



P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.texas.gov
Phone (512) 463-7847, Fax (512) 475-2053

AGENDA ITEM MEMO

BOARD MEETING DATE: January 16, 2025

TO: Board Members

THROUGH: Bryan McMath, Executive Administrator
Larry Gee, General Counsel
Rebecca Trevino, Chief Financial Officer
John T. Dupnik, P.G., Deputy Executive Administrator, Water Science and Conservation

FROM: Saul Nuccitelli, P.E., Director, Flood Science and Community Assistance

SUBJECT: Enhancing the performance of hydraulic modeling software

ACTION REQUESTED

Consider authorizing the Executive Administrator to negotiate and execute two payable contracts, one with the University of Texas at Austin (UT) for a total amount not to exceed \$450,000.00 and one with the United States Army Corps of Engineers (USACE) not to exceed \$963,503.00, in a coordinated effort to parallelize the USACE's Hydrologic Engineering Center's (HEC's) River Analysis System (RAS) hydraulic modeling software.

BACKGROUND

HEC-RAS hydraulic modeling software is the most commonly used software in Texas for analyzing and mapping riverine and overland flood risks and has been applied to large-scale ongoing state and federal agency flood studies, including the TWDB's Base Level Engineering studies and regional flood planning efforts as well as the Texas General Land Office's River Basin Flood Studies. HEC-RAS was originally developed to simulate areas of limited extent (e.g., a single watershed), though recently the model's capabilities have been extended to include more complex river/coastal systems. While current parallel computer processing (parallelization) approaches work well for small to medium size study areas, they are inefficient for larger areas. For instance, some analyses require hundreds of simulations to include different alternative scenario evaluations, taking approximately 10-days of computational run-time for 10-days of simulation time. This increase in extended computational run-times limits the state's ability to implement the large-scale modeling efforts needed in Texas.

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Board Members

L'Oreal Stepney, P.E., Board Member | Tonya R. Miller, Board Member
Bryan McMath, Executive Administrator

A team from HEC is modernizing the HEC-RAS code to support the upcoming release of the next generation, referred to as HEC-RAS 2025. In this current effort, the TWDB will oversee and coordinate work with USACE and UT to improve the functionality of HEC-RAS 2025 by extending the parallelization to operate on distributed memory computing platforms. This will significantly expand the capabilities of the software to incorporate larger domains with higher resolution, meanwhile reducing computational run-times from days to hours. The parallelization effort will be incorporated into the 2025 HEC-RAS version and when completed, a new version of HEC-RAS software will be released.

An overview of the tasks USACE and UT will perform includes reviewing and modifying the source code, developing pre-processing software for local input files, and verifying and evaluating the performance and scalability of the code through a large-scale testbed. The investment in HEC-RAS 2025 parallelization will provide lasting benefits by improving inundation mapping, flood resiliency planning, real-time flood forecasting, and other flood mitigation efforts.

KEY ISSUES

The General Land Office recently awarded the TWDB \$1,413,503 to lead this collaborative effort between the software developers at USACE and the technical experts at UT Austin to generate a parallelized version of HEC-RAS 2025 that could enhance the applications of this software in future flood planning, mapping, and mitigation efforts. Funding for the project, including TWDB staff time to coordinate the project, is provided by the General Land Office via the U.S. Department of Housing and Urban Development's Community Development Block Grant Mitigation program. The project is expected to take approximately two years to complete.

The Executive Administrator proposes to negotiate and execute the following two contracts, not to exceed a total of \$1,413,503, to meet the objectives of this effort:

- 1) UT Austin, not to exceed \$450,000
- 2) USACE, not to exceed \$963,503

RECOMMENDATION

The Executive Administrator recommends approval to authorize executing contracts with the UT Austin and the USACE to expand the functionality of HEC-RAS 25 through a parallelization effort and significantly reduce computational run-time, thereby improving state-wide efforts in inundation mapping, flood resiliency planning, real-time flood forecasting, and other flood mitigation efforts.