories to select the LCR sampling pool, collecting fifth liter samples is likely to identify an even larger percentage of PWSs where corrosion control is not reducing lead levels as much as current compliance sampling indicates. This in turn means that current exposure to lead in water is likely much higher than estimated under current compliance sampling procedures.

Figure 2 shows counts of first and fifth liter samples from 2,928 sample sites in Michigan PWSs where paired 1st and 5th liter samples were collected in 2019, presented by ranges of lead results. These results show that lead results at 5 ppb and less were more frequently measured in first liter samples. Fifth liter sample results were greater than 15 ppb and 10 ppb at twice as many sites as first liter samples. While 2.8% of 1st liter samples measured lead above the action level, the 5th liter samples above the lead action level were nearly double at 5.4%. Again, **the data indicate that if corrosion control is not working to reduce lead levels, it is more likely to be identified in the 5th liter sample than the 1st liter sample of the LCRR proposal.**

[12] Kaplan, Robert A. Memorandum: Region 5's Experience in Implementation of the Lead and Copper Rule. December 29, 2017.

Figure 2: 2019 Michigan 1st and 5th Liter Compliance Samples by Range of Lead Results



Once the LCRR is revised to require the collection of lead service line samples, the 90th percentile calculation should be revised to use the higher value of the 1st or the 5th sample to calculate the 90th percentile. This approach is reflected in the Michigan data analysis presented here.

If the final LCRR requires only first liter compliance samples, only a small fraction of PWSs with high lead levels will be identified and triggered into the more protective provisions of the rule. This phenomenon is not limited just to Flint or just to Michigan. Data collected in Chicago[13] and Milwaukee[14] also follow the same trends. Summary data presented in Lewis et al., 2017, show that in a variety of conditions liters 2-12 are more likely to exceed 15 ppb than the first liter samples.

The attached memo from EPA Region 5 includes analysis of Chicago data collected in 2011 that highlights several inadequacies of LCR compliance sampling procedures and interpretation within the

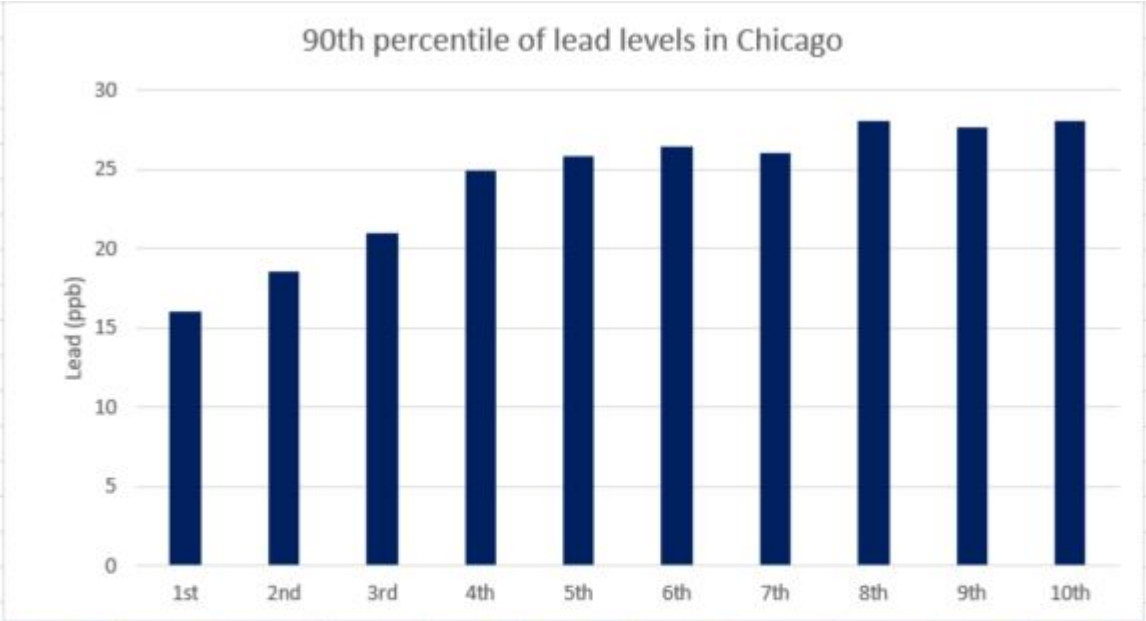
[13] Del Toral MA, Porter A, Schock MR. Detection and evaluation of elevated lead release from service lines: a field study. *Environ Sci Technol* . 2013;47(16):9300–9307pmid:23879429

[14] Lewis, Carrie M. et al. 2017. "Lead Water Service Lines: Extensive Sampling and Field Protocol Protect Public Health," Journal American Water Works Association. January: 109:1 p. 34–41.

rule. Since then, Chicago embarked on an extensive lead sampling initiative, collecting lead samples at customer request, then following up by collecting 10 liters of sequential samples where initial samples exceeded 15 ppb.[15] The customer requested data set illustrates that Chicago's compliance sampling does not represent the highest risk sampling sites nor the highest risk water.

Chicago's 2018 Consumer Confidence Report states that the lead 90th percentile was 9.1 ppb and no samples (first liter compliance samples) were over the lead action level of 15 ppb.[16] However, the Chicago customer sampling dataset for the same time period shows there are several first liter samples over 15 ppb and the 90th percentile for the first liter samples is 19 ppb. Further, the 90th percentile values for liters 2-10 only increase as shown in Figure 3. It is further notable that these samples were collected at high risk sites – the sequential samples were collected after an initial sample measured over 15 ppb - yet 90% of the first liter samples on the retest date were 19 ppb or lower. This analysis further demonstrates the importance of sampling at high risk sites and collecting samples beyond the first liter to accurately measure the extent of lead corrosion in lead service lines.

