Appendix A: Technical Evaluation of the Denver Water Lead Reduction Program Plan

The Safe Drinking Water Act (SDWA) Section 1415(a)(3) gives EPA the authority to issue a variance from a treatment technique requirement upon showing that an alternative is "at least as efficient in lowering the level of the contaminant with respect to which such requirement was prescribed [in this case, optimal corrosion control treatment, OCCT]." In March 2018, the Colorado Department of Public Health and Environment (CDPHE) designated orthophosphate as the optimal corrosion control treatment for Denver Water in accordance with the requirements of the Lead and Copper Rule (LCR). Denver Water has requested a variance in lieu of implementing orthophosphate treatment and proposed that its Lead Reduction Program Plan (LRPP) is at least as efficient at lowering tap lead levels as orthophosphate. This Appendix describes the information EPA considered in its evaluation of the variance request and EPA's basis for issuance of the variance.

<u>Why is the Denver Water variance at least as efficient in lowering lead levels?</u>

EPA has considered Denver Water's LRPP comprehensively in making the determination that it is at least as efficient in lowering lead levels as compared to the optimal corrosion control treatment technique requirement. In the 1991 LCR, OCCT is defined as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." 40 C.F.R. Section 141.2. Consideration of other factors such as cost and watershed impacts, including nutrient levels, are not explicitly mentioned in the OCCT definition. In its March 2018 OCCT designation letter, CDPHE states that while acknowledging the impacts of orthophosphate on receiving waters and wastewater utilities, orthophosphate was identified as OCCT to protect public health and to minimize lead concentrations at all consumer's taps while ensuring that the treatment does not cause the water system to violate any provision of the Colorado Primary Drinking Water Regulations, consistent with 5 CCR 1002-11, Regulation 11.26 (Colorado Lead and Copper Rule).

The "at least as efficient" language in the SDWA means that, on a system-specific basis, the alternative to be required under the variance is equally effective in achieving the public health protection objective of the rule while addressing system-specific issues. EPA evaluates this statutory standard in light of the objectives achieved as a whole under the LCR and variance combined, not just considering the component of the rule which is the subject of the variance (i.e., the definition of OCCT).

Denver Water's LRPP includes:

1. Development of a Lead Service Line (LSL) Inventory.
2. Distribution of drinking water filters certified for lead removal to homes with LSLs and to certain homes with lead solder.

3. Conducting a Lead Service Line Replacement (LSLR) program that will fully replace all LSLs within 15 years at a rate of 7 percent of the lead service lines each year.
4. Operating and maintaining pH and alkalinity adjustment corrosion control treatment (CCT).
5. Implementing communication, outreach, and education actions.

Lead Service Line Inventory

Denver Water is proposing to expand upon the materials evaluation previously conducted under the LCR and undertake a targeted investigative effort to more precisely determine the locations of all LSLs in its distribution system. Denver Water's proposed inventory assigns each site with a service line of unknown material a probability being an LSL, based on: known construction practices, historical records, expert judgement, and data interpretation. This approach will inform the LSLR program as well as the filter distribution program, which provides a water filter to all homes served by a known, suspected, or possible LSL.

Lead Service Line Replacement Program

Removing the lead source is an effective way of reducing lead in drinking water, and LSLs are the largest contributor of lead in drinking water. Under the current LCR, large water systems are required to conduct LSLR after exceeding the lead action level and are required to replace the system-owned LSLs. In addition, under the current LCR, public water systems (PWSs) can cease LSL replacement once the 90th percentile tap lead levels are below the action level in two consecutive rounds of monitoring. Denver Water is not currently exceeding the lead action level and thus is not required to replace LSLs. Moreover, Denver Water has not conducted any LSLR under the current LCR as they own no portion of the LSLs within their system.

Given the benefits of LSLR, EPA supports Denver Water's proactive removal of LSLs and other lead sources from its distribution system. Denver Water has proposed a plan to fully replace all LSLs from its distribution system, currently estimated at 64,000 LSLs, over a timeframe of 15 years, and at a rate of 7% per year. Denver Water would offer to conduct the replacements at no direct cost to the individual customer. Costs of the replacement program would be recuperated through water rates paid by all customers, as well as loans, grants, donations, and a commitment of $22.5 million in funding from the Metro Wastewater Reclamation District. These efforts have the potential to substantially reduce lead levels in drinking water within 15 years, compared to the 50 years it would take Denver Water to replace all LSLs at its current rate of 1,200 per year, replaced on a voluntary basis through various activities by Denver Water, developers, and other third parties.

pH and alkalinity Adjustment Corrosion Control Treatment

A lead pipe rack study submitted by Denver Water in September 2017 compared three CCT strategies: silicate, pH and alkalinity adjustment, and orthophosphate addition. This lead pipe rack study evaluated the effectiveness of the three CCT strategies in reducing lead levels in water that was circulated through 32 lead pipes that were collected from the Denver Water's distribution system and is representative of the expected lead reductions that would be achieved in homes with lead service lines. The findings from this study indicated that silicate was not effective, and the focus was on results from the other two CCT strategies, which are presented in Table 1 below. While both treatments were shown to be successful at reducing lead levels, because orthophosphate performed more effectively, the State designated it as the optimal CCT under 40 C.F.R. Section 141.82(d).

