Quarterly Progress Report:
Project Number and Title: #C5.2018: Leveraging High-Resolution LiDAR and Stream Geomorphic Assessment Datasets to Expand Regional Hydraulic Geometry Curves for Vermont: A Blueprint for New England States
Research Area: Thrust 1 Develop improved road and bridge monitoring and assessment tools
PI: *Kristen Underwood, Ph.D.; University of Vermont*
Co-PI(s): *Arne Bomblies, Ph.D.; Donna M. Rizzo, Ph.D.; University of Vermont*
Reporting Period: *1/1/2020 – 3/31/2020*
Submission Date: *3/31/2020*

Overview: (Please answer each question individually)

- Filtering of existing USGS streamflow gaging stations and stream geomorphic assessment reach data is complete, resulting in the identification of 10 new sites to complement the 20 existing sites upon which VT Regional Hydraulic Geometry Curves were based.

- Existing stream geomorphic assessment (SGA) data including bankfull channel dimensions (width, depth, cross-sectional area, and discharge) have been compiled for the 30 sites.

- GIS analysis is underway to develop catchment-scale variables that will serve as potential explanatory variables in statistical models to predict bankfull channel dimensions for ungauged locations.

Provide context as to how these activities are helping achieve the overarching goal(s) of the project…
By relying on SGA datasets to expand the number of observations, and by exploring additional predictor variables that may better refine regression estimates, our objective is to improve the prediction ability and reduce estimation uncertainty using RHGCs.

Table 1: Task Progress			
Task Number	**Start Date**	**End Date**	**% Complete**
Task 1: Compile Expanded Set of Observation Sites	6/1/2019	1/31/2020	100%
Task 2: Compile Regression Variables	9/1/2019	3/31/2020	65%
Task 3: Develop and Test Statistical Models	1/1/2020	10/30/2020	20%
Task 4: Summary Report	3/1/2020	1/14/2021	20%
Overall Project:	6/1/2019	1/14/2021	

Table 2: Budget Progress		
Project Budget	**Spend – Project to Date**	**% Project to Date***
$146,244	$93,890.99	64.2% as of 3/27/2020

***Include the date the budget is current to.**

Describe any opportunities for training/professional development that have been provided…
Masters student, Roberge, is enrolled in a multivariate statistics class this semester.

*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)
N/A				

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status
N/A				

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
Kristen Underwood	Kristen.Underwood@uvm.edu	UVM CEE	PI
Donna Rizzo	Donna.Rizzo@uvm.edu	UVM CEE	Co-PI
Arne Bomblies	Arne.Bomblies@uvm.edu	UVM CEE	Co-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.)

Table 6: Student Participants during the reporting period				
Student Name	Email Address	Class	Major	Role in research
Sienna Roberge		M.S.	Civil & Env Eng	Data analysis, GIS

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

Table 7: Student Graduates			
Student Name	Role in Research	Degree	Graduation Date
N/A			

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

Table 8: Research Project Collaborators during the reporting period						
Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
N/A						

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.)

Table 9: Other Collaborators			
Collaborator Name and Title	Contact Information	Organization and Department	Contribution to Research
Nick Wark, Hydraulics Manager	(802) 828-3987 Nick.Wark@vermont.gov	VT Agency of Transportation	Technical Champion

Who is the Technical Champion for this project?
Name: Nick Wark
Title: Hydraulics Manager
Organization: VT Agency of Transportation
Location (City & State): 219 North Main Street, Barre, VT 05641
Email Address: Nick.Wark@vermont.gov

Changes:

Discuss any actual or anticipated problems or delays and actions or plans to resolve them…
The emergence of the coronavirus and a COVID-19 epidemic has caused substantial disruption to this research, since the announcement that UVM would transition from on-campus work to remote instruction and research on or about March 11. Since that time, the Masters student assigned to this project has had limited internet access to software programs needed to run statistical and GIS tasks through a virtual private network. A remedy to improve her internet access and connection speed is underway, and anticipated in the first week of April. Dr. Underwood requested a no-cost extension to this grant on March 6, which has been forwarded by our grant administrator to Vu Phan at U Maine.

Discuss any changes in approach and the reasons for the change…

Planned Activities:

Description of future activities over the coming months.
- Resolve tele-working challenges of the Masters student.
- Resume GIS analyses to complete development and estimation of potential explanatory variables.
- Continue with statistical analyses to generate new empirical relationships.
- Summarize findings in a report.