THE Water Research FOUNDATION

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REQUEST FOR PROPOSALS (RFP)

UV/Chlorine AOP in Potable Reuse: Assessment of Applicability, Operational Issues, and Potential By-Products (RFP 5050)

Due Date: Proposals must be received by 2:00 pm Mountain Time on Tuesday, November 5, 2019

WRF Project Contact: Ashwin Dhanasekar, adhanasekar@waterrf.org

Project Sponsors

This project is co-funded by The Water Research Foundation (WRF), the California State Water Resources Control Board (SWB), and contributors to the *Advancing Potable Reuse Initiative* as part of the SWB Grant D1705003.

Project Objectives

- Understand the current state of the science of UV/chlorine (UV/Cl_2) Advanced Oxidation Processes (AOPs).
- Provide a framework to enable utilities to determine which AOP is most suitable to their treatment application both in the context of RO-based treatment and in alternative treatment approaches (e.g., ozone/bio-filtration).
- Detail the photochemical mechanisms of oxidation, identification of radical species, and dependency on pH, UV dose, chlorine dose, ammonia concentration, and monochloramine concentration.
- Assess the dynamic and unique operational challenges of operating a UV/Cl_2 AOP system including identification of critical control points, challenges with regard to monitoring, and management of the formation of by-products of concern.
- Utilize traditional analytical chemistry to evaluate the existence of or potential for formation of by-products.

Budget

Applicants may request up to $150,000 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

In an effort to improve water quality, utilities are increasingly employing advanced oxidation processes (AOPs) in potable water reuse. AOPs are technologies that generate hydroxyl radicals. The goal of an AOP technology is to maximize the production of hydroxyl radicals to provide fast reaction kinetics to most efficiently destroy specific contaminants at the lowest possible cost. Since some compounds are not easily biodegradable, adsorbable, or strippable, AOPs are often considered to be the best solution to destroy these types of compounds of concern. UV/Cl_2, is an excellent solution when it comes to being cost effective and implementable in comparison to UV/hydrogen peroxide (UV/H_2O_2) processes, since

chlorine reacts with UV to create hydroxyl and chlorine radicals at low pH. UV/H_2O_2 processes have been installed at numerous potable reuse facilities, with membranes as pre-treatment (e.g., reverse osmosis). In exploring options to reduce the ongoing costs of purchasing oxidant chemicals, and to reduce the number of chemicals onsite, the UV/Cl_2 AOP has been investigated and is being installed at several facilities.

An immediate need to more fully investigate the applicability of the UV/Cl_2 AOP, explore the potential for by-product formation, and to provide guidance to utilities considering its implementation exists.

Research Approach
The ideal proposal would include the following elements in the team's research approach.

- A detailed literature review, summarizing the state of the science on UV/Cl_2 AOPs. It is important to understand and explain the science behind UV/Cl_2 technology, as well as to document the current state-of-implementation at facilities.
- A summary of results of the performance data on UV/Cl_2 AOP from operating facilities, including small-scale and pilot- scale facilities. This information will be utilized to benchmark UV/Cl_2 AOP effectiveness in comparison to facilities using UV/H_2O_2.
- Identify data gaps, develop a work plan for additional data collection, and conduct sampling and testing of operating UV/Cl_2 at facilities, including, but not limited to pilot-scale facilities to fill the data gaps.
- Development of an optional guidance document, documenting the findings, as well as establishing a baseline for continued research identifying future needs with regards to UV/Cl_2 implementation at utilities.

This RFP is intentionally flexible in the research approach to encourage creativity and originality from proposers. Proposers should describe in detail how they will conduct the research to meet the objectives listed above.

Expected Deliverables
The main deliverable for this project would be a **final report** which would include the following:

- A detailed literature review highlighting the current state of the science for UV/Cl_2 AOPs.
- An in-depth analysis documenting all the collected, sampled data, and the findings regarding UV/Cl_2 processes, as well as a thorough comparative study with UV/H_2O_2 processes. This would include a benchmarking study to identify and evaluate the effectiveness of UV/Cl_2 processes.
- An optional guidance document, tool, or factsheet that summarizes the significant findings, and if there is a considerable amount of information specifying how the UV/Cl_2 AOP process is being utilized. This document or tool would ideally serve as a reference to any utilities willing to implement this process at their premises.

