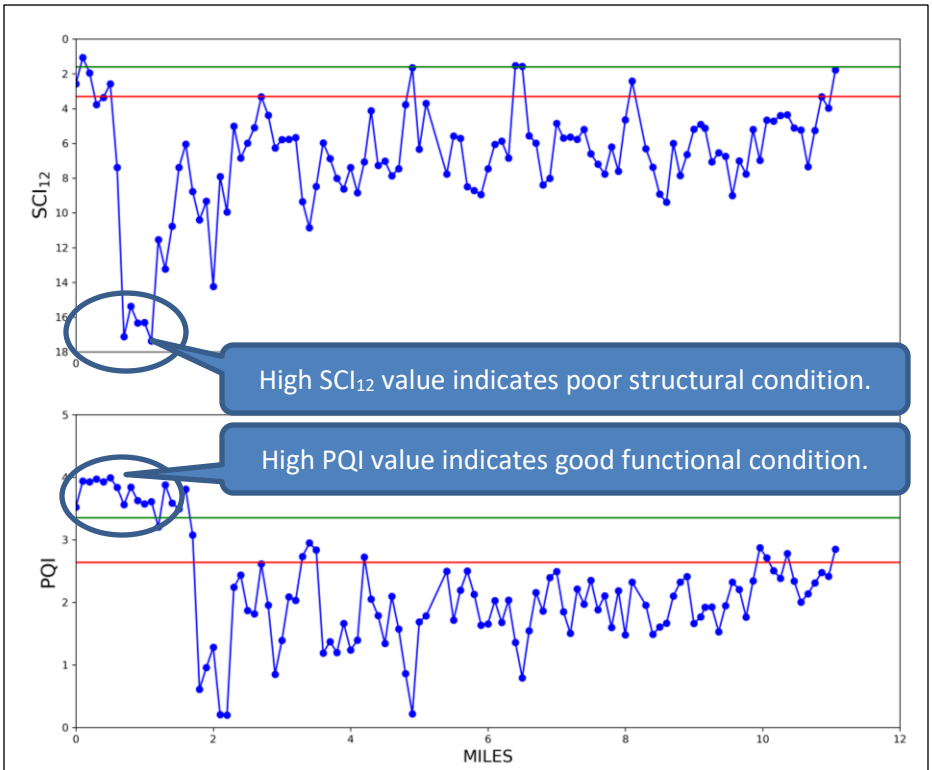
Research Summary

South Carolina Department of Transportation | Office of Materials and Research

Utilization of Traffic Speed Deflectometer for Pavement Management

Problem

The SCDOT's current method of selecting candidate projects for rehabilitation relies heavily on the Pavement Quality Index (PQI). While PQI is an effective measure for ride quality and surface distresses, it may not be indicative of the pavement structural condition, as illustrated below.



SCI_{12} and PQI of section on US-321 in Allendale County

This project investigated how the Traffic Speed Deflectometer (TSD) data the South Carolina Department of Transportation (SCDOT) obtained as part of the pooled fund studies (i.e., TPF-5(282) and 5(385)) can be used to improve the selection of candidate projects for rehabilitation. The objectives of this project were to: 1) develop a method to use TSD data to classify pavement sections as structurally good, fair, or poor for primary routes, and 2) develop a method to use TSD data to assist the SCDOT with the selection of potential rehabilitation candidates.

Project Information

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Research Administration

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This final report is available online at:

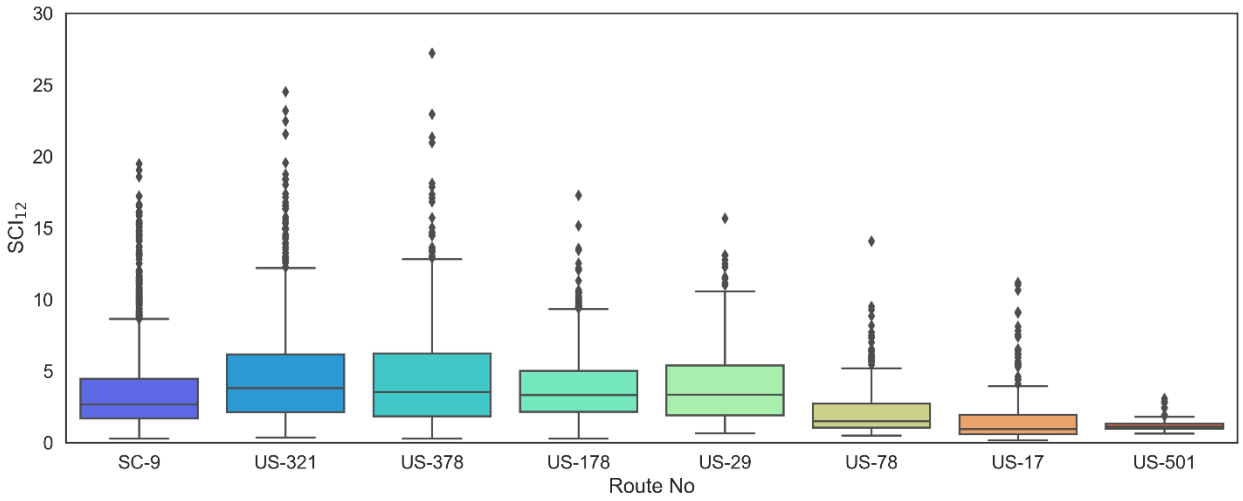
http://www.scdot.scltap.org/projects/completed/

Research

Approximately 950 miles of TSD data along 8 primary routes were analyzed in this study. The Structural Condition Index, SCI_{12}, was selected to quantify the structural condition of a pavement. It was determined that good pavements are those with SCI_{12} values below 1.6, fair are those with SCI_{12} values between 1.6 and 3.3, and poor are those with SCI_{12} values above 3.3. Pavement Quality Index (PQI) was selected to quantify the functional condition of a pavement. The correlation between SCI_{12} and PQI was assessed for all routes. Based on the calculated Pearson correlation, it was found that 50% has low correlation (below ± 0.29), 27.5% has moderate correlation (between ± 0.30 and ± 0.49), and 22.5% has high correlation (between ± 0.5 and ± 1.0). This finding confirmed prior knowledge that PQI does not accurately portray the pavement's underlying conditions related to remaining service life or the potential for future deterioration.

Results

Box plot of SCI_{12} data for TSD routes is shown below. It can be seen that the SCI_{12} data for all of the TSD routes are right-skewed. This suggests that some segments along these routes have a very poor structural condition, and thus, making the mean > median. It can be seen that US-321 and US-378 have the worst structural condition among the TSD routes and US-17 has the best structural condition. Similar to SCI_{12} data, the PQI data for all of the TSD routes are also right-skewed. US-78 has the best functional condition among the TSD routes, and US-17 has the worst. US-17 serves as a prime example of why PQI alone does not accurately capture the condition of the pavement. Equipped with this knowledge, the SCDOT will be able to identify the appropriate maintenance activity (preservation or rehabilitation) for each project.



A TSD score was developed to help inform the district pavement engineers of the structural condition of various segments. This score is intended to be used as another criterion, along with relative condition, corridor continuity, connectivity, and contractability at the second stage after the top 20% of candidate projects have been identified via Engineering Directive 63. To demonstrate the potential impact of using TSD scores, the scores were applied to the 2020 top 20% candidate projects sent to district engineers. The results indicated that the TSD scores may have an impact on project selection.

Value & Benefit

From this project's findings, it is recommended that the SCDOT consider obtaining TSD data and use the developed TSD scores to guide the selection of candidate projects. There are three uses for the TSD data and scores. The first is the identification of the top 20% of candidate projects using the current procedure in Engineering Directive 63. This list could be expanded to include projects with high TSD scores (i.e., poor structural condition). The second is when district pavement engineers need to make the final selection. The TSD score, specifically a threshold value, can be used to guide the selection. Lastly, TSD data can be utilized to help guide field investigations. That is, knowing the locations where pavements have poor structural conditions will expedite the field investigation process and reduce the overall effort involved.

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