Figure 3: Chicago Customer Requested Drinking Water Sample Results by Liter



year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
2019	13.5	18	18.9	24.1	22.2	24.4	24.4	26.8	26.2	27.8
2018	19.2	16.4	23.4	24.1	28.5	27.5	26.6	28.3	27.6	25.2
2017	16.8	20.4	29.5	35.9	36.5	35.1	34.5	34.4	32.5	29.5
2016	15.5	18.1	20.7	21	21.8	24.4	23.6	25.8	26.9	26

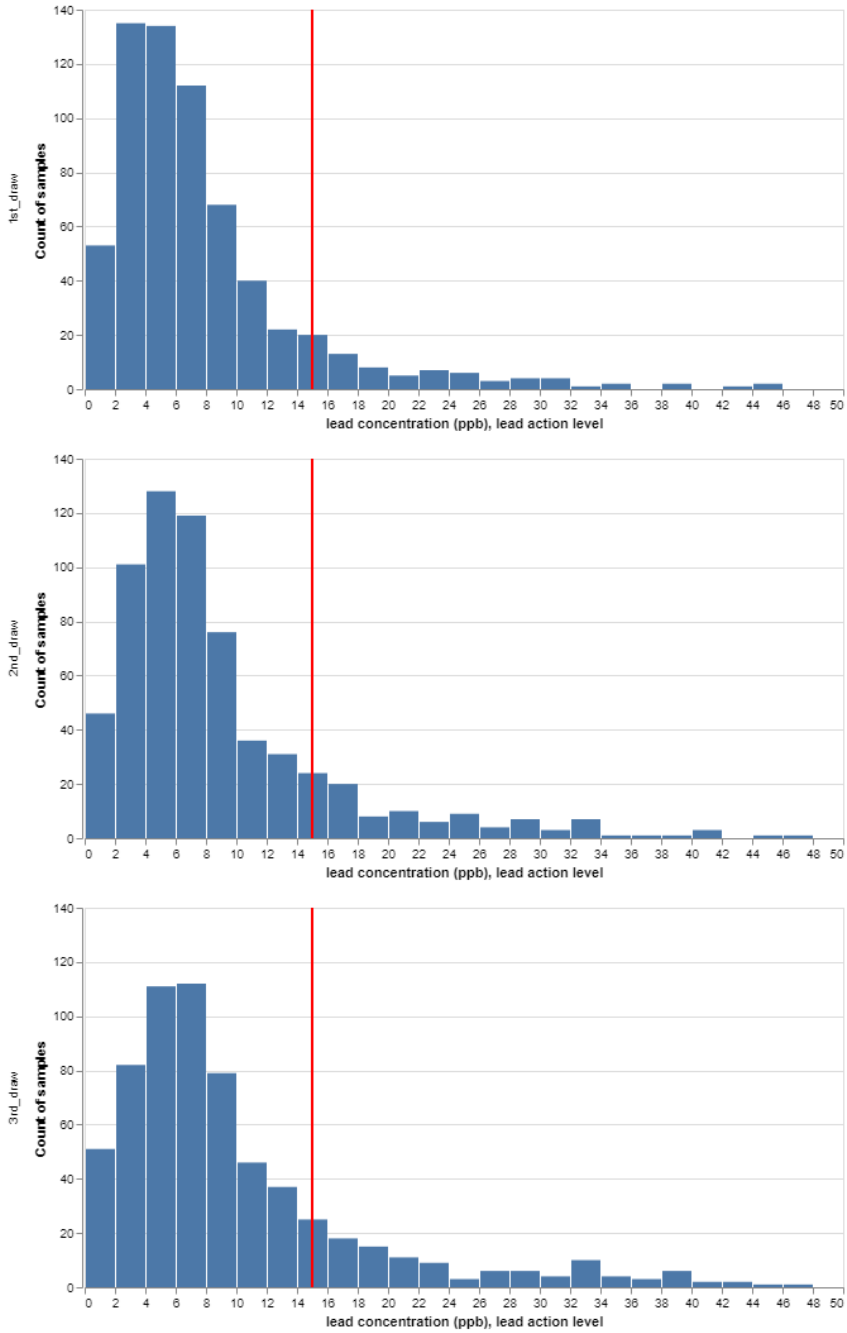
As one looks at the distribution of sample results look at each sequential liter, the entire distribution of lead results moves towards higher values. In other words, the increase in 90th percentile values is not just a matter of increasing results at the highest risk sites, the sample results at all sites increase with

