Problem Title: Modeling of 85th Percentile Speed for Rural Highways for Enhanced Traffic Safety

Problem Statement: Traffic operations on two-lane rural highways and setting realistic speed limits are some of the difficult tasks faced by the Oklahoma Department of Transportation (ODOT). For such highways, over taking slower vehicles is possible only by the use of the opposing lane where site distance and gap in the opposing traffic stream play a key role. While, most states, including Oklahoma, use the 85th percentile speed as a major factor in determining posted speeds for rural highways, other factors such as pavement width, type and width of shoulder, topography, weather, roadside development, and accident experience also play an important role in determining posted speeds. In recent years neural network models have been used successfully for many engineering problems, including modeling 85th percentile speeds in rural highways in Kansas. Similar models are needed for Oklahoma for enhanced traffic safety on rural highways in the state. A neural network model based on appropriate pavement, traffic and environmental data can be an effective tool for ODOT to enhance traffic safety in the state. Research is needed to develop such a model.

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Problem Title: Development of a Rigid Pavement Database for Local Calibration of MEPDG

Problem Statement: Evaluation of local material properties of typical concretes for rigid pavement in the state of Oklahoma to produce inputs for the MEPDG program

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Problem Title: Development of a Flexible Pavement Database for Local Calibration of MEPDG

Problem Statement: The goal of this project is to develop a flexible pavement database and to populate this database with data required for calibration of new Mechanistic-Empirical Pavement Design Guide (MEPDG) design criteria. Data items include material properties, pavement structural characteristics, traffic data and environmental conditions. Successful implementation of MEPDG will include a comprehensive, effective development of a database and performance of local material calibration activities. Thru the results of this research, the research will enable pavement design professionals with appropriate tools and a better understanding of how the new MEPDG will allow for optimization of materials, evaluate and incorporate new materials into designs, and evaluate the impacts of anticipated heavier loads and new axle configurations on pavement performance in Oklahoma.

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Problem Title: Heave in Sulfate-Bearing Oklahoma Soils due to Stabilization with Calcium-Based Additives

Problem Statement: Lime and other calcium-based stabilizers are added to soils in order to reduce their plasticity, increase their shear strength, reduce their compressibility, and reduce their tendency to undergo volume change when subjected to variations in water content. In simple terms, additives like lime render highly plastic expansive soils non-plastic and non-expansive. However, when a soil stabilizer such as lime is added to soil containing soluble sulfate the resulting reactions can have the opposite effect and actually make the volume change tendencies much more devastating. An example of such devastation was realized on a recently constructed Oklahoma State Highway, where due to what appears to be sulfate-induced heave in lime stabilized soil, miles of new pavement were destroyed resulting in the loss of millions of dollars.

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