Table 1: Summary of Results from Lead Pipe Rack Study

Pilot Plant Location	pH 8.8	Orthophosphate
Marston Treatment Plant (representing 80% of Denver Water's supply)	Median Reduction: 35% to 51%*	Median Reduction: 66% to 72%*
Moffat Treatment Plant (representing 20% of Denver Water's supply)	Median Reduction: 57% to 72%*	Median Reduction: 64% to 81%*

*Three pipes were dedicated to each treatment type at each pilot plant. The range here represents the low and high results from the three pipes.

(Source: Denver Water's Lead Reduction Program Plan, Table 3)

In a later CCT study using pipe coupons, Denver Water provided data that compared the effectiveness of the two CCT approaches for copper service lines with lead solder (but not LSL). The percent reductions listed in Table 2 would equate to an estimated 90th percentile lead level of 2.2-2.3 ppb with orthophosphate and an estimated 90th percentile lead level of 4.1-4.2 ppb with pH and alkalinity adjustment (calculated solely for sites with copper service lines and lead solder, based on the coupon study results). Thus, at these sites with copper service lines and lead solder, the estimated 90th percentile differential is approximately 2 ppb, with orthophosphate performing better than pH and alkalinity adjustment.

Table 2: Percent Reduction in Lead as Observed from Testing with Copper Coupons with Lead Solder

Sample Location	pH 8.8	Orthophosphate (2 mg/L as PO_4)
Marston Treatment Plant (representing 80% of Denver Water's supply)	41% (32% - 61%)	70% (66% - 80%)
Moffat Treatment Plant (representing 20% of Denver Water's supply)	43% (29% - 71%)	68% (54% - 84%)

**Median reduction (interquartile range)*
(Source: Denver Water's Lead Reduction Program Plan, Table 4)

Homes with LSLs would be expected to experience higher lead levels than homes with copper pipes with lead solder under any CCT scenario, based on Denver Water's historical lead sampling data. Denver Water calculated the anticipated average and 90th percentile lead concentrations at LSL sites under current water quality conditions as well as after pH and alkalinity adjustment as proposed in the variance. The findings, presented below in Table 3, show an expected reduction in first-draw lead levels at LSL sites with the installation of pH and alkalinity adjustment CCT.

Table 3: Past and Projected Lead Concentrations in First Draw Samples for Homes with a Lead Service Line Protected by pH and alkalinity Corrosion Control Treatment Only (No Filter)

Time Period	Average Lead Concentration (ppb)	90th Percentile Lead Concentration (ppb)
Pre-Variance: 1997 to 2019 (average)	6.7	14.0*
Projected Post-Variance: 2021 & Beyond	3.4	7.0

*Based average of all 90th percentile lead concentration reported for each monitoring period from 1997 to 2019.

(Source: Denver Water's Lead Reduction Program Plan, Table 13)

As noted above, although lead concentrations at sites served by a LSL are expected to be reduced with pH and alkalinity adjustment CCT, they are expected to be higher than sites without a LSL. To account for this difference, Denver Water's plan includes a provision to distribute filters certified to remove lead to all homes with a known, likely, or possible LSL (see next section) until the LSL is removed under the variance.

Actual 90th percentile lead levels achieved through pH and alkalinity corrosion control treatment are a critical component to the overall success of the LRPP in meeting the "at least as efficient as" standard.

Filter Distribution Program

Until all LSLs are replaced, Denver Water proposes to provide water filters certified to remove lead to all homes with known, suspected, or possible LSLs. Customers with LSLs that properly use filters should experience decreased lead exposure when using the filter for drinking and cooking purposes, as compared to the absence of a filter. Denver Water is currently testing the performance of multiple filters NSF/ANSI (53)-certified for lead removal and will not distribute a filter model that fails to meet the NSF/ANSI certification requirements. Denver Water will perform field testing of filters in use by customers enrolled in Denver Water's filter program who are also enrolled in Denver Water's LCR compliance tap sampling program at the same frequency as LCR compliance tap sampling. Actual lead reductions achieved by the filters are integral to Denver Water's modeled demonstration that the LRPP is "at least as efficient as" orthophosphate OCCT in reducing lead levels.

Communication, Education and Outreach Program

The efficacy of the filter program to reduce lead exposure is contingent on customers' willingness to adopt filters and ability to use filters correctly. Denver Water's LRPP includes a campaign to ensure all customers with a known, suspected, or possible LSL are informed about the filter program. Denver Water's goal is 100% filter adoption. Under the variance, Denver Water must provide documentation that it has provided public education materials on the proper use of filters (including filter cartridge replacement) to at least 95% of households enrolled in the filter program. Communications channels may include "door-to-door" communications, a customer tracking system, how-to videos, and local opportunities to engage residents. Denver Water must demonstrate the percent of customers properly using their filter to ensure the communication program is effective in shaping customer behavior to adopt filters and use them correctly. The percent of customers that properly use the filters for drinking, cooking, and, if applicable, mixing infant formula, each year is a critical component to the overall success of the LRPP in meeting the "at least as efficient as" standard.

