

NEW ENGLAND TRANSPORTATION CONSORTIUM
RESEARCH PROBLEM STATEMENT FORMAT

Due to netc@ctcandassociates.com by January 24, 2020

I. PROBLEM TITLE

Network-Level Guardrail Inventory and Condition Evaluation using Mobile LIDAR

II. RESEARCH PROBLEM STATEMENT

The presence and condition of the installed guardrails are critical for roadway safety. Public transportation agencies are responsible for a large inventory of guardrails and are responsible to make timely repair or replacement if any guardrail is damaged or missing. In addition, the AASHTO Manual for Assessing Safety Hardware (MASH) is the new state of the practice for the crash testing of safety hardware devices. By 2020, the locations of all bridge rails, transitions, other barriers, terminals, sign supports, and breakaway hardware on the National Highway System (NHS) must be in compliance with the MASH standards. It is critical for state department of transportations to develop a comprehensive guardrail inventory to better plan and manage the statewide guardrail MASH upgrades, and to develop a statewide guardrail database that can be integrated with the transportation asset management plan. Traditional, manual field or windshield survey are used for inventorying and updating guardrail information. However, such a practice often leads to time-consuming effort and may expose the field engineers to dangerous working environment. With the advancement of mobile LiDAR and imagery technologies, it becomes feasible for state transportation agencies to leverage the widely available data for more cost-effective and efficient method for inventorying and updating guardrail information.

III. RESEARCH OBJECTIVES

This proposed study is aimed at developing and validating new automated LiDAR and video-log imagery processing methodologies for identification and extraction of in-service guardrail, and then for evaluating the condition and compliance of the guardrails. The detailed anticipated objectives include:

- 1. To develop an automated method (including algorithms and procedures) for identifying the presence of guardrails along the roadway, and for extracting the critical information, e.g., georeferenced starting and ending points, terminal types, lateral offset, height, etc.*
- 2. To develop an automated method (including algorithms and procedures) for identifying typical conditional changes for guardrails, e.g., face dentation, terminal damage/missing, support deficiency, etc.*
- 3. To develop a geodatabase for guardrail inventory, integrating the in-service presence and condition information, for evaluating the MASH compliance, and for supporting network-level maintenance strategy*

IV. COST ESTIMATE

\$200,000

V. RESEARCH PERIOD

24 Month

VI. URGENCY AND PAYOFF POTENTIAL

If proved feasible, automated methods leveraging mobile LiDAR and imagery will become a cost-effective and efficient means for inventorying guardrail information on a network-level. The form of the research implementation is methods (containing automated algorithms and procedures) that will provide more accurate guardrail data in less time, comparing to the traditional manual field survey methods. The implementation of the automated methods from this research will provide state departments of transportation in New England a powerful, yet cost-effective tool to both address the pressing need for MASH compliance and to support the routine guardrail maintenance program. While a return on investment (ROI) cannot be appropriately calculated until the research is completed, it is anticipated that the payoff potential can be significant, especially because this research will lay a strong foundation for the state department of transportation's continuous transportation asset inventory and condition evaluation effort.

VII. IMPLEMENTATION POTENTIAL

- **The intended DOT audience(s) for using the research products.**
 - *The intended DOT audiences will include asset management, traffic safety and GIS data.*
- **Type of implementation anticipated as a result of the project.**
 - *The anticipated implementation of this project will include an automated method for collecting the presence, condition and compliance information of the in-service guardrails, and pilot network of roadway with detailed guardrail information.*
 - *If proved feasible, a large network-level guardrail inventory can be implemented.*
- **Activities to facilitate implementation to help create awareness and facilitate the implementation of the research results.**
 - *The activities to facilitate implementation will be carried out via training workshops and pilot test projects.*
- **Anticipated barriers or constraints to implementation and ways to overcome them.**
 - *One of the anticipated barriers to implementation would be the integration of the new automated methods with the existing asset management practice in different state departments of transportation in New England. Such a barrier can be mitigated through effective communication, training process, and technical supports.*
- **Methods of tracking and measuring the impacts of implementation.**
 - *The impacts of implementation can be measured based on the successful deployment of the methods in the MASH compliance effort, or the routine guardrail maintenance practice in different state departments of transportations in New England.*

TWO DOT STAFF ENDORSEMENTS ARE REQUIRED (To be signed by separate individuals.)

VIII. ENDORSEMENT BY THE SPONSORING DOT REPRESENTATIVE TO THE NETC ADVISORY COMMITTEE

By signing the endorsement, the DOT representative is certifying that:

1. *The Problem Statement follows the required format.*
2. *The Problem Statement addresses a transportation issue of relevance to NETC and does not duplicate another Problem Statement being submitted at this time.*

NICHOLAS ZAVOLAS
Name

MASSDOT, CP-Research
DOT

[Signature]
Signature

2/24/2020
Date

ENDORSEMENT BY THE SPONSORING DOT PROBLEM STATEMENT AUTHOR/SUBMITTER

By signing the endorsement, the DOT Problem Statement author/submitter is certifying that:

1. *I have technical knowledge of the project topic and will be committed to the research outcome.*
2. *I agree to serve as Chair of the project's Technical Committee if this Research Problem Statement is selected for funding by NETC.*

[Signature]
Name

Mass DOT
DOT

James Daniels
Signature*

1/23/20
Date

*Attached email/correspondence may substitute signature

NOTE: To expedite the processing of Research Problem Statements, NETC requires submittal by e-mail from signing Advisory Committee member to (netc@ctcandassociates.com) by January 24, 2020.