COLORADO
Water Quality Control Division
Department of Public Health & Environment

Appendix K – Application Form
Lead and Copper Rule
Source Water Treatment Recommendation and
Optimal Corrosion Control Treatment Recommendation

Under the Lead and Copper Rule (LCR), community and non-transient, non-community public water systems (PWS) that have a lead and/or copper action level exceedance are required to submit two recommendations: i) a source water treatment recommendation and ii) an optimal corrosion control treatment (OCCT) recommendation.

These two recommendations are required by the LCR to address the separate ways by which lead and/or copper contamination is introduced into drinking water. The source water treatment recommendation evaluates if lead and/or copper is coming from the supplier's raw water. The OCCT recommendation evaluates treatment options to prevent corrosion of premise plumbing and service lines.

Both recommendations are primarily based on the results of sampling conducted following a lead and/or copper action level exceedance. Therefore, it is imperative that timely follow-up lead, copper, and water quality parameter sampling occurs in order to have the information necessary to make informed treatment recommendations. Please note – to be accurate, pH and temperature measurements must be made in the field within 15 minutes of sample collection. The pH of the water will change over time as the water comes into equilibrium with the air. **pH results from a laboratory are not acceptable and will delay the review.**

Small and medium systems (less than or equal to 50,000 people) may use this form to make the required treatment recommendations to the Colorado Department of Public Health and Environment (department). This form should be completed in reference to the *US EPA Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems* manual (US EPA, March 2016 (Updated)). A digital copy of the EPA OCCT manual may be found at: www.epa.gov/dwreginfo/optimal-corrosion-control-treatment-evaluation-technical-recommendations.

IMPORTANT: Community water systems must have recommendations completed by a professional engineer (PE) licensed in Colorado. A Colorado PE is not required for non-transient, non-community water systems but the department recommends that the supplier work with an engineer, licensed waterworks operator, or other professional experienced with water treatment chemistry

1. SYSTEM INFORMATION

Please provide PWS information and a contact person in case there are questions.

a) Public Water System Name: Woodland West Water Users Association
b) Public Water System PWSID Number: CO0160950
c) System Contact Person: Larry Watters
d) System Contact Phone: 719-338-5429
e) System Contact Email: wh2osllc@gmail.com
f) Engineering / Designer Contact Person/Firm: Douglas Schwenke (Respec)
g) Engineering / Designer Contact Phone: 719-402-0009
h) Engineering / Designer Contact Email: douglas.schwenke@respec.com

Application is for the following type of action level exceedance.

- ☐ Lead
- ☑ Copper
- ☐ Lead and Copper

2. SOURCE WATER TREATMENT RECOMMENDATION

In the context of the LCR, source water treatment refers to the removal of lead and copper already present in drinking water at the supplier's distribution system entry points (EP) following treatment. This is not common in Colorado. Following an action level exceedance, a lead and copper sample is collected

at all EPs. Some PWS systems may have only a single EP, while other PWS systems may have many. Examples of EPs include: point of entry at an individual or collection of wells, the point of entry at a water treatment plant, or at a master meter connection for a consecutive water system. If lead and/or copper is not detected in any of the EPs samples, then the do nothing recommendation for source water treatment is acceptable.

In Table 2-1, please enter the lead and copper data taken at each entry point to the distribution system. Please attach copies for additional entry points or for additional sampling data. A minimum of one data set must be provided.

Table 2-1: Entry Point -Source Water Quality Parameter Sample Data

Sample Date	Entry point sample ID 008		Entry point sample ID _____	
	Lead (mg/L)	Copper (mg/L)	Lead (mg/L)	Copper (mg/L)
12/04/2025	0.00050	0.0309		

a) Do any of the source water samples exceed the action level for lead (0.015 mg/L or 15 µg/L)?

☐ Yes ☑ No

b) Do any of the source water samples exceed the action level for copper (1.3 mg/L)?

☐ Yes ☑ No

c) What is the source water recommendation?

☑ **Do Nothing**. EP samples do not show the presence of lead and/or copper at levels which are of concern.

☐ **Install Treatment**. EP samples contain levels of lead/and or copper which are of concern. Please provide a description of the proposed treatment in the box below.

