Division of Drinking and Ground Waters
June 2020

Instructions for Completing the Corrosion Control Treatment Recommendation Form

The Corrosion Control Treatment Recommendation Form (CCTR Form) should be included with any new or updated corrosion control treatment recommendation or study that is submitted pursuant to Ohio Administrative Code (OAC) Rule 3745-81-81.

In accordance with OAC Rule 3745-81-81, a public water system (PWS) may be triggered into corrosion control treatment (CCT) evaluation for a number of reasons, including:

- 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;
- 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.

Depending on the size of the system and the circumstances of the CCT evaluation trigger, 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. The CCTR Form should be used to submit a CCT recommendation and may be used to summarize the results of comparison of water quality data. A system required to conduct a CCT study may use the CCTR Form to supplement and summarize the results of the CCT study; however, the form should not be used to replace the CCT study report or other requirements outlined in OAC Rule 3745-81-82.

The CCTR Form is a modified version of the forms provided in the US EPA document, ***Optimal Corrosion Control Treatment (OCCT) Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems*** (referred to as the OCCT Manual). The OCCT Manual should be consulted when conducting a CCT evaluation; however, it is not necessary to use the forms created by US EPA, as Ohio's CCTR Form has been adapted to align with OAC requirements. The exhibit numbering in the CCTR Form has not been significantly altered from the original US EPA version and corresponds to exhibits referenced in the OCCT Manual.

If a PWS has multiple treatment facilities, then a separate CCTR Form should be submitted for each treatment plant.

The CCTR Form is contained in excel and consists of the following five worksheets; instructions for completing each sheet is described in the following sections.

- PWS Information
- Exhibit D – Community
- Exhibit D – NTNC
- Exhibit E
- Appendix A
- Appendix B

PWS Information

All water systems must complete the PWS Information worksheet to provide basic information to the reviewing engineer.

Exhibit D

Exhibit D provides a data summary to support the CCT recommendation and corresponds to Appendix D of the OCCT Manual.

Non-transient non-community (NTNC) water systems must complete the Exhibit D – NTNC worksheet. Community PWSs must complete the Exhibit D – Community worksheet; however, small, single building community systems (e.g. nursing

homes or correctional institutions) may complete Exhibit D – NTNC in lieu of the community worksheet. Only one version of Exhibit D is required in the recommendation.

A summary of WQP data is required for all CCT evaluations; however, due to the differences in sampling requirements, the format of this form may not be effective for all water systems. A data summary can be provided using this form or any other format that is effective in representing the data.

Exhibit D.1: Water Quality Data – Raw Source

Raw water monitoring is not required unless a PWS is adding a new source, or in some cases if a PWS has had an ALE or is proposing a treatment change. Utilize Exhibit D.1 to summarize any required monitoring. Maximum, minimum, and average values will be automatically calculated as data is entered.

All other PWSs completing this form should attempt to complete Exhibit D.1 utilizing any data available.

Copy the worksheet to provide information on multiple sources, as applicable.

Exhibit D.2: Water Quality Data – Entry Point

At least two samples (collected at least a week apart) for each of the applicable water quality parameters (WQPs) must be collected at each entry point to conduct a CCT evaluation. Exhibit D.2 summarizes these results.

Copy the worksheet to provide information on multiple sources, as applicable; however, if your PWS has multiple treatment facilities, then a separate CCTR Form should be submitted for each plant.

The entry point WQPs that are always required by Ohio EPA in evaluating CCT include:

- **pH**
- **Water Temperature**
- **Alkalinity**
- **Calcium**
- **Total Dissolved Solids (TDS) or Conductivity**
- **Hardness**
- **Chloride**
- **Sulfate**
- **Iron**
- **Manganese**

The following additional WQPs are required based on the noted conditions:

- **Lead**, when the PWS has had a lead or copper ALE, otherwise include if data is available;
- **Copper**, when the PWS has had 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;
- **Free Chlorine**, when disinfection is present;
- **Total Chlorine**, when disinfection is present;
- **Dissolved Oxygen (DO)**, if aeration is proposed or if ozone treatment is present or proposed; and
- **Aluminum**, if an aluminum-based coagulant is present or proposed.

Additionally, if calculations for the following WQPs are used in the CCT evaluation, provide results and attach the method used for the calculation to the CCTR Form:

- **Dissolved Inorganic Carbon (DIC)**
- **Stability**

Complete the information about the entry point at the top of Exhibit D.2. Then add all additional required parameters applicable to your PWS (as detailed above) under the cell that reads "Additional Parameters Required" (utilize the dropdown or handwrite). Fill in results for each sample date, ensuring correct units (mg/L, mg/L as $CaCO_3$, ^0C, etc.). Maximum, minimum, and average values will be automatically calculated as data is entered.