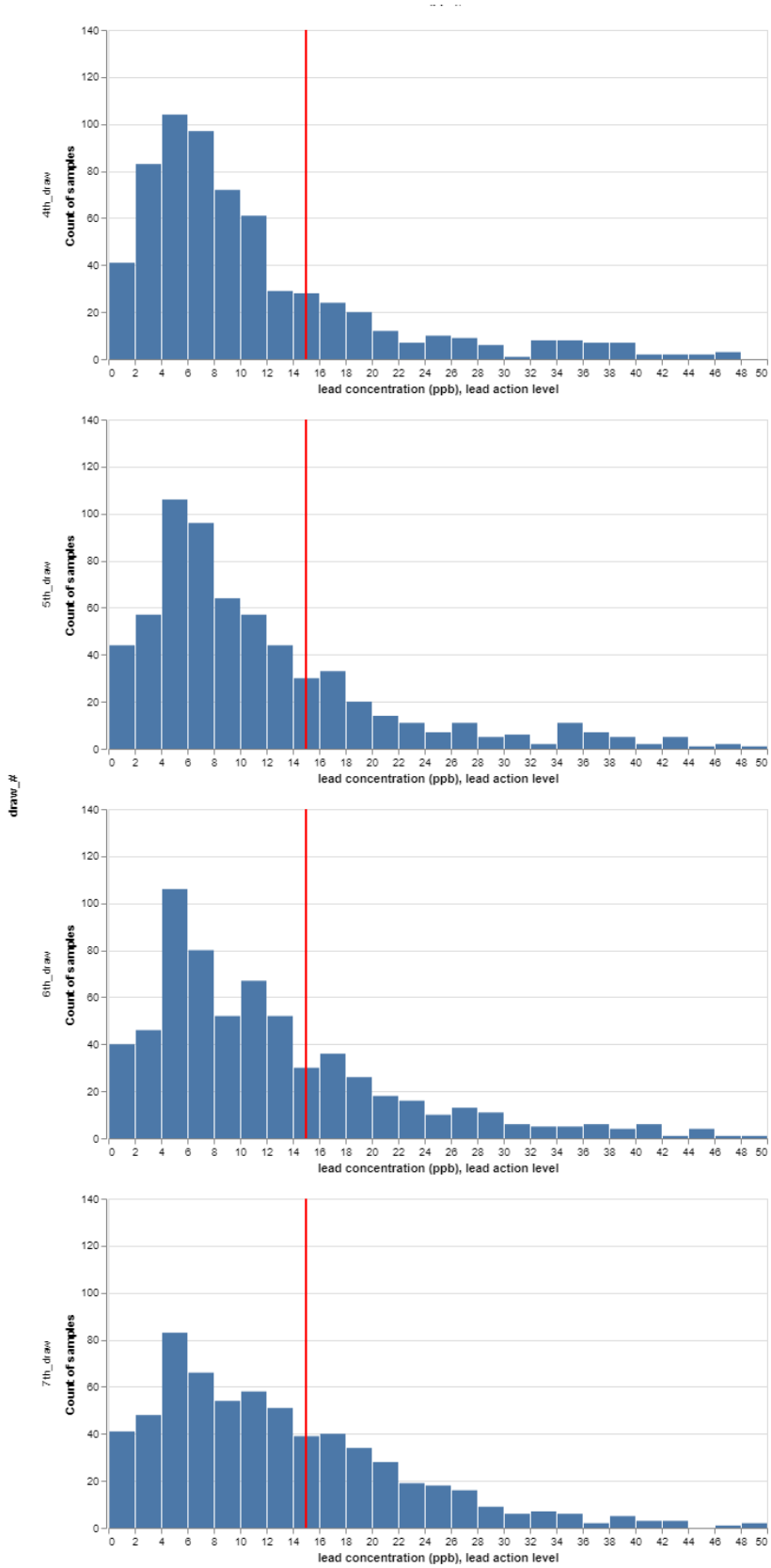
[15] http://www.chicagowaterquality.org/home

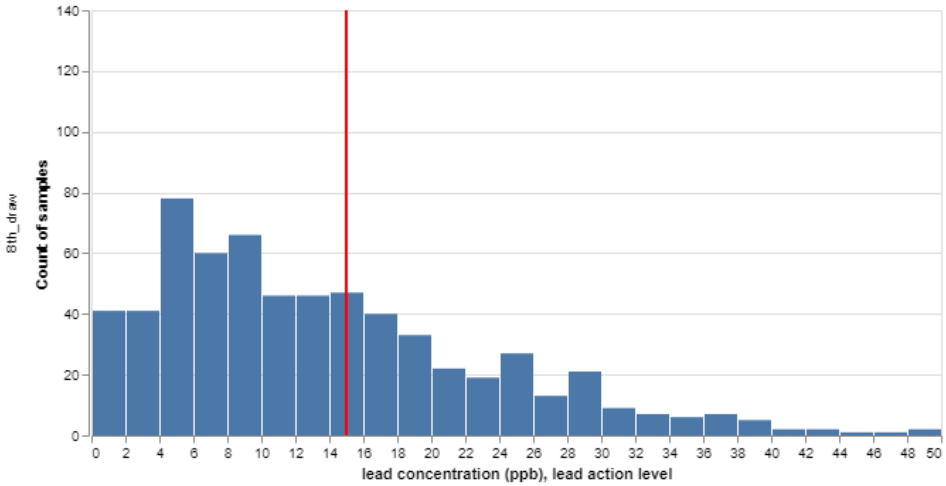
[16] https://www.chicago.gov/content/dam/city/depts/water/ConsumerConfidenceReports/ChicagoWaterQuality2018.PDF

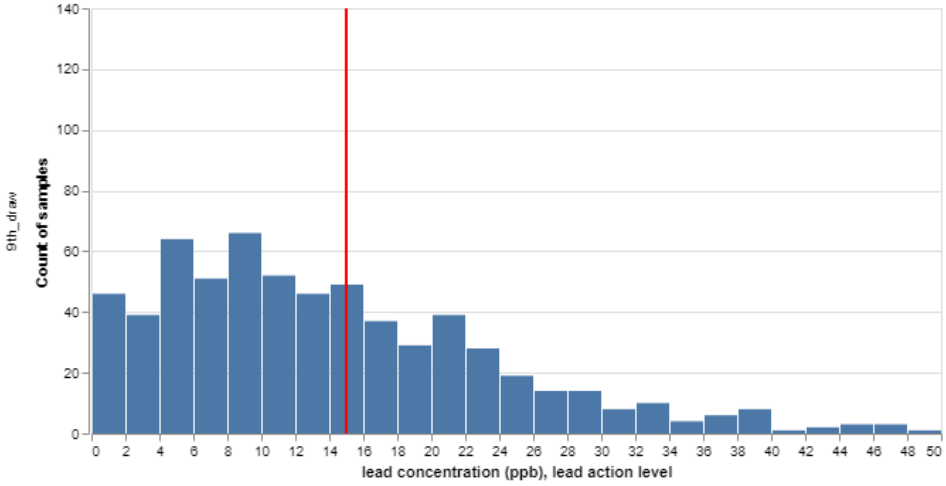
each sequential liter. This phenomenon can be seen in the attached “Chicago_lead_sample_count.gif” file and following Figure 4. This data analysis only includes samples between 0 and 50 ppb.

