Florida Department of Transportation Research

Development of Speed Models for Improving Travel Forecasting and Highway Performance Evaluation
BDK83-977-14

Travel forecasting models predict travel demand based on the present transportation system and its use. Transportation modelers must develop, validate, and calibrate models to ensure that predicted travel demand is as close to reality as possible. Most travel forecasting models require measures of free flow speed and practical capacity, based on evaluations of current highway performance, as well as functions that relate traffic volume to travel time, so-called volume delay functions (VDF), which are very sensitive to free flow speed and practical capacity. Several VDFs have been proposed, including the four examined in this project: the Bureau of Public Roads (BPR) function; the Davidson function; the Conical function; and the Akcelik function. The choice of VDF depends on the nature of the highway to which it is applied, and classifying highways for this purpose and matching them to appropriate models represents a major challenge to modelers.

In this project, Florida State University researchers improved travel forecasting models and highway performance evaluation in Florida by evaluating various VDFs and testing their parameters using data from Florida Department of Transportation (FDOT) traffic monitoring sites. Where applicable, data collected by private vendors for traveler information purposes were also used. Because accurate free flow speed and practical capacity are critical to this modeling, researchers updated these parameters using data covering most area types and facility types.

One-year field data of hourly volumes and hourly speeds from permanent FDOT traffic count stations were used to determine prevailing free flow speeds and practical capacities of highway facilities categorized by area type and facility type. Area types were rural, urban, or residential, and facilities were categorized as uninterrupted or interrupted flow facilities. Field data of speed and volume were used to calibrate VDFs, which were

Keeping up with congestion on Florida highways requires careful planning based on accurate modeling.

then tested with FDOT's modeling environment, Florida Standard Urban Transportation Modeling Structure (FSUTMS), using the Orlando Urban Area Transportation Study (OUATS) region. Free flow speeds and practical capacities were in line with those in the literature, although capacity on rural freeway segments could not be estimated because of uncongested operations on those segments.

Results indicated that the FSUTMS speed-capacity tables, based on a much larger set of areas and types than used in this study, should be updated. Although testing VDFs on the OAUTS region revealed reasonable matches between estimated counts and field counts from both Modified BPR and Modified Davidson volume delay functions, the results need to be validated further due to lack of permanent counts stations in the test region.

Accurate forecasting methods are essential for estimating future traffic flows, otherwise, resources may be misallocated and travel times may be impacted, delaying the travelers and shipments that use Florida's highways in significant numbers. Projects such as this one can assist planners in developing and maintaining a highly efficient roadway network in Florida.

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For more information, visit http://www.dot.state.fl.us/research-center