NEW ENGLAND TRANSPORTATION CONSORTIUM
QUARTERLY PROJECT PROGRESS REPORT

A. PROJECT NUMBER AND TITLE:
Project: NETC 18-1
Title: Development of MASH Computer Simulated Steel Bridge Rail and Transition Details
State Project No.: 023430.18

B. PRINCIPAL INVESTIGATOR(s) & UNIVERSITY(s):
Chuck A. Plaxico, Ph.D
Roadsafe LLC
Canton, ME

C. WEB SITE ADDRESS: www.RoadsafeLLC.com

D. START DATE (*Per NETC Agreement*): 09-October 2018

E. END DATE (*Per NETC Agreement*): 31-December 2019

F. **ANTICIPATED COMPLETION DATE: 31-December 2019**

G. PROJECT OBJECTIVES:

The objectives of the project are to: 1) review existing NETC bridge rail and AGT designs and assess performance aspects to determine preliminary MASH compliance/equivalency, 2) review current standard details and specifications for NETC style bridge rails and transitions used by MaineDOT, NHDOT, RIDOT and VTrans to identify differences in material specifications and dimensional details and 3) evaluate the crash performance of the NETC bridge rail and approach guardrail transition (AGT) designs using finite element analysis (FEA) computer simulation. The impact conditions and assessment procedures for the FEA will conform to the specifications in *MASH* for TL-3 or TL-4 (as appropriate) and will included evaluations of structural capacity of the railing, risk of occupant injury, and vehicle stability during impact and redirection. The systems included in the evaluation are listed below along with the target test level for each system:

- Bridge Rail Systems:
  - NETC curb-mounted 2-Bar Rail (TL3)
  - NETC curb-mounted 3-Bar Rail (TL4) (4-bar curb mounted NETC rail would be considered equivalent to this type)
  - NETC sidewalk-mounted 4-Bar Rail (TL4)
- Bridge Rail Transitions:
  - NETC Style 2-Bar Rail to Thrie Beam (TL3) (NHDOT steel rail transition)
  - NETC Style 3-Bar Rail to Thrie Beam (TL4) (NHDOT steel rail transition)
  - Concrete Transition Barrier to Thrie Beam (TL4) (MaineDOT standard detail)

Project Tasks

- Task 1: Literature Review and Preliminary Assessment of Current Designs
- Task 2: FEA Model Development and Validation of Baseline R350 Design(s)

a) Develop model of sidewalk-mounted 4-bar bridge rail based on existing validated model reevaluate validity against Test NETC 3.

b) Develop model of NETC AGT for 2-Bar bridge rail and validate with Test 401181-1 (R350 Test 3-21).

- Task 3: MASH TL-4 Simulations for NETC 3-Bar Bridge Rail
- Task 4: MASH TL-4 Simulations for NHDOT 3-Bar Transition
- Task 5: MASH TL-4 Simulations for NETC 4-Bar Bridge Rail
- Task 6: MASH TL-4 Simulations for MaineDOT 4-Bar Transition
- Task 7: MASH TL-3 Simulations for NETC 2-Bar Bridge Rail
- Task 8: MASH TL-3 Simulations for NETC 2-Bar Transition

H. REPORT PERIOD:
Quarter 2, 2019 (April 1 – June 30)

I. ACCOMPLISHMENTS THIS PERIOD:

- Tasks 4 – 7 were completed.

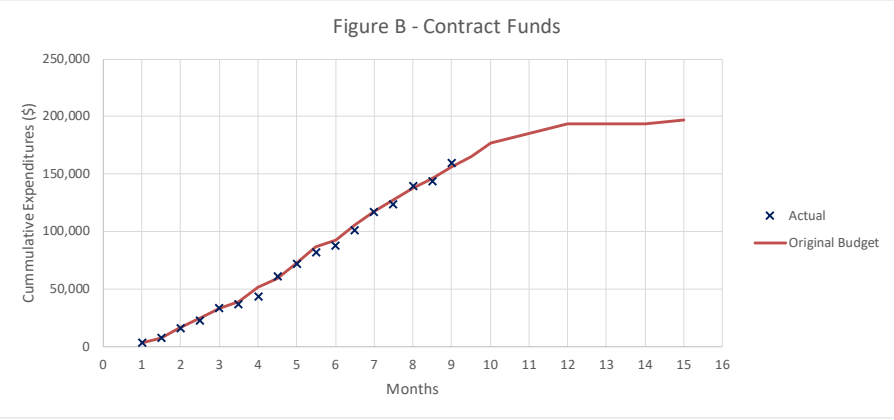
J. PROBLEMS ENCOUNTERED (If any): No problems were encountered this quarter that would affect the overall scope or budget for the project. The project is on schedule.

K. TECHNOLOGY TRANSFER ACTIVITIES: The results from the project were presented to the Bridge committee at the NETC Symposium on June 19th at the Grappone Conference Center in Concord, New Hampshire. The title of the presentation was "Crash Performance Evaluation of MassDOT and NETC Steel Bridge Rail and Transition Designs Using FEA." Several of the TAC members were in attendance for the meeting.

L. STATUS BY TASK:

Task NO.	Task Code	Task Description	QTR	QTR 1			QTR 2			QTR 3			QTR 4			QTR 5			% Complete
			Month	Oct	2	3	Jan	5	6	Apr	8	9	July	11	12	Oct	14	15	
1	Literature Review	Literature Review and Preliminary Assessment of Current Designs		25	50 75	85 100													100
2(a)	BR Model Validation	Development and Validation of NETC 4-Bar Bridge Rail Model			25	50 80	90 100												100
2(b)	AGT Model Validaiton	Finite Element Model Development and Validation of 2-Bar AGT				10	12 15	70 100											100
3	3-Bar BR (TL4)	TL4 Simulations of the NETC 3-Bar Bridge Rail Design					10	50 75	100										100
4	3-Bar AGT (TL4)	TL4 Simulations for AGT to 3-Bar Bridge Rail							25 50	75 100									100
5	4-Bar BR (TL4)	TL4 Simulations for the NETC 4-Bar Bridge Rail Design								50 100									100
6	4-Bar AGT (TL4)	TL4 Simulations for AGT to Concrete Abutment									50 80	100							100
7	2-Bar BR (TL3)	TL3 Simulations of the NETC 2-Bar Bridge Rail Design									33	66 100							100
8	2-Bar AGT (TL3)	TL3 Simulations for AGT to 2-bar Bridge Rail										25							25
9	Interim Meetings	Interim Reports / Meetings				13	25	38	50	63	75	88							88
10	QPR	Quarterly Progress Reports					33			67									67
11	Final Report	Final Report																	0
	Direct Expense	Computational Resources and Software (ls-dyna)		0	8	17	25	33	42	50	58	67							67

Original Schedule
Projected Schedule



Funds Expended:		79.94%	Time Expended:	60%
Contract Amount:	$	199,936	Start Date:	10/9/2018
Expended this Month	$	20,797.25	Completion Date:	12/31/2019
Total Expended to Date:	$	159,826.12		
Balance:	$	40,110.08		

M. PERCENT COMPLETION OF TOTAL PROJECT: 60%

N. ACTIVITIES PLANNED FOR NEXT QUARTER:

Task 8 will be complete, and work on the draft final report will be initiated. As of the date of this report (July 26, 2019), Task 8 is complete.

O. FINANCIAL STATUS:
As of June 30, 2019
Total Project Budget: $ 199,936
Total Expenditures : $ 159,826.12