

September 4, 2024

Dear Research Partner:

The Missouri Highways and Transportation Commission requests proposals from qualified organizations—namely private consultants, universities, and research organizations—to furnish professional services as described in the following request for proposal to be coordinated by the Research Unit of the Construction and Materials Division.

Please submit a proposal for project **TR202510** entitled, **“Use of Small UAVs for Field Measurement of Hydraulic Parameters in Small Drainage Basins.”** Your submittal must include a work plan, the proposed project team and its background, and any related projects now active or recently completed by your firm. The project team must be led by a licensed professional engineer in the state of Missouri and the final report must be sealed, in accordance with the provisions of Chapter 327 RSMo.

The selection committee will use Qualification Based Selection. A “not to exceed” budget amount is included in the RFP to assist with the required scope, but budgets are not to be included with the proposal submissions and will not be presented to the selection committee.

Please submit all proposals to MoDOTResearchRFP@modot.mo.gov by **October 16, 2024 10:00 AM (CST)**. More information about project contracting in general can be found at <https://www.modot.org/information-researchers> under RFP documents.

Sincerely,



Jen Harper
Research Director



Background

Conventional methods for measuring water surface elevations, water depths and stream flow velocities are done by conducting field surveys and using some form of a current meter such as the USGS Type AA Current Meter.

Conventional methods for determining discharge requiring surveying can be time consuming, costly, and unsafe during flooding events, thus is seldom undertaken for smaller drainage basins. Any high-water marks recorded are hard to determine what the corresponding discharge was for that elevation, hence, unreliable for the calibration of hydraulic models. Being able to efficiently and safely determine an accurate water surface elevation with the corresponding velocity and water depths across a section can help calibrate hydraulic modeling when it comes time for replacing the structure. If used during a flooding event, it could provide more useful information than a typical high-water mark or extreme high-water mark as an associated discharge can be connected to that elevation. MoDOT currently uses UAVs (drones) for certain activities and are interested in exploring them to use for this application.

Objectives

To determine the feasibility of using UAVs (aka drones) to field measure water surface elevations with corresponding velocities and water depths (bathymetry) within a 10% accuracy in calculated discharge compared to conventional methods.

If it is determined that this method can achieve the necessary accuracy the researchers shall establish the following:

- What equipment and/or sensors are necessary for attachment to drones to capture the required data?

(NOTE) The equipment should be compatible with at least one model of MoDOT's current UAV fleet: Mavic 3 and DJI Matrice 30T models are preferred by MoDOT. The Matrice 300 will be an additional UAV option if needed.

- What is the cost of the necessary equipment?
- How much data storage will be required for the field collected data?
- What, if any, specific training is required to operate the required equipment?

Being able to collect field measured data to calibrate our hydraulic models in an efficient manner will lead to more accurate models. Which in return will lead to more efficient, safer and resilient design of hydraulic structures.

Project Requirements

Task 1: Project Management

The Research Team will facilitate a kick-off meeting with MoDOT to review the work plan, scope and schedule; and establish a protocol for regular ongoing communications and coordination (monthly) with the team. The Research Team will also develop minutes from the kick-off meeting and any other status meetings that may be held during the project.

The finalized work plan will detail implementation of the following tasks as well as the resources and schedule to carry them out.

Task 2: Literature Search

The Research Team will perform a literature search of past and current research related to using UAVs to field measure water surface elevations with corresponding velocities and water depths (bathymetry) within a 10% accuracy in calculated discharge compared to conventional methods, along with necessary equipment and software needed.

Task 3: Presentation of Findings in Literature Search

The research team will present the findings of the literature search and provide a recommendation for equipment needed, cost of equipment and software if needed.

Task 4: Survey and Validation

The research team will perform field surveys using a UAV and equipment needed on a minimum of 5 bodies of water with known water surface elevations with corresponding velocities and water depths (bathymetry) and validate a 10% accuracy in calculated discharge compared to conventional methods. The minimum of five bodies of water should be of varying size and hydrological regions. It is not anticipated any will be large bodies of water such as major rivers, this is intended for smaller drainage basins.

Task 5: Field Demonstration

The research team will demonstrate in the field a minimum of one demonstration of how data is obtained using said equipment above along with how to analyze data to MoDOT.

Task 6: Develop a Step-by-Step Procedure

The research team will develop and share with MoDOT a step-by-step procedure (and procedure manual) explaining how data is collected including how data is processed from the field surveys for hydraulic modeling.

Task 7: Present Task 6 Deliverables to the TAC

The research team will submit the Task 6 deliverables two weeks prior to the presentation to the TAC.

Task 8: Draft Report and Research Summary

The Research Team will develop and submit the draft report and research summary for MoDOT's review.