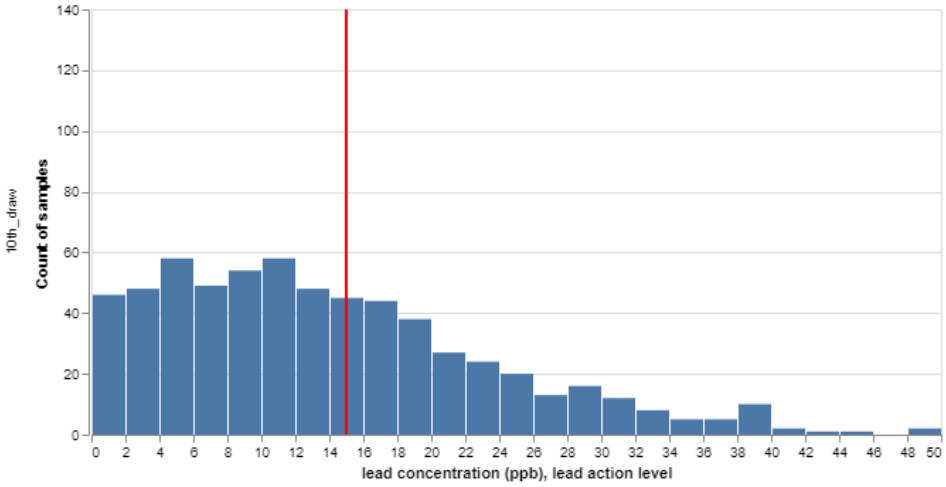
Figure 4: Number of Chicago Customer Requested Sequential Samples with a Given Lead Concentration in Sequential Sampling Liters




draw_#
4th_draw
5th_draw
6th_draw
7th_draw
Count of samples
lead concentration (ppb), lead action level


8th_draw
Count of samples
lead concentration (ppb), lead action level


9th_draw
Count of samples
lead concentration (ppb), lead action level


10th_draw
Count of samples
lead concentration (ppb), lead action level

This dataset further illustrates that the first liter sample consistently has the lowest lead concentration of all sequential samples, and the first liter sample is not a reliable indicator of the higher lead levels in water collected from the lead service line. Samples taken from the lead service line in Chicago show that, although compliance samples indicate the water meets the criteria of the current LCR, corrosion control treatment in Chicago is not effective in reducing lead below the current lead action level of 15 ppb.

This analysis of data collected through sequential sampling studies in Chicago, IL; Michigan, and Milwaukee, WI demonstrates that lead samples collected according to the LCR and proposed LCRR sampling protocol are not achieving their purpose of identifying high lead in the water and correcting it via corrosion control.

Source Water Monitoring Requirements for Lead and Copper

141.88 In the final LCRR should require a PWS to publish their most recent source water monitoring data for lead with the rest of the lead data they must provide to the public. Water systems frequently state that lead is not found in their source water but they do not make this data available to the public. It should be noted that the "source water samples" required in the LCR are post-treatment entry point samples. In a related note, the ability of state to determine a "maximum permissible source water level" is difficult to reconcile with the rest of the LCR that claims that lead in water comes only from pipe, solder, fittings, and fixtures. Lead should be non-detectable at the entry point to the distribution system.

The waiver for source water sampling is inappropriate when the data is not available to the public, and this proposed provision should be removed from the final LCRR.

Reporting Requirements

- 141.90(1)(a)(ix) A copy of tap sampling protocol provided to residents or those sampling, to verify that pre-stagnation flushing, aerator cleaning or removal and the use of narrow-necked collection bottles were not included as recommendations.
    - This is a good and needed addition, allowing water systems to demonstrate compliance and states to verify water system sampling practices.
- 141.90 (e) Lead service line inventory and replacement reporting requirements. Water systems shall report the following information to the State to demonstrate compliance with the requirements of § 141.84: (1) No later than 12 months after the end of a monitoring period in which a water system exceeds the lead action level in sampling referred to in § 141.84(~~f~~g), the water system must submit written documentation to the State of the service line inventory ~~material evaluation~~ conducted as required in § 141.84(a), identify the initial number of lead service lines and service lines of unknown material in its distribution system at the time the water system exceeds the lead action level, and provide the water system's schedule for annually replacing at least 3 percent of the initial number of lead service lines in its distribution system.

- 141.90(e) should begin with the basic inventory and lead service line replacement reporting requirements that currently appear as 141.90(e)(5) and later. The order of the requirements as written are confusing.
- This section should refer to 141.84(g) regarding lead action level exceedances. It should be noted that the water system was already required to submit the inventory on the compliance date of the rule and update it annually, so the state would already have that required information. The water system should already have a violation if it has not complied with the annual reporting requirement. The only new piece of information a water system would need to submit in case of a lead action level exceedance would be the schedule for replacing at least 3 percent of the initial number of lead and unknown service lines in its distribution system.

- 141.90(e)(2) No later than 12 months after the end of a monitoring period in which a water system exceeds the lead action level in sampling referred to in § 141.84(~~f~~ g), and every 12 months thereafter, the water system shall certify to the State in writing that the water system has: (i) Replaced in the previous 12 months at least 3 percent of the initial lead service lines (or a greater number of lines specified by the State under § 141.84~~(f)(10)~~ (g)(9)) in its distribution system,

- 141.90(e)(5) No later than the compliance date of the rule, the water system must submit to the State an inventory of ~~lead~~ service lines as required in § 141.84(a), and every 12 months thereafter, any water system that has lead or unknown service lines must submit to the State an updated inventory that includes the number of lead service lines remaining in the distribution system as required in § 141.84(a).
  - As stated in the preamble and elsewhere, unknown service lines are to be treated as lead service lines. As such, any water system with unknown service lines must continue providing annual updates of its inventory until the material of all service lines are identified.
  - The rule language is not clear about what should be submitted that constitutes an "inventory." Add new (i) as follows "The inventory submission shall include the composition (full, partial public, partial private, etc.) and number of service lines of each material type, and a description of the records and validation techniques used to populate the inventory. A comprehensive inventory with at least one record for every service connection shall be maintained at the water system for review during the next sanitary survey."
- 141.90(e)(5)(i) Any water system that contains a lead service line in their distribution system must submit to the State, as specified in section § 141.84(b) a lead service line replacement plan at the same time the ~~lead~~ service line inventory is submitted. Any water system that contains an unknown service line in their distribution system must submit to the State a plan for identifying the material of all unknown service lines at the same time the service line inventory is submitted.
- 141.90(6) No later than 12 months after the end of a monitoring period in which a water system exceeds the lead trigger level but not the lead action level in sampling referred to in § 141.84(~~e~~ (f) the water system must submit written documentation to the state that the system has replaced lead service lines at the annual goal rate. In addition, every 12 months thereafter, the water system shall certify to the State in writing that the water system has:
  - The requirement is not a complete sentence and references the wrong section of the rule.
- 141.90(6)(iii) (iii) Additionally, the water system must certify to the State that it delivered the notification of lead service line materials as specified in § 141.85~~(b)~~ (e)
  - (b) refers to delivery of public education requirements.

