I. RESEARCH PROJECT TITLE

Developing Safety Performance Functions for Kansas Safety Studies

II. RESEARCH PROBLEM STATEMENT

Safety money spent for any transportation/traffic improvement should be cost-effective. There should be some evidence that the improvement will (or has been) be a positive benefit and improve traffic safety, i.e., reduce crashes, injuries, and/or deaths. To show the dollars have been well spent and safety has been improved, documentation of the results and proper analysis of the changed safety is essential. Unfortunately, good data for documentation of positive (or negative) "after" safety benefits has been generally lacking. In addition, nationally recognized experts such as Ezra Hauer and others have been telling the highway safety community for years that the usual before-after analysis has not been properly done. This usually has involved taking the number of crashes after some safety improvement has been made, subtracting this number from the number of crashes before the improvement was constructed and assuming the after is less than the before, claiming the sum is the safety benefit- or dividing this sum by the before number and claiming a percent reduction in crashes as the benefit. This approach is indefensible as it is naive to believe that the result of this approach can only be attributed to the safety improvement, i.e., nothing else has changed, and it is sometimes called a naive before and after study. It is easy but indefensible and open to criticism. It is essential to be able to make a reliable, defensible analysis. This is especially important in evaluating any safety improvement, e.g. such as roundabouts of various AADT, legs and lanes. The proper state-of-the art-approach, called the Empirical Bayes (EB) method involves calculating the expected number of crashes that would have occurred in the after period without the safety improvement (call it "B") and subtracting the number of reported crashes in the after period. The expected number of crashes, B, requires using a Safety Performance Function (SPF) to estimate a number of predicted crashes "P" that is combined in a weighted function with the actual count of the number of crashes observed in "N" years before improvement to get a site-specific estimate of the expected crashes, i.e. the EB estimate. The "problem" is very few transportation organizations, including KDOT, have SPFs. For proper state-of-the-art, Empirical Bayes (EB), before-after analysis of any safety improvement, these need to be developed locally, i.e., with Kansas data for specific safety improvement functions, and calibrated for local, Kansas conditions.

III. RESEARCH OBJECTIVE

The objective of this research is to develop safety performance functions (SPFs) for specific safety improvements on various categories of Kansas roadways where sufficient data is available to do so. The initial effort will be on developing SPFs for all classes of Kansas roundabouts, very important for determining locations where they should be planned and justifying the decision. SPFs for other safety improvements will be developed in the cases where adequate data is available. In other cases data from the

literature will be adapted to Kansas conditions. They will be very valuable in determining most cost-effective use of available local road funds.

IV. STUDY METHOD/WORK PLAN

First, the literature will be searched to find functions developed by others and investigate adapting these to Kansas site specific conditions. The methodology will involve data mining of Kansas Crash records and integrating these with geometric features of a selected set of roadway elements and changes due to various safety improvements.

V. ESTIMATE OF FUNDING AND RESEARCH PERIOD

Period: 18 months
Funding: $40,000

VI. URGENCY AND PAYOFF

This research applies to any safety improvement where data is available to develop useable SPFs. Likewise, Roundabouts are new and it is very important to be able to present state-of-the-art results to document their safety improvements. SPFs are needed to do this properly and provide defensible results. It is extremely important to justify and prove effectiveness of safety expenditures. This importance is magnified when having reliable SPFs can help decide the most cost-effective improvements for scarce funds needed to improve the safety of local roads.

VII. IMPLEMENTATION STRATEGY

The implementation will be by KDOT personnel responsible for documenting and defending the benefits of spending safety dollars. Also, the results and use of the results will be presented in a manual for local government which will help them determine the best use of HRRR funds to improve the safety of local roadways. It is envisioned that an instructional manual will be developed that will provide guidelines on the use of the SPFs

VIII. PROJECT PERSONNEL

Dr Sunanda Dissanayake will be the P.I. on this research assisted by co-P.I. Dr Gene Russell. Dr Russell is an expert in all phases of roundabouts and has several years for experience in safety improvements on local roads and safety improvements on roadways in general. Dr Dissanayake is an expert in statistical analysis and in using the Kansas accident data base and other crash data which will be used to develop the SPFs necessary for proper evaluation of roundabouts and other safety improvements.