Instructions for Completing the CCTR Form

Exhibit D.3: Water Quality Data – Distribution System

At least two samples (collected at least a week apart) for each of the applicable water quality parameters (WQPs) must be collected at sites within the distribution system to conduct a CCT evaluation. The number of WQP sampling sites in the distribution depends on PWS size, as determined by OAC 3745-81-87(A)(2). Exhibit D.3 summarizes these results.

The distribution system WQPs that are always required by Ohio EPA in evaluating CCT include:

- **pH**
- **Water Temperature**
- **Alkalinity**
- **Calcium**
- **Total Dissolved Solids (TDS) or Conductivity**
- **Hardness**

The following additional WQPs are required based on the noted conditions:

- **Iron,** if your PWS has cast iron mains or if iron or manganese are detected at the entry point;
- **Manganese,** if your PWS has cast iron mains or if iron or manganese are detected at the entry point;
- **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;
- **Free Chlorine**, when disinfection is present;
- **Total Chlorine**, when disinfection is present;
- **Dissolved Oxygen (DO)**, if aeration is proposed or if ozone treatment is present or proposed; and
- **Aluminum**, if an aluminum-based coagulant is present or proposed.

Additionally, if calculations for the following WQPs are used in the CCT evaluation, provide results and the method used for the calculation:

- **Dissolved Inorganic Carbon (DIC)**
- **Stability**

Complete the information about the distribution service area at the top of Exhibit D.3. Then add all additional required parameters applicable to your PWS (as detailed above) under the cell that reads "Additional Parameters Required" (utilize the dropdown or handwrite). Fill in results for each sample date and sample location, ensuring correct units (mg/L, mg/L as $CaCO_3$, ^0C, etc.). Maximum, minimum, and average values will be automatically calculated as data is entered.

Exhibit D.4: Lead and Copper Rule Data Summary

Complete Exhibit D.4 by summarizing your LCR monitoring results for the last 5 monitoring periods (6-month, annual or triennial). Historical sample results can be found on our ***Data Reporting*** page under the Data Received tab or on ***Drinking Water Watch***.

Exhibit D.5: Treatment Process Information

Include information about your current and planned future treatment processes in Exhibit D.5. Mark an 'X' for all applicable treatment processes and complete additional columns for all selected processes.

If current treatment is more substantial than Exhibit D.5 allows, include a treatment schematic with chemical dosage, chemical concentration, and installation date for each unit process and chemical feed.

Exhibit D.6: Lead Service Line/Piping Information

Answer the questions about lead in your distribution system. Exhibit D – Community includes Exhibit D.6a- Lead Service Line Information to be completed by community PWSs and Exhibit D – NTNC includes Exhibit D.6b - Lead Piping Information to be completed by NTNC and small, single building PWSs.

Note: Unknown service lines are considered LSLs by Ohio EPA. Include unknowns in estimations.

Exhibit D.7: Distribution System Materials and Operation

Exhibit D – Community includes Exhibit D.7a - Community Distribution System Materials and Operation and Exhibit D – NTNC includes Exhibit D.7b - NTNC and Single Building Community Distribution System Materials and Operation. Answer the questions and include any attachments, as applicable.

Instructions for Completing the CCTR Form

Exhibit E

Exhibits E.1 through E.3 document your PWS's evaluation of CCT options and CCT Recommendation. This form is also to be used by PWSs requesting a waiver from CCT installation requirements. This worksheet corresponds to Appendix E of the OCCT Manual.

Exhibit E.1: Identification of Options

This section of the form is used to identify the type of treatment process that is being proposed as CCT. A PWS may need to fill out one or more sections of Exhibit E.1 to identify their selected CCT approach.

Exhibit E.1a: Identification of Primary Recommended Optimized Corrosion Control Treatment

If alkalinity and/or pH adjustment is recommended for CCT, then the specific chemical or process should be identified in this section. Chemicals or processes such as caustic soda, soda ash (sodium carbonate), aeration, calcite contactors, etc. have different impacts on pH relative to alkalinity and have different applicability and limitations, so the specific chemical being proposed must be clearly identified. In some cases, a coagulant chemical may also be considered as the PWS's pH/alkalinity adjustment chemical (e.g. optimizing coagulant dose to minimize reduction in pH and alkalinity), if the PWS can provide information to demonstrate the ability to reliably maintain water quality at sufficient pH and alkalinity levels to minimize corrosion.

