Enhanced Pavement Test Data Analysis Methodology

Engineers have used the methodology of destructive testing to evaluate the condition of transportation infrastructures for nearly a century. Destructive testing often requires the disruption of traffic in order to obtain structural samples for destruction and analysis in laboratory settings. Both on-site sampling and laboratory testing are time consuming and labor intensive.

To overcome the disadvantages of destructive testing, various nondestructive testing (NDT) methods have been developed and implemented worldwide to evaluate transportation infrastructure. In general, the primary advantages of NDT methods are that they are rapid, allow for more data to be collected, and do not damage the infrastructure. However, as the amount of collected data increases using NDT methods as compared to the traditional destructive testing methods, the greater the need for a strategy to summarize the data in a more efficient manner.

The conventional method for presenting the NDT survey data is through a two-dimensional scatter plot such as the one shown in Figure 1. Although scatter plots provide a simple and useful method for viewing information for a given survey path, they are limited when data collected along a single path is not necessarily representative of the entire area occupied by the structure. Also, scatter plots can be difficult to interpret when the frequency of two-dimensional plots increases.

Because of these disadvantages, the Florida Department of Transportation (FDOT) has implemented a contour plotting process that is capable of summarizing a large amount of test results in an efficient, reliable, and easy-to-interpret manner. In 2008, FDOT engineers began applying the new contour plotting process to represent the entire survey area. Basically, the contour plot is a two-dimensional representation of three-dimensional data that allows multiple two-dimensional plots to be merged onto a single plot. Figure 2 is an example of a contour plot generated from Falling Weight Deflectometer (FWD) data. It depicts FWD data collected along 40 discrete longitudinal paths and demonstrates the benefits of the contour plot because it depicts the data in an aerial view, as opposed to depicting 40 discrete longitudinal paths on a two-dimensional plot.

Although it still may be necessary to obtain field samples and conduct laboratory destructive tests to validate or improve upon the results from nondestructive tests, destructive testing can be limited to critical areas determined from nondestructive surveys as seen from Figure 2. Combining the nondestructive testing method with contour plotting allows for an efficient presentation of a large amount of NDT data, and provides an improved methodology for selecting the most critical areas for destructive testing. Although the example shown here for analyzing NDT data is limited to data collected with an FWD, the concept of using contour plots to evaluate NDT data can be applied using a wide variety of equipment or data types.

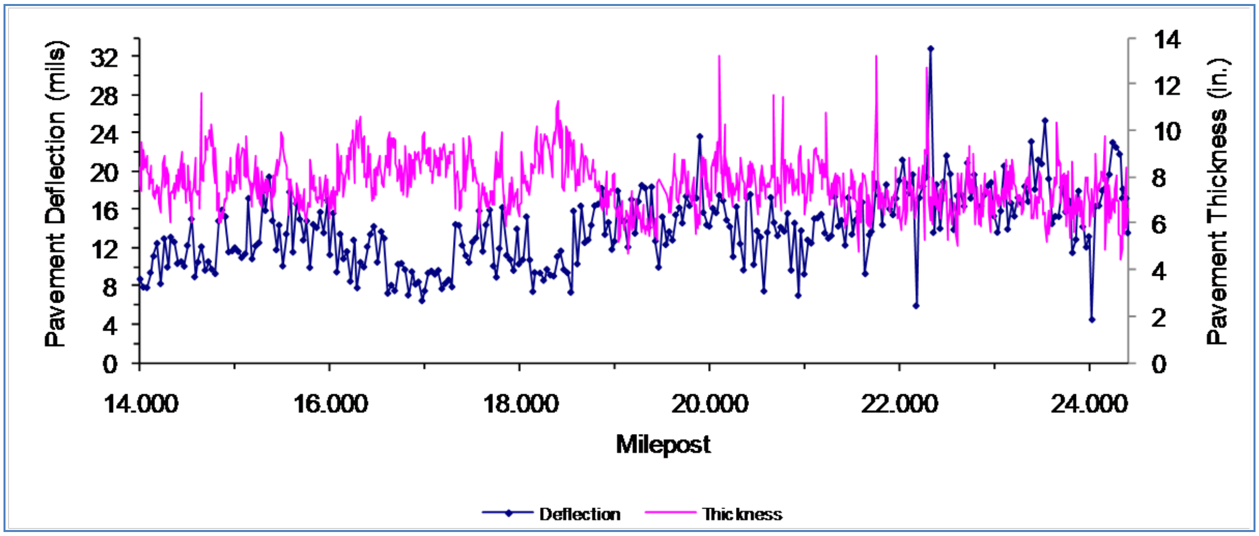

Figure 1 Traditional Scatter Plots for FWD Pavement Deflection and GPR Thickness

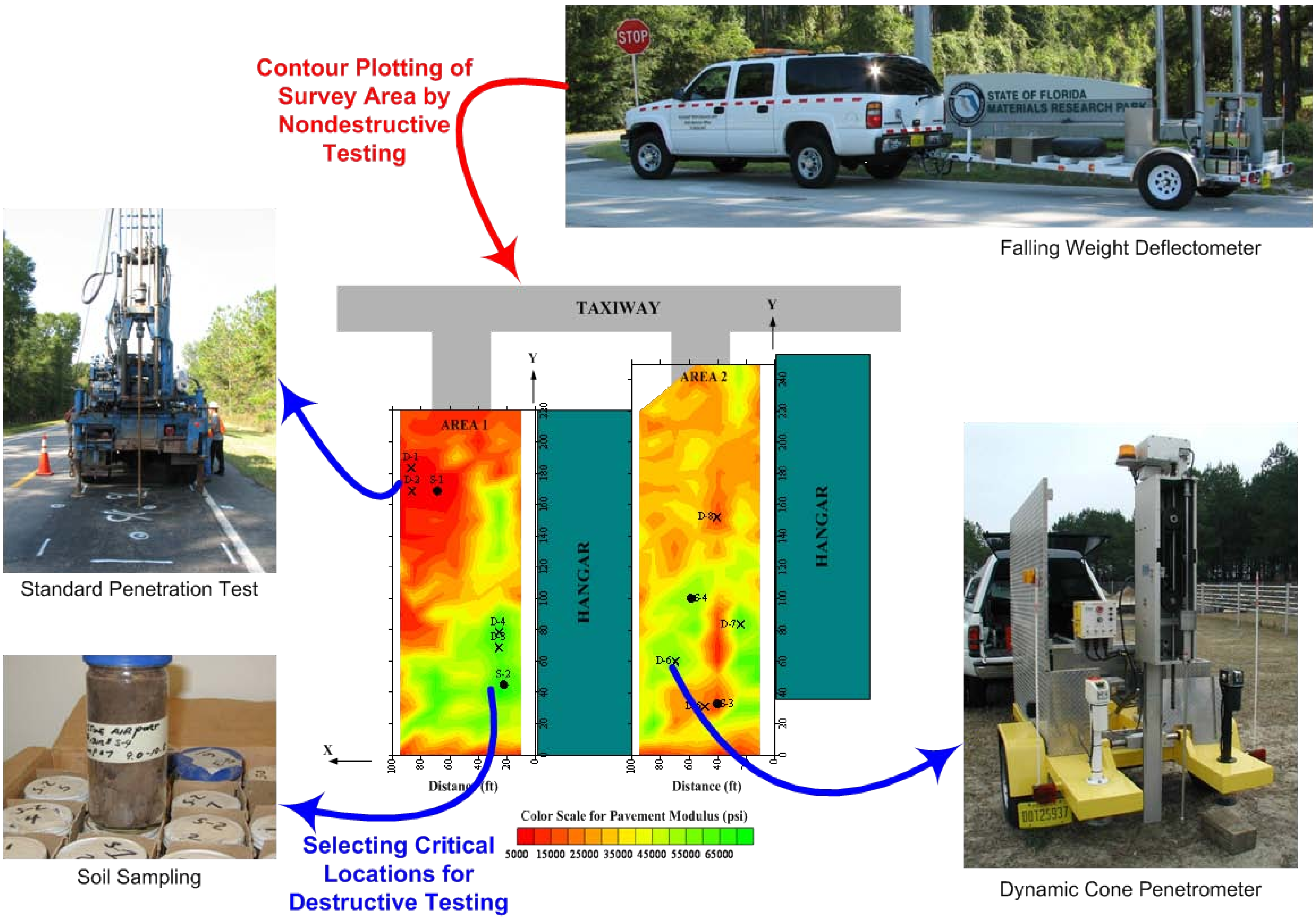

Figure 2 Contour Plot of Pavement Stiffness and Location Selection for Destructive Testing