Evaluation of Comprehensive Actions of the Lead Reduction Program Plan

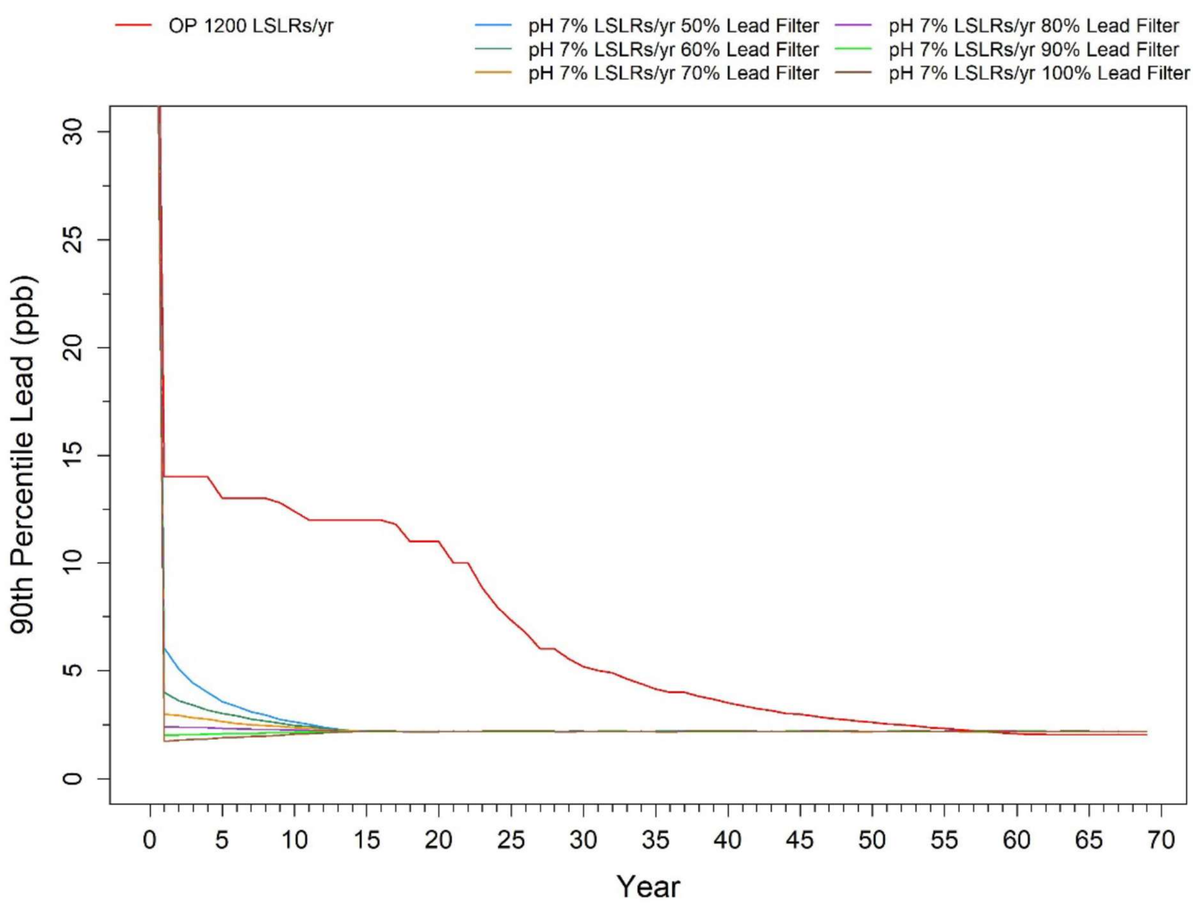
Based on the information provided by Denver Water, EPA believes that the combined actions under the LRRP will be at least as efficient as the orthophosphate OCCT. EPA believes that the pipe rack and coupon studies performed by Denver Water were conducted in accordance with accepted practices and provide a component of the best available information on which to judge whether the LRPP will be at least as efficient. Denver Water's corrosion studies predict that the corrosion control treatment under the variance will further reduce tap lead levels compared to current levels and, coupled with the use of filters and removal of LSLs, provide equivalent or greater lead reductions than installation of orthophosphate OCCT alone.

As described above, Denver Water's inventory predictive model will establish the universe for the LSLR program as well as the filter distribution program, which provides a water filter to all homes served by a known, suspected, or possible LSL. EPA reviewed the historical records and judgments that form the basis of the inventory predictive model and found them to be reasonable. As part of the variance requirements, Denver Water must make a continued effort to update the LSL inventory, investigating a minimum number of 1.4% of the total estimated number of suspected and possible LSLs in the inventory each year. Denver Water has found that a minimum investigative rate of 1.4% per year is adequate for these purposes as a statistically representative sample to verify and support the assumptions made to build the inventory. EPA expects that Denver Water's inventory will improve over time as targeted service line investigations and LSLR inform the logic-based predictive model and reduce the number of service lines of unknown material. If the variance is extended to 15 years by the variance end date, Denver Water must have no remaining sites in the known, suspected, or possible LSL categories, as defined in Paragraph 1 of the Order. By the variance end date Denver Water would have replaced all known LSLs and determined, by direct investigation or statistical inference in accordance with its predictive inventory model, that no remaining sites meet the definition of a suspected or possible LSL.

