VOLUSIA FLAGLER 2050

Long Range Transportation Plan

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VOLUSIA FLAGLER TPO

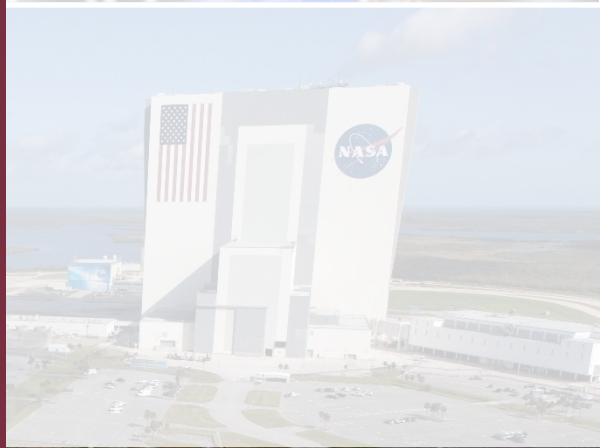
TRANSPORTATION PLANNING ORGANIZATION

APPENDIX O

CFRPM, Version 7 - Model Validation Report

Central Florida
Regional
Planning
Model
v7.0

Model Validation Report



January 2021

BREVARD | FLAGLER | LAKE | MARION | ORANGE | OSCEOLA | SEMINOLE | SUMTER | VOLUSIA

Lake-Sumter MPO
Metropolitan Planning Organization

metroplan orlando

TPO
Ocala Marion County

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

SPACE COAST TPO

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List of Acronyms

AADT	Average Annual Daily Traffic
BPR	Bureau of Public Roads
CBD	Central Business District
CFRPM	Central Florida Regional Planning Model
DOT	Department of Transportation
FDOT	Florida Department of Transportation
FF	Free-flow
FHWA	Federal Highway Administration
FSUTMS	Florida Standard Urban Transportation Model Structure
FT	Facility Type
GIS	Geographic Information System
HBO	Home-Based Other Trips
HBS	Home-Based Shop Trips
HBW	Home-Based Work Trips
KNR	Kiss-and-Ride
LOS	Level of Service
LRTP	Long Range Transportation Plan
MPO	Metropolitan Planning Organization
MUT	Multi-Unit Trucks
NCHRP	National Cooperative Highway Research Program
NHB	Non-Home-Based Trips
NHO	Non-Home Other Trips
NHTS	National Household Travel Survey
NHW	Non-Home Work Trips
PNR	Park-and-Ride
PRMSE	Percent Root Mean Square Error
RMSE	Root Mean Squared Error
SUT	Single-Unit Trucks
TAZ	Traffic Analysis Zone
TOD	Time-of-Day
TRB	Transportation Research Board
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled

1 Introduction

The Florida Department of Transportation (FDOT), District 5, developed the Central Florida Regional Planning Model, version 7 (CFRPM 7). The 2015 base year and 2045 future year scenarios in CFRPM 7 provide the MPOs/TPOs, the FDOT, and other entities with a dependable tool for forecasting travel demand in the District's nine counties.

CFRPM 7 includes a new roadway network and enhanced traffic analysis zone (TAZ) system across the entire District. It is a time-of-day model that is implemented in ArcGIS, Cube Voyager, and the Federal Transit Administration's Simplified Trips on Project Software (STOPS). It has three major components: a geographic information system (GIS)-based interface for editing, visualization, and reporting of the roadway network and socio-economic data; a primary travel demand model that includes trip generation, distribution, mode choice, and assignment steps; and a dedicated transit-only STOPS model that estimates public transportation ridership.

Three CFRPM 7 documents complement this one:

- The User's Guide describes network editing and model running procedures
- The Model Description Report fully describes the model
- The Data Dictionary describes all the attributes used in the model

A travel model is designed to react and respond appropriately to reasonable changes in socio-demographic variables and transportation systems. The purpose of the validation process is to assess the model's ability to reflect travel characteristics. CFRPM 7 was validated at each major step of the model. The model outputs were also validated against the common performance measures used today, including congested travel times and person flows. Longitudinal tests were conducted to address errors in horizon year input data or model calibration before the model is used in long range transportation plan (LRTP) applications. This validation report details the model validation procedures and results. Indian River County, which is outside the District 5 area, is only partially incorporated in CFRPM 7's modeling region. Consequently, when observed values are only available at a county level, comparisons of observed data and model results do not include Indian River County.

Model calibration and validation is vital to producing defensible travel demand forecasts. In calibration, parameters in the models are adjusted so that each model step replicates travel behavior. Although validation primarily involves comparing model results to observed data, it can also involve comparing results to independently derived benchmarks.

Validation assesses how well CFRPM 7 reflects existing transportation network and demand so the model can be a useful tool for developing LRTPs and other studies. The validation results inform planners, policy and decision-makers of the model's strengths and weaknesses beyond its immediate intended purpose, and the results also identify future adjustments for addressing those weaknesses or accentuate strengths.

1.1 Validation Tests and Metrics

Four categories of tests are commonly used in travel model validation. The descriptions of these tests are taken from the Federal Highway Administration's (FHWA) Reasonableness Manual[1].

Comparisons of base year model results to observation or benchmarks are considered traditional validation. The comparisons might be of model results to disaggregate data, such as data from a supplementary survey not used for model estimation, or to aggregate data, such as traffic counts or transit boardings. The practice of comparing the base year model to data that was used to estimate or calibrate a model is not as robust as comparing to independent data. However, this practice is unavoidable, especially for validation tests of trip generation and distribution sections because the data used for model estimation or calibration are the only data available.

Reasonableness and logic checks include the comparison of estimated (or calibrated) model parameters against those estimated in other regions with similar models. Reasonableness and logic checks may also include "components of change" analyses or an evaluation of whether the model procedures "tell a coherent story" about the transportation system and how people use it (as recommended by the Federal Transit Association [FTA] for New Starts analysis).

Model sensitivity testing includes both disaggregate and aggregate checks. Disaggregate checks, such as the determination of model elasticities, are performed during model estimation. Aggregate checks are tested from temporal validation. Sensitivity testing can also include model application using alternative demographic, socio-economic, transportation supply, or policy assumptions to determine the reasonableness of the resulting travel forecasts.

Longitudinal tests compare model results to data not used in model estimation. Both backcasts and forecasts may be used for model validation. For example, if a model is estimated using 2007 survey data, the model could be used to backcast to 2000 conditions and compared to the year 2000 traffic counts, transit boardings, CTPP data, or other historical data. Likewise, if a model is estimated or calibrated using the 2005 survey data, a forecast validation might be performed against 2008 data.

The CFRPM 7 validation used tests in all four categories and applied to all components of the model: socio-economic and roadway network data validation, trip generation, trip distribution, special area sub-models and non-motorized trips, highway assignment, and transit assignment from STOPS.

[1]https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/validation_and_reasonableness_2010/index.cfm. Accessed August 15, 2020.

1.2 Validation Process

Each model component is validated by completing the following steps:

1. Assemble the described observed data and benchmarks.
2. Determine the extent of how the observed data can be used for validation testing. For example, the observed data could have systemic biases or variability that make them untenable for validation purposes.
3. Assemble the appropriate input data and outputs.
4. Compare input data and outputs to the observed data and/or benchmarks.
5. Assess the model's performance, given the quality of the observed data and identify significant differences.
6. Discuss the root cause of significant differences between model input data and outputs and observed data or benchmarks. Adjust the model if the adjustment conforms to well-studied aspects of travel behavior.
7. Summarize the model's performance and highlight its strengths, weaknesses, and unknowns.

The observations are from the various data resources such as American Community Survey (ACS), 2017 National Household Travel Survey (NHTS), Census Transportation Planning Products (CTPP), and 2017 Transit On-Board Survey. The benchmarks are from FDOT's Model Calibration and Validation Standards Report (2008); they are based on a variety of national sources, including census data, household travel surveys, NHTS tabulations, and federal and state guidelines on modeling practice. Travel time metrics related to performance-based planning are also used in model validation.

