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.e, SPR-2(XXX), SPR-3(XXX) or 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)
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	$29,334	20%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$23,300 (25%)	$29,334	15%

Project Description:

The overall goal of the TPF-5(445) project is to leverage the extensive research conducted in Iowa though 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 will entail 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, 2020), the work was has been focused on the following tasks:

T#2. Survey of partnering State DOT's on the types, extent and degree of sedimentation at multi-box culverts to account for regional issues related to culvert sedimentation. The survey will include inventory of regional practices for mitigating sedimentation. Assemblage of the survey information and development of the study road map.

T#3. Screening and compiling culvert-related data resources (e.g., aerial photos, culvert National Bridge Inventory databases, etc) for assessment of the degree of sedimentation of selected culverts in project partnering states.

T#4. Development of metrics for assessment of sediment transfer/removal efficiency for the identified self-cleaning solutions. This task will involve laboratory experiments and potentially numerical simulations.

Tasks #2 and #3 were originally planned to be firstly discussed in the annual project meeting scheduled for the Summer of 2020. Due to the circumstances created by the COVID-19 pandemic, the scheduling of the meeting has been continuously postponed. Given that the home institutions of the project partners have travel restrictions still in place, the Project PI (M. Muste) assembled the request for information specified in these task in a new survey *Survey #2) that was sent to all the partners for garnering input. The input from all partners has been received on October 26. Currently, the input to the survey is assembled for synthesis.

Task #4 of the project was tackled earlier than originally planned as the design and construction of the experimental facility does not require involvement of the TAC. Following the finalization of the flume design in early June, the flume construction was initiated at the end of July (caused by delay created by COVID-19) and continued up to these days. Currently, the flume commissioning is nearing.

On October 26, 2020, the Project TAC held a virtual meeting to update the whole team on the project status and to set the next steps in the Project development.

Despite the unforeseen circumstances (i.e., total interruption of the laboratory work and issues found in the debugging stage of the model), starting with mid-December we recovered some of the delay in project progress.

Anticipated work next quarter:

- Follow up on the input provided by partners for Survey #2.
- Continuation of the laboratory experiments
- Setup of an additional virtual meeting with the Project TAC to finalize the modeling sceanrios.

Significant Results:

The debugging and preliminary tests have been completed. Half of the first series of production tests on the "as is" culvert configuration have been finalized.

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:

- We could not held the 1st face-to-face meeting. Besides the importance of having live meeting rather than virtual communication, the initial meeting (planned to be held in Iowa City, IA) was supposed to include a site visit to the four demonstration culverts investigated by the Iowa research team during 2017-2020.
- The IIHR shop was closed for two weeks (from November 9 to 20) due to facility infestation with COVID. The shop personnel was available only partially.

During the debugging stage of the project, the model showed a flow instability due to the formation of, the so called "Stall-flow regime", a very rare situation in hydraulic modeling. During all our previous laboratory and filed work this process was not apparent. Fixing the instability required iterative alterations of the model geometry. % different model configuration were thoroughly tested until the flow in the model became satisfactory. The debugging of the problem creater at least 2 months of additional laboratory work.

We consider that we can recover the time lost due to COVID pandemic and additional modeling issues, therefore we do not ask for any change in the project scheduling at this time.

Potential Implementation: