NJIT New Jersey's Science & Technology University

NEWARK COLLEGE OF ENGINEERING

Transportation Research
New Jersey Institute of Technology

To: Camille Crichton-Sumners

Title: Quarterly Reports

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NJDOT Bureau of Research
QUARTERLY PROGRESS REPORT

Project Title:	**Safety and Accessibility of Dynamic Message Signs (DMS)**
RFP Number: 2013-09	**NJDOT Project Manager:** Edward Kondrath
Task Order Number: TO-109	**Consultant:** New Jersey Institute of Technology
Customer: Anthony Pelligrino	**Principal Investigator:** Daniel, Janice R.
Project Starting Date: 07/01/2013 **Original Project Ending Date:** 07/01/2014 **Modified Completion Date:** 08/31/2014	**Period Starting Date:** 04/01/2014 **Period Ending Date:** 06/30/2014

Task	% of Total Budget	Total Budget	% of Task this quarter	Cost this quarter	% of Task to date	Cost To Date
Literature Review	5.0%	$4,866	0.00%	$0	100.00%	$4,866
Develop Research Exit Criteria	3.0%	$2,920	50.00%	$1,460	100.00%	$2,920
Preliminary Data Gathering	15.0%	$14,598	50.00%	$7,299	100.00%	$14,598
Identify Procedural Approach	10.0%	$9,732	0.00%	$0	100.00%	$9,732
Prepare Inspection Schedule	2.0%	$1,946	0.00%	$0	100.00%	$1,946
Perform Training of Inspectors	3.0%	$2,920	0.00%	$0	100.00%	$2,920
Perform Inspection	30.0%	$29,197	53.00%	$15,474	100.00%	$29,197
Perform DMS Safety Assessment	7.0%	$6,813	66.00%	$4,497	66.00%	$4,497
Develop DMS Database	15.0%	$14,598	0.00%	$0	0.00%	$0
Prepare Quarterly and Final Reports	10.0%	$9,732	0.00%	$0	0.00%	$0
Final Report	0.0%	$0	0.00%	$0	0.00%	$0
TOTAL	100 %	$97,323		$28,730		$70,676

Project Objectives:

The overall objective of the proposed research is to perform an evaluation of all older DMS designs to allow employees to safely access overhead DMSs.

Specific objectives to be accomplished in this research include:

- To perform a systematic inspection of the approximately one hundred and sixty DMSs located in the State of New Jersey to determine the safety and accessibility for maintenance of the signs;

- To assess whether existing procedures used for accessing newer signs can also be used for the older signs or whether revised procedures are needed.

- To identify safe work practices and develop engineering solutions or alternative solutions to allow employees to safely access overhead DMSs.

Project Abstract:

The Manual of Uniform Traffic Control Devices (MUTCD, 2012), defines dynamic message signs (DMSs) (or changeable message signs) as "...a traffic control device that is capable of displaying one or more alternative messages". Both permanent and portable DMSs are used to provide messages related to: Incident management and route diversion; warning of adverse weather conditions; travel times; and other types of warning situations. DMSs may also be used by State and local highway agencies to display safety messages, transportation-related messages, emergency homeland security messages, and America's Missing: Broadcast Emergency Response (AMBER) alert messages.

Section 2L.06 of the MUTCD provides guidance on the installation of permanent DMSs. The factors to be considered include: identifying locations to enable road users to select alternate routes or take other appropriate actions; factors related to safety and avoiding driver overload. No guidance, however, is provided to ensure the safety and accessibility to overhead DMSs for the required regular maintenance of these signs.

Occupational Safety and Health Standards (OSHA) Part 1910.23 provides standards on "Walking-Working Surfaces"Â which should be adhered to by employees accessing DMSs. The standards require that catwalks include handrails capable of supporting 200 lbs. of force, with means of egress be from/to permanent or stationary structures. Although DMSs in New Jersey are now designed to meet OSHA requirements for employee access of overhead signs during maintenance, older generation signs exist with limited or no safe access. For some older generation signs, walkways are not provided in accordance with OSHA regulations, may not be wide enough or may be loose and not properly supported. In addition, for some older DMS signs, hand-rails may not meet OSHA standards and although gates in front of the sign are provided, these gates can be loose or do not close.