If the addition or modification of a phosphate-based inhibitor is recommended for OCCT, then specific information regarding the composition of the proposed inhibitor (orthophosphate or phosphate blend) should be provided. For polyphosphate blends this should include specific manufacturers, type of polyphosphate (hexametaphosphate, diphosphoric acid, linear chain polyphosphates, etc.) and the ratio of orthophosphate to polyphosphate. If a specific phosphate inhibitor has not been selected, but the PWS is contemplating a polyphosphate blend, then, at a minimum, an approximate ratio of orthophosphate to polyphosphate should be provided. Safety Data Sheets (SDS) for proposed phosphate-based inhibitors should be included with the CCTR Form if a specific product has been selected or is considered as a design basis at the preliminary stage.

If the pH or alkalinity will be adjusted to optimize phosphate corrosion inhibition, multiple primary CCT options should be selected and the specifics should be identified in each.

Note: The OCCT Manual indicates calcium hardness adjustment is generally not a reliable OCCT method, therefore DDAGW does not consider this a primary OCCT option. Similarly, silicate-based corrosion inhibitors may also have limited success and are generally not considered a primary OCCT option. In the event a PWS wants to propose calcium hardness adjustment or a silicate-based corrosion inhibitor as primary CCT, DDAGW will consider such recommendations on a case-by-case basis and will likely require a higher degree of analysis and supporting documentation or the performance of a corrosion control study. These options may be noted in Exhibit E.1b as supplemental CCT options.

Exhibit E.1b: Identification of Supplemental Corrosion Control Options

Corrosion mitigation methods involving adjustment of chloride to sulfate mass ratio (CSMR), oxidation-reduction potential (ORP), water age or other novel approaches are not recognized as OCCT in OAC Rule 3745-81-82 and therefore cannot be used as the primary or sole OCCT method for a PWS exceeding the AL. However, such factors may still play a critical role in improving water quality and reducing corrosivity; therefore, one or more of the methods from Exhibit E.1b can be used in conjunction with a primary treatment method identified in Exhibit E.1a. For instance, chloride to sulfate mass ratio adjustment can be used in conjunction with pH and alkalinity adjustment if a PWS has the ability to substitute chemicals to reduce the chloride to sulfate mass ratio and can also reliably maintain water quality at sufficient pH and alkalinity levels to minimize corrosion; in such cases, water quality parameter ranges may be established for pH, alkalinity, and/or the chloride to sulfate mass ratio.

Additionally, a supplemental CCT method may be employed in conjunction with source or treatment changes to ensure homogenous water quality on a case-by-case basis. If a supplemental CCT process is proposed, the specific parameter of interest (e.g. CSMR, ORP, other) and the specific chemicals or processes that will be added or modified to adjust the parameter should be identified in this section.

Exhibit E.1c: No Installation of Optimal Corrosion Control Treatment

Some PWSs may have the option to not install treatment. NTNC PWSs who exceed the AL have the option to choose fixture replacement or complete distribution system replacement instead of the installation of OCCT. Additionally, PWSs triggered

into CCT evaluation by a source or treatment change or following an OWQP excursion violation may propose no change if water quality is not expected to change or if CCT/OCCT is already installed and does not need adjustment.

Note: This selection must be supported by documentation and rationale accepted by DDAGW.

Exhibit E.2: Evaluation of Secondary Impacts

In accordance with OAC Rule 3745-81-82(c)(4), any system required to conduct a CCT study due to an ALE must evaluate the following three CCT methods:

- pH/Alkalinity Adjustment
- Calcium Carbonate Stabilization
- Addition of a phosphate- or silica-based inhibitor

Although both calcium carbonate stabilization and addition of a silica-based inhibitor are not recognized as primary CCT methods by Ohio EPA, evaluation of all the above methods is required by federal rule for systems required to conduct a CCT study following an ALE. Exhibit E.2 should be used to summarize the alternatives analysis, as required under OAC Rule 3745-81-82(c)(4) by briefly describing the disadvantages or rationale for the treatment options that were not selected.

Systems required to provide a CCT recommendation are not required to evaluate each of the above methods, only the selected CCT option(s) in E.1a (and E.1b, as applicable) are required to be evaluated in Exhibit E.2.

Community PWSs do not have to complete the last column "Complete Distribution System Replacement".

Refer to Appendix B for more information regarding CCT constraints. OCCT means the CCT that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the water system to violate any national primary drinking water regulations. Please indicate which constraints will apply to your PWS. Use the following key to complete E.2:

- "1" Some constraint = Potential impact but extent is uncertain
- "2" Significant constraint = Other treatment modifications required to operate treatment option
- "3" Severe constraint = Additional capital improvements required to operate treatment option
- "4" Very severe constraint = Render treatment option infeasible

Issues related to maintaining compliance or water quality impacts should be evaluated and this section should either confirm no secondary compliance or water quality impacts are expected or the specific impacts of concern should be identified. For instance, pH has a large impact on the effectiveness of free chlorine disinfection for giardia inactivation and can also influence the formation of disinfection byproducts. In some cases, implementation of an OCCT may destabilize existing scales in the distribution system and lead to taste and odor issues, discoloration, and potentially loss of residual disinfectant and risk of microbial contamination.

