

TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Iowa DOT

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 # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> TPF-5(445)	Transportation Pooled Fund Program - Report Period: Quarter 1 (January 1 – March 31) Quarter 2 (April 1 – June 30) Quarter 3 (July 1 – September 30) X Quarter 4 (October 1 – December 31), 2021	
Project Title: Design Guidelines and Mitigation Strategies for Reducing Sedimentation of Multi-barrel Culverts		
Name of Project Manager(s): Marian Muste	Phone Number: 319-384-0624	E-Mail marian-muste@uiowa.edu
Lead Agency Project ID:	Other Project ID (i.e., contract #):	Project Start Date: February 1, 2020
Original Project End Date: January 31, 2023	Current Project End Date: January 31, 2023	Number of Extensions:

Project schedule status:

On schedule
 On revised schedule
 Ahead of schedule
 X Behind schedule (see comments)

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$300,000	\$88,985	70%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
	\$ 24,996	

Project Description:

The overall goal of the TPF-5(445) project is to leverage the extensive research conducted in Iowa through a multi-state research effort leading to design guidelines and specifications for mitigation measures for reducing sedimentation at existing and proposed multi-barrel culvert locations. The guiding principles and best practices for mitigating sedimentation will complement the existing hydraulic design guidelines. The project entails laboratory, numerical, and field monitoring and analysis to determine the overall effect of the sedimentation-reduction designs on the hydrology and transport of sediment at culverts. The project outcomes will be assembled in a web-based platform with interactive parameters that can uniquely support the routine activities related to culverts.

The TPF-5(445) project objectives are:

1. Assemblage of data and knowledge on sedimentation at culverts and mitigation measures
2. Synthesis of the practical knowledge in guidelines for design and operations for reducing or eliminating sedimentation at culverts
3. Development of a web-based platform that will embed the formulated guidelines in easy to use interactive interfaces that will facilitate to retrieve design and operation information and to guide in the selection of a self-cleaning culvert design fit for the local flow and sediment transport conditions.

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

For the reference period (September 30 - December 31, 2021), the research was focused on the following tasks:

The major accomplishment of this reporting period was the organization and delivery of the first in-person meeting of the project TAC. The meeting was held in Iowa City, December 1-2, 2021 with participation of Iowa, Mississippi and New Mexico IDOTs (2 representatives state) and 1 representative from Utah IDOT.

During the December 1-2 meeting, the TAC reviewed all the previous activities and proposed adjustments to the research plan that better suit particular interests of the TPF project participants. The main changes to the plan are as follows:

- Introduction of a methodology quantification of the amount of sediment accumulated in the sediment deposits after the execution of the experimental runs using an accurate instrumentation. IIHR-Hydroscience & Engineering possesses the equipment required for this purpose (a lidar-based scanning system) that can be used by paying an internally-established recovery rate.
- modifications to the culvert model's current configuration to better match the culvert design specifications and sediment transport conditions occurring in New Mexico and Utah environments.

Consequently, the initial Tasks #3 and 4 of the initial project plan have been considerably modified. The modifications entail a doubling of the tests to be conducted and changes of the modeling protocols to a higher degree of complexity. Given that the above-mentioned modifications bring along additional costs for changing the model and executing the modeling, a new survey (#5) was created to evaluate what can be done with the initial funds and how much funding is needed to accomplish the newly proposed activities. This survey is currently in evaluation.

Following the meeting, we initiated laboratory tests for the original configuration with inclusion of the lidar surveys for accurate quantification of the amount of the sediment accumulated for each of the previously tested culvert configuration.

Anticipated work next quarter:

- Finalization of the production testis for the self-mitigation designs implemented in the original culvert configuration (typical for Iowa, Mississippi, Missouri).
- Construction of the new culvert configuration (typical for New Mexico and Utah), setting of new measurement protocols, and execution of the tests in the light of the meeting discussions.

Significant Results:

The comparison of the self-mitigation configuration with the reference (i.e., the “as is” culvert design) showed that all solutions are improving the overall operations of the culverts in terms of initiation of the sediment deposits and limiting their growth for all tested hydrologic scenarios. The best performance so far is delivered by the long-tapered curtain wall positioned at the culver inlet followed by the raised inverts in the side boxes.

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).

- The COVID-19 pandemic adversely affected the project developments in multiple ways. However, we were able to have the first in-person meeting of the project TAC. Despite the unforeseen circumstances created by the COVID-19 pandemic (i.e., total interruption of the laboratory work twice in the 2020-21 time interval) and issues found in the debugging stage of the model, we expect to deliver the tasks specified by TAC.
- The December 1-2, 2021 TAC meeting brought considerable changes in the original plans that require re-evaluation of the available resources and re-aligning the project to the restructured activities.
- We hope that by garnering additional funding and by intensifying the modeling efforts, we will be able to recover the time lost due to COVID pandemic and additional modeling tasks, therefore we do not ask for any change in the project scheduling at this time.

Potential Implementation: