Division of Drinking and Ground Waters

Issued Date: 4/19/19	DDAGW Name: ENG-9119-GD: Guidelines for Determining when Source and Treatment Changes Trigger Optimal Corrosion Control Evaluation (Ver. 06/07/2021)	**Type of Document**: ○ Policy (External) ○ Procedure (Internal) ◉ Guidance (External)
Status: Final	**Short Title of Document**: Source and Treatment Change CCT Triggers	
Revised Date: 6/7/21	Statutory References: ORC 6109.30	**Documents Attached**?
Check Box If NO CHANGE ☐	Rule References: OAC 3745-81-81, OAC3745-81-87, OAC 3745-81-90	☐ Internal Documents ☑ External Documents

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I hereby approve the:

◉ Issuance

○ Revision

○ Revocation

of the above-reference policy, guidance or internal procedure to support the consistent, fair and efficient implementation of rules and programs administered by the Division of Drinking and Ground Waters. In accordance with Revised Code 3745.30 policies will be advertised in the Ohio EPA Weekly Review and include a banner stating that "This policy does not have the force of law".

Signature of Chief: Amy Jo Klei

Date Signed: 07/07/2021

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Ohio Environmental Protection Agency

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I. PURPOSE

The purpose of this document is to provide guidance on when a source or treatment change in a public water system (PWS) requires the evaluation of optimal corrosion control treatment (OCCT). Based on the information provided in the evaluation, Ohio EPA may require the installation or modification of corrosion control treatment (CCT) in conjunction with a source or treatment change.

II. BACKGROUND

Ohio Administrative Code (OAC) Rules 3745-81-81 and 3745-81-90 require any community or nontransient noncommunity (NTNC) water system to notify Ohio EPA of any change or modification in treatment or the addition of a new source. The addition, removal or modification of treatment or source water must be reviewed and approved by Ohio EPA prior to water system implementing the change. In addition, the agency may require additional monitoring or other appropriate actions to ensure that CCT is optimized.

Ohio Revised Code (ORC) section 6109.121(A)(6), effective September 9, 2016, instructed Ohio EPA to establish rules requiring a community or NTNC water system to conduct a new or update an existing CCT evaluation under certain conditions. In accordance with OAC Rule 3745-81-81, effective May 1, 2018, a PWS is triggered into CCT evaluation for the following reasons:

- The exceedance of the lead or copper action level (AL);
- A change in population from less than 50,000 to greater than 50,000;
- A change in source or addition of a new source;
- A substantial change in treatment, as defined in OAC Rule 3745-91-01;
- Operating outside of previously approved acceptable ranges for corrosion control indicators as determined by OAC Rule 3745-81-82 (i.e. a PWS that receives an optimal water quality parameter (OWQP) excursion violation); or,
- Any other event determined by the director to have the potential to impact the water quality or corrosiveness of the system.

Ohio EPA developed this guidance to specifically clarify OAC Rule 3745-81-81 paragraphs (F)(1)(a) and (F)(1)(b) regarding source and treatment changes.

Regardless if the system is currently in compliance with the lead and copper rule, if a system proposes a source or treatment change then it must:

- Notify Ohio EPA of the intent to make a source or treatment change.
- Submit detail plans for the proposed change.
- Complete or update a CCT recommendation, study or plans as required. Note: Ohio EPA may require the CCT evaluation to be completed prior to detail plan submittal.
- Notify Ohio EPA when the source or treatment change is made or installed, as required under OAC Rule 3745-81-90(C)(4).

- If proposed changes are made or treatment is installed, complete two 6-month water quality parameter (WQP) monitoring periods and two 6-month lead and copper tap monitoring periods, as applicable in accordance with OAC 3745-81-86(D)(2) and 3745-81-87(C).

In developing this guidance, Ohio EPA considered the current recommendations provided by U.S. EPA when evaluating a water system's OCCT as well as the latest published scientific research. As presented in U.S. EPA's *Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems, March 2016 (Updated 2019)*, research from the last several years has revealed previously unknown impacts of source water and treatment changes on corrosion, especially for systems with lead service lines. The research has shown that corrosion is dependent on many WQPs and that treatment or source water changes can have a significant impact on lead release.

Ohio EPA does not intend to apply this guidance to short term, emergency situations where an interconnection is needed for less than 14 consecutive days; however, the director may determine a PWS with an emergency connection with different water quality, based on those parameters listed in Section IV, needs to address those water quality differences in their contingency plan. This guidance would be applicable if a water system needs interconnections frequently due to an inadequate source water supply.

Additionally, Ohio EPA does not intend this guidance to apply to day-to-day changes in chemical dosage necessary to address raw water quality changes. However, if a system decides to change vendor or chemical manufacturer, the PWS must ensure products are equivalent (or like-kind, as defined under OAC Rule 3745-91-01) and be cognizant of the potential changes to WQPs which could affect corrosion control. It is recommended the PWS collect samples for WQPs if chemical vendor changes are being made.

Definitions

Corrosion Control Treatment (CCT) A treatment designed to reduce the corrosivity of water toward metal plumbing materials, particularly lead and/or copper.

Corrosion Control Treatment Evaluation A WQP comparison, CCT Recommendation, or CCT Study, including necessary detail plans which includes an assessment of WQPs collected.

Corrosion Control Treatment Recommendation (CCTR) A proposal as to the best course of action for controlling corrosion.

Corrosion Control Treatment Recommendation Form (CCTR Form) Ohio EPA developed spreadsheet, which is to be completed by the PWS when they are required to submit a recommendation.

Demonstration Corrosion Control Treatment Study A bench-scale or field pilot study to evaluate alternative treatment approaches for minimizing lead and/or copper levels which includes the development and implementation of testing protocols. Demonstration testing can incorporate pipe loops, coupon tests, scale analysis, or partial system testing.

Desktop Corrosion Control Treatment Study A study to determine if corrosion control treatment is warranted and the appropriate corrosion control treatment for minimizing lead and/or copper levels which includes evaluations of literature, historical data and information, theory, and similar system information.

Large Water System A public water system that serves more than 50,000 persons.

Lead Service Line (LSL) A service line made of lead which connects a water main to a building inlet and any lead pigtail, gooseneck, or other fitting which is connected to such a lead line. An **LSL system** is a public water system with LSLs in their distribution, including partial and/or privately-owned LSLs.

Medium Water System A public water system that serves greater than 3,300 and less than or equal to 50,000 persons.

Optimal Corrosion Control Treatment (OCCT) The corrosion control treatment that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the PWS to violate any national primary drinking water regulations.

Small Water System A public water system that serves less than or equal to 3,300 persons.

III. OTHER APPLICABLE GUIDANCE

U.S. EPA Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems, EPA 816-B-16-003, March 2016 (Updated 2019).

PWS-04: Guidelines for Lead Mapping in Distribution Systems

PWS-05: Guidelines for Mapping Lead Plumbing and Fixtures for Individual Buildings

Guidelines for Design of Small Public Water Systems (Greenbook)

USEPA: Water Supply Guidance Manual

AWWA Research Foundation: Lead Control Strategies (1990)

Hill and Cantor, American Water Works Association: Internal Corrosion Control in Water Distribution Systems (AWWA Manual M58, Second Edition)

Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers: Recommended Standards for Water Works (2012 Edition)

IV. CCT EVALUATION OVERVIEW

Depending on the size of the system and the circumstances of the specific source or treatment change being proposed, a water system may be directed to complete a CCT recommendation, a CCT study, or submit a comparison of water quality data to conduct their CCT evaluation. To determine the extent of CCT evaluation required for a specific project, refer to Section V. This guidance is meant to address the majority of proposed source and treatment changes; a water system's unique situation may warrant a different level of evaluation. Based on the information provided in the CCT evaluation, Ohio EPA may require the installation or modification of CCT.

In all cases, WQPs relevant to corrosion must be collected as a part of the CCT evaluation. WQPs are also generally required after the change in source or treatment is implemented. WQPs are discussed further in this section and in Appendix C.

Additionally, the owner or operator of a PWS required to complete a CCT evaluation must notify any of their consecutive or wholesale system(s) about their system being subjected to evaluation, in accordance with OAC 3745-81-81(F)(2).

Comparison of Water Quality Parameters

In accordance with OAC 3745-81-81(G), Ohio EPA may waive the requirement to conduct a new or updated CCT recommendation upon demonstration by a PWS that a source or treatment change will not impact the water quality or corrosiveness of the system.

