TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): __FHWA_____

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project #	**Transportation Pooled Fund Program - Report Period:**
TPF-5(248)	☐Quarter 1 (January 1 – March 31) 2012 ☐Quarter 2 (April 1 – June 30) 2012 √Quarter 3 (July 1 – September 30) 2012 ☐Quarter 4 (October 1 – December 31) 2012

Project Title:
Enhancements to the FHWA-FST2DH Model for Simulating Two-dimensional Depth-averaged Flow and Sediment Transport

Name of Project Manager(s):	**Phone Number:**	**E-Mail**
Kornel Kerenyi	*(202) 493-3142*	*kornel.kerenyi@fhwa.dot.gov*
Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**

Project schedule status:

√ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date

Project Description:

FST2DH is FHWA's Two – Dimensional Hydraulic Model for modeling flows in floodplains and through complex bridge openings. The model was developed more than ten years ago and since that time many improvements have been made in computational capability. The program needs to be modified to take full advantage of these capabilities. Additionally, much advancement has been made to the computer hardware that is needed to solve the complex series of equations used by the program. Numeric algorithms for solving simultaneous series of equations have continued to evolve and computers with multiple cores that can speed up the solution times by a factor of ten are now the norm. From an engineering perspective, we are more frequently being asked to solve complex problems involving multiple bridge openings, different types of structures, multiple embankments that alter natural flow patterns, unsteady flows, sediment transport, and scour countermeasure design. Because of the increasingly more difficult types of problems that are routinely being encountered, the state-of–practice needs to continue to improve to keep pace.
The current version FST2DH is not suitable for modern computer standards and has to be improved. FST2DH is used by many sate DOT's to perform hydraulic modeling for bridge scour calculations. The objective of the study is to update the FHWA-FST2DH model for simulating two-dimensional depth-averaged flow and sediment transport.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

Investigation on the potential of executing 2D hydraulic modeling on the TRACC computation clusters was conducted. Once such capability is established, field engineers will be able to utilize the high performance computational facility at the Argonne National Laboratory for solution of large 2D hydraulics problems. There are two primary approaches to implementing parallelism in a serial program that runs on only one processor and one core of a multi-core processor. These approaches are using the industry standard message passing interface (MPI) to implement parallelism and alternatively using multi-threading to implement parallelism. Before the implementation of these parallelization schemes, attempt was made to run nonparallel versions of the software on the cluster as a starting point for stages of the upgrading process.

Anticipated work next quarter:

- Running validation cases for the single core version software on the high-performance cluster.
- Finalizing the investigation on the approach for parallelization.
- Develop a multi-core processor version of the FST2DH software in accordance with the Software Requirements.

Significant Results:

Detailed description of all results will be included in the final documentation.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

Potential Implementation:

A parallel version of FST2DH that utilizes the computational power of modern high-performance computers.