3. OPTIMAL CORROSION CONTROL TREATMENT RECOMMENDATION

Lead and copper contamination in drinking water is often caused by the corrosion of premise plumbing and service lines. The purpose of corrosion control treatment is to prevent and/or minimize the metals release associated with corrosion. Corrosion control treatment can be accomplished by adjusting water chemistry (pH, alkalinity, dissolved inorganic carbon (DIC), adding a corrosion inhibitor (orthophosphate, silica- based inhibitor, blended phosphate), or by a combination of the two.

According to the EPA OCCT manual, corrosion control treatment selection follows five steps:

- Step 1 - Review Water Quality Data
- Step 2 - Evaluate Potential for Scaling
- Step 3 - Select Potential Treatment Option(s)
- Step 4 - Identify Possible Limitations for Treatment Options
- Step 5 - Evaluate Feasibility and Cost for Treatment Options

Each step is covered below.

3a. Step 1 - Review Water Quality Data

The corrosion control treatment selection process largely depends on the chemical and physical properties of the water to be treated. Therefore, the first step in the treatment selection process is to gather and review all available water quality information. The source of this information may be from monthly operational reports, the required water quality parameter (WQP) sampling in the action letter exceedance letter (ALE letter), and/or additional investigatory sampling.

The WQP sampling is outlined in the action level exceedance letter. Each entry point requires a minimum of 2 samples from different days. Distribution system sampling requirements are stated in the system's action level exceedance letter. A minimum of 2 samples on different days will be required from 1 to 10 tap locations. Provide the entry point water quality data in Table 3a-1 and the distribution system water quality data in Table 3a-2. Please provide documentation of the field pH/ temperature measurements and lab water quality reports for other parameters if not previously uploaded to the portal.

Table 3a-1: Entry Point(s) Water Quality Parameter Sample Data

Entry point sample ID 008					
	Sample dates (minimum of two) (results given as mg/L where applicable)				Average Value
Parameters	06/28/2026	07/06/2026			
*pH (Field Test)	7.20	7.78			7.49
*Temperature (°C) (Field Test)	14.1	14.1			14.1
Alkalinity as $CaCO_3$	79.9	81.1			80.5
Conductivity (uS/cm) or					
Total Dissolved Solids	229	224			227
**Calcium as $CaCO_3$	103	101			102
Chloride	59.1	38.4			48.8
Sulfate	12.9	12.9			12.9
Iron	0.313	0.317			0.315
Manganese					
***Orthophosphate (mg/L as P)					
***Total Phosphorus (mg/L as P)					
Silica (If Applicable)					

* Analyze pH and temperature as soon as possible, but no more than 15 minutes after sample collection (pH measurements taken more than 15 minutes after sampling)

** If the result is given as mg/L as Ca multiple by 2.5 to get mg/L as $CaCO_3$.

*** If the result is given as mg/L as PO4 divide by 3 to get mg/L as P.

Table 3a-2: Distribution System Water Quality Parameter Sample Data

Distribution sample ID or address 609 University Dr.					
Parameters	Sample dates (minimum of two) (results given as mg/L where applicable)				Average Value
	06/28/2026	07/06/2026			
*pH (Field Test)	8.19	7.78			7.99
*Temperature (°C) (Field Test)	17.1	17.5			17.3
Alkalinity as $CaCO_3$	80.8	80.2			80.5
Conductivity (uS/cm) or					
Total Dissolved Solids	226	205			216
**Calcium as $CaCO_3$	101	102			102
Chloride	38.0	38.0			38.0
Sulfate	12.9	13.1			13.0
Iron	0.320	0.310			0.315
Manganese					
***Orthophosphate (mg/L as P)					
***Total Phosphorus (mg/L as P)					
Silica (If Applicable)					

* Analyze pH and temperature as soon as possible, but no more than 15 minutes after sample collection (pH measurements taken more than 15 minutes after sampling)

** If the result is given as mg/L as Ca multiple by 2.5 to get mg/L as $CaCO_3$.

*** If the result is given as mg/L as PO4 divide by 3 to get mg/L as P.

3b. Step 2 - Evaluate Potential for Scaling

The second step in the treatment selection process is to identify the potential for scaling in the distribution system. The presence of calcium in the distribution system water may limit the system's ability to raise pH. By maintaining water below the saturation pH, calcium carbonate precipitation should be minimal, thus preventing scaling problems. Because many corrosion control treatment processes involve the adjustment of pH, it is important to know at what level calcium carbonate precipitation may occur. Calcium carbonate precipitation can limit the upward adjustment of pH to below an effective range for certain types of treatment.

