Date Posted: Monday, September 13, 2021

REQUEST FOR PROPOSALS (RFP)

Holistic Wet Weather Management through Adaptive Volume and Pollutant Source Control at a Community Scale: Finding the Sweet Spot (RFP 5131)

Due Date: Proposals must be received by **3:00 pm Mountain Time** on **Tuesday, November 9, 2021**

WRF Project Contact: Harry Zhang, PhD, PE, hzhang@waterrf.org

Project Sponsors

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

Project Objectives

- To develop a user-friendly document including modeling guidance on holistic wet weather management through adaptive volume and pollutant source control at a community scale, that ensures affordability and equity, and positions communities and utilities to respond optimally to future climate impacts.
- To demonstrate the use of proactive and adaptive strategies such as integrated planning frameworks in support of holistic approaches to meet regulatory requirements of wet weather challenges through case studies, particularly in the face of competing objectives.
- To advance the modeling practices that allow integration of adaptive volume and pollutant source control strategies across different scales in the watershed and/or sewershed, and additional qualitative and quantitative cost benefit analysis to better manage urban runoff and water quality impacts from wet weather flows.

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

Water utilities and municipalities are under increasing pressure from competing regulatory requirements for their Municipal Separate Storm Sewer System (MS4) and Combined Sewer Overflow (CSO) systems, their ability to manage urban flooding and higher flow volumes, and water quality challenges from multiple pollutants. These pollutants include but are not limited to nitrogen, phosphorus, silt and sediment, pathogens, floatables, heavy metals, toxics, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons. The increased wet weather flows and associated pollutant loads can be attributed to aging infrastructure and associated increased infiltration from more saturated soils, population increases and new and redevelopment densification, as well as the uncertain rate of growth in more frequent and intense extreme wet weather events related to climate change. These uncertainties make designing and sizing infrastructure for 50 to 100 years into the future very challenging.

For decades, municipalities and utilities with combined sewer overflows have negotiated long-term control plans (LTCP) with regulatory agencies, agreeing to reduce CSO events to approximately four to six per year. As some LTCPs near completion, there is a national discussion about whether further CSO control actions at water resource recovery facilities, and hard infrastructure in particular, are the most cost-effective strategies, particularly given the limited water quality improvements they are likely to achieve, the inequitable benefits they provide across watersheds and sewersheds, and situations where rate payers are already struggling with budget constraints.

There are a variety of strategies that can be used to manage wet weather flows like urban flooding and related water quality issues from MS4 and CSO systems. The integrated municipal stormwater and wastewater planning approach framework was incorporated as an amendment to the Clean Water Act in January 2019. Taking a holistic approach has potential benefits, but more research is needed to help utilities determine the best wet weather strategies and tools that create the greatest downstream water quality benefits, while mitigating urban flooding mitigation and improving community resilience at the lowest possible cost.

An overall wet weather strategy also needs to consider local geography, waterbody-pollutant combinations, climate, and existing systems along with the best science available on expected climate change impacts. To develop the best strategies and methods for determining and implementing capital investments and maintenance practices, better information and a rigorous approach is needed by municipalities and water utilities. Options for managing stormwater, urban flooding, and wet weather issues need to be analyzed by considering the financial, environmental, and social costs and benefits of each option as well as who benefits and who doesn't to determine the most appropriate practices for CSO, MS4 and flood management, particularly in the face of competing objectives.

Despite significant infrastructure investments, communities and utilities continue to face challenges to wet weather management and can expect these challenges to increase as a result of climate change. Rather than considering costly additional infrastructure projects in isolation, communities can employ integrated planning to implement cost-effective volume and pollutant source control strategies in their respective watersheds and sewersheds (outside the traditional infrastructure "fence line") to reduce both stormwater flow and pollutant loading during wet weather events.

Even in instances where community-based strategies cannot meet desired flow and pollutant loading reductions, such strategies can help reduce the size and cost of regional water quality control infrastructure needed to meet regulatory requirements. There is a need to provide a robust toolbox of interconnected, adaptive strategies and other resources that, in the context of One Water, identify the appropriate mix of gray and green infrastructure, adaptive volume and pollutant source control measures and other best management practices (BMPs) that strike the optimal balance between potential cost and triple bottom line benefits that are equitably distributed across the entire watershed and/or sewershed (i.e., the "sweet spot").