Task 9: Final Report, Research Summary and Presentation

The Research Team will submit the final report and research summary of the research along with a final presentation.

Project Deliverables

For templates and forms for reports and plans, visit <https://www.modot.org/information-researchers>.

Email Communications

E-mail and phone communications between the Principal Investigator(s) and MoDOT contacts as necessary are required to provide on-going updates of progress throughout the project.

Data Management Plan

The plan is a formal document that describes the data that is acquired, created or produced during the project, specifies who owns it and who can access it as well as information on how it will be described, managed, analyzed, stored, shared and preserved during and after the project is over. Please refer to templates on the [website](#).

Quarterly Reports

Quarterly reports should be submitted throughout the project by the 15th of April, July, October, and January. The quarterly reports are not intended to replace any additional correspondence between the research team and MoDOT needed to keep the project moving. Please refer to template on the [website](#).

Interim Presentation

An interim presentation shall be scheduled near the mid-point of the project to update MoDOT on the progress and the direction of the project. The purpose of the interim presentation is to evaluate the progress and determine if any mid-project corrections are necessary.

Draft Final Report and Research Summary

These drafts should be final products except for revisions based on MoDOT's review. A final report must include a completed Technical Report Documentation page. Please refer to Publication Guidelines and summary template on the [website](#).

Final Report and Final Research Summary

After MoDOT's review is complete and documents have been edited to MoDOT's satisfaction, final documents should be submitted as a Word documents (unless otherwise instructed). Please refer to Publication Guidelines and summary template on the [website](#).

Other Deliverables

Field demonstration to MoDOT and the creation of a step-by-step procedure manual.

Final Presentation

The Contractor will present the results, recommendations, and implementation ideas to MoDOT and other stakeholders. The Contractor will coordinate location, date, and meeting fees with

MoDOT. For stakeholder and agency participants, any travel and lodging fees are to be covered by individual attendees or their firms. MoDOT and stakeholders will provide feedback to the contractor, especially related to implementation.

Task-Specific Deliverables

Task	Deliverables
1	Schedule and conduct kickoff meeting. Submit work plan and data management plan. Kickoff meeting minutes.
2	None (literature search).
3	Present findings from literature search.
4	Field surveying and validation of equipment.
5	Perform field demonstration to MoDOT.
6	Develop a step-by-step procedure manual.
7	Presentation of Task 6 deliverables.
8	Draft report and research summary.
9	Final report, research summary and final presentation.

Project Schedule

14-month project duration; 4 months for reviewing body of knowledge, 6 months for experimentation, field data collection and calibration, and 4 months for analysis of results and reporting.

The following is an estimate of the project timeline or information on key dates within the project, presuming the project starts November 22, 2024. Proposals need to include a work plan with a proposed timeline. For a sample of a work plan template, see link below. Changes to our estimated project timeline below will be considered, however, timeline extensions cannot be guaranteed. If the Contractor believes the project can be completed sooner, please include a revised schedule with the proposal. The project timeline will be discussed and finalized during the kickoff meeting.

For report templates and forms, visit <https://www.modot.org/information-researchers>.

Date	Milestone
12/18/2024	A kick-off meeting with MoDOT will be scheduled to discuss project requirements and deliverables. The dates of key milestones and deliverables will be determined from this meeting.
3/12/2025	Presentation on literature search findings.
7/16/2025	Interim presentation must be done by this date.
9/17/2025	Field surveying, validation completion and field demonstration to MoDOT shall be completed by this date.
11/12/2025	Draft final report, draft summary report, other deliverables are due. The draft documents shall be submitted to MoDOT approximately two months prior to the final report.
1/14/2026	Final report, summary report, presentations, other deliverables are due. The final documents shall be due approximately one month before the end of the contract. This is to allow all billing to be completed prior to the end of the project.
2/18/2026	Final invoice due.
2/18/2026	Contract ends.

Special Notes

Project budget is not to exceed \$300,000. A budget is not to be included in the proposal but will be required for the contract and must be within this limit. For a sample Budget template, report templates and forms, see <https://www.modot.org/information-researchers>.

All questions, information, data and/or manual requests regarding any aspect of the RFP details or process for submissions should be submitted to MoDOTResearchRFP@modot.mo.gov by the date and time listed in the "RFP Schedule" section of the RFP. This is the only acceptable method for contact regarding the RFP and contacting MoDOT employees via other methods is prohibited. Not adhering to this rule is cause for disqualification of the proposal.

RFP Requirements

- "Contracting Documents" provide further details and links to the required forms. They are available at <https://www.modot.org/information-researchers>.
- Contractor's Project Experience: The proposal must clearly identify the Organization's experience in offering the services requested in this RFP during the past three (3) years.

The description should include a list of the agencies which your organization has served during this time or currently serves. Please highlight any work you have done with other state agencies or local governments.

- Team Member Experience: Please list all team members (including subcontractors) proposed to work on the project. Attach licenses, certifications and resumes for key personnel.
- Contractor's Client References: Proposals should indicate the name, title, and telephone number of at least three clients within the past three years.
- Proposals must be no more than 10 pages in length with a font size no less than 11 points. This length limit does not include the Proposal Submission Form, Contractor's Project Experience, Team Member Experience, Contractor's Client References and optional cover letter (if included one page maximum).
- Proposals must be submitted as one combined PDF document. The submission should only include the required documents organized in the following order: 1) Proposal Submission Form; 2) Cover Letter (Optional; 1 page maximum); 3) Body of Proposal (including work plan and project schedule); 4) Contractor's Project Experience; 5) Team Member Experience; and 6) Contractor's Client References.
- The Offeror must respond to this RFP by submitting all the information required herein for its proposal to be evaluated and considered for award. Failure to submit all the required information shall be deemed sufficient cause for disqualification of a proposal from consideration.
- Proposals will be evaluated by an agency and stakeholder team with knowledge and backgrounds in relevant areas for this project. Selection of the successful Contractor will be based on the Contractor's demonstrated knowledge in the required areas, the merit of the proposed methods and approach in achieving the desired goals, the experience and qualifications of the team, the plan for ensuring implementation of results, and the adequacy and availability of team members to complete the work in a timely manner.
- Correct proposal submission is one of the evaluation criteria. If submission instructions in this section are not followed, the Contractor risks an automatic 10-point deduction (out of 100 total points) when points are awarded during the Proposal Evaluation Process.

RFP Schedule

This document constitutes an RFP from qualified organizations to conduct the TR202510 Use of Small UAVs for Field Measurement of Hydraulic Parameter in Small Drainage Basins study for the MHTC and Missouri Department of Transportation (MoDOT). MHTC reserves the right to reject any and all proposals for any reason whatsoever.

The following RFP Schedule of Events represents MoDOT's best estimate of the schedule that shall be followed. The time of day for the following events shall be between 7:30 am and 4:00 pm, Central Time unless otherwise noted. MoDOT reserves the right at its sole discretion to expand this schedule, as it deems necessary, without any notification except for the deadline date for submitting a proposal. Time is of the essence for responding to the RFP within the submission deadlines.

The following timeline must be met for a proposal to be accepted.

Date	Action
9/4/2024	MoDOT posts RFP to the website at https://www.modot.org/research-requests-proposal .
9/18/2024 4:00 PM (Central)	Written comments or questions must be submitted to MoDOTResearchRFP@modot.mo.gov . This is the only acceptable method for contact regarding the RFP and contacting MoDOT employees via other methods is prohibited. Not adhering to this rule is cause for disqualification of the proposal. This includes all requests for information, data, and manuals.
10/2/2024	MoDOT will post written responses publicly on the website at https://www.modot.org/research-requests-proposal .
10/16/2024 10:00 AM (Central)	Written proposals must be submitted to MoDOTResearchRFP@modot.mo.gov . Do not consider your proposal submitted until you receive notification of receipt. A notification should be sent by noon of the same day.
10/30/2024	MoDOT will notify submitters about project selection, or if needed about interviews to finalize selection.

Contracting Requirements

The successful team will be required to complete additional documentation and enter into a contract such as a "Standard Research Agreement" or "Task Order." Applicants should be aware of these additional needs so contracting can proceed in a timely manner.

As part of the eAgreements process, MoDOT uses an electronic signature tool, DocuSign, for signing agreements electronically. All parties of the agreement must agree to sign electronically in order to utilize the electronic signature option. If your proposal is selected, you will be informed about how to obtain your credentials for electronic signatures (including how to become a MoDOT vendor if you are not already).

Standard contracts, forms, attachment templates and additional information are available from the website at <https://www.modot.org/information-researchers>.

Proposal Submission

Submission Deadline

Proposals must be emailed by 10:00 AM (Central Time) according to email time stamp by the submission date in the RFP Schedule to the Research Director's attention (Jen Harper) at: MoDOTResearchRFP@modot.mo.gov. Please reference the project title since more than one RFP may be due at one time. Electronic proposals are required.

Submission Confirmation

You will receive an email confirmation after your proposal has been received. If you do not receive such a confirmation by 12 noon (Central Time) on the day of the deadline, please contact us at MoDOTResearchRFP@modot.mo.gov as soon as possible. Your submission should not be considered received until you have received your email confirmation.