Denver Water also developed an equivalency model to compare lead exposure from drinking water to all Denver Water customers resulting from using orthophosphate as OCCT and the variance alternative of implementing the LRPP. The model estimates lead concentrations using data from LCR compliance and customer requested sampling and the lead service line pipe rack study, predicted lead reductions from the pipe rack and coupon studies, and anticipated filter adoption and filter performance rates to predict lead concentrations at all connections in the Denver Water service area every year. The results of this exposure model are shown in Figure 1.

EPA reviewed the inputs, assumptions, and statistical methodology that Denver Water used for its exposure model. Overall, EPA concludes this is a reasonable methodology to use to evaluate the LRPP system-wide. As shown in Figure 1, the LRPP is expected to achieve greater lead reductions than orthophosphate treatment beginning in year 1 of the variance, assuming 7% of LSLs are removed annually, filters are widely used and remove lead, and the pH and alkalinity CCT performs as indicated by Denver Water.

Figure 1: Projected Lead Concentrations (90th Percentile) Comparing Orthophosphate to Denver Water's Proposed Variance Approach



(Source: Denver Water's Lead Reduction Program Plan, Appendix II.A, Page 15)

EPA has found that if implemented effectively, the variance would assure at least equal efficiency in lowering drinking water lead exposure as orthophosphate. However, in order to verify the Agency's findings, EPA has decided to approve the variance for an initial three years and collect additional data as a condition of the variance. The information is needed to assure the LRPP can be effectively implemented, resulting in at least as efficient reductions in drinking water lead exposure as orthophosphate. This includes, but is not limited to, ensuring LSLs are replaced on schedule, pH and alkalinity adjustment is maintained as CCT and achieves additional lead reductions, filters are widely adopted and used in accordance with manufacturer instructions, and filters reduce lead levels. The variance may be extended for twelve additional years – the time period necessary for Denver Water to complete its LSL replacement program – if during the initial three-year period, EPA confirms that the program is effective, and the variance conditions have been met.

Table 4 compares the current LCR and Denver Water's variance to demonstrate how the LRPP contains within it several components within the LCR, such as LSLR and CCT. Note that EPA determined efficiency under the SDWA Section 1415(a)(3) standard by evaluating the combined effect that the various components of the LRPP would have in reducing lead as compared to orthophosphate (as described above), rather than by comparing each component of the LRPP with the entire LCR.

Table 4: Summary of the Comparison of Current Lead and Copper Rule (LCR) to Denver Water's Variance

Element	LCR	Equivalence Comparison
Lead Service Line Inventory	All systems subject to the LCR OCCT requirements, were required to create a materials evaluation of their distribution system.	Denver Water proposes to conduct a continuing program to locate LSLs and update the inventory to be used in the LSL replacement program. The current LCR does not require a comprehensive inventory unless the system is triggered into LSLR; otherwise, it only requires a materials evaluation and does not specify criteria for that evaluation.
Filters	The LCR does not require water systems to provide filters to homes with LSLs.	Pitcher filters, if used appropriately for drinking and cooking and perform effectively, are predicted to reduce lead levels at homes with LSLs.
Lead Service Line Replacement (LSLR)	Conduct 7% LSLR per year after lead action level exceedance, allowing for partial LSLR and test-outs. Discontinue LSLR after two consecutive 6-month monitoring periods below the lead action level.	Variance as proposed will continue to reduce the number of LSLs over the period of the variance, removing the major source of lead in the distribution system. Under the current LCR, Denver Water has not conducted any LSLR as it owns no portion of the LSLs within its system.
Corrosion Control Treatment (CCT)	Water systems serving greater than 50,000 persons install and maintain OCCT.	Denver Water variance proposal is not OCCT as defined in 40 C.F.R. Section 141.2 and identified in Denver's CCT study, and therefore does not meet LCR requirements to install and maintain OCCT. Denver Water variance proposal's prediction of 90^{th} percentile tap lead levels achieved is significantly lower than the LCR 90^{th} percentile lead tap level of 15 ppb.
Tap Sampling	Collect samples twice a year at Tier 1 sites.	Equivalent. All tap sampling requirements under LCR will be met.
Water Quality Parameters set by the primacy agency	Meet all LCR requirements for monitoring and compliance.	Equivalent (but WQPs set will be for pH and alkalinity adjustment CCT instead of orthophosphate.)