Research Approach

Task 1: Development of proactive strategies for volume and pollutant source control at a community scale

The research team will evaluate the state-of-the-practice and advancement in non-structural BMPs at a community level, in addition to structural BMPs, as cost-effective strategies while equitably maximizing the benefits for the community.

Non-Structural BMPs, from the municipality/utility perspective, refers to stormwater BMPs that focus on management of pollutants from stormwater runoff at their source or as close to the source as possible, including commercial and industrial facilities within the watershed/sewershed, by minimizing exposure to runoff, rather than treating or storing runoff in constructed facilities. Non-structural BMPs are often referred as source controls in the literature as well. Examples of non-structural BMPs include street sweeping, catch basin cleaning, reducing impervious cover, full or partial disconnection of rooftops, disconnection from storm sewers, protection/conservation/enhancement of riparian areas, product replacement, integrating stormwater management into the initial site design process, new development or re-development regulations, ordinances, and policies such as requirements for onsite stormwater retention, and smart growth practices. Multiple utilities also have utilized their regulatory authority by amending their sewer use regulations and/or stormwater regulations for increased source controls.

The objective of source control is to reduce volume and pollutant loading from upstream drainage areas prior to reaching collection systems to help meet MS4 and CSO regulatory requirements. There are few rigorous quantification tools for cost and benefits/co-benefits from non-structural BMPs for key pollutants. Understanding these values can help make a robust business case for better managing CSO and MS4 problems equitably and as cost effectively as possible.

The related research questions to be considered include:

- Can a list of comprehensive source control BMPs be compiled for a wide range of pollutants of concern, which could extend beyond the municipal sector (e.g., source control BMPs for non-municipal sectors that can benefit wet weather pollutant load reduction at a community scale)?
- What kinds of frameworks and/or modeling tools exist to quantify the non-structural BMP benefits equitably and report those benefits as flow and pollutant load reductions and avoided costs, from baseline numbers at the community scale? What are the key data needed to drive these tools to support decision making?
- What is the current status of water quality crediting methodologies at state or local agency level for non-structural BMPs for regulatory purpose?

In addition, the research team will demonstrate the use of stormwater harvesting as an innovative strategy for volume mitigation and pollutant source control that can be regionally customized through beneficial use/reuse, onsite and distributed stormwater reuse and rainwater harvesting that can help reduce runoff volume and pollutant loading.

A key underlying concept is to treat “stormwater” as a resource with economic value in concert with sewage as a resource from which energy and nutrients can also be harvested decentrally, providing local water fit-for-purpose and reducing pressure on both potable and non-potable water sources, all while decreasing the downstream impacts during wet weather events.

The community-scale and larger-scale stormwater harvesting systems can have a positive impact on the water supply from urban runoff in dry climates for water-scarce cities. In addition, successful stormwater capture, treat, and recharge projects provide co-benefits of sustainable surface and groundwater supply, urban amenities, and pollutant reduction, which are important for public acceptance and financing.

The research team will conduct an evaluation of existing frameworks and supporting tools that can assess onsite, distributed water reuse, and stormwater harvesting from the perspective of holistic wet weather management for both volume and pollutant loading at a community scale, which can be broadly extended to city scale as needed. This could include but not limited to the use of life cycle cost analysis, life cycle assessment, and economic quantification of benefits / co-benefits.

The objective is to incorporate stormwater capture and harvesting, and onsite and distributed reuse into regional contexts to provide “fit-for-purpose” water according to the needs and drivers of water-scarce and water-abundant regions. Widespread engagement in stormwater capture and reuse, including groundwater recharge, is often hampered by perceived institutional, logistical, regulatory, and financial constraints. For example, stormwater harvesting and reuse could connect with flood mitigation measure as part of this holistic analysis.

In practice, it is expected that the “sweet spot” for holistic wet weather management at a community level can have unique characteristics in different climatic regions. The research team will use rigorous approach such as decision tree logics to demonstrate how the “sweet spot” concept and related analysis (e.g., triple or quadruple bottom line, tradeoff analysis under competing objectives, and multi-objective decision making / optimization) can be applied at regional level to address multiple pollutants.

In addition, utilities typically need to invest additional resources “beyond the fence line” in order to create multiple benefits at a community level, which could pose some further challenge for situations where rate payers are already struggling with budget constraints. The research team will evaluate how a “sweet spot” and/or a win-win situation could be accomplished from the perspectives of both communities and utilities beyond their fence line. For example, this may include an analysis on potential drivers and incentives beyond meeting regulatory compliance requirements at the utility level.

