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 # *TPF-5(081)*	**Transportation Pooled Fund Program - Report Period:** Quarter 1 (January 1 – March 31, 2013) X Quarter 2 (April 1 – June 30, 2013) Quarter 3 (July 1 – September 30, 2013) Quarter 4 (October 4 – December 31, 2013)
Project Title: Midwest Smart Work Zone Deployment Initiative	
Project Manager: Dan Sprengeler	**Phone:** 515-239-1823 **E-mail:** dan.sprengeler@dot.iowa.gov
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Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
RT 63	Addendum 189	2001-On-going Pooled Fund
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**
On-going	On-going	None

Project schedule status:

X On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Total Percentage of Work Completed
$1,917,500	$1,854,516.12	On-going

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
N/A	N/A	On-going

Project Description:

- Vendor Solicitation
- Distribute Group Reports
- Maintain website
- TAC meetings
- Maintain research report
- Recommend research reimbursement
- Solicit state participation
- Inquiry contact
- (On-going project)

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

Quarter Ending June 30, 2013:
Contracts for the 2013 program have been approved by the Iowa Department of Transportation and returned to the Principal Investigators with approval to initiate work.

Received and recorded quarterly report data from Principal Investigators for contracted projects. Following is a summary of accomplishment for individual projects under contract.

2008 Program
-Evaluation of Variable Advisory Speed Limit Systems for Work Zones, University of Missouri,
Praveen Edara, PI

During this quarter, the simulation analysis of several 'what if' scenarios was completed. Different truck percentages, compliance rates, and VASL algorithms were tested. The PIs have started compiling the draft final report consisting of the literature review and the results of field studies and simulation analysis

2011 Program
-Investigation of Incentive Contracting for Minimizing Work Zone Traffic Impacts, University of Missouri with
Carlos Sun as PI.
The final report has been reviewed and accepted by the Board of Directors, project is completed. .

-Influencing Work Zone Traffic Flow Through Variable Messaging Technologies, Missouri University of Science and Technology with Ming Leu as PI.

During this quarter, the driving simulator was further developed as follows:
Extensive testing was conducted for the simulated work zone scenarios, which will be prepared to simulate traffic volumes between 600 and 1000 vph. Software improvements were further made to the simulator to allow different algorithms to be used to track vehicles on a three dimensional road. Various techniques were used to reduce the errors due to vehicle movements in three dimension. Software improvements also were made to increase the frame rate during simulation. And algorithms were developed to optimize the frame rate. Effects of potable message signs on vehicle operation were analyzed and improved. Further testing and improvements in the lane change logic were made for more realistic lane change movements of vehicles in simulation. Project is about 89% complete at this time.

2012 Program

-Development of a TL-3 Transition between Temporary Concrete Barrier and Guardrail, University of Nebraska with Ron Faller as PI.

During the 2nd Quarter of 2013, MwRSF continued simulation work on the development of a TL-3 transition between portable concrete barriers and W-beam guardrail. The next step after a simple overlap of the two systems was to connect the W-beam guardrail to the PCB system with an end shoe. The purpose of this connection was to develop downstream tension in the W-beam guardrail system that would aid in the capture of the vehicle. This system also utilized two of guardrail posts from the W-beam guardrail system in front of the flared PCB system. The purpose of having these posts in front of the PCB system was to initiate displacement of the PCBs caused by post rotation.

This connected system was simulated and analyzed for impact at several locations. For impacts downstream of the upstream end of the PCB system, the backward post rotation initiated PCB displacement as intended. However, the posts tended to wedge against the face of the PCB and act as ramps for the tires of the pickup truck. This caused vehicle instability and, in most cases, rollover. For impacts upstream of the upstream end of the PCB system, the W-beam guardrail system showed a propensity for pocketing. Upon impact, the tension in the guardrail caused rotation of the PCB segment that it was attached to. This rotation caused bowing of the guardrail system, late post rotation and subsequently pocketing in the W-beam guardrail system. Another concern was the height of the G4(1s) guardrail system and its capability to capture and redirect the pickup truck.

