

Driver Behavior Model Calibration at the Basic Managed Lanes Segments – South Florida Case Study

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Overview

Microsimulation is a commonly used tool for modeling managed lanes for different purposes. Managed lanes microsimulation models require a well calibrated/validated car following and driver behavior models to generate reliable results. The scope of the study is 1-lane and 2-lane managed lane facilities in the under saturated regime. The southern part of state of Florida takes advantage of numerous managed lane facilities and this study focuses on such managed lanes.

Objective

Calibrate car-following part of the driver behavior for managed lane facilities in the under-saturated regime for 1-lane and 2-lane facilities with focus on the South Florida.

Data Collection

- Two sites were selected for this study (1-lane managed lane facility and 2-lane managed lane facility).
- Data covering two full days of study with no indication of incident or inclement weather condition were collected from i95express website.
- Data was collected as in 1-min time intervals and then aggregated into 15-min time intervals.
- Before analyzing the data, the data were checked for any missing points and erroneous points were removed from the consideration.

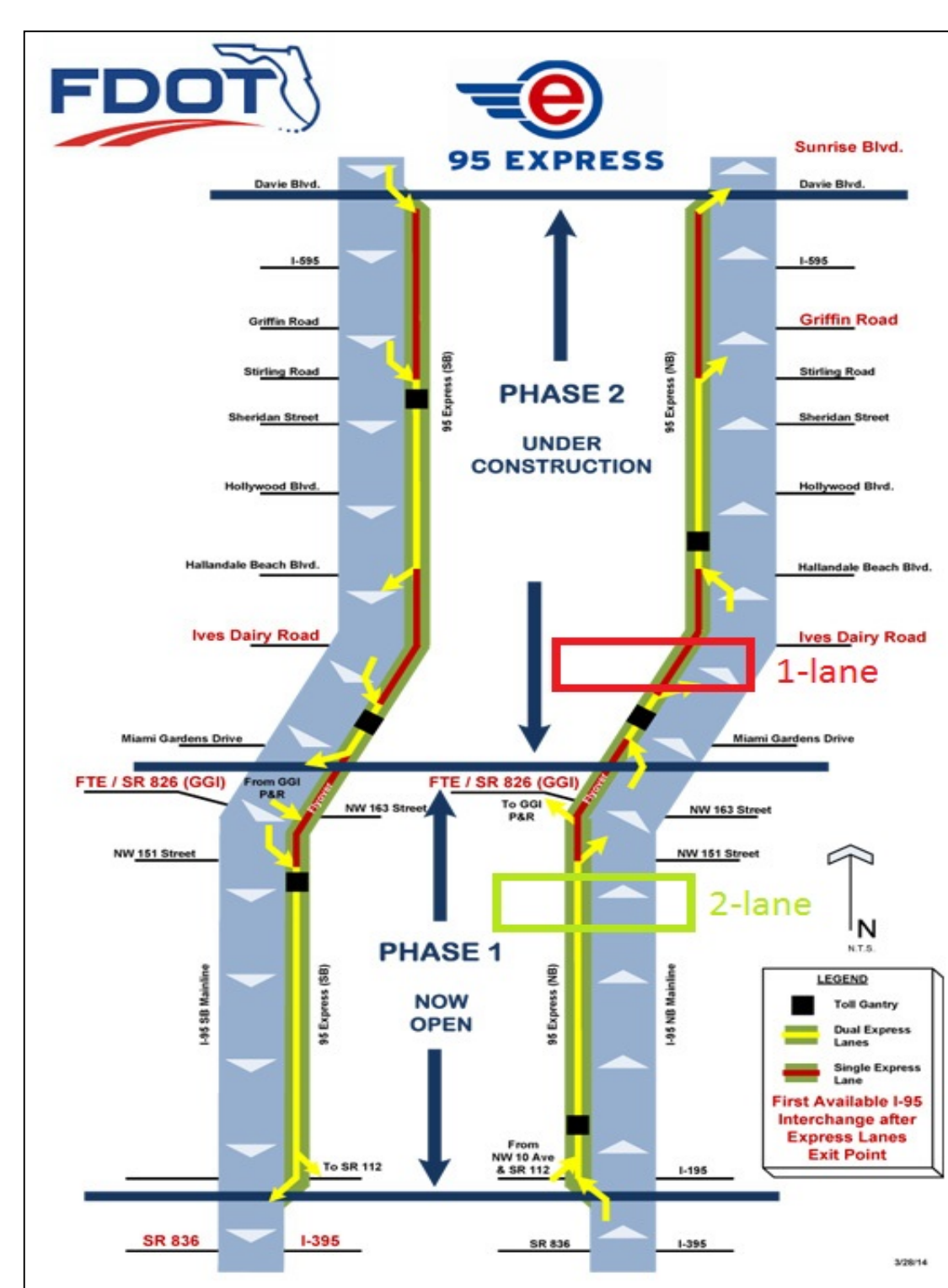


Figure 1: Study Scope (Source: www.i95express.com)

Methodology

- The Wiedemann driver behavior in Vissim microsimulation model was selected for this purpose.
- The key capacity parameters of CC0, CC1 took three different values each creating 9 scenarios. Two key performance measures of Free Flow Speed and Pre-Breakdown Capacity were determined for each site.
- The microsimulation model was set to run the simulation for 9 scenarios.
- In this approach the managed lane volume was increased in 100 vehicles increments until reaching the capacity.
- The CC0 values selected for this study were 0.9, 1.0, and 1.05.
- The CC1 values selected for this study were 4.5, 4.82, and 5.1.
- 9 Scenarios were generated out of these driver behavior parameters.
- Sc.1(4.82,0.9); Sc.2(4.5,1.0); Sc.3(4.5,1.05); Sc.4(4.5,1.0); Sc.5(4.82, 1.05); Sc.6 (4.82,1.0); Sc.7 (5.3,0.9); Sc.8 (5.3,1.05); Sc.9 (5.3,1.0).

Results

The 1-lane data showed FFS of 60 mph and estimated capacity of 1,985 (vphpln) with assumption of 6% trucks in the network. Almost all of the selected scenarios replicated the real world condition well. **Scenario 3 (CC0= 4.5 ft., and CC1=1.05 t)** almost matched the observed capacity with 2% difference.

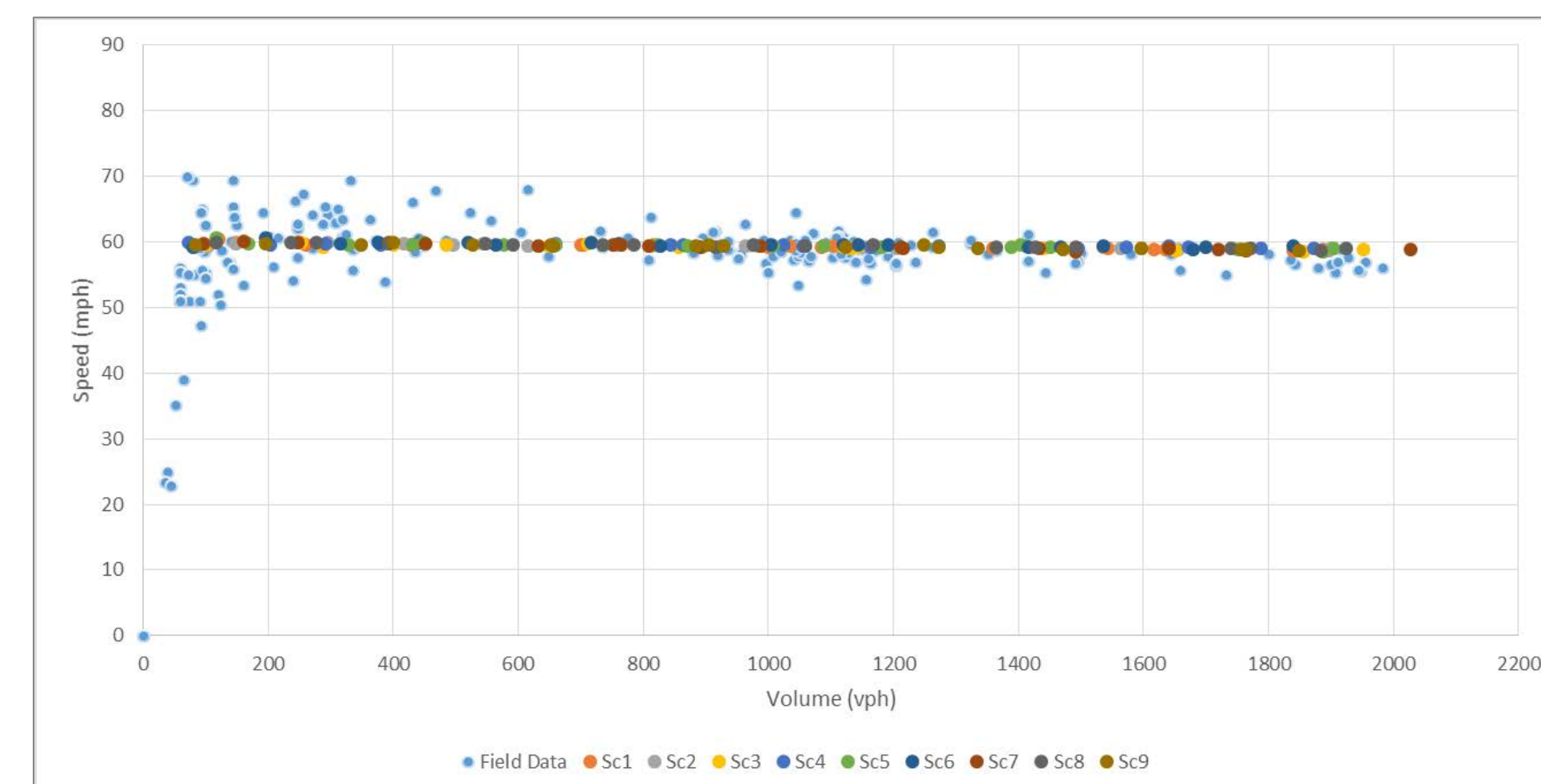


Figure 2: 1-Lane Managed Lane Facility

The 2-lane data showed FFS of 68 mph and estimated capacity of 1,780 (vphpln) with assumption of 6% trucks in the network. Almost all of the selected scenarios replicated the real world condition before the breakdown but they were unable to show the capacity drop trend. **Scenario 2 (CC0= 4.5 ft.-CC1=0.9 t)** and **Scenario 9 (CC0=5.3 ft.-CC1=1.0 t)** matched the observed capacity with 1% difference.

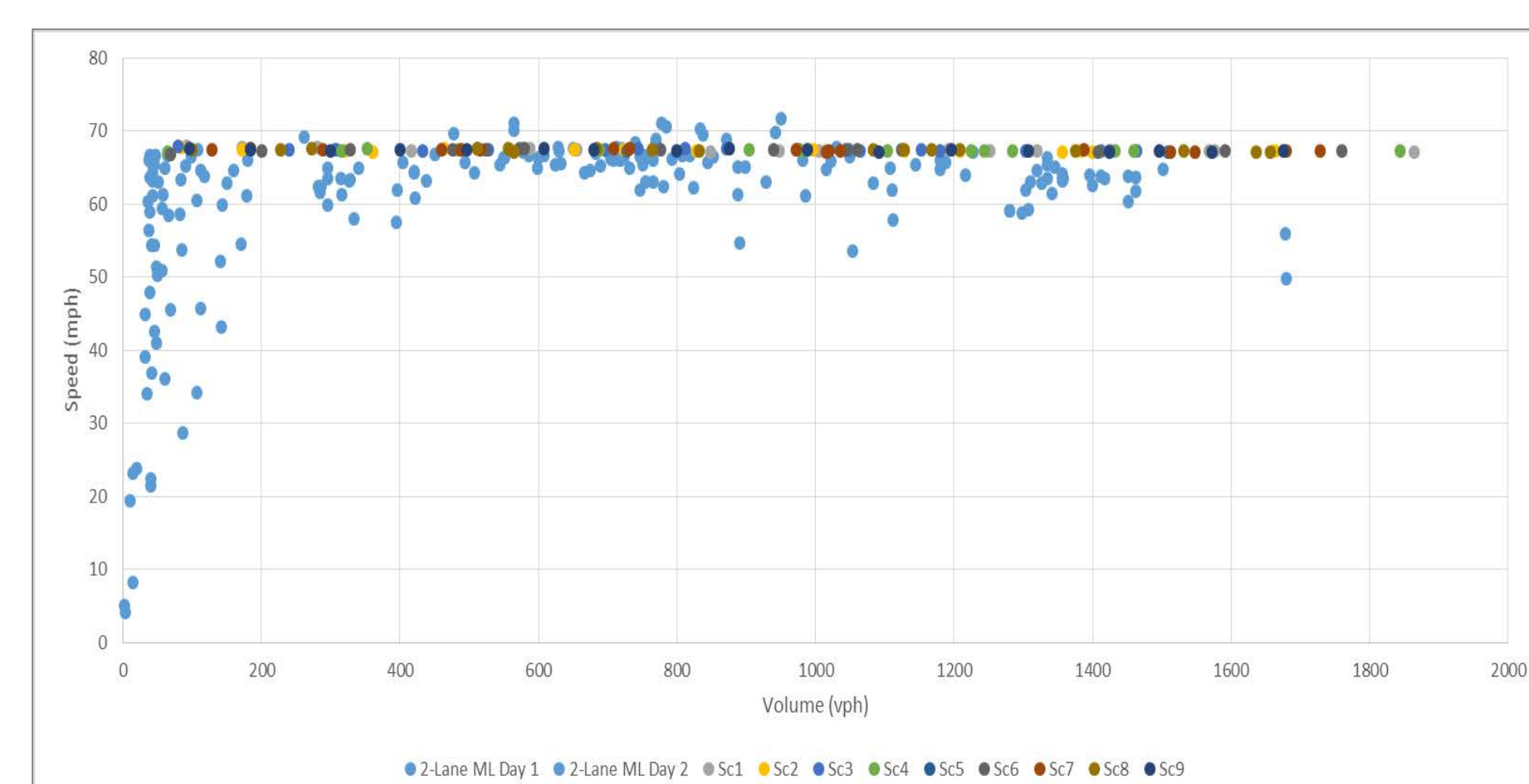


Figure 2: 2-Lane Managed Lane Facility

Conclusions and Recommendation for Future Research

Even the default parameters in the Wiedemann car-following model represent the field condition to a good extent. The Desired Speed setting plays an important role in calibrating managed lane facilities as the managed lane speed-flow curve is not much sensitive to the car following parameters per findings. The managed lane calibration is a site specific task. Exact calibration requires data for different sections. Based on the result of this study sites, a combination of CC0= 4.5 ft., and CC1=1.05 t is recommended for 1-lane managed lane facility and combination of CC0= 4.5 ft.-CC1=0.9 t is recommended for 2-lane facility. For future research, it is intended to collect more data to cover the congested regime and analyze the speed-flow curve further for the congested regime. It is desired to replicate the drop in the speed that was not observed in this study as well.

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