Research Needs Statement

Please complete all sections in blue

Title:	**Rapid Emergency Evacuation Planning/Assessment for Tourist Attractions and Isolated Communities**
Key Words:	EVACUATION PLANNING, Traffic Signals, Corridor Operations, Delay, Congestion, Big Data, Deficiency Analysis, Intelligent Transportation System
Research Problem Statement:	The devastation and fatalities of the Gatlinburg Fires of 2016 exposed the inefficiency in the area's evacuation operations and the lack of alternative transportation accessibility. In the State of Tennessee, most evacuation planning responsibilities are charged to Tennessee Emergency Management Agency (TEMA). However, evacuation plans developed by non-transportation agencies may sometimes lack certain crucial considerations such as road work, maintenance closure, rapid population shift/surge at tourist attractions and during special events, real-time incidents and crashes. To this end, this study will develop a tool dubbed T-REX, or Tennessee Rapid Evacuation MicroSimulation, to expeditiously model various evacuation scenarios at selected tourist attractions, e.g. Gatlinburg, or other isolated small urban communities. The study focuses on touristy and isolated areas because larger urban areas typically have many alternative evacuation routes and existing network/population data for modeling. But smaller areas don't have the resources or data readily available typically. T-REX will utilize existing transportation network and day/night time population at high resolution to automatically create input data needed for microsimulation based models, such as TRANSIMS and MITSIMS. Various scenarios can be modeled quickly to generate evacuation plans, assess existing plans, perhaps developed by TEMA, update these plans, and identify problems. A dynamic GIS-based animation and visualization tool will be implemented to visualize the problem spots in temporal and spatial context.

Research Objective:	• Develop an ease to set-up evacuation modeling tool without the need of expensive/time-consuming network/population coding stages.
	• Demonstrate the evacuation planning tool on several tourism towns/isolated communities in Tennessee.
	    • Modeling large transportation networks and identifying best evacuation routes.
	    • Design and recommend a path forward for TDOT to implement the findings of this study to save lives.

Related Research/Continuation of Past or Current Project:	Oak Ridge Evacuation Modeling System (OREMS) – OREMS is a software program developed by the Oak Ridge National Laboratory in Oak Ridge, Tennessee, "to analyze and evaluate large-scale vehicular emergency evacuations, conduct evacuation time estimation studies, and develop evacuation plans," as reported on the Oak Ridge National Laboratory Web site.
Expected Deliverables:	• A workshop/demonstration of how T-REX works and several case studies using T-REX. • A procedure for implementing T-REX at TDOT or in conjunction with TEMA. • A plan for moving forward towards automating and implementing the study results at TDOT.
Estimate of Problem Funding & Research Period:	$195,000 over two years.
Urgency and Potential Benefits:	• TDOT will have an easy-to implement evacuation modeling tool that does not need extensive network coding preparation or expensive data collection. • TDOT will be able to see the implications of different evacuation scenarios through the web-based animation/visualization tool for fast decision-making. • TDOT will have a convincing tool for communicating with general public the decisions and operations under evacuation situations. • Residents and visitors will enjoy a better sense of safety and security when visiting Tennessee.
Implementation Planning:	Upson the successful demonstration of the proposed work, the procedure could be automated and implemented at TDOT.
Person(s) Developing the Problem Statement:	Research Office, TDOT.Research@tn.gov
Submission Date:	**35T**
Problem Number	To be assigned by Research Office