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REQUEST FOR PROPOSALS (RFP)

Impact of Bromate Control Measures on Ozone Oxidation/Disinfection and Downstream Treatment Processes in Potable Reuse (RFP 5035)

Due Date: Proposals must be received by 2:00 pm Mountain Time on Tuesday, September 24, 2019

WRF Project Contact: Justin Mattingly, jmattingly@waterrf.org

Project Sponsors

This project is funded by The Water Research Foundation (WRF) as part of WRF's Research Priority Program.

Project Objective

- Evaluate the impact of bromate control strategies on ozone oxidation of compounds of emerging concern (CECs).
- Investigate the impact of bromate control strategies on pathogen inactivation.
- Investigate the impact of bromate control strategies on the removal of total organic carbon (TOC) and CECs in downstream biofiltration processes.
- Investigate the impact of bromate control strategies on microbial activity and the need for quenching upstream of biofiltration.

Budget

Applicants may request up to **\$275,000** in WRF funds for this project. WRF funds requested and total project value are evaluation criteria considered in the proposal selection process.

Background and Project Rationale

The mechanism of bromate formation by the application of ozone and the strategies for mitigation are well understood and have been applied in drinking water applications for decades. Recently, the implementation of ozone and biologically active filtration (BAF) in potable reuse treatment trains has become more common, especially in inland communities and other communities unable to utilize reverse osmosis. In potable reuse, the treatment goals differ significantly from conventional drinking water treatment, and, as a consequence, the required ozone dose may differ due to a greater need for chemical oxidation and pathogen disinfection. Therefore, there will be different strategies for maximizing the oxidation and disinfection potential of ozone in potable reuse, while limiting the

formation of bromate. The purpose of this project is to balance these needs and determine how relevant bromate control measures impact downstream treatment processes in potable reuse.

This project will investigate the potential impact of the most common bromate control strategies on the efficacy of ozone to both oxidize CECs and inactivate pathogens, as well as the impacts to downstream processes such as biological filtration. The project will detail the available bromate control strategies in the context of potable reuse to help operators mitigate bromate formation while also obtaining the required efficiency for contaminant oxidation and pathogen disinfection.

Research Approach

The proposal should include the following elements in the team's research approach:

Task 1 – Literature Review: Identify and summarize all commonly applied bromate control strategies relevant to potable reuse, including how the strategies impact water quality and operations.

Task 2 – Interview Utilities/Operators: Identify how bromate control measures are applied in operational reuse facilities (e.g., doses, types of chemicals, dosing point locations, quenching, etc.). Develop a better understanding of source and fluctuations of incoming bromide, and how such conditions can impact the control measures.

Task 3 – Bench-Scale Testing: Develop bench-scale test plans, and conduct bench-scale testing to evaluate the impact of key bromate control techniques on CEC oxidation and pathogen inactivation.

Task 4 – Full-/Demonstration-/Pilot-Scale Testing: Engage utilities to conduct testing on their pilot-, demonstration-, and/or full-scale systems (where possible). Partner with utilities to conduct challenge testing in systems to demonstrate the impact of key bromate control strategies on pathogen and CEC removal.

Task 5 – Analysis: Investigate the impact of bromate control strategies and quenching on the performance of biofiltration on TOC/dissolved organic carbon removal. Determine maximum tolerable bromide levels and control measures (e.g., chemical dosing) until the biofilter is negatively affected in pilot-/demonstration-scale testing (e.g., worst case scenario). The impact of control strategies on facility operations should also be taken into consideration.

Expected Deliverables

- Final Report

Communications Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communications plan. The guidelines are available at <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx>. Conference presentations, webcasts, peer review publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 24 months from the contract start date.

References and Resources

The following list includes examples of research reports, tools, and other resources that may be helpful to proposers. It is not intended to be comprehensive, nor is it a required list for consideration.

- AwwaRF Project 156: *Strategies to Control Bromate and Bromide*
 - WaterReuse Research Foundation Project Reuse-08-05: *Use of Ozone in Water Reclamation for Contaminant Oxidation*
 - WE&RF Project Reuse-13-10: *Controlling Trace Organic Contaminants Using Alternative, Non-FAT Technology for Potable Water Reuse*
 - WE&RF Project Reuse-15-04: *Characterization and Treatability of TOC from DPR Processes Compared to Surface Water Supplies*
 - WRF Project Reuse-15-10/4776: *Optimization of Ozone-BAC Treatment Processes for Potable Reuse Applications*
 - WRF Project Reuse-15-11/4777: *Ozone Biofiltration Direct Potable Reuse Testing at Gwinnett County*
 - WRF Project 4588: *Effect of Ozone Dissolution on Bromate Formation, Disinfection Credit, and Operating Cost*
 - WRF Project 4832: *Evaluation of CEC Removal by Ozone/BAF Treatment in Potable Reuse Applications*
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Proposal Evaluation Criteria

The following criteria will be used to evaluate proposals:

- Understanding the Problem and Responsiveness to RFP (maximum 20 points)
- Technical and Scientific Merit (maximum 30 points)
- Qualifications, Capabilities, and Management (maximum 20 points)
- Communication Plan, Deliverables, and Applicability (maximum 15 points)
- Budget and Schedule (maximum 15 points)

Proposal Preparation Instructions

Proposals submitted in response to this RFP must be prepared in accordance with the WRF document *Guidelines for Research Priority Program Proposals*. The current version of these guidelines is available at <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx>, along with *Instructions for Budget Preparation*. The guidelines contain instructions for the technical aspects, financial statements, indirect costs, and administrative requirements that the applicant must follow when preparing a proposal.