In order to address both of these concerns, it was determined that a transition to the more robust and taller thrie beam guardrail was the next step. Installation of the thrie beam hardware into the model and simulation are currently underway.

In the 3rd Quarter of 2013, MwRSF will continue the development of design concepts for the guardrail to PCB transition system. Design modifications will be added incrementally to the thrie beam guardrail transition currently being simulated during this quarter in order to improve its performance without adding unnecessary complexity to the design. These modifications could include removal of posts in front of the PCB system, increased offset and flaring of the barrier systems, and additional hardware designed to prevent snag and improve the barrier transition.

A TAC meeting was held with NDOR representatives on 4-3-13. In this meeting the results of the simulation analysis from the First Quarter of 2013 where shown to the committee and input on further development of the system was given by the TAC. A TAC meeting is anticipated in the late summer early fall time frame to show the proposed transition designs as determined by the simulation and design effort.

Project is approximately 40% complete.

-Work Zone Performance Measures, Iowa State University with Shauna Hallmark as PI.

All project tasks have been completed and a guidebook has been developed and reviewed by the technical advisory committee. Project is approximately 99% complete.

-Effectiveness of Work Zone Intelligent Transportation Systems, University of Missouri with Praveen Edara as PI.

.In this quarter, the following tasks were completed: comprehensive literature review on ITS in work zones, a general framework for Departments of Transportation in evaluating work zone ITS deployments, two different applications of the developed framework to work zones, and a benefit-cost analysis to estimate the monetized ITS benefits. The first case study was the I-70 Blanchette Bridge closure near St. Louis, Missouri. Field data was collected before and during the I-70 bridge closure in order to determine the use of alternative routes. By supplementing the recorded data with the calculated diversion rates, the network was simulated using VISSIM software. One challenge for this site was that ITS was deployed permanently, thus non-ITS field data was unavailable. To find the effect of ITS on traffic, a survey was conducted to find the use of alternative routes around a work zone due to Dynamic Message Signs. 52% of drivers in the St. Louis area responded that their choice to use an alternative route relied, at least partially, on DMS. Using this 52% value, the

recorded diversion rates due to the work zone were altered in the simulations to reveal the differences in traffic with and without the presence of DMS. The second case study was a work zone on I-44 at Antire Rd. near St. Louis, Missouri. This site also faced the same challenge of not having any time periods when ITS was not used. Additionally, there were no alternative routes for traffic to detour. Without alternative routes, ITS promoted slower speeds due to the downstream formation of queues to prevent crashes. Based on the available data, an analysis was still performed on delays, queue length, accident rates, and speeds. To quantify the results of ITS, a benefit-cost analysis is being performed taking into account cost of permanent and temporary ITS equipment, and benefits resulting from delay savings.
Project is approximately 70% complete.

-Effects of Road Construction Intensity and Operations on Rural Freeway Work Zone Capacity, Missouri University of Science and Technology with Ronaldo Luna as PI.

During the last quarter work was carried out on Tasks 1 and 2 mostly reviewing literature as well as Department of Transportation survey and methodology for estimating work zone capacity which takes work zone activity into account. The literature was reviewed to identify methodologies to analyze the efforts of construction activity on work zone capacity. Base on this review, three methodologies are now being evaluated; a method proposed by Khazraee and Bham (2012), a method proposed by Elefteradiouand and Lertworawanich (2003), and the method presented in Chapter 25 of the Highway Capacity Manual (2010). A detailed DOT survey was prepared to be deployed online in July. Qualitrics was used for preparation of the survey. After the survey has been finalized, it will be sent to all state departments of transportation and highway agencies in the USA. Project is about 35% complete at this time.

Anticipated work next quarter:
Work will continue on contracted projects and projects contracted for the 2013 program should be underway soon.

Significant Results:
Several projects were completed in 2012 and others should be completed before the end of the year. Approved contracts for 2013 program work have been sent to the principal investigators.

Circumstance affecting project or budget (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).

No problems to report.