

**Quarterly Progress Report:**

**Project Number and Title:** Project C19.2020: Damage Modeling, Monitoring, and Assessment of Bridge Scour and Water Borne Debris Effects for Enhanced Structural Life

**Research Area: Thrust 1** -Transportation Infrastructure Monitoring & Assessment for Enhanced Life

**PI:** Wei Zhang, Ph.D., P.E., Associate Professor, Department of Civil & Environmental Engineering, University of Connecticut

**Co-PI(s):** Ramesh B. Malla, Ph.D., F. ASCE, F. EMI, Professor, Department of Civil & Environmental Engineering, University of Connecticut; Nalini Ravishanker, Ph.D., Professor, Department of Statistics, University of Connecticut

**Reporting Period:** Oct. 01, 2020 to December 31, 2020

**Submission Date:** December 31, 2020

**Overview: (Please answer each question individually)**

*Brief overview and summary of activities performed during the reporting period:*

Activities performed during this reporting period have been focused primarily on communicating and collecting data from Maine DOT and VTrans to analyze bridge scour and waterborne debris impacts on bridges, and preparing methodologies for the field testing and data collection and processing.

- Meetings has been organized to determine the data collection on bridge scour and waterborne debris impacts for bridges located in the state of Vermont and Maine.
- Efforts is ongoing to contact additional local Department of Transportations (DOTs) to obtain more related data to bridge scour and water borne debris.
- Preliminary work procedure for image processing of waterborne debris sizes has been prepared.
- Collaboration with VTrans and Maine DOT has been maintained. The meeting with DOT technical champions Mr. Jeff DeGreaff from VTrans, and Mr. Benjamin Foster from Maine DOT took place on Nov. 13, 2020

*Provide context as to how these activities are helping achieve the overarching goal(s) of the project...*

The overarching goal of the project is to develop efficient waterborne and scour modeling and assessment methodology for bridges during flooding events to improve bridge safety and resilience. Many bridges in the region could experience possible damages from waterborne debris impacts or bridge scour impacts, that could put risks on bridge safety and increase burdens for bridge maintenance. As the initial step of the project, project PIs were working with our technical champions from two DOTs to determine the available data sources that could be used in the project so that the data could be better prepared by the DOTs for the project PIs.

*Describe any accomplishments achieved under the project goals...*

- Sample bridge information in GIS datasets were discussed to determine the current available data sources from DOTs, including VTrans and Maine DOT;
- Key parameters were determined for statistical analysis of the project for bridge scour and waterborne debris impacts. Major data information includes: 1) dimensions for the accumulated debris, length and width; 2) how are these data related to channel width, water shed area, water speed, and drag coefficient.
- The research team has been conducting literature review on waterborne debris dimensions and analysis.
- The research team has determined to contact more DOTs to obtain more related waterborne debris data and bridge scour data for the entire New England region.

*Complete the following tables to document the work toward each task and budget (add rows/remove rows as needed, make sure you complete the Overall Project progress row and include all tasks even if they have ended or have not been started)...*

<b>Table 1: Task Progress</b>			
<b>Task Number</b>	<b>Start Date</b>	<b>End Date</b>	<b>% Complete</b>
Task 1:	Oct. 20, 2020	Jan. 31, 2021	30%
Task 2:	Dec. 1, 2020	Jun. 30, 2021	5%
Task 3:	Feb. 1, 2020	Sep. 30, 2021	0%

Task 4:	Oct. 1, 2021	Mar. 31, 2021	0%
Task 5:	Oct. 1, 2021	July 31, 2021	0%
Task 6:	Jan. 1, 2022	Dec. 31, 2022	0%
Task 7:	Sep. 1, 2022	May 31, 2022	0%
Task 8:	Jan. 1, 2023	Sep. 30, 2023	0%
Overall Project:	Oct. 20, 2020	Sep. 30, 2023	

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
\$400,000	0%	0%

\*Include the date the budget is current to.

Describe any opportunities for training/professional development that have been provided...

Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period. Please use the tables below for any Publications and Presentations in addition to the description of any other technology transfer efforts that took place during the reporting period. )... Use the tables below to complete information about conferences, workshops, publications, etc. **List all other outputs, outcomes, and impacts after the tables** (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings).

