

Concurrent Flow Lanes: Phase III

Problem

As has been demonstrated in various regions within the United States, the use of express toll lanes or similarly functioning high occupancy toll (HOT) lanes can lead to more effective use of existing roadway capacity, improved traffic flow along general purpose lanes and additional revenue to support much needed transportation improvements. Such lanes are under consideration along the I-270 corridor in Maryland. A platform and corresponding models are, thus, required to enable quantification of savings that may be achieved through an alternative concurrent flow lane design in, for example, travel delay and fuel consumption.

Objectives

The objectives of this third phase of a multi-phase effort was to develop and apply simulation modeling techniques for the analysis of a proposed concurrent flow lane design along the I-270 corridor in Maryland.

Description

This effort culminated in two fully calibrated VISSIM peak-hour simulation models of existing concurrent flow lane designs of north- and southbound lanes of I-270, a total of 82 miles of roadway, from the interchange at I-70 to interchanges on I-495 at Connecticut Avenue in Maryland and Georgetown Pike in Virginia. Efforts taken to calibrate and evaluate the existing conditions models are presented. The models were calibrated against surveyed segment travel times and evaluated against main lane volumes and segment densities. The study also evaluated the potential benefits of a proposed ETL managed lane facility design for forecast year 2030 along the I-270 freeway between interchanges at I-370 and I-70. The report describes VISSIM models that were developed to replicate this segment in both south- and northbound directions for a total of 46 miles. Traffic performance in terms of average travel time, total travel delay, emissions and fuel consumption under the proposed managed lane design was evaluated and compared with that of the existing facility design given 2010 and predicted 2030 traffic demand levels.

Results

Results of the calibration and post-calibration evaluation confirm VISSIM's ability to replicate real-world traffic operations along freeways with concurrent flow lanes. Simulation run results predict that traffic performance in terms of the studied measures will significantly degrade under 2030 demand estimates given no facility upgrade. Construction of ETLs is expected to lead to improved roadway performance in the southbound direction. In the northbound direction, however, such improvements may be precluded by a significant bottleneck at one of the off-ramps identified in model runs.

Report Information

Miller-Hooks, E., C-S. Chou, L. Feng, R. Faturechi (2011). "Concurrent Flow Lanes-Phase III," Maryland State Highway Administration Report MD-11-SP009B4P.