<u>What actions does Denver Water need to complete before the end of the initial three-year variance period?</u>

In order to demonstrate compliance with the variance, Denver Water must regularly submit information to EPA regarding implementation of the variance. EPA requires this information to independently verify that the variance conditions are being met. Using this information, EPA will confirm whether the LRPP, as implemented, meets the "as least as efficient in lowering the level of" lead standard as compared to orthophosphate, which will be a critical factor in EPA's decision to extend the variance past three years. This section highlights some of the critical information EPA will require from Denver Water and why. The full list of submission requirements is listed in Paragraph 7 of the variance Order.

<u>Lead Service Line Inventory</u>
Denver Water's variance requires the water system to create a comprehensive LSL inventory. To allow EPA to verify Denver Water's LSLR targets are being met and that its filter program meets or exceeds the minimum adoption rate expressed in the variance, Denver Water must annually submit to EPA the following components of its inventory:

- Total number of service lines;
- Total number of replaced LSLs per year;
- Total number of known, suspected, and possible LSLs;
- Total number of unlikely LSLs; and
- Total number of non-LSLs.

Denver Water must also annually provide EPA with an up-to-date map of its LSL inventory. Denver Water must annually provide EPA with the total number of investigations conducted so EPA can verify that the 1.4% minimum verification rate has been met. Where the LSL status of a site has been changed, Denver Water must provide the rationale for the change (for example, investigation, replacement, water quality data, etc.).

<u>Lead Service Line Replacement</u>
Denver Water is pursuing accelerated LSLR to reduce lead levels in drinking water as part of a proposed alternative to installing orthophosphate as OCCT. For the variance to be approved for an extension beyond three years, Denver Water needs to demonstrate that it is maintaining a cumulative 7% average annual LSLR rate. Denver Water will demonstrate compliance by annually reporting to EPA the address and date of all LSLRs as well as the type of replacement (full, partial, galvanized, and if the replacement was conducted by Denver Water or a third party). Denver Water must also report the addresses of households that decline LSLR. In Denver Water's system, the customer owns the entire length of the service line. Although Denver Water is offering to conduct LSLR at no direct charge to the customer, the customer may still refuse the LSLR. EPA may consider the number of customer refusals in its determination of efficiency and whether to extend the variance past three years. Although the variance recognizes that there may be LSLR refusals by customers, if Denver Water were to receive a significant number of customer refusals in the first three years of its LSLR program, EPA may decide not to extend the

variance. This determination would likely be based on the evidence suggesting that Denver Water would not be able to achieve full LSLR in 15 years due to its inability to obtain consent from a substantial number of customers to complete the LSLR. Denver Water must also submit to EPA any lead sampling results associated with the completion of a LSLR to ensure lead levels have been reduced.

<u>Corrosion Control Treatment</u>
Denver Water completed a corrosion control study following a Lead Action Level Exceedance (ALE) in 2012. That study evaluated the use of silicates, orthophosphate, and pH and alkalinity adjustment as corrosion control treatments. The use of orthophosphate was found to be optimal corrosion control. While not optimal corrosion control treatment, adjusting the finished water to a pH of 8.8 resulted in a significant reduction in lead concentrations. To verify it meets CCT conditions of the variance, Denver Water must report data to demonstrate that it can consistently maintain water quality parameters within the ranges designated by CDPHE in its modification decision.

Denver Water must report 90^{th} percentile lead levels at LSL and copper with lead solder sites to inform EPA's evaluation of the comprehensive performance of the LRPP and the Agency's decision of whether to extend the variance.

<u>Filter Use and Efficacy</u>
A condition of Denver Water's variance is that filters certified to remove lead must be distributed to all customers served by a known, suspected, or possible LSL. The variance includes a provision requiring Denver Water to determine the number of customers that properly use and maintain their filter and report that information to EPA. EPA is also requiring Denver Water to provide information about filter distribution so EPA can independently verify how many customers use their filter. EPA will consider the filter adoption rate when determining the overall success of Denver Water's filter program and in the Agency's decision of whether to extend the variance.

EPA is also requiring Denver Water to regularly submit to CDPHE and EPA laboratory and field filter testing results to assess the effectiveness of the filters in removing lead. Denver Water shall notify CDPHE and EPA within 10 days if data indicate measurable lead in filtered drinking water and shall provide the measured levels of lead in filtered water and shall provide all filter performance sampling results. Denver Water must also report the data on filter maintenance. EPA will consider this filter performance data when determining the overall success of Denver Water's filter program and in the Agency's decision of whether to extend the variance.

<u>Communication, Outreach, and Education</u>
Denver Water's variance includes a requirement for the water system to take increased public education actions. Each year, Denver Water must submit to EPA a summary of activities, updated outreach, and education plan for the new program year. This will allow EPA to determine if the activities and outreach materials are adequate to meet the requirements of the

variance. This includes, but is not limited to, a requirement that outreach and education materials must be provided to at least 95% of the of households enrolled in the filter program.

Updated Equivalency Model

Denver Water must submit an Annual Program Year Report that includes a comprehensive evaluation of LRPP performance to date using the equivalency model described in the LRPP with updated inputs based on actual LRPP implementation for: 90th percentile lead levels at LSL and copper with lead solder sites after operation of increased pH and alkalinity adjustment as CCT, number of LSLRs conducted, filter adoption rate, and filter performance in the field. The updated equivalency model will allow EPA to consider the actual performance of key components of the LRPP to evaluate whether the overall program meets the efficiency standard as implemented and determine whether to extend the variance for an additional twelve years.

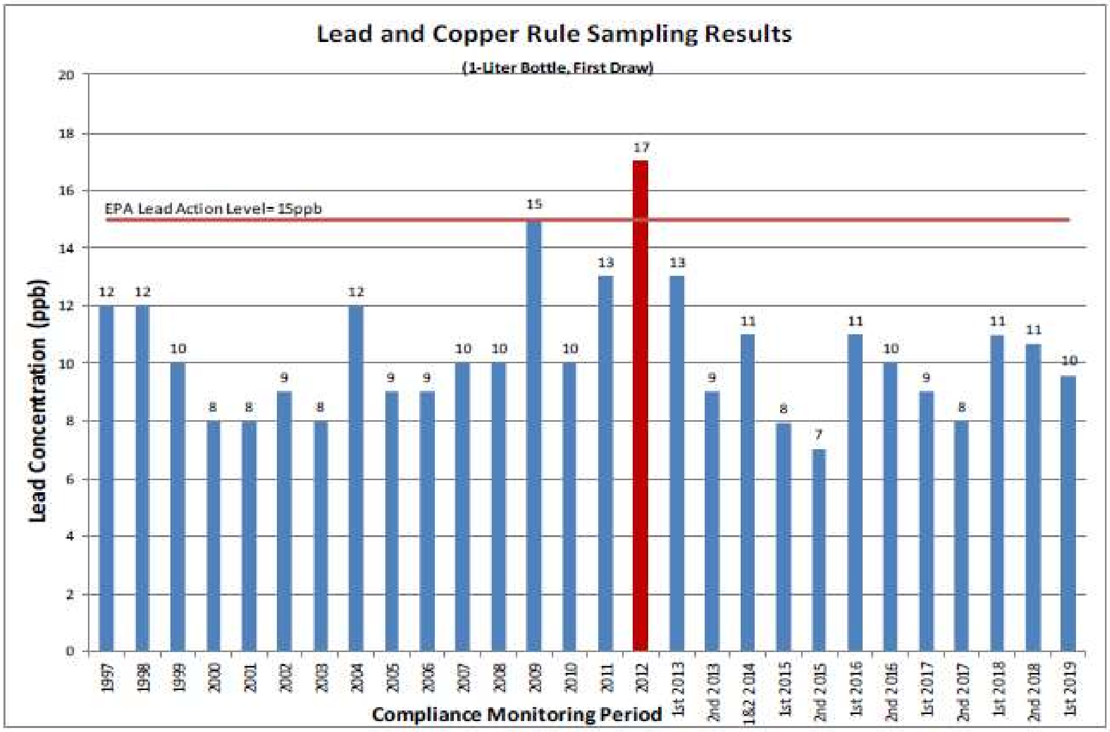
Additional considerations of why the proposed variance is acceptable

EPA rarely approves variances under SDWA Section 1415(a)(3). EPA is approving this variance from the definition of OCCT in 40 C.F.R. Section 141.2 for Denver Water for a three-year time period with possible extension for twelve additional years in light of several important considerations.

First, Denver Water was in compliance with the LCR prior to submitting the variance request. Denver Water conducted a corrosion control treatment study in the mid-1990's. Based on that study, CDPHE designated pH and alkalinity treatment as optimal corrosion control treatment for Denver Water and set a minimum pH of 7.5 and alkalinity of 15 mg/L, respectively, as OWQPs on October 18, 1995. Denver Water installed pH and alkalinity adjustment treatment prior to January 1, 1997. Denver Water has consistently monitored, met these OWQPs and has not had any excursions or violations related to OWQPs. Denver Water has been correctly monitoring for lead at properly designated Tier 1 sites, as confirmed by CDPHE most recently in 2018. Following an ALE in 2012, Denver Water re-evaluated its corrosion control treatment.

- The Denver Water 2017 corrosion control treatment study found that the use of orthophosphate as a corrosion inhibitor provided optimal corrosion control treatment (as defined in 40 C.F.R. Section 141.2).
- Denver Water examined potential SDWA simultaneous compliance issues associated with the future use of orthophosphate as a corrosion inhibitor and found that the use of orthophosphate is anticipated to minimize lead and copper concentrations at users' taps without causing Denver Water to violate any national primary drinking water regulations.
- The CDPHE designated the use of orthophosphate as optimal corrosion control.

The 90th percentile lead levels in tap samples in the Denver Water distribution have consistently been below the lead action level since 1997 with the exception of an exceedance in 2012, as shown in the figure below. Denver Water's most recent 90th percentile lead level was 10 ppb. Based on the lead pipe rack data provided on the effectiveness of pH and alkalinity adjustment CCT, EPA anticipates that the implementation of the variance will result in Denver Water continuing to meet the lead action level, and that lead levels will be further reduced by pH and alkalinity adjustment as CCT. In the proposed variance, filters are used as a means to lower lead levels by an additional increment while customers await their LSLR, and not as a means to avoid an exceedance of the lead action level.