Monitoring for lead in schools and child care facilities

The school and child care water sampling requirements presented in the LCRR proposal are inadequate, misleading, and will waste money with no public health benefit and no remediation is required. As proposed, it won't even successfully identify problem fixtures in schools because it does not include a comprehensive testing program. The requirements to collect 5 samples in schools and 2 samples in child cares every 5 years are not enough to detect actual lead exposure and availability of safe drinking water in schools and childcares.

EPA requests comment on an alternative to the proposed requirements for public education and sampling at schools and child care facilities described in this section. My suggestions for more active lead risk reduction in schools are the following:

- 141.92(a)(1) requires identifying a list of all schools and child care facilities served by the system by the compliance date of the rule, at the same time that the PWS must complete the service line inventory of 141.84(a). When the inventory is made available to the public, it should clearly identify any school or child care with a lead service line or service line of unknown materials. Lead service line notification and education activities should begin immediately at schools and childcares. The final LCRR should include a requirement to replace school and child care lead service lines first.
- In lieu of the proposed sampling requirements, modify the small system flexibility requirements of 141.93 option (3) for POU devices to apply to schools and child cares. Given that lead is present in virtually all plumbing, a POU strategy for schools and child cares that includes regular maintenance will result in an immediate source of safer drinking water with improved protection from lead in drinking water. The revised NSF certification standard of 5 ppb of lead for POU devices certified under NSF 53 and NSF 58 for lead removal[17] allows for schools and childcares to continue to use water from public water systems rather than switching to bottled water to protect our most vulnerable children from lead exposure.

I offer the following comments on the preamble discussion of lead sampling in schools:

- EPA has included school sampling requirements in the LCRR because "Water systems have developed the technical capacity to do this work in operating their system and complying with current drinking water standards"
    - CWSs have no requirements for building water quality. They insist that they have no responsibility past the meter. Only a few water systems have developed this expertise, and it is the exception not the rule. Most PWSs are not plumbing experts and do not have capacity to add this expertise to their staff. Most small and medium PWS will struggle greatly to comply with this portion of the rule.

[17] https://www.nsf.org/newsroom/drinking-water-treatment-units-stricter-requirements-lead-reduction-cert

- School and child care facility sampling contributes to increased public awareness of the potential for elevated levels of lead in premise plumbing independent of a water system's 90th percentile value
    - The rule provides no context for school tap sampling data, and there are no public data sharing requirements
    - The rule requirements do nothing to advance this cause, which could be advanced through better communication about compliance sampling and its relevance to household exposure (see http://graham.umich.edu/project/revised-lead-and-copper-rule/faq?faq=30)
- The CWS would not be required under this proposed rule for taking any remedial action at the school or childcare facility following the sampling and notification requirements of this proposal. Would use the 3T's guidance to respond.
    - The 3T's guidance is not mandatory and, in many ways, can result in misleading information being presented to schools and child care facilities. School sampling programs across the country produce results on a daily basis that do not follow the guidance, or conveniently skip pieces of the guidance. Relying on guidance, rather than requirements, for the actual protection of children's health is not a winning strategy.
- Alternative school sampling programs
    - The LCRR allows more stringent state or local school sampling programs to continue, but does not allow an explicit option for maintaining a POU filter program as an alternative to this sampling requirement. However, the sampling requirements and assumptions for a bill currently under consideration in Michigan for filtering drinking water in schools and child cares are more stringent than the school/childcare sampling requirements presented in this rule.
- The LCRR has no requirement for schools to share lead PE with staff, students, and families (not in current rule either).
    - My school district has told me that they just dump their PE in the trash every time they receive it. They have refused to share the current PE for a current lead action level exceedance with the school community despite me asking them directly at least 3 times.
    - New 141.92(a)(2)(i) to share information about health risks from lead in drinking water on an annual basis will do nothing to actually push information out to the school community because there is no requirement to share that information with students, staff, and families.
- In 141.92(f), the school sampling data must be shared with the primacy agency no later than 30 days after the results are received.
    - Why does the CWS also have to certify that they have completed the requirement? Shouldn't the data be sufficient to prove this? States and CWS do not need the added busy work.
- If EPA must keep the school and childcare testing provisions in the final LCRR, EPA should include a requirement for states to compile, publish, and share all school data for students, families, and staff to see. If state primacy agencies had enough resources, they could use the compiled data to detect trends in the safety of drinking water in schools and push for zero lead plumbing to replace school pipes, fittings, and fixtures so that actual lead-free water can be provided to students.
- Depending on specific circumstances, these LCRR school sampling requirements may be more stringent than NTNCWS requirements under the LCR. Many NTNCWS schools must sample 1-5

taps and sampling can be reduced to every 9 years, but they do have more PE requirements. The LCRR school sampling program requires each school to collect at least 5 samples every 5 years. This rule allows schools that are NTNCWS to skip the provision of 141.92.