In this research, work will be performed to evaluate all older sign designs to identify safe maintenance practices and develop engineering solutions or alternative solutions to allow employees to safely access overhead DMSs in New Jersey.

1.Progress this quarter by task:

ent of the DMS. The assessment involved determining whether existing procedures used for accessing newer signs can also be used for the older signs or whether revised procedures are needed. To assist in performing the assessment, criteria were developed to identify minimum standards that should exist at each DMS to be deemed safe for access. Minimum standards were developed for three areas: (1) Minimum standards for catwalks; (2) Minimum standards for utility lines adjacent to DMS; and (3) Minimum standards for accessibility. All three criteria would need to be satisfied to state the DMS had safe access for maintenance personnel.

To be deemed safe for access, catwalks must meet the following standards: (1) Transfer points or anchorage points are provided allowing employees to transfer from the aerial lift to the catwalk; and (2) Catwalk meets OSHA 29 CFR 1910.23 standards including the provision of: a standard railing system, toeboard, 28 inch minimum width of the crosswalk; adequate strength to support weight of all individuals/equipment; and has a self- closing gate. The assessment found that ground mounted and butterfly type DMSs are typically not provided with a catwalk. Of the DMS inspected, 24 DMSs were buttefly and 44 DMSs ground mounted. Applying the minimum standards for catwalks at these type DMS would result in these DMS being identified as having unacceptable accessibility. Access to ground mounted and butterfly type DMS, however, may be provided either through the use of a ladder or through the use of a bucket truck. For this reason, the minimum standards for catwalks were not applied to butterfly and ground mounted DMSs.

Utility lines within close proximity of DMSs can limit the safe access to these signs and pose serious dangers to maintenance personnel. For this reason, minimum standards for utility lines adjacent to DMS were also developed. The criteria used to identify acceptable location of utility lines included the following: (1) Maintain a vertical distance between utility lines and maintenance personnel standing in an aerial lift of approximately 10 feet; and (2) Maintain a horizontal distance between utility lines and DMS large enough for bucket truck to access DMS, or approximately 20 feet.

The criteria used to identify acceptable locations for accessibility to the DMS included the following: (1) Maintenance personnel using an aerial lift to access the DMS can safely park in an adjacent shoulder or within the median; (2) At locations with no shoulder or median, maintenance personnel can safely close travel lane(s) adjacent to DMS for parking; and (3) Maintenance personnel does not have to cross active travelway to access DMS. These criteria were applied to each DMS and a safety and accessibility rating determined.

2. Proposed activities for next quarter by task:

The minimum standards for the assessment will be applied to each DMS and a safety and accessibility rating determined. Three ratings will be used including a rating of 0 - indicating that minimum standards are not met and limited opportunity to improve accessibility. A rating of 1 indicates that minimum standards are partially met and recommendations exist to improve accessibility. A rating of 2 indicates minimum standards are met. Work will also be completed on the Final Report.

3. List of deliverables provided in this quarter by task (product date):

4. Progress on implementation and training activities:

5. Problems/proposed solutions:

6. Budget summary:

Total Project Budget	$97,323
Modified Contract Amount	$0
Total Project Expenditure to date	$70,676
% of Total Project Budget Expended	72.62 **%**

NJDOT Research Project Manager Concurrence: _____ **Date:** _____

NJDOT Bureau of Research
QUARTERLY PROGRESS REPORT

Project Title:	**Feasibility of Lane Closures Using Probe Data**
RFP Number: 2012-05	**NJDOT Project Manager:** Paul Thomas
Task Order Number: TO-104	**Consultant:** New Jersey Institute of Technology
Customer: Dhanesh Motiani	**Principal Investigator:** Chien, Steven I-Jy
Project Starting Date: 4/15/2013 **Original Project Ending Date:** 12/15/2014 **Modified Completion Date:**	**Period Starting Date:** 04/01/2014 **Period Ending Date:** 06/30/2014