In order to identify the saturation pH, the calcium and the dissolved inorganic carbon (DIC) levels are used. To estimate DIC levels, use the measured distribution pH and alkalinity levels and the tables in Appendix B of the EPA OCCT manual (pg. B-1).

a) What is the pH used for the DIC estimate?
7.99 s.u.

b) What is the alkalinity used for the DIC estimate?
80.5 mg/L as $CaCO_3$

c) What is the estimated DIC level based on Appendix B?
19 mg/L as C

Once DIC is estimated, use Exhibit 3.2 in the EPA OCCT manual (pg. 31) to estimate the saturation pH.

d) What is the calcium concentration used for the saturation pH? Please note Exhibit 3.2 is based on calcium measured in mg/L. If results given as mg/L as $CaCO_3$ divide by 2.5 to get mg/L as Ca before using.
40.7 mg/L as Ca

e) What is the estimated saturation pH in Exhibit 3.2?
7.96 s.u.

3c. Step 3 - Select Potential Treatment Option(s)

The third step involves identifying potential corrosion control treatment options using the applicable flowchart in the EPA OCCT manual Exhibit 3.3 in the manual (pg. 32), the flow charts (pg. 33-41) and the information from steps one and two.

a) Is this a lead, copper, or lead and copper action level exceedance?
- ☐ Lead
- ☑ Copper
- ☐ Lead and Copper

b) Is there iron and manganese present in the finished water? If iron and/or manganese is present then provide a discussion in the box below of how the iron/manganese concentration is addressed in the flowchart selection. Note: the secondary maximum contaminant levels (MCL) are 0.3 mg/L for iron and 0.05 mg/L for manganese.
- ☑ Yes
- ☐ No

Average iron concentration in distribution system samples = 0.315 mg/L, slightly above the SMCL. Manganese concentration was not reported.

c) What is the pH range?
- ☐ <7.2
- ☐ 7.2-7.8
- ☑ 7.8-9.5
- ☐ >9.5

d) According to Exhibit 3.3 on page 32 of the EPA OCCT manual, what is the applicable flowchart?

☐ 1a	☐ 2a	☐ 3a
☐ 1b	☐ 2b	☑ 3b
☐ 1c	☐ 2c	
☐ 1d		

e) On the applicable flow chart, what range does the estimated DIC fall under? These are listed as (< 5 mg/L as C, 5-15 mg/L as C, >25 mg/L C, etc.)
- ☑ > or = to 5 mg/L as C
- ☐ _____ to_____ mg/L as C

f) What are the identified corrosion control treatment options on the appropriate branch of the flow chart?
- ☑ Raise pH
- ☐ Raise DIC (alkalinity)
- ☑ Add orthophosphate
- ☑ Add blended phosphate
- ☐ Add silicate

g) Please provide a discussion on the selected OCCT process flow in the box below.

Options for optimizing CCT under 3b include: 1) add blended phosphate (WWWUA has been using Carus 8100 blended phosphate) or 2) remove source water iron/manganese and add orthophosphate with pH adjusted to 7.2-7.8 (it is not practical at this time for WWWUA to remove source water iron and manganese prior to corrosion control treatment.)

3d. Step 4 - Identify Possible Limitations for Treatment Options

Step four is to identify possible limitations of certain corrosion control treatment processes. A description of these limitations is found on pages 41-44 of the EPA OCT manual. Please provide a description of why a limitation is or is not applicable.

a) Identification of Possible Limitations of pH/Alkalinity/DIC Adjustment

☑ Interference with optimal pH ranges for other processes

☑ Yes, applicable.

☐ No, not applicable.

Reasoning:
Target pH for orthophosphate use is 7.2-7.8 and for copper control is 7.0-7.8. Use of blended phosphate is less restricted by pH. Buffer intensity/chemical stability is lowest in pH range of 8.0-8.5 and can increase leadcopper release. As pH increases, less H+ ions are available and the proportion of more powerful HOCl species decreases and that of less effective OCl- ions increases.

☑ Calcium carbonate precipitation

☐ Yes, applicable.

☑ No, not applicable.

Calcium carbonate saturation pH = 7.96

Reasoning:
At 7.99, adjusted/distribution system pH is near saturation pH of 7.96; the water is essentially saturated with CaCO3 but not necessarily scale-forming. CaCO3 precipitation can interfere with phosphate effectiveness; keeping pH at or below pH(sat) should mitigate this.