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)
None. The project is new and is in preliminary stage.				

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status
None. The project is new and is in preliminary stage.				

Encouraged to add figures that may be useful (especially for the website)...

Insert figures here

**Participants and Collaborators:**

Use the table below to list all individuals who have worked on the project.

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
Dr. Wei Zhang, Associate Professor	wzhang@uconn.edu	Civil & Environmental Engineering, University of Connecticut, Storrs	Principal Investigator (PI)
Dr. Ramesh B. Malla, Professor	Ramesh.Malla@UCONN.EDU	Civil & Environmental Engineering,	Co-Principal Investigator (PI)/ TIDC Institutional Lead, UConn

		University of Connecticut, Storrs	
Dr. Nalini Ravishanker	Ravishanker, Nalini	Statistics, University of Connecticut, Storrs	Co-Principal Investigator (PI)

Use the table below to list all students who have participated in the project during the reporting. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.)

<b>Table 6: Student Participants during the reporting period</b>				
<b>Student Name</b>	<b>Email Address</b>	<b>Class</b>	<b>Major</b>	<b>Role in research</b>
Xiaolong Ma		Ph.D.	Civil Engr.	Graduate Assistant
Leana Santos		Ph.D.	Civil Engr.	Graduate Assistant

Use the table below to list any students who worked on this project and graduated during this reporting period.

<b>Table 7: Student Graduates</b>			
<b>Student Name</b>	<b>Role in Research</b>	<b>Degree</b>	<b>Graduation Date</b>
None. The project is new and is in preliminary stage.			

Use the table below to list organizations have been involved as partners on this project and their contribution to the project.

<b>Table 8: Research Project Collaborators during the reporting period</b>						
<b>Organization</b>	<b>Location</b>	<b>Contribution to the Project</b>				
		<b>Financial Support</b>	<b>In-Kind Support</b>	<b>Facilities</b>	<b>Collaborative Research</b>	<b>Personnel Exchanges</b>
Vermont Agency of Transportation	Barre, VT		X			X
Maine Department of Transportations	Augusta, ME		X			X

List all other outputs, outcomes, and impacts here (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings). Please be sure to provide detailed information about each item as with the tables above.

Have other collaborators or contacts been involved? If so, who and how? (This would include collaborations with others within the lead or partner universities; especially interdepartmental or interdisciplinary collaborations.)

<b>Table 9: Other Collaborators</b>			
<b>Collaborator Name and Title</b>	<b>Contact Information</b>	<b>Organization and Department</b>	<b>Contribution to Research</b>
Benjamin Foster, State Bridge & Structures		Bureau of Maintenance & Operations, Maine	Technical Champion

Maintenance Engineer/ Deputy Chief Engineer,		Department of Transportation (Maine DOT),	
Mr. Jeff DeGraff, P.E., Hydraulics Project Engineer		Vermont Agency of Transportation (VTrans)	Technical Champion

*Who is the Technical Champion for this project?*

Name: Benjamin Foster

Title: Maintenance Engineer/Deputy Chief Engineer

Organization: MaineDOT

Location (City & State): Augusta, ME

Name: Jeff DeGraff

Title: Hydraulics Project Engineer

Organization: VTrans

Location (City & State): Barre, VT

### **Changes:**

*Discuss any actual or anticipated problems or delays and actions or plans to resolve them...*

*Discuss any changes in approach and the reasons for the change...*

### **Planned Activities:**

*Description of future activities over the coming months.*

- As our projects start with Coronavirus outbreak, the University of Connecticut is partially closed and faculty, staff and students are teleworking. Currently, all members of the research teams are working remotely online on tasks that are based on analytical and computational in nature.
- The data collection process will be finished in the coming month with further communications with VTrans, Maine DOT and additional connections with other DOTs will start.
- The research team will continue to work with Maine DOT and VTrans through the data collection and methodologies of the analysis for bridge scour and waterborne debris impacts.
- The research team will continue to maintain communication with other DOTs regarding potential future research topics so that the research will be relevant and of great importance to the DOTs and industry.