Task	% of Total Budget	Total Budget	% of Task this quarter	Cost this quarter	% of Task to date	Cost To Date
Literature Review	5.0%	$22,517	0.00%	$0	100.00%	$22,517
Evaluation of Real Time Surveilance Technologies	4.0%	$18,014	0.00%	$0	100.00%	$18,014
Data Sources and Data Collection	9.0%	$40,531	18.00%	$7,296	50.00%	$20,266
Database Development	15.0%	$67,551	20.00%	$13,510	25.00%	$16,888
NJLCAM Development	21.0%	$94,571	5.00%	$4,729	5.00%	$4,729
Case Study	5.0%	$22,517	0.00%	$0	0.00%	$0
Benefit/Cost Analysis	12.0%	$54,041	0.00%	$0	0.00%	$0
NJLCAM Software Tool	20.0%	$90,068	0.00%	$0	0.00%	$0
Presentation, Implementation, and Training	5.0%	$22,517	0.00%	$0	0.00%	$0
Final Report	4.0%	$18,014	0.00%	$0	0.00%	$0
TOTAL	100 %	$450,341		$25,534		$82,413

Project Objectives:

The objective of this research project is to develop a methodology for integrating probe-vehicle data into the traffic impact analysis model, and to develop a user-friendly software tool that would implement the calculation methodology.

Project Abstract:

NJDOT must develop an adequate traffic operations management and congestion mitigation plan for every roadway maintenance and construction project requiring lane closures. To do this properly, NJDOT needs accurate and reliable estimates of traffic impacts associated with pertinent maintenance and construction projects, and the corresponding roadway capacity reductions. The

current analytical model used by NJDOT for this purpose is based on traditional volume/capacity formulae and deterministic traffic queuing modeling method. NJDOT recognizes the shortcomings of these methods that often result in inaccurate estimates of the impact of lane closures in terms of vehicle delays and queue lengths. These estimates may be significantly improved by utilizing probe-vehicle traffic data. Probe-vehicle traffic data is based on the "actual" vehicle travel times and speeds, measured in reference to roadway segment in question, traveled distance, and time of travel. It is expected that use of this data can significantly improve accuracy of the estimated vehicle delays associated with lane closures. The objective of this research project is to develop a methodology for integrating probe-vehicle data into the traffic impact analysis model, and to develop a user-friendly software tool that would implement the calculation methodology.

1.Progress this quarter by task:

Task 3:

- Collected, processed, and stored additional real-time and historical data (i.e., INRIX and OpenReach) required for the model development.

Task 4:

- The preliminary database for this project was developed. It contains roadway geometry data (e.g. number of lanes, lane width, shoulder width etc.), work zone information (e.g. date and location of the lane closure, lanes closed, duration, and length) and incident data (e.g. location, duration, affected lanes, severity).
- The collected data in previous and current quarters was analyzed using conventional statistical methods (e.g., significance tests, correlation analysis, regression analysis) to develop relationships among lane closure work zone characteristics, safety effects, and delays.

Task 5:

- Based on collected data, a linear regression model was developed for estimating average queue propagation speed and assessing the performance the impact of lane closures.
- Developing a method for estimating user costs.

2. Proposed activities for next quarter by task:

Task 3:

- Continue collect, process, and store the data required for the model development.

Task 4:

- Continue develop the proposed database that will effectively integrate the data sets determined in Task 3.

Task 5:

- Continue to develop methods for estimating user costs.
- Test linear and non-linear models for estimating average queue propagation speed and find out the most suitable one for NJ freeways and arterials.

3. List of deliverables provided in this quarter by task (product date):

Task 3&4:
- Present collected data and database development status.

Task 5:
- Present proposed user costs estimation model and delay estimation model.

4. Progress on implementation and training activities:

None yet

5. Problems/proposed solutions:

6. Budget summary:

Total Project Budget	$231,060
Modified Contract Amount	$450,341
Total Project Expenditure to date	$82,413
% of Total Project Budget Expended	18.30 **%**

NJDOT Research Project Manager Concurrence: _____ **Date:** _____