To demonstrate that a proposed source or treatment change will not impact the water quality or corrosiveness of the system, a PWS must provide a comparison of current water quality and proposed water quality, as well as a letter summarizing the information and requesting the waiver. To obtain proposed water quality, systems may have to complete a bench scale or pilot study to determine the effects of the proposed change. If a pilot study is already required for the chosen proposed treatment, then collection of WQPs is recommended during the study.

Corrosion Control Treatment Recommendation

If a CCT recommendation is required, the PWS must submit the recommendation using Ohio EPA's Corrosion Control Treatment Recommendation Form (CCTR Form). Data gathered from WQP monitoring should be used to complete the CCTR Form. Appendix A of the CCTR Form must also be completed to compare current and proposed water quality for source and treatment changes. To obtain proposed water quality, systems may have to complete a bench scale or pilot study to determine the effects of the proposed change.

An acceptable CCTR Form must be submitted to Ohio EPA and approved prior to instituting a source or treatment change project. Upon review of the CCTR Form, Ohio EPA may require additional monitoring, a CCT study, or the installation of CCT before issuing plan approval.

Corrosion Control Treatment Study

If a CCT study is required, the CCT study must evaluate the impact and effectiveness of the installation of CCT in conjunction with the proposed change. Analyses should be based on analogous system comparisons, pipe rig/loop tests, metal coupon tests, or partial system tests.

Data gathered from WQP monitoring should be used, in addition to data gathered throughout the CCT study to determine the need for CCT, and the type of CCT if needed. Chemical and physical constraints limiting the use of CCT or a particular type of CCT should be outlined. The effects of the change proposed and impact of the installation of CCT on other water quality treatment processes should be evaluated. Additionally, current and proposed water quality must be compared. To obtain proposed water quality, systems may have to complete a bench scale or pilot study to determine the effects of the proposed change.

To summarize the findings from the CCT Study, systems may utilize the Corrosion Control Treatment Recommendation Form (CCTR Form). An acceptable CCTR Form or equivalent report must be submitted to Ohio EPA and approved prior to instituting a source or treatment change project. Upon review of the CCT evaluation, Ohio EPA may require additional monitoring or the installation of CCT.

WQPs Relevant to Corrosion

There are a number of important WQPs relevant to corrosion control. As a part of any CCT evaluation, Ohio EPA will require the water system to collect samples for relevant WQPs at the entry point and in the distribution system. For evaluations conducted in response to a source water change, WQPs must also be collected from the raw water source. Any WQP monitoring required by Ohio EPA as a part of a CCT Evaluation shall be conducted in accordance with OAC Rule 3745-81-87(A) and (B).

The specific parameters required to be measured at the source, entry point, and distribution prior to a source or treatment change are outlined in Appendix C. These parameters may include:

- pH
- Water Temperature
- Alkalinity
- Calcium
- Total Dissolved Solids (TDS) or Conductivity
- Hardness
- Chloride
- Sulfate
- Iron
- Manganese
- Lead
- Copper
- Orthophosphate
- Total Phosphorus
- Silica
- Combined Chlorine
- Free Chlorine
- Total Chlorine
- Dissolved Oxygen (DO)
- Aluminum

Additionally, water systems may also provide information on the following WQPs, although they are not required to be collected by Ohio EPA:

- Dissolved Inorganic Carbon (DIC)
- Calcium Carbonate Saturation (stability)
- Buffer Intensity
- Oxidation Reduction Potential (ORP)
- Total Organic Carbon (TOC) or Dissolved Organic Carbon (DOC)

V. DETERMINATION OF CCT EVALUATION REQUIREMENT

The requirement for a CCT evaluation varies depending on the risk of the proposed source or treatment change, the water system size, and the prevalence of lead service lines in the water system's distribution. Additional factors may also be considered to determine if a specific project needs a more thorough evaluation.

Table 1 assigns a level of risk affecting corrosivity for a source or treatment change and whether a CCT evaluation will be required based on that risk level. **Table 2** outlines the monitoring and CCT Evaluation requirements, as well as follow up actions required based on a water system's size and the risk of the proposed source or treatment change.

Common source and treatment changes have been evaluated using the risk definitions outlined in **Table 1**. Refer to **Appendix A and B**, respectively, for the **minimum** risk level associated with common types of source and treatment changes; then, refer to **Table 2** to determine the requirements for a specific project based on the minimum risk level identified.

Ohio EPA may determine that a specific project necessitates a different risk level than outlined in this guidance. If there are multiple changes being made as a part of one project, the highest minimum risk level associated with a project component is applied to the overall project. On a case-by case basis, Ohio EPA may consider a lower minimum risk level for a proposed project at a PWS with optimal CCT installed and optimal WQPs designated. Any such system would need to demonstrate that the proposed change would not impact their existing optimal CCT.

This guidance is meant to address the majority of proposed source and treatment changes. A water system's unique situation, as well as the treatment and distribution history may warrant a different level of evaluation.

Table 1: Risk Definitions

Risk of Source or Treatment Change	Explanation of Requirement
0 - Unlikely	A corrosion control evaluation is not required. The change is not expected to have any impact on corrosivity; however, the system should be cognizant of any unintended changes to pH, alkalinity, and other WQPs which may affect corrosion.
1 - Minimal	The risk that the change will affect the corrosivity is minimal. The system may request to waive the requirement for the evaluation of corrosion control under OAC Paragraph 3745-81-81(G) by providing water quality parameter data before and after the change. The system may be required to conduct standard 6-month lead and copper tap monitoring following the change.
2 - Possible	There is a possibility that the change will affect the corrosivity. The system will be required to submit a corrosion control recommendation using the CCTR Form along with the detail plans submitted for the change. Water quality parameter data must be collected both before and after the change. The system will be required to conduct standard 6-month lead and copper tap monitoring following the change.
3 - High	The risk that the change will affect the corrosivity is high. The system will be required to submit a corrosion control recommendation using the CCTR Form along with the detail plans submitted for the change. Systems with lead service lines will likely be required to conduct a corrosion control treatment study. Ohio EPA may require the installation of corrosion control treatment in conjunction with the change. Water quality parameter data must be collected both before and after the change. The system will be required to conduct standard 6-month lead and copper tap monitoring following the change.

Table 2: Requirements based on Risk and PWS Size

Risk of Source or Treatment Change	PWS Size	Monitoring Required Prior to Change	CCT Evaluation Requirements	Follow Up Actions
0 - Unlikely	Any	None	None	No required follow up actions. System should be cognizant of any unintended changes which affect corrosion.
1 - Minimal	Any	Collect WQPs	Submit request to waive the requirements under OAC Paragraph 3745-81-81(F), as allowed under OAC Paragraph 3745-81-81(G); include comparison of WQPs with proposed WQPs following the change.	Collect WQPs. Standard 6-month lead and copper monitoring may be required.
2 - Possible	Small/Medium	Collect WQPs	Submit a CCTR Form.	Collect WQPs. Standard 6-month lead and copper monitoring for two monitoring periods following the change.
2 - Possible	Large	Collect WQPs	Submit a CCTR Form. A desktop CCT study may be required (e.g., for LSL systems). Evaluation of current OCCT/OWQPs may be required	Collect WQPs. Standard 6-month lead and copper and OWQP monitoring for two monitoring periods following the change. If applicable, OWQPs may be updated.
3 - High	Small	Collect WQPs	Submit a CCTR Form. A desktop CCT study may be required (e.g., for LSL systems). Evaluation of the installation of CCT to mitigate corrosivity may be required.	Collect WQPs. Standard 6-month lead and copper monitoring for two monitoring periods following the change.
3 - High	Medium	Collect WQPs	Submit a CCTR Form and complete a desktop CCT study. A demonstration CCT study may be required (e.g., for LSL systems with a population >10,000). Evaluation of the installation of CCT to mitigate corrosivity may be required.	Collect WQPs. Standard 6-month lead and copper monitoring for two monitoring periods following the change.
3 - High	Large	Collect WQPs	Submit a CCTR Form and complete a desktop CCT study. A demonstration CCT study may be required for LSL systems. Evaluation of current OCCT/OWQPs.	Standard 6-month lead and copper monitoring and OWQP monitoring for two monitoring periods following the change. If applicable, OWQPs may be updated.

VI. GENERAL RECOMMENDATIONS

It is important to plan for any future changes, including the potential impact on corrosion control. Below are some additional considerations for PWSs:

- Even if not required, regularly collecting WQPs outlined in Section IV will better facilitate a CCT Evaluation that may be needed for future source or treatment changes. Samples collected in accordance with US EPA approved methods may be able to be utilized in a future evaluation.
- Additional WQPs collected should also be used to evaluate process control for chemical feed systems.
- Consider installing a permanent pipe-loop system at the treatment plant, utilizing exhumed service line material to monitor the effects of any potential water quality change on corrosion.
- Anticipate how potential regulatory changes, future treatment needs, future source water needs, etc., could impact corrosion control.
- Consider simultaneous compliance issues that may arise from the addition or modification of corrosion control treatment or source or treatment changes.
- Study lead service line contributions to soluble lead levels by performing sequential lead sampling before and after the installation or modification of corrosion control treatment.
- Remove all lead service lines; removing the source of lead reduces the vulnerability of the system to unexpected changes in lead release due to future water quality changes.

VII. APPENDICIES

Appendix A: Minimum Risk Levels for Common Source Change Projects

Appendix B: Minimum Risk Levels for Common Treatment Change Projects

Appendix C: Required Water Quality Parameters

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APPENDIX A

MINIMUM RISK LEVELS FOR COMMON SOURCE CHANGE PROJECTS

Adding a New Source	Minimum Risk Level
Adding a well from a different aquifer as an existing well (including re-drilled wells if in a different aquifer)	2
Adding a well from the same aquifer as an existing well (including re-drilled wells if in the same aquifer)	0
Adding a new (additional) purchased water source	1

Changing Source	Minimum Risk Level
Interconnections	
Interconnections made on a routine frequency (greater than 14 consecutive days or 60 days of the year)	1
Short-term, emergency interconnections (less than 14 consecutive days and no more than 60 days of the year)	0
Switching Between Sources (including regionalization projects)	
From a ground water source to a surface water source or vice versa	2
From a treated source to any untreated source or an untreated source requiring treatment	3
From a similar source with similar treatment	1
From a dissimilar source with similar treatment	1
From a similar source with dissimilar treatment	2
Surface Water Source Modifications	
Modifications to existing surface water intake structure (depth or horizontally); this does not include seasonal changes	1
Addition of copper sulfate in the source water - algaecide application	0

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APPENDIX B

MINIMUM RISK LEVELS FOR COMMON TREATMENT CHANGE PROJECTS

Modifications to Corrosion Inhibitor Chemicals	Minimum Risk Level
Removing orthophosphate or blended phosphate	3
Changes of orthophosphate or blended phosphate resulting in a lower orthophosphate percentage (< 50% orthophosphate is not permitted)	2
Adding orthophosphate or blended phosphate	2
Addition of a corrosion inhibitor chemical	2
Changes of orthophosphate or blended phosphate resulting in a greater orthophosphate percentage	1
Changing chemical manufacturers (Blended phosphates must have an identical percentage of orthophosphate)	0
Chemical dose changes previously approved for day-to-day operations or for seasonal purposes	0

Changes to Disinfectant	Minimum Risk Level
Conversion to chloramine	3
Change from chlorine gas to hypochlorite	1
Addition of other oxidants/disinfectants (chlorine dioxide, ozone)	1
Increase in free chlorine dose	0
Addition of UV disinfection	0
Addition of chlorine booster in the distribution	0
Discontinuation of pre-chlorination, where a primary disinfectant is still utilized	0
Chemical dose changes previously approved for day-to-day operations or for seasonal purposes	0

Changes to Softening	Minimum Risk Level
Discontinuing precipitative softening	3
Changes/addition of precipitative softening	2
Changes/addition of Cation Exchange	1
Change in softener type	2
Chemical dose changes previously approved for day-to-day operations or for seasonal purposes	0

Changes to Coagulant	Minimum Risk Level
Switch from a sulfate-based to a chloride-based coagulant	2
Switch from a chloride-based to a sulfate-based coagulant	1
Addition of aluminum-based coagulants	1
Changes of primary coagulant with the same chemical formula (e.g. vendor or manufacturer change)	0
Changes/additions of coagulant aid, flocculation aid, or filter aid (polymers)	0
Increasing use of coagulants to achieve enhanced coagulation	0
Chemical dose changes previously approved for day-to-day operations or for seasonal purposes	0

Treatment Projects – Chemical Changes	Minimum Risk Level
Removal of polyphosphate or other phosphate-based chemicals (not for corrosion control)	3
Removal of pH adjustment (e.g., soda ash, caustic soda)	3
Changes/additions of polyphosphate or other phosphate-based chemicals (not for corrosion control)	2
Changes/additions of pH adjustment (e.g., soda ash, caustic soda)	2
Changes to fluoridation which impact pH	1
Changes/additions of oxidant (chlorine dioxide, permanganate, etc.)	1
Addition of powder activated carbon	0
Relocation of existing approved chemical	0
Chemical dose changes previously approved for day-to-day operations or for seasonal purposes	0

Filtration	Minimum Risk Level
Changes/addition/removal of reverse osmosis (RO) or nanofiltration	3
Changes/modifications to filtration between different families of filters (e.g., from conventional to microfiltration)	1
Physical modifications to flocculation or sedimentation	0
Changes/modifications to filtration within the same family of filters (e.g., conventional media change out, microfiltration module replacement, etc.)	0
Addition of Bag or Cartridge or micro (ultra) filtration with no coagulant addition	0
Sediment removal for groundwater (no coagulant added)	0

Other Treatment Projects	Minimum

	Risk Level
Anion Exchange	3
Other Inorganics Removal (e.g. activated alumina)	3
Iron and Manganese Removal	1
Aeration (including in the distribution system)	1
Granular Activated Carbon Contactors	0

Other Projects	Minimum Risk Level
Storage tanks - Physical changes to storage tanks, addition of distribution system storage tanks	0
Addition of mixers to storage tanks	0

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APPENDIX C

REQUIRED WATER QUALITY PARAMETERS

Source Water	Entry Point	Distribution
pH **Water Temperature** **Alkalinity** **Calcium** **Total Dissolved Solids (TDS) or Conductivity** **Hardness** **Chloride** **Sulfate** **Iron** **Manganese** **Total Phosphorus**	**pH** **Water Temperature** **Alkalinity** **Calcium** **Total Dissolved Solids (TDS) or Conductivity** **Hardness** **Chloride** **Sulfate** **Iron** **Manganese** **Lead,** for a lead or copper ALE, otherwise include if data is available. **Copper,** for a lead or copper ALE, otherwise include if data is available. **Orthophosphate,** when an inhibitor containing a phosphate compound is present or proposed. **Total Phosphorus,** when a chemical containing a phosphate compound is present or proposed. **Silica,** when an inhibitor containing a silicate compound is present or proposed. **Combined Chlorine,** when chloramination is present or proposed. **Free Chlorine,** when disinfection is present. **Total Chlorine,** when disinfection is present. **Dissolved Oxygen (DO),** if aeration or ozone treatment is present or proposed. **Aluminum**, if an aluminum-based coagulant is present or proposed. **Dissolved Inorganic Carbon (DIC),** if calculations are used in the CCT evaluation, provide results and attach the method utilized. **Stability,** if calculations are used in the CCT Evaluation, provide results and attach the method utilized.	**pH** **Water Temperature** **Alkalinity** **Calcium** **Total Dissolved Solids (TDS) or Conductivity** **Hardness** **Iron,** presence of cast iron mains or detected iron or manganese at the entry point. **Manganese,** presence of cast iron mains or detected iron or manganese at the entry point. **Lead,** for a lead or copper ALE, otherwise include if data is available. **Copper,** for a lead or copper ALE, otherwise include if data is available. **Orthophosphate,** when an inhibitor containing a phosphate compound is present or proposed. **Total Phosphorus,** when a chemical containing a phosphate compound is present or proposed. **Silica,** when an inhibitor containing a silicate compound is present or proposed. **Combined Chlorine,** when chloramination is present or proposed. **Free Chlorine,** when disinfection is present. **Total Chlorine,** when disinfection is present. **Dissolved Oxygen (DO),** if aeration or ozone treatment is present or proposed. **Aluminum**, if an aluminum-based coagulant is present or proposed. **Dissolved Inorganic Carbon (DIC),** if calculations are used in the CCT evaluation, provide results and attach the method utilized. **Stability,** if calculations are used in the CCT Evaluation, provide results and attach the method utilized.