

## Research Needs Statement

*Please complete all sections in blue*

<b>Title:</b>	<b>A Localized Safety Performance Functions (SPFs) Approach Accounting for “Within” Tennessee Variations on Multilane Highways</b>
<b>Key Words:</b>	Road traffic crashes, localized SPFs, fatal and injury crashes, multilane highways, spatial & temporal variations.
<b>Research Problem Statement:</b>	<p>Multilane highway segments (especially rural) are among the most hazardous locations on our highway network. The safety performance functions for multilane highways contained in the Highway Safety Manual (HSM) are estimated using data from specific states. Given the differences in crash, traffic, and environment related factors across the U.S. states, the HSM SPFs can either be calibrated to better represent the jurisdiction-specific conditions, or a single state-specific SPF can be estimated using the data from a specific jurisdiction such as Tennessee. Even though jurisdiction-specific SPFs (as compared to HSM SPFs) can better represent local conditions at hand, traffic crash frequencies and associated factors (such as traffic volumes) can vary significantly across similar, or even identical, road segments within the jurisdiction (such as Tennessee) where a single SPF is estimated. For example, the nature of crash occurrence in Knoxville and Chattanooga can be entire different due to spatial and temporal variations. Alternatively, this means that associations between crashes on multilane highways and associated factors are generally varying, and it is important to correct for this. The research team will employ state-of-the-art simulation assisted analytical methods to develop “localized” SPFs that can capture variations in the relationships within the Tennessee’s multilane highway segments.</p>
<b>Research Objective:</b>	<b>To develop highly “localized” Safety Performance Functions for multilane highways accounting for the spatial and temporal differences “within” Tennessee. Comprehensive framework for advanced simulation-assisted methodology will be formulated and implemented.</b>
<b>Related Research/Continuation of Past or Current Project:</b>	The proposed project will benefit greatly from two projects currently undertaken by the research team: 1) Highway Safety Manual, Safety Performance Functions, and Roadway Calibration Factors sponsored by TDOT, and 2) Highway Safety Manual safety project focusing on methodological advances undertaken by the research team through the USDOT at University of Tennessee.

<b>Expected Deliverables:</b>	<p>The key deliverable from this project will be a final report summarizing study findings and actionable recommendations about more accurate crash predictions and countermeasure development with a focus on the following actions:</p> <ul style="list-style-type: none"> <li>• Assemble an integrated database of crash, traffic, roadway, and environment related factors from ETRIMS.</li> <li>• Develop and propose “localized” Tennessee specific SPFs based on rigorous predictive modeling (maximum simulated or Bayesian realm) that can better reflect Tennessee roadway conditions, climate, terrain, population and crash reporting methodologies. Data from ETRIMS will be used.</li> <li>• Presentations and coordination with TDOT Project Team and Safety Committee.</li> <li>• Technology transfer by sharing the final report on the Internet at the University of Tennessee Transportation Engineering and Science Program website and UT’s Center for Transportation Research website.</li> </ul> <p>A paper will be submitted to the Transportation Research Board. Other scholarly journals and conference venues will also be considered.</p>
<b>Estimate of Problem Funding &amp; Research Period:</b>	\$145,000 (24 months)
<b>Urgency and Potential Benefits:</b>	<p>Moderate to high.</p> <p>To account for clustering of crashes in space and time, highly localized Safety Performance Functions will be estimated to provide even more accurate crash predictions and evaluate countermeasure effectiveness on specific multilane highway segments. A key output will be SPFs that will not be state-specific, i.e., TDOT won’t rely on using Knoxville data to predict crashes in Chattanooga and so on.</p>
<b>Implementation Planning:</b>	<p>Concepts in the resulting guide/new SPF protocols will be ready for implementation by TDOT on multilane highway segments.</p>
<b>Person(s) Developing the Problem Statement:</b>	<p>Research Office in LRP at TDOT, <a href="mailto:TDOT.Research@tn.gov">TDOT.Research@tn.gov</a></p>
<b>Submission Date:</b>	<b>8/28/2017</b>
<b>Problem Number</b>	<b>05</b>