Furthermore, special attention will be given to ensure affordability and equity at a community scale, including through a robust framework that can integrate social analysis methodology into holistic decision making process by utilities and municipalities.

The related research questions to be considered include:

- What strategies and resources currently exist (including integrated planning) to address these constraints effectively?
- What additional strategies and resources are needed to enable stormwater harvesting across complex organizations and under varying jurisdictions such as health departments, local municipalities and water/wastewater utilities?

<u>Task 2: Development of proactive and adaptive strategies for wet weather flows and pollutant load reduction that can help utilities be better positioned to respond to the uncertain intensity of future climate impacts.</u>

The objective of this task is to develop adaptive strategies in response to extreme wet weather events and increased pollutant loading based on projected climate impacts on MS4 and CSO systems.

Climate change has undermined the basic assumption that past weather patterns are predictive of future weather patterns in developing strategies and designing and operating stormwater, CSO, and pollution prevention water management programs and infrastructure. In the past, it was generally a common practice to take a more reactive approach as opposed to a more proactive and adaptive approach.

Proactive and adaptive strategies are needed to respond to the realities of an uncertain climate future whose rate of change and intensity cannot be predicted reliably. Volume and pollutant source control strategies that can be cost effectively implemented and ramped up as needed over time based on emerging near-term climate impacts have not yet become a common practice in wet weather management for MS4 and CSO systems. This poses a risk for not meeting water quality objectives and regulatory requirements in the future, as well as putting communities at risk for flooding and extended droughts that stress systems designed without a proactive approach to future climate change.

The research team will develop a suite of adaptive strategies for existing challenges which can be adjusted cost effectively in the future to respond to the uncertainties of future climate change impacts to water quality as well as increased risk from flooding and extended drought from community perspective. Special consideration should be given to variations among different climate regions at a national scale, including for coastal communities which climate-induced sea level rise and storm surge would pose additional challenges. Furthermore, the current practices and case studies from other countries beyond the United States (e.g., Canada, UK/European countries, and Australia) will be reviewed and incorporated in this study as well.

In addition, the research team will evaluate the needed enhancement for stormwater master planning that can meet MS4 and CSO regulatory requirements under projected climate uncertainty in the future, for both rainstorms and snowstorms. Discussion of international and other alternative regulatory frameworks that differ in approach from the U.S. for separate and/or combined sewer systems should be considered.

Most planning and design tools rely upon historical weather data and statistics. The research team will give special emphasis on how to better integrate future climate projections into currently applied planning and design tools relevant to utilities and municipalities. This task should include changes to 1) intensity-duration-frequency (I-D-F) curves used for sizing of drainage systems and 2) annual time series for modeling combined sewer overflows and stormwater runoff, under both warm and cold climate impacts. Advanced techniques such as the use of artificial intelligence (AI) / machine learning (ML) in support of holistic wet weather management will be included in this study.

The related research questions to be considered include:

- To what degree do current wet weather modeling resources allow integration of adaptive volume and pollutant source control strategies in the watershed and/or sewershed, and what additional qualitative and quantitative modeling resources are needed (including cost benefit analysis)?
- What would be cost-effective strategies for meeting regulatory requirements for MS4 and CSO systems while ensuring affordability and equity, as well as uncertain climate impacts in the future?

This project will build from several WRF research projects listed in the reference section and address identified research gaps for developing more holistic and adaptive wet weather management systems and programs at a community and/or city level.

Task 3: Discussion of the research findings through two invitation-only virtual workshops.

The research team will host two invitation-only virtual workshops. The first virtual workshop will be held at the beginning of the project. The second virtual workshop will be held once the draft report is ready. The workshop participants will include the Project Advisory Committee (PAC), representatives from participating utilities, WRF's collaborators and partners, and other invitees recommended by WRF.

The research team will then discuss the project progress and draft findings during these two virtual workshops. For each workshop, the research team will prepare the workshop agenda, facilitate the plenary and breakout discussions, and prepare a document containing a summary of the workshop discussions. In addition, the research team will gather information on proactive case studies and adaptive wet weather management strategies for volume and pollutant source control at the community scale.

Task 4: Development of a user-friendly document of adaptive wet weather management strategies and modeling guidance.

The guidance document will focus on holistic wet weather management through adaptive volume and pollutant source control at a community scale, which includes the following items:

- The use of non-structural best management practices (BMPs) at a community level, in addition to structural BMPs, as a cost-effective strategy while equitably maximizing the benefits for the community.
- The use of stormwater harvesting and reuse as an innovative strategy for volume mitigation and pollutant source control that can be regionally customized (e.g., through beneficial use/reuse, onsite and distributed use/reuse applications, and flood mitigation).
- Summary of proactive and adaptive strategies for wet weather flows (e.g., MS4, CSO, and flooding) and reduction in volume and pollutant loading that can help utilities be better positioned to respond to the uncertain intensity of future climate impacts.
- Synthesis of wet weather modeling resources for MS4, CSO, and flooding that allow integration of adaptive volume and pollutant source control strategies in the watershed and/or sewershed, and additional qualitative and quantitative cost benefit analysis. This synthesis will include the use of advanced techniques such as AI/ML by utilities in supporting their decision making.

Task 5: Community outreach and publications.

For broader community outreach, the research team will conduct two webcasts hosted by WRF and collaborating organizations on the overall findings of this project. The research team is also expected to present the project findings at conferences whenever possible (without support from project funding). The research team will publish one open access peer-reviewed journal paper, after the completion of this study.

Finally, because successful adoption of holistic wet weather management requires both the buy-in and participation of the entire affected community, the research team will develop public outreach materials that can help inform stakeholders at all levels of engagement.

Expected Deliverables

(1) A stand-alone literature review summary document, including annotations for the list of publications and resources used for the evaluation of the state-of-the-practice and proactive case studies.

(2) Two invitation-only virtual workshops (e.g., one at the beginning and the other at the time when a draft report is ready), along with logistics planning and all supporting materials (e.g., agenda, presentations, meeting notes and workshop summary).

(3) Guidance document on holistic wet weather management through adaptive volume and pollutant source control at a community scale, which will include the following specific chapters.
   - A decision support framework for identifying the appropriate adaptive strategies for a suite of measures including advanced modeling that can respond to existing challenges, which can also be cost-effective and aligned with the uncertainties of future climate change impacts.
   - A chapter that summarizes the knowledge gaps, research needs, and preliminary project concepts for recommended research projects.

(4) Outreach Efforts.
   - Webcasts, conference presentation materials, and one open access peer-reviewed journal paper.
   - Public outreach materials (e.g., a short video within a few minutes and multiple infographics).

Communication Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communication 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 21 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.

Bartlett, M. Forthcoming. *Holistic and Innovative Approaches for Flood Mitigation Planning and Modeling under Extreme Wet Weather Events and Climate Impacts.* Project 5084. Denver, CO: The Water Research Foundation.

EPA (U.S. Environmental Protection Agency). 2017. Prioritizing Wastewater and Stormwater Projects Using Stakeholder Input. Report Number EPA 830-R-17-002.

EPA. 2019. EJSCREEN: Environmental Justice Screening and Mapping Tool. Technical Documentation for EJSCREEN (https://www.epa.gov/ejscreen/technical-documentation-ejscreen)

EPA. 2019. Non-Potable Environmental and Economic Water Reuse (NEWR) Calculator. Application to Identify Source Water Options for Non-Potable Reuse. (https://www.epa.gov/water-research/non-potable-environmental-and-economic-water-reuse-newr-calculator)

Fischbach, J., D. Knopman, K. R. Grocholski, A. Cohn, and J. Brock. 2020*. An Action Agenda for the Water Sector to Advance Methods for Achieving Integrated Climate Resilience.* Project 5058. Denver, CO: The Water Research Foundation.

Harold, E. Forthcoming. *Exploring Cost-Benefit Analysis of Post Long-Term Control Plan Approaches to Wet Weather Management*. Project 4849. Denver, CO: The Water Research Foundation.

Kirezci, E., I. R. Young, R. Ranasinghe, S. Muis, R. J. Nicholls, D. Lincke and J. Hinkel. 2020. Projections of Global-Scale Extreme Sea levels and Resulting Episodic Coastal Flooding over the 21st Century, *Scientific Reports (Nature)*, Vol. 10, Article number 11629 (2020). (https://doi.org/10.1038/s41598-020-67736-6).

Kobayashi, Y., N. J. Ashbolt, E. G. R. Davies, and Y. Liu. 2020. Life Cycle Assessment of Decentralized Greywater Treatment Systems with Reuse at Different Scales in Cold Regions. *Environ. Int*. *134*, 105215.

Kulp, S.A. and Strauss, B.H. 2019. New Elevation Data Triple Estimates of Global Vulnerability to Sea-Level Rise and Coastal Flooding. *Nature Communication*, Vol. 10, Article number 4844 (2019). (https://doi.org/10.1038/s41467-019-12808-z).

Luthy, R. G., S. Sharvelle, and P. Dillon. 2019. Urban Stormwater to Enhance Water Supply. *Environ. Sci. Technol.* 53, 10, 5534-5542.

Marlow, D., D. Beale, and S. Gould. 2014a. *Practitioner's Guide for Economic Decision Making in Asset Management*. *Part 1: Background*. Project SAM1R06b1. Alexandria, Va.: WERF.

Marlow, D., D. Beale, and S. Gould. 2014b. *Practitioner's Guide for Economic Decision Making in Asset Management. Part II: Guidance*. Project SAM1R0b2. Alexandria, Va.: WERF.

Milly, P. C. D., J. Betancourt,M. Falkenmark, R. M. Hirsch, Z. W. Kundzewicz, D. P. Lettenmaier, and R. J. Stouffer. 2008. Stationarity Is Dead: Whither Water Management? *Science.* Vol. 319, Issue 5863, pp. 573-574.

National Academies of Sciences, Engineering, and Medicine. 2016. Using Graywater and Stormwater to Enhance Local Water Supplies: An Assessment of Risks, Costs, and Benefits. Washington, DC: The National Academies Press. (https://www.nap.edu/catalog/21866/using-graywater-and-stormwater-to-enhance-local-water-supplies-an).

National Academies of Sciences, Engineering, and Medicine. 2019. Framing the Challenge of Urban Flooding in the United States. Washington, DC: The National Academies Press. (https://www.nap.edu/catalog/25381/framing-the-challenge-of-urban-flooding-in-the-united-states)

Nicholls, R. J., D. Lincke, J. Hinkel, S. Brown, A. T. Vafeidis, B. Meyssignac, S. E. Hanson, J. Merkens and J. Fang. 2021. A Global Analysis of Subsidence, Relative Sea-Level Change and Coastal Flood Exposure. *Nature Climate Change*, Vol. 11, 338–342 (2021). (https://doi.org/10.1038/s41558-021-00993-z).

Rasmus, J., and E. Garvey. Forthcoming. *Assessing the State of Knowledge and Research Needs for Stormwater Harvesting*. Project 4841. Denver, CO: The Water Research Foundation.

Sharvelle, S. Forthcoming. *Assessing the Microbial Risks and Potential Impacts from Stormwater Collection and Uses to Establish Appropriate Best Management Practices*. Project 5034. Denver, CO: The Water Research Foundation.

Thompson, K. Forthcoming. *Designing Sensor Networks and Locations on an Urban Sewershed Scale with Big Data Management and Analytics.* Project 4797. Denver, CO: The Water Research Foundation.

US Water Alliance. 2020. Water Rising: Equitable Approaches to Urban Flooding. (http://uswateralliance.org/sites/uswateralliance.org/files/publications/Final_USWA_Water%20Rising_0.pdf)

WRF (The Water Research Foundation). 2021. Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC). (https://www.waterrf.org/clasic)

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 https://www.waterrf.org/proposal-guidelines, 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.

Proposals that include the production of web- or software-based tools, such as websites, Excel spreadsheets, Access databases, etc., must follow the criteria outlined for web tools presented in the Web Tool Criteria and Feasibility Study for The Water Research Foundation Project Deliverables at https://www.waterrf.org/sites/default/files/file/2021-07/WebToolCriteria.pdf.

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 https://www.waterrf.org/policies. 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 https://www.waterrf.org/proposal-guidelines.

Budget and Funding Information

The maximum funding available from WRF for this project is $150,000. 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 $150,000. **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 https://www.waterrf.org/proposal-guidelines 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 https://www.waterrf.org/policies.

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 3:00 pm Mountain Time on Tuesday, November 9, 2021.

The online proposal system allows submission of your documents until the date and time stated in this RFP. Submit your proposal at https://forms.waterrf.org/212024293241847.

Please ensure you upload the required documents before the deadline. **Proposals submitted after the deadline will not be accepted.**

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Harry Zhang, PhD, PE at (571)384-2098 or hzhang@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 an 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