(Source: Denver Water's Lead Reduction Program Plan, Figure 5)

Second, conditions are in place to quickly identify potential failure of the variance or Denver Water's ability to meet the conditions of the variance and to quickly respond to such failures.

- The variance requires frequent reporting of key information, including lead and water quality parameter sampling results on a monthly basis.
- If Denver Water does not meet conditions of the variance at any time, or is unsuccessful in meeting a performance metric, the variance can be terminated.
- In the case of the variance being terminated, use of orthophosphate as OCCT can begin relatively quickly because the necessary equipment and facilities are in place. The variance grants Denver Water 180 days after the variance is revoked to begin use of orthophosphate as OCCT.

Third, Denver Water has committed to and has the capacity to replace the full lead service lines. Denver Water will have the capacity and resources to replace all lead service lines within 15 years at an average rate of 7% per year.

Fourth, Denver Water has the technical, organizational and financial capacity to implement all the elements of the program for consumers served by their integrated PWSs in addition to customers served directly by Denver Water.

Fifth, Denver Water has the technical, organizational, and financial capacity to implement and maintain the alternative treatment technique including:

- The public outreach and education program.
- The corrosion control treatment.
- The filter program including distribution and routine replacement for affected consumers until six months after the LSL replacement is completed and continuous measurement of success of the program.
- Compliance with all provisions of the LCR, other than the definition of OCCT in 40 C.F.R. Section 141.2, including for consumer notice and education.

EPA also recognizes that Denver Water is concerned about the potential impacts of increased levels of phosphate in discharges from the Denver Water service area and increased nutrient levels in receiving waters. Although Denver Water explored alternatives to compliance with the State's designated optimal corrosion control treatment of orthophosphate, under the LCR, the regulations do not allow the State to designate a form of CCT that does not meet the definition of OCCT in 40 C.F.R. Section 141.2, or to include actions such as LSLR or pitcher filter distribution into a designation of OCCT.[1] In the case of Denver Water, the definition of OCCT in 40 C.F.R. Section 141.2 precludes implementation of an alternative approach to address the potential watershed impacts due to increased nutrient levels in receiving waters that may result from Denver Water's use of the designated optimal corrosion control treatment of orthophosphate. EPA's approval of the variance is based on an assessment of the "at least as efficient as" standard and the strength of Denver Water's LRPP in protecting public health from sources of lead in drinking water. But, EPA does recognize that additional ecological and public health benefits can accrue from limiting new sources of nutrients into surface water, particularly when the surface water – the South Platte River – is a wastewater effluent dominated stream with limited options to effectively control nutrient levels.

Appendix B: List of PWSs Integrated to Denver Water as of October 30, 2019

NAME	DESCRIPTION	PWSID
ALAMEDA_WS	Alameda W&S	CO0130116
BANCROFT_CLOVER_WS	Bancroft - Clover W&S	CO0130133
BEAR_CK_WS	Bear Creek W&S	CO0130138
BENNETT_BR_CK_WS	Bennett Bear Creek Farm W&S	CO0139139
BERKELEY_WS	Berkeley W&S	CO0116140
BONVUE_WS	Bon-Vue W&S	CO0130152
BOWMAR_WS	Bow-Mar W&S	CO0103153
BROOKRIDGE_HTS_WS	Brookridge Heights W&S	CO0103155
BROOMFIELD	City of Broomfield	CO0107155
CASTLEWOOD	Castlewood	CO0103166
CHATFIELD_SOUTH	Chatfield South Water District	C00118175
CHERRY_CK_VALLEY	Cherry Creek Valley	CO0103175
CHERRY_CK_VILLAGE	Cherry Creek Village	CO0103176
CHERRY_HILLS_FARM	Cherry Hills Farm Metro	CO0116177
CHERRY_HILLS_HTS_WS	Cherry Hills Heights W&S	NULL
CHERRY_HILLS_N_WS	Cherry Hills North W&S	NULL
CHERRY_HILLS_VILLAGE	Cherry Hills Village, City of	CO0103176
CHERRY_HILLS_VILLAGE_CITY	City of Cherry Hills Village	NULL
CO_DEPT_NAT_RES	Colorado Department of Natural Resources	NULL
COLO_ACAD	Colorado Academy	NULL
COLUMBINE_WS	Columbine W&S	NULL
CON_MUTUAL	Consolidated Mutual Water	CO0130145
COUNTRY_HOMES	Country Homes Metropolitan	CO0103186
CRESTVIEW_WS	Crestview W&S	CO0101040
DEVONSHIRE_HTS_WS	Devonshire Heights W&S	NULL
EDGEWATER	City of Edgewater	CO0130237
FEHLMANN	Fehlmann Subdivision Water Assn.	NULL
GALLERIA_METRO	Galleria Metropolitan	NULL
GLENDALE	City of Glendale	CO0103055
GRANT	Grant	NULL
GREEN_MTN_WS	Green Mountain W&S	CO0130321
GREENWOOD_VILLAGE	City of Greenwood Village	NULL
HAVANA_WS	Havana W&S	NULL
HI_LIN_WS	Hi-Lin W&S	NULL
HIGH_VIEW	High View	CO0130344
HILLCREST_WS	Hillcrest W&S	NULL
HOLLY_HILLS_WS	Holly Hills W&S	NULL
HOLLY_MUTUAL	Holly Mutual Water Company	NULL
KEN_CARYL	Ken Caryl W&S	CO0103075
KING_LLOYD	King, Lloyd J.	NULL
LAKEHURST_WS	Lakehurst W&S	CO0130466
LAKEWOOD	City of Lakewood	CO0130467
LITTLETON	City of Littleton	NULL
LOCHMOOR_WS	Lochmoor W&S	NULL
LOCKHEED	Lockheed Martin Astronautics Group	NULL
LORETTO_HTS	Loretto Heights Re-Sub Water Assn.	NULL
MANSFIELD_HTS_WS	Mansfield Heights W&S	NULL
MEADOWBROOK	Meadowbrook Water	CO0130500
N_LINCOLN_WS	North Lincoln W&S	CO0116552
N_PECOS	North Pecos W&S	CO0116553
N_WASH_WS	North Washington W&S	CO0101110
PANORAMA_PK	Panorama Park Water Assn.	NULL
PHILLIPS	Phillips Petroleum Co.	CO0201060
PLATTE_CANYON_WS	Platte Canyon W&S	CO0103614
S_ADAMS_WS	South Adams County W&S	CO0101140
S_SHERIDAN	South Sheridan Water, Sewer, & Storm Drainage	CO0130718
S_UNIV_PL	South University Place Water Assn.	NULL
SE_ENGLEWOOD	Southeast Englewood Water	NULL
SHERIDAN	City of Sheridan	NULL
SOUTHGATE	Southgate Water	CO0103721
SW_METRO	Southwest Metropolitan	CO0103723
SW_PLAZA_METRO	Southwest Plaza Metropolitan	NULL
SW_SUB_DEN_WS	Southwest Suburban Denver W&S	NULL
VALLEY	Valley Water	CO0130800
WHEATRIDGE	Wheatridge	CO0130842
WILLOWBROOK_WS	Willowbrook W&S	CO0130843
WILLOWS_WD	Willows Water District	C00103100