Additionally, the project team could would work with WRF to do a webcast to present the findings of this research study to a broader audience.

Communications Plan
Please review WRF's *Project Deliverable Guidelines* for information on preparing a communications plan. The guidelines are available at https://www.waterrf.org/project-report-guidelines. 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 **18 months** from the contract start date. See SWB deadline information below.

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. Additionally, there are unique requirements for this SWB-funded project, as detailed below.

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. However, for this specific project, because a portion of the funding is from California, there are territory limitations that can be reviewed at https://oag.ca.gov/ab1887 that prohibit individuals and/or organizations from certain states from participating in this project. ***See funding provisions below.***

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.

For this specific project however, indirect costs are limited to and may not exceed $38,770.55, as no funding from the State of California can be used for indirect costs by any recipient (prime or sub) at any contracting level.

Budget and Funding Information
The maximum funding available from WRF for this project is $150,000.00. 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 $150,000.00. **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.

Funding Provisions
The SWB is funding approximately 75% of this project through their Proposition 1 bond funds. The agreement No. D1705003 entitled 'Research to Advance Potable and Non-potable Reuse in California' between SWB and WRF was fully executed on March 30, 2018.

- Indirect Costs – SWB Grant Funds may not be used for any Indirect Costs (Gov. Code, § 16727), however WRF will cover **up to approximately 25%** of the project budget (not including in-kind) for indirect costs. Still, we must see the indirect cost breakout to substantiate to the State of CA that their funds are not used for indirect costs of any recipient on the team (whether prime or sub). ***See FAQs below for further requirements on providing budgets and indirect costs.***

  Definition per the SWB grant: "Indirect Costs" means those costs that are incurred for a common or joint purpose benefiting more than one cost objective and are not readily

assignable to the Research (i.e., costs that are not directly related to the Research). Examples of Indirect Costs include, but are not limited to: central service costs; general administration of the Recipient; non-research specific accounting and personnel services performed within the Recipient's organization; depreciation or use allowances on buildings and equipment; the costs of operating and maintaining non-research specific facilities; tuition and conference fees; generic overhead or markup; and taxes.

- Travel – Prohibition, Prior Approval, Reimbursement
  - Prohibition – SWB Grant funds may not be used for any travel to or research in banned states that are identified by the Attorney General pursuant to Government Code section 11139.8, subd.(e), unless otherwise approved by the Grant Manager. The list of states identified by the Attorney General can be found here: https://oag.ca.gov/ab1887.
    - The Recipient shall not perform research in, travel to, or hold any meetings in states that are identified.
    - The Recipient shall ensure that the SWB, the Governor of the State, or any authorized representative of the foregoing, will have safe and suitable access to the Research site at all reasonable times during Research work.
  - Prior Approval – Travel to be reimbursed by grant funds requires prior written authorization. Please allow at least two (2) weeks' notice for WRF to gain approval from SWB.
  - Reimbursement – Reimbursement shall be at rates not to exceed those set by the California Department of Human Resources. These rates may be found at http://www.calhr.ca.gov/employees/pages/travel-reimbursements.aspx. Reimbursement will be at the State travel and per diem amounts that are current as of the date costs are incurred by the Recipient.

- Subcontracting – The Recipient shall not contract or allow subcontracting with excluded parties. The Recipient shall not contract with any party who is debarred or suspended or otherwise excluded from or ineligible for participation in any work overseen, directed, funded, or administered by the SWB program for which this funding is authorized. For any work related to this Agreement, the Recipient shall not contract with any individual or organization on the SWB's List of Disqualified Businesses and Persons that is identified as debarred or suspended or otherwise excluded from or ineligible for participation in any work overseen, directed, funded, or administered by the SWB program for which funding under this Agreement is authorized. The SWB's List of Disqualified Businesses and Persons is located at https://www.waterboards.ca.gov/water_issues/programs/enforcement/fwa/dbp.html.

- Deadline – The current SWB grant agreement states that final deliverables are due by January 31, 2021. For WRF to comply with this requirement, all deliverables are due to WRF by October 31, 2020. The appropriations end date for Grant funds has been extended to June 30, 2024, however a formal modification to the agreement will require several months to execute. Please consider these timing challenges in the proposal – while the project duration should be honored in the fulfilling the scope, a premature end date may be needed until the extension modification is granted.

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 Tuesday, November 5, 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, Ashwin Dhanasekar at (303) 734-3423 or adhanasekar@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**.**

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.)**

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FAQs on SWB Funded Projects

Q: Are any indirect costs covered for these projects?

A: Yes, but only up to approximately 25% of the budget (not including in-kind contribution from the applicant). This includes prime recipient as well as subcontractors and consultants. The State of CA does not cover any indirect costs – those are funded by WRF and need to be clearly budgeted and submitted with the required supporting indirect cost documentation as per the Guidelines for the Research Priority Program, Section 17. Please see the "WRF Contribution – Indirect Costs" column in the table below for the exact values of allowed Indirect Costs for each project:

Project #	Research Title	Total Costs	Direct Costs	Indirect Costs
5047	Guidelines for the Demonstration of Pathogen Log Removal Credits in Wastewater Treatment	$80,000.00	$59,322.38	**$20,677.62**
5048	Integrating Real-Time Collection System Monitoring Approaches into Enhanced Source Control Programs for Potable Reuse	$200,000.00	$148,305.94	**$51,694.06**
5049	Public Health Benefits and Challenges for Blending of Advanced Treated Water with Raw Water upstream of a Surface Water Treatment Plant in DPR	$100,000.00	$74,152.97	**$25,847.03**
5050	Applicability of the UV/Chlorine AOP: Assessment of Applicability, Operational issues, and Potential By-Products	$150,000.00	$111,229.45	**$38,770.55**
5051	Geochemical Considerations for Managed Aquifer Recharge (MAR) Implementation in Potable Reuse	$112,000.00	$83,051.33	**$28,948.67**
5052	Standardizing Methods with QA/QC Standards for Investigating the Occurrence and Removal of ARB/ARGs in Wastewater and Advanced Treated Water	$200,000.00	$148,305.94	**$51,694.06**

Q: Is there a special budget form for the SWB projects? How do I show required indirect costs?

A: No, there is not a special budget form for the SWB projects. However, under this RFP all of the proposer's (prime's) participants (subs, consultants and contractors) must each complete the standard WRF Budget Form, and all subs, consultant, and contractor Budget Forms need to be submitted to the proposer to be included along with the proposer's online submission to WRF.

Indirect Costs (base, rate and resulting expense) are shown on each entity's (proposer and all participants) individual Budget Form (above).

Additionally, each entity must provide indirect cost rate documentation in accordance with Section 17 of the Guidelines for Research Priority Program Proposals. As with the Budget Form, each entity must submit their indirect cost rate documentation to their proposer to be included in the online submission to WRF.

If any entity cannot provide the required indirect cost rate documentation (as described in Section 17), then the proposer must count that entity's entire budget towards the indirect cost recovery cap. WRF is able to separately budget for the payment of indirect costs that are equal to or less than the amount/percentage of the total WRF budget for the cap as indicated in this RFP. **Proposals that do not meet this requirement in accordance with the indirect cost rate cap will not be accepted.**

Finally, if for genuine and necessary protection of confidential business information, subs are restricted from submitting their indirect cost rate documentation (see Section 17 of the Guidelines) through their proposer, they may send that one document only (NOT the Budget Form which has to be submitted only to the proposing entity and NOT Financial Statements (Balance Sheet and Income Statement) or any other forms in the proposal (none of which are required by WRF from any of the proposers subs) to Steve Sidars at ssidars@waterrf.org.

Q: I am located in a banned state; can I participate on a research team?

A: No, due to the SWB funding of this research, projects cannot be in any way connected to work in banned states (team members or participating agencies from banned states are not permitted). This is even the case if services are donated.

Q: Can a project meeting or workshop be held in a banned state?

A: No, this is not allowed, since SWB employees are not permitted to travel to banned states.

Q: I am located in a banned state; can my utility provide in-kind service towards the project?

A: No, the SWB cannot be connected with research performed/data collected in banned states.

Q: Is prior approval for all travel, even for regular work at a utility, necessary? What is the process to gain approval?

A: Yes, prior approval is needed, as the SWB must ultimately provide this authorization. Please request a travel authorization form from your Research Manager. If there is frequency to your travel/site visits, you can indicate so in the form to request multiple trips. Plan to submit to your research manager quarterly to avoid last-minute approval requests.