Eligibility to Submit Proposals

Proposals will be accepted from domestic or international entities, including educational institutions, research organizations, governmental agencies, and consultants or other for-profit entities.

WRF's Board of Directors has established a Timeliness Policy that addresses researcher adherence to the project schedule. The policy can be reviewed at <http://www.waterrf.org/funding/Pages/policies.aspx>. Researchers who are late on any ongoing WRF-sponsored studies without approved no-cost extensions are not eligible to be named participants in any proposals. Direct any questions about eligibility to the WRF project contact listed at the top of this RFP.

Administrative, Cost, and Audit Standards

WRF's research program standards for administrative, cost, and audit compliance are based upon, and comply with, Office of Management and Budget (OMB) Uniform Grants Guidance (UGG), 2 CFR Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, and

48 CFR 31.2 Contracts with Commercial Organizations. These standards are referenced in WRF's *Guidelines for Research Priority Program Proposals*, and include specific guidelines outlining the requirements for indirect cost negotiation agreements, financial statements, and the Statement of Direct Labor, Fringe Benefits, and General Overhead. Inclusion of indirect costs must be substantiated by a negotiated agreement or appropriate Statement of Direct Labor, Fringe Benefits, and General Overhead. Well in advance of preparing the proposal, your research and financial staff should review the detailed instructions included in WRF's *Guidelines for Research Priority Program Proposals* and consult the *Instructions for Budget Preparation*, both available at <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx>.

Budget and Funding Information

The maximum funding available from WRF for this project is **\$275,000**. The applicant must contribute additional resources equivalent to at least 33 percent of the project award. For example, if an applicant requests \$100,000 from WRF, an additional \$33,000 or more must be contributed by the applicant. Acceptable forms of applicant contribution include cost-share, applicant in-kind, or third-party in-kind that comply with 2 CFR Part 200.306 cost sharing or matching. The applicant may elect to contribute more than 33 percent to the project, but the maximum WRF funding available remains fixed at \$275,000. **Proposals that do not meet the minimum 33 percent of the project award will not be accepted.** Consult the *Instructions for Budget Preparation* available at <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx> for more information and definitions of terms.

Period of Performance

It is WRF's policy to negotiate a reasonable schedule for each research project. Once this schedule is established, WRF and its sub-recipients have a contractual obligation to adhere to the agreed-upon schedule. Under WRF's No-Cost Extension Policy, a project schedule cannot be extended more than nine months beyond the original contracted schedule, regardless of the number of extensions granted. The policy can be reviewed at <http://www.waterrf.org/funding/Pages/policies.aspx>.

Utility and Organization Participation

WRF encourages participation from water utilities and other organizations in WRF research. Participation can occur in a variety of ways, including direct participation, in-kind contributions, or in-kind services. To facilitate their participation, WRF has provided contact information, on the last page of this RFP, of utilities and other organizations that have indicated an interest in this research. Proposers are responsible for negotiating utility and organization participation in their particular proposals. The listed utilities and organizations are under no obligation to participate, and the proposer is not obligated to include them in their particular proposal.

Application Procedure and Deadline

Proposals are accepted exclusively online in PDF format, and they must be fully submitted before 2:00 pm Mountain Time on September 24, 2019. All proposal documents must be compiled into two (2) PDF files consisting of your technical review documents and your financial review documents. All forms and components of the proposal are available in the *Proposal Component Packet* zip file on the proposal website at <https://proposals.waterrf.org/Pages/RFPs.aspx>. An FAQ and a tutorial are also available. A login is required to access the proposal website and download the packet. Proposers are encouraged to create logins and verify the validity and compatibility of the system well in advance in order to avoid last-minute errors or delays.

The online proposal system allows submission of your documents until the date and time stated in this RFP. To avoid the risk of the system closing before you press the submit button, do not wait until the last minute to complete your submission.

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Justin Mattingly at (571) 699-0024 or jmattingly@waterrf.org. Questions related to proposal submittal through the online system may be addressed to Caroline Bruck at (303) 347-6118 or cbruck@waterrf.org.

5035 Utility and Organization Participants

The following utilities have indicated interest in possible participation in this research. This information is updated within 24 business hours after a utility or an interested organization submits a volunteer form, and this RFP will be re-posted with the new information. **(Depending upon your settings, you may need to click refresh on your browser to load the latest file.)**

N/A