[1] The order is a variance from the definition of "optimal corrosion control treatment" in 40 C.F.R. Section 141.2 as that term is used in 40 C.F.R. Sections 141.82(c), (d), (e), and (h). 40 C.F.R. Section 141.82(d) provides that "the State shall either approve the corrosion control treatment option recommended by the system, or designate alternative corrosion control treatment(s) from among those listed in paragraph (c)(1) of this section." 40 C.F.R. Section 141.82(h) authorizes a State to modify its determination of the optimal corrosion control treatment under paragraph (d) of this section." 40 C.F.R. Section 141.82(c)(1) provides that "[a]ny public water system performing corrosion control treatment studies shall evaluate the effectiveness of each of the following treatments, and if appropriate combinations of the following treatments to identify the optimal corrosion control treatment for that system: (i) Alkalinity and pH adjustment; (ii) Calcium hardness adjustment; and (iii) The addition of a phosphate or silicate based corrosion inhibitor at a concentration sufficient to maintain an effective residual concentration in all test tap samples." 40 C.F.R. Section 141.82(c)(6) provides that on the basis of that evaluation, "the water system shall recommend to the State in writing the treatment option that the corrosion control studies indicate constitutes optimal corrosion control treatment for that system." 40 C.F.R. Section 141.2 defines "optimal corrosion control as "the corrosion control treatment that minimizes the lead and copper at users' taps while insuring that the treatment does not violate any national primary drinking water regulations."

When Denver conducted the most recent CCT study pursuant to 40 C.F.R Section 141.82(c) and CDPHE modified its determination of OCCT, as authorized under 40 C.F.R. Section 141.82(h), the utility and State they were bound by 40 C.F.R. Sections 141.82(c) and (d), respectively, and the definition of OCCT in 40 C.F.R. Section 141.2. CDPHE designated OCCT as orthophosphate because it "minimizes" the lead concentrations at users' taps in comparison to pH and alkalinity adjustment. Denver Water, in turn, was required under 40 C.F.R. Section 141.82(e) to "properly install and operate throughout its distribution system the optimal corrosion control treatment designated by the State under paragraph (d) of this section." This variance is from the definition of "optimal corrosion control treatment" in 40 C.F.R. Section 141.2. It will relieve Denver Water from that aspect of the requirement in 40 C.F.R. Section 141.82(e) to install the "optimal" corrosion control treatment designated by the State under 40 C.F.R. Section 141.82(d) and require Denver Water to comply with the terms and conditions of this variance instead. Accordingly, CDPHE may designate as OCCT alkalinity and pH adjustment even though it does not minimize lead concentrations at users' tap, and CDPHE may modify its OCCT designation under 40 C.F.R. Section 141.82(h) to require Denver Water to comply with the terms and conditions of this variance, which includes actions other than installation of CCT.