NUMBER FOR EVALUATION: [x]

SUBMITTED BY:

# FORMAT OF RESEARCH NEEDS STATEMENT FOR POSTING ON TRB WEBSITE

**I. RESEARCH NEEDS TITLE**

Multi-Variate Analysis for Pavement Assessment

**II. RESEARCH NEEDS STATEMENT**

The pavement industry has changed significantly in the last couple of decades. Digital technology is now capable of generating continuous streams of multiple metrics (longitudinal and transverse profile, cracking, texture, structural condition, etc) for pavement assessment. Continuous data provides unique challenges for analysis and application. Analyzing multiple metrics simultaneously further compounds these challenges.

As technology continues to rapidly advance, it seems reasonable to question whether we are applying the most efficient and/or effective means for analyzing the large volumes of pavement response data being collected. With an efficient analysis methodology, continuously collected data has the potential to help determine when and where pavement deterioration is occurring (before it is apparent from the surface), provide design support, and aid in construction quality control.

The greatest potential of continuous data collection may come from analyzing the interactions between metrics. With appropriate study and validation, it is anticipated that the occurrence or detection of predetermined metric thresholds and/or combination of metrics could be used to refine treatment needs. As an example., if profile is greater than x, cracking is less than y, and structural capacity is more than z, then treatment A is warranted). Tools to facilitate such analysis have yet to be created. It is envisioned that such tools could aid not only in network level assessment but also in project level assessment.

**III. RESEARCH OBJECTIVE**

The objectives of this research are to:

1. Conduct a literature review to establish appropriate thresholds by functional class for multiple pavement metrics:
   1. Cracking
   2. Longitudinal Profile
   3. Transverse Profile
   4. Texture
   5. Structural Metric(s)
2. Develop standard set of data needs (along with appropriate precision and bias estimates) for each metric.
3. Identify or develop methodologies and guidance for effectively aggregating these statistics for network level analysis. This shall include approaches focused on:
   1. incorporating leading pavement performance metrics within an agency’s PMS process
   2. identify combinations of metrics and their thresholds that provide unique performance distinctions.
   3. demonstrates its value through application using one or more agency PMS.
4. Identify Future Research Needs.

**IV. ESTIMATE OF FUNDING AND RESEARCH PERIOD**

**Recommended Funding:**

$ 250,000-350,000.

**Research Period:**

24 months.

**V. URGENCY, PAYOFF POTENTIAL, AND IMPLEMENTATION**

A significant portion of the existing roadway system in the US was built over 50 years ago, and it is beginning to show signs of age, needs of repair, upgrade and/or replacement. There is need for real-time or quasi real-time in-situ testing of pavement properties to facilitate efficient assessment and establish treatment needs.

The following are the potential benefits of this study:

1. Practical methodologies for applying continuous data from multiple metrics to establish appropriate treatment selections.
2. Expanding agencies’ pavement management systems to include continuous data from multiple metrics will enhance the maintenance and rehabilitation decision making process.
3. Applying leading performance measures as opposed to lagging performance measures should result in significant cost savings by selecting effective maintenance and rehabilitation strategies based on comprehensive evaluations of existing pavements.

Continuous monitoring and cost-effective assessment of infrastructure systems can facilitate risk assessment at different stages and more efficient planning of maintenance and rehabilitation activities during the life-cycle of these structures.

**VI. IMPLEMENTATION PLANNING**

These results should be applied by State Agencies and/or their consultants to improve the evaluation, design and construction of pavements.

**VII. PERSONS DEVELOPING THE PROBLEM**

Jerry Daleiden

**VII. PROBLEM MONITOR**

TRB Committee AFD20 on Pavement Monitoring and Evaluation. AFD10, Pavement Management Systems and AFD80, Pavement Structural Monitoring and Evaluation

**III. DATE AND SUBMITTED BY**