- 141.92(b)(1) does not require sampling at enough taps per school to determine whether water is safe for children to drink (5 samples per school, 2 per childcare in schools with well over 200 taps).
    - Lead in water is highly variable. There is no such thing as a representative tap in a school. If the rule will require school sampling, it should require sampling all taps used for drinking water in the school or child care.
    - School sampling data sets show that even when the same faucet make and model is used in multiple rooms, individual sample results vary. A room that tests low today may test high in a repeat sample (see Figure 3).
    - Single samples can flag a lead problem, but cannot be used to declare a tap safe.
    - Single 250 mL samples cannot identify if the lead source is the faucet or upstream.
    - These sampling requirements are not even effective as a test and tell strategy. They will not identify the range of lead in water nor the extent to which taps throughout the school buildings have lead in the water.

Figure 3

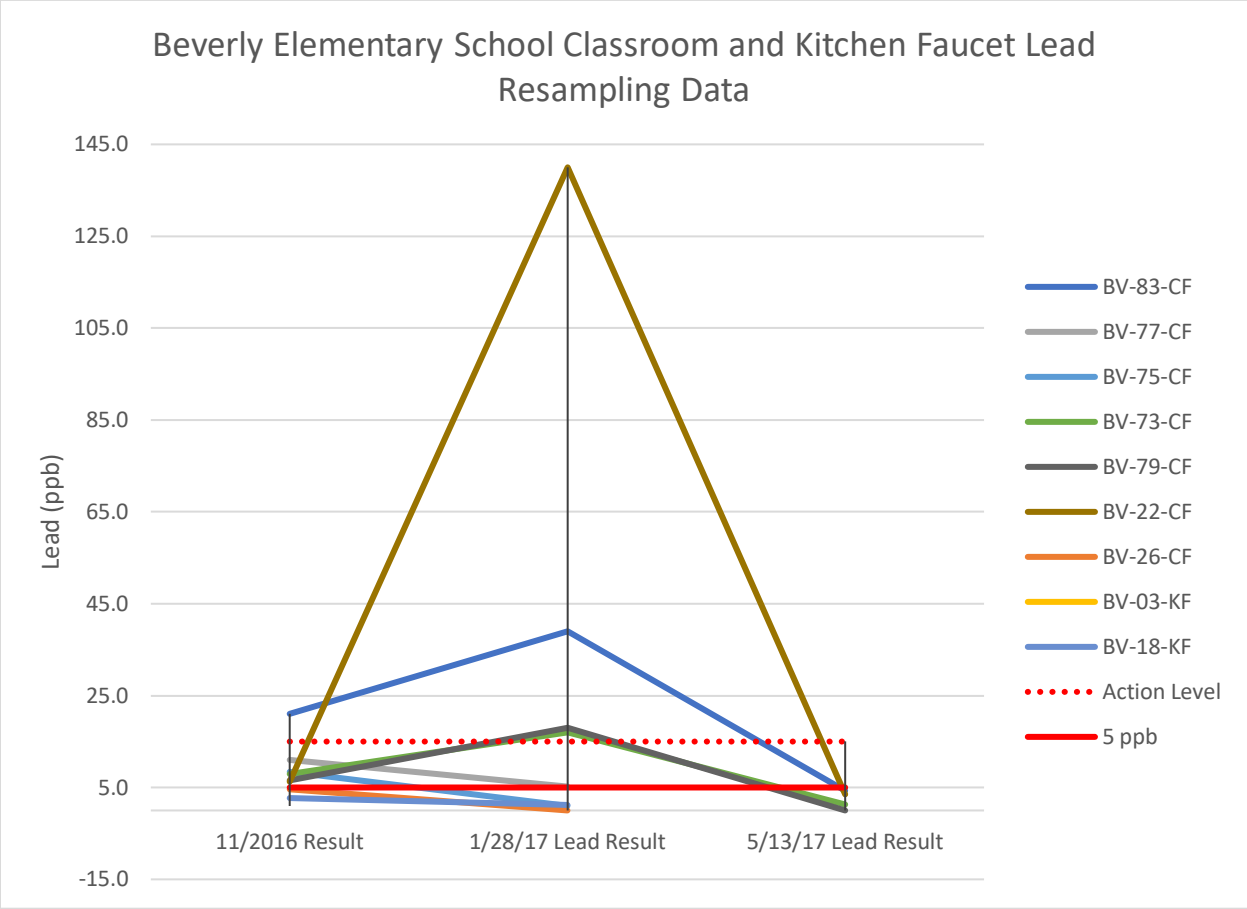


Figure 3 shows data for all the classroom and kitchen faucets at Beverly Elementary in Beverly Hills, MI that were retested due to exceeding the lead or copper action level. The majority of sites were resampled for exceeding the copper action level. This graph shows that taps that "passed" during the

first round of sampling (i.e., a result under 15 ppb) were as likely to have a result over the action level during a following sampling period as to have a result under the action level during a following sampling period. This is one example of how lead release is sporadic, and no single sample represents the risk of lead exposure at a given tap. After remediation and initial confirmation that the sample meets the action level, additional samples must be collected to confirm the ongoing safety of the remediation strategy.

- 141.92(b)(1)(v) The sampling protocol for the limited number of samples does not represent the worst-case water that students actually drink. Allows for a maximum stagnation of 18 hours and does not prohibit pre-flushing which has been identified in some school districts as a way to mask the actual lead levels in water, e.g., NYC, others.
    - An example of worst-case water that students may actually be drinking would be water the first day back after winter or summer break. (even if they flushed the plumbing the week before school started, it is unlikely that someone flushed all the fountains the morning of the first day of school)
- There are no requirements to share the actual sampling data with students, families, and staff. The "Tell" part of this "Test and Tell" strategy is missing. Students, families, and staff will not even be able to use this limited information to take steps to ensure they can find their own safe drinking water in schools.
- We already know through current voluntary and state/locally required school sampling programs that many schools will not be forthcoming with information about the water quality, and often they do not understand what it means themselves.
- There are no requirements to actually provide safe drinking water in schools, no requirements to take any action based on lead sampling results nor what lead results might merit action, and no requirements for remediation or filtration. These requirements present additional burden, provide little to no actionable information, and no requirements to provide safe drinking water. In other words, all cost with no benefit.
- There are no requirements on how to interpret or explain the significance of the sampling results. This is particularly critical because these school requirements are presented in the context of the Lead and Copper Rule, with an action level of 15 ppb that measures treatment effectiveness. As mentioned in the EPA R5 memo, 15 ppb has been used by many as the default measure of safety and has been used for purposes beyond its original intent.[18] Even the preamble to the proposed rule confuses this issue. When evaluating lead in water in schools, we are not evaluating treatment effectiveness. We are evaluating the safety of water that children are actually drinking. It is irresponsible to present these sampling requirements for schools without associated requirements for interpreting or explaining the sampling results, particularly when the LCR rule construct encourages schools to interpret 15 ppb as a safe level of lead in drinking water when, at the same time, the LCR itself states that 0 ppb is the safe level of lead in water.
- These requirements present a challenging implementation burden for both primacy agencies and regulated PWSs because they create a significant amount of new work with no public health benefit. They also have no jurisdiction over schools. This may be particularly challenging for private and charter schools.

[18] Kaplan, Robert A. Memorandum: Region 5's Experience in Implementation of the Lead and Copper Rule. December 29, 2017.

- 141.92(f) Notification of Results. A water system shall provide analytical results as soon as practicable but no later than 30 days after receipt of the results.
    - Preamble actually states the opposite – provide sampling results no less than 30 days after receipt.

Small Water System Compliance Flexibility 141.93

This new section is novel and forward looking, but it is entirely optional. These options allow for bold commitments to public health protection. It would be most protective to require all three options at the same time: lead service line replacement, corrosion control treatment, *AND* POU devices. This package option should be available to all size water systems, and states should have the authority in the final LCRR to require this approach at any time.

Taken as a package, the small water system compliance flexibility provisions provide an effective framework around which the entire revised rule should be designed. EPA should consider rewriting the entire LCRR to require the package of "Flexibility" options for all water systems, establishing deadlines for each. This would result in a simpler, more protective LCR.

The LCRR will be far more effective for long-term public health protection if EPA includes a similar requirement in the lead service line replacement section where large systems must maintain mandatory lead service line replacement programs after a single lead action level exceedance regardless of whether the 90th percentile lead results are below the lead action level in the future, and also requires the water system to replace all lead service lines by a certain date.

The final LCRR could include an option to stop using POU devices if all LSLs are removed and corrosion control is optimized so that all compliance samples are non-detect.

- 141.93(a) A small community water system ~~that exceeds the lead trigger level but meets the lead and copper action levels~~ must evaluate compliance options in paragraphs (a)(1) through (3) of this section and make a compliance option recommendation to the State when the water system submits its service line inventory as specified in 141.84(a) on the date the rule becomes effective. ~~within six months of the end of the monitoring period in which the exceedance occurred~~
    - Rather than waiting for a lead trigger level or lead action level exceedance to prepare for a small system compliance alternative, small water systems should be required to submit their compliance recommendation at the same time as their service line inventory on the date the rule becomes effective. Alternatively, this schedule could be phased to facilitate primacy agency review of inventories and compliance plans like the LT2ESWTR and Stage 2 DBPR implementation schedules were.
    - This way the water system will be ready to take action within 6 months if they have a trigger level or action level exceedance, and the water system will not have to wait for an additional lead action level exceedance to respond appropriately. If this recommendation is adopted, sections (c) and (d) can be deleted.
    - The way items (c) and (d) are written, it appears that the small water system compliance flexibility is not intended to apply if a water system exceeds both the lead and copper action levels. I would support allowing the options in 141.93 to apply in the case of both a lead and

copper action level exceedance if the water system is also required to evaluate corrosion control for the maintenance of copper levels in the drinking water.

- 141.93(a)(3)(ii) The POU device must be certified by a third party to meet ~~the~~ NSF/American National Standards Institute standard 53 for the reduction of ~~to reduce~~ lead in drinking water.
    - It is my understanding that third party organizations certify filters to NSF/ANSI standard 53 for lead reduction. I think my suggested language better reflects the way the certification programs work. This edit should be made in all the locations of 141.93 where this language appears.
- 141.93(a)(3)(iv) The community water system must monitor one-third of the POU devices each year and all POU devices must be monitored within a three-year cycle. First-draw tap samples collected under this section must be taken after water passes through the POU device to assess its performance. Samples should be one-liter in volume and have had a minimum 6-hour stagnation time. All samples must be at or below the current requirements of NSF/ANSI standard 53 for lead reduction ~~lead trigger level~~. The system must document the problem and take corrective action at any site where the sample result exceeds the lead trigger level.
    - The new NSF/ANSI standards 53 and 58 allows a filter to be certified for lead reduction if the filtered samples are at 5 ppb or lower. The proposed LCRR sets the lead trigger level at 10 ppb. This standard has just been revised and a filtered sample will need to meet 5 ppb in order to meet the NSF/ANSI certification. In this case, it is inappropriate to tie POU compliance to the trigger levels. To use the POU compliance option, filtered samples must meet the current certification requirements of NSF/ANSI 53 or 58 for lead reduction. This edit should be made in all places in the LCRR where language regarding filter certification appears.

Consumer Confidence Reports

- 141.153(vi) For lead and copper: The 90th percentile concentration of the most recent round of sampling, the number of samples required, the number of samples collected, the number of sampling sites exceeding the action level, and the range of tap sampling results;
- Add new 141.153(vii): The report shall include the number of lead service lines, the number of service lines of unknown material, and the total number of service lines in the water system. The report shall include a statement that a service line inventory has been prepared and is available for review either on the water system website or at the water system offices. The report shall notify consumers that complete lead sampling data are available for review and shall notify how to access the data.