If a PWS is proposing alkalinity and pH adjustment, the PWS should evaluate whether the proposed target pH and alkalinity could potentially cause excessive scaling. Supporting information and calculations regarding the scaling evaluation should be attached to the CCTR Form.

The PWS can provide any additional notes, comments, and concerns or identify other potential impacts that are not necessarily related to compliance or water quality in the "Additional Notes/Comments" row.

Exhibit E.3: Documentation of Recommendation

This section of the form is used to summarize the technical details of the CCT Recommendation. Additionally, this page of the form must be signed by both the person responsible for preparing the recommendation and a representative of the PWS to acknowledge submittal of the CCT Recommendation.

Exhibit E.3a: Documentation of Recommended Approach

This section of the form identifies which approach is selected by the PWS following the CCT evaluation. Details are then provided in Exhibit E.3b.

If a NTNC PWS is proposing fixture replacement/complete distribution system replacement, the rationale must be reiterated in Exhibit E.3a. If a PWS is proposing no change, additional information regarding the proposed water quality

should be included in Appendix A for proposed source and treatment changes, and/or information regarding any existing CCT/OCCT should be included in Exhibit E.3b under the applicable column.

Exhibit E.3b: Documentation of CCT Recommendation

Only the section pertaining to the proposed primary CCT option and any proposed supplemental corrosion options need to be completed.

If alkalinity and pH adjustment is the proposed primary CCT option, then the proposed chemical or process should be reiterated, and the approximate dosage of that chemical should be provided when applicable (dosage would not be applicable for processes such as calcite contactors or aeration). Multiple chemicals for optimization of pH and alkalinity adjustment can be proposed.

Note: If chemical(s) will be used for pH and alkalinity adjustment, the specific chemical does not need to be specified, and can be finalized during the design review process.

Target goals for water quality parameters for pH and alkalinity should be identified and expressed as a range. Exhibit G.4 of the OCCT Manual suggests that the range of pH values measured at the entry point should not vary greater than 0.4 pH units (range = max entry point pH - min entry point pH). The goals may differ slightly from the entry point compared to the distribution system to reflect a tighter degree of control at the treatment plant and to account for some change and fluctuation in the distribution system. Exhibit G.4 of the OCCT Manual suggests the range of pH values measured in the distribution system should not vary by greater than 0.6 pH units.

If the proposed primary OCCT option includes a blended phosphate or orthophosphate, then this section of the form will be used to confirm the specific composition of the proposed chemical, what the associated target pH values will be, and whether additional chemicals are required to adjust the pH to desired levels. The OCCT manual recommends that phosphate-based inhibitors work best when pH is greater than 7.2. Recommendations to use a phosphate-based inhibitor at pH values less than 7.2 will be evaluated on a case by case basis.

Target goals for orthophosphate, pH, and total phosphorus should be identified and expressed as a range; note that pH values are required for phosphate treatment regardless of whether pH is adjusted. In situations where the pH will not be adjusted, the target values for the pH should be reflective of the normal range in pH values seen at the PWS's entry point. The recommended orthophosphate and total phosphorus residual values should generally be consistent with the OCCT manual and manufacturer dosing recommendations. Blended phosphates are typically most appropriate when iron and manganese or excessive calcium scaling also needs to be mitigated; calculations or other supporting data based on site-specific water quality data should be included with the OCCT recommendation to justify the proposed blend ratio. The OCCT Manual generally recommends that orthophosphate levels are maintained in the range of 0.3 to 1.0 mg/L as P and the pH is maintained in the range of 7.2 to 7.8. Additionally Exhibit G.5 of the OCCT Manual suggests 100 percent orthophosphate treatment should target a residual closer to 1.0 mg/L and Exhibit G.6 suggests blended phosphate treatment should target an orthophosphate residual closer to 0.5 mg/L as P (which, in the case of a 50:50 ortho to poly blend, the associated target total phosphorus residual would be closer to 1.0 mg/L as P).

Following the installation of treatment, follow-up monitoring will be required by Ohio EPA. Systems who have exceeded the lead or copper AL will be designated with OWQPs based on the results of follow up monitoring and guidelines in Exhibit G of the OCCT Manual. Systems with OWQPs already designated may have their OWQP values re-designated. OWQP designation for systems who have made a source or treatment change will be based on changes to water quality seen following the change and during follow-up monitoring.

Appendix A

Systems proposing a source or treatment change will use Appendix A to summarize proposed water quality at the entry point and in the distribution system. **The same parameters required in Exhibit D are required in Appendix A.**

Appendix B

Appendix B provides information on several of the constraints that must be evaluated in Exhibit E.2.