☑ Oxidation of iron and manganese

☑ Yes, applicable.

☐ No, not applicable.

Reasoning:
Increasing pH along with higher levels of free chlorine can cause oxidation of iron and manganese. Iron concentration appears relatively constant in the source water and distribution system and is slightly above the SMCL. pH adjustment should not be increased so as not to risk additional oxidation of iron within the distribution system.

b) Identification of Possible Limitations of Phosphate Based Inhibitors

☑ Reactions with aluminum

☐ Yes, applicable.

☑ No, not applicable.

Reasoning:

The water system does not use aluminum-based chemicals.

☑ Impacts on wastewater

☑ Yes, applicable.

☐ No, not applicable.

Reasoning:

Homes in this district utilize On Site Wastewater Treatment Systems (OWTS.) Phosphorus from corrosion control chemicals will enter the soil through septic systems and/or directly with irrigation use. Removal of phosphorus by septic systems varies from 60%-90% depending upon the soil's phosphorus affinity; calcium-rich soils on the eastern plains tend toward lower adsorption/chemical precipitation of phosphorus. The intent is to utilize the minimum amount of phosphates required for corrosion control. Typical SeaQuest dosing range is lower than that of other blended phosphates.

3e. Step 5 - Evaluate Feasibility and Cost

Step five in the treatment selection process is to evaluate the feasibility and costs associated if multiple treatment options are identified in the EPA flowcharts. Systems should consider operability, reliability, system configuration, and other site-specific factors when evaluating CCT alternatives. In cases where more than one treatment option can meet the OCCT definition of the LCR rule, systems may want to consider cost factors including costs for capital equipment, operations, and maintenance.

3f. Final Corrosion Control Treatment Recommendation

After completing the five steps, an informed corrosion control treatment recommendation can be made. In the recommendation, identify possible treatment options, the chemical or process selected to implement the option, and the target value or dose. Information regarding target values (pH, orthophosphate, etc.) can be found on pages 45- 49 of the EPA OCCT manual. Note that “no treatment” is not an acceptable selection.

a) Indicate the final OCCT option (select all that apply) and treatment chemical or process:

☑ pH/alkalinity adjustment

- ☐ Aeration
- ☐ Caustic potash, KOH
- ☑ Caustic soda, NaOH
- ☐ Lime, $Ca(OH)_2$
- ☐ Potash, K_2CO_3
- ☐ Soda ash, Na_2CO_3
- ☐ Other (explain in box below)

Maintain current pH adjustment - no changes to caustic soda dose.

- [x] Phosphate based inhibitor
  - [ ] Orthophosphate
  - [x] Blended phosphate
- [ ] Silicate based inhibitor
  - [ ] Silicate inhibitor

b) Discuss the treatment selection or reasoning in the box below.

Continue pH adjustment and the use of Carus 8100 while lowering the dose to as directed by Carus. Continue to monitor phosphate at the entry point weekly. Continue to monitor free chlorine in the distribution system during and following the stabilization period (60 days.) Complete additional water quality monitoring (raw water, entry point and distribution system pre-reduction and 60 days post-reduction). It is anticipated that the system will switch from the Carus 8100 (70% poly/30% ortho) to the Carus 8500 (50% poly/50% ortho) once this evaluation is complete.

c) Discuss the preliminary target value (e.g., pH of 8.0) or dose (e.g., 1 mg/L-PO4) in the box below.

Continue to target an entry point pH of 7.5. It is expected that pH will continue to increase within the distribution system to approximately 8.0. These pH values should be considered maximum values until Carus has evaluated additional water quality monitoring results. Reduce current Carus 8100 dose to target 0.5 mg/L to 0.6 mg/L PO4 throughout the distribution system. Provide water quality monitoring results (raw water, entry point and distribution system pre-reduction and 60 days post-reduction) to Carus for further evaluation of product, dose, and optimal pH.

4. SUBMISSION OF RECOMMENDATIONS FORM

To complete the application process, you must:

- ☐ Submit this form, attachments and certification to the Drinking Water Portal
- ☐ Attach any additional information (e.g., water quality parameters, manufacturer recommendations)
- ☐ Sign certification below.

I certify that all of the above is correct to the best of my knowledge.

a) Submitter's Name: _____

b) Date: _____

c) Signature:

_____

d) Colorado Professional Engineer Stamp (required for community water systems)