Required additional health information

- 141.154(1) A short informational statement about lead in drinking water and its effects on children. The statement must include the following information: ~~If present, lead can cause~~ Lead exposure causes serious health problems, especially for pregnant women and young children. Where there is lead in the plumbing, there is frequently lead in the water. Lead can come from the service line that delivers water to some homes, and/or from interior plumbing and fixtures in your home. ~~Lead in drinking water is primarily from materials and components associated with service lines and home plumbing.~~ [NAME OF UTILITY] is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components in your home. You share the

responsibility for protecting yourself and your family from the lead in your home plumbing. ~~You can take responsibility by identifying and removing lead materials within your home plumbing and taking steps to reduce your family's risk. Before drinking, flush your pipes for several minutes by running your tap, taking a shower, doing laundry or a load of dishes. You can also use a filter certified to remove lead from drinking water.~~ If you are concerned about lead in your water you may wish to have your water tested, contact [NAME OF UTILITY and CONTACT INFORMATION]. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available at http://www.epa.gov/safewater/lead.

  - This section is misleading, incomplete and can cause consumers to take actions that may increase their exposure to lead in water. Many or in some cases most consumers receiving this notice are likely to have lead in their tap water, yet the notice says "if present" lead will present a problem—without making it clear that many consumers of water from the system do have lead in their tap water. The suggested revisions will clarify certain statements.
  - If a PWS is not providing appropriate corrosion control or removing lead service lines, consumers are limited in their ability to adequately protect themselves from lead in water. Under the inventory provisions of the LCRR, it is the PWS' responsibility to identify lead service lines. This should be clarified separately from identifying leaded components within household plumbing. Flushing instructions should include flushing the tap that will be used for consumption prior to drinking or cooking in addition to using the water for other household purposes. Filter instructions must include an explanation of how to identify a certified filter, especially when so many filters are offered for sale on the internet from a variety of sources. Infographics, pictures, and videos may be more effective ways to communicate critical information to consumers.

- Appendix A to subpart O of Part 141, Major sources of lead in drinking water: Lead service lines, corrosion of household plumbing including fittings and fixtures ~~systems~~, Erosion of natural deposits.
  - The mandatory must acknowledge the largest source of lead in drinking water as specified in the preamble to the LCRR.
- Appendix A to subpart O of Part 141, and Appendix B to Subpart Q of Part 141Health effects language
  - Exposure to lead, even at low levels, can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems. Pregnant women have increased prenatal risk, and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy.

Public Notice

141.202(10) I support Tier 1 public notice for a lead action level exceedance.

Primary Enforcement Responsibility

- 142.14(d)(8)(viii) Section 141.84(e) determinations of lead service line replacement goal rate as well as mandatory full lead service line replacement rates below 3 percent.

    - The previous language here was "determinations establishing shorter lead service line replacement schedules under 141.84"
    - This changes a reporting requirement for documenting a decision that is more protective of public health to documenting a decision that reduces protection of public health. This revision reiterates that reducing the lead service line replacement rate after a lead action level exceedance to 3% results in a reduction in public health protection.
    - These portions of 141.84(e) and this associated provision should be deleted from the final LCRR.
    - As noted earlier, I recommend that this provision be changed to require 10% replacement of lead service lines per year.
- 142.14(d)(8)(xviii) Section 141.88 – evaluation of water system source water or treatment changes
    - This is an important requirement that should be retained in the final LCRR.
- 142.14(d)(8)(xx) Section 141.84(a) completed lead service line inventories and annual updates to inventories.
    - This is an important provision to maintain in the final LCRR since it is critical for the primacy program to maintain these records to support future decision making. States also need to maintain records for LSLR plans and compliance sampling pools.
- Add new: Section 141.84(b) Lead Service Line Replacement Plans and updates and Section 141.86(a) Compliance sampling pools and updates.
- 142.15 (b)(4)(i)(B)(ii) States shall report the PWS identification number of each public water system identified in paragraphs (c)(4)(iii)(A) through (F) of this section.
    - There is no F in this section. It is not clear if this was meant to replace (i) or (iii), but it seems like (ii) is not correct.
- 142.15 (b)(4)(i)(B)(ii)(E) For each public water system required to begin replacing lead service lines after a lead trigger level or action level exceedance, the replacement rate that the water system must meet as specified in § 141.84 of this chapter and the date each system must begin replacement; and
    - This is not a complete sentence. Not clear what was intended, but I made a guess.

Special Primacy Conditions

The following comments apply to new provisions described in section 142.16 (d). Many of these provisions should be removed from the final rule:

- (5) Section 141.84—Establishing lead service line replacement goal rates.
    - As stated previously within these comments, the implementation burden on states for custom replacement goal rates does not make sense. There should be one national standard. There is no need for a special primacy condition
- (6) Section 141.84—Designating acceptable methods for determining service line material for the lead service line inventory.
    - Again the definitions for an acceptable service line inventory should be established at the national level, not at the state level.
- (7) Section 141.92—Defining a school or childcare facility and determining any existing State testing program is at least as stringent as the Federal requirements.

    - The school and childcare sampling requirements described in the LCRR proposal are not scientifically defensible and provide no public health protection. These requirements should be removed from the final LCRR and the special primacy condition removed. This section should be replaced with a requirement for POU devices for all drinking and cooking water in schools.
- (8) Section 141.82—Verifying compliance with ''find-and-fix'' requirements.
    - Find-and-fix should be removed from the final LCRR
- (9) Section 141.88—Reviewing any change in source water or treatment and how this change may impact other National Primary Drinking Water Regulations.
    - The final rule should have explicit requirements regarding appropriate studies and should not rely on a special primacy condition.
- Add (o)(2)(i)(B)(I) lead and copper rule service line inventory, verification methodology, and compliance sampling pool
    - The state should have the ability to review detailed records regarding service line inventories and lead and copper rule compliance sampling pools during their onsite sanitary survey.
- 142.19(b) Pursuant to the procedures in this section, the Regional Administrator may review state determinations establishing a goal lead service line replacement rate or the lead service line replacement rate established under 141.84(g) and may issue an order establishing federal ~~goal~~ replacement rate requirements for a public water system pursuant to § 141.84(b) where the Regional Administrator finds that an alternative ~~goal~~ lead service line replacement rate is feasible.
    - The Regional Administrator should be able to order a faster lead service line replacement rate any time it is determined feasible, even under a mandatory program after a lead action level exceedance.