1.3 Purpose of the Report

A travel model is designed to react and respond appropriately to reasonable changes in sociology-demographic variables and transportation systems. The purpose of the validation process is to assess the model's ability to reflect travel characteristics. Models can be considered valid even if they do not replicate each observed value exactly, or meet every benchmark, reasonableness, or logic check. Sometimes, errors or issues in the way the observed data were collected make it challenging for a demand model to replicate. In other circumstances, the benchmarks and reasonableness checks reflect an average; they are not always directly relatable to Central Florida and its unique travel markets.

In fact, models that pass every validation test are commonly found later to be over-calibrated. Unfortunately, over-calibrating is instinctive to modeling analysts because of the inherent desire to have the model match observed values or benchmarks as closely as mathematically possible. Given the reasons above, this desire is misplaced and therefore needs to be tempered with the

realization that over-calibrating both restricts the model's ability to provide helpful information for project-level analysis and mistakenly disregards the natural variability of the observed data.

The CFRPM 7 project team made every effort to adjust the model when it clearly did not reflect a key aspect of Central Florida travel. This was performed in a way to avoid over-calibrating. However, some of the validation results could not be improved further without over-calibrating. In these situations, the team did not over-calibrate but instead let the results stand without further modification so as to allow users to make adjustments, as necessary for their individual needs. The specific areas can be identified by comparing CFRPM 7 results to the benchmarks and metric thresholds. Refer to the Model Description Report for details of adjustments.

This report summarizes all the validation results and informs the reader as to which aspects of transportation in the Central Florida region that the model estimates well, estimates somewhat, and does not estimate well. A wide range of calibration adjustments were made to the modeling system to produce positive validation results. The validation results demonstrate that CFRPM 7 does a reasonable job of replicating the transportation system and how people use the transportation system.

1.4 Report Outline

The report is organized as follows:

- Chapter 2 – Data Validation. This section summarizes the validation of various input data used in CFRPM 7, such as traffic analysis zone (TAZ) level household, demographic information, and network information.
- Chapter 3 – Trip Generation. This section summarizes the trip generation validation results for CFRPM 7 and compares benchmarks and CFRPM 6.2 trip generation outputs.
- Chapter 4 – Trip Distribution. This section provides the trip distribution validation results. Three aspects are reviewed: county-to-county flows, average trip length by trip purposes, and percentage of trips that occur within a single TAZ.
- Chapter 5 – Mode Choice. This section compares the non-motorized, Orlando International Airport (OIA), and transit trip results to observed values.
- Chapter 6 – Highway Assignment. This section provides numerous comparisons of observed data (i.e., traffic counts and travel time observations) and model estimates.
- Chapter 7 – Longitudinal Tests. This section presents the backcast results to 2010 and a forecast to 2045.
- Chapter 8 – Summary. This section presents an overview of all validation results.

2 Data Validation

This chapter summarizes the validation of socio-economic data and network data used in CFRPM 7. The process of obtaining socio-economic data and network data is explained in the Model Description Report, Chapter 2 and Chapter 3, respectively.

Socio-economic data were developed for each traffic analysis zone (TAZ). The TAZs are the specific geographic areas, with homogenous land use and activities, for a trip generation. The socio-economic data include household, employment, hotel/motel, school enrollment, and other special generator data. This information was pooled from various data sources, which undergoes various corrections and adjustments before arriving at the final dataset. This dataset is called ZDATA.

2.1 Socio-Economic Data

Each of the seven MPO/TPOs in the CFRPM region developed socio-economic data (household and employment), which were pooled to develop ZDATA. Table 2-1 presents the household data fields in the ZDATA.

Table 2-1 Household Data Elements in ZDATA

Data Element	Description
TAZ	TAZ Numbers
SF_DU	Number of Single Family Dwelling Units
SF_PCT_VNP	Percentage of Single Family are Vacation and Non-Permanent Resident Homes
SF_PCT_VAC	Percentage of Single Family are Vacation Homes
SF_POP	Permanent Single Family Population
SF_0AUTO	Single Family Percentage of 0 Auto-owning households
SF_1AUTO	Single Family Percentage of 1 Auto-owning households
SF_2AUTO	Single Family Percentage of 2+ Auto-owning households
MF_DU	Number of Multiple Family Dwelling Units
MF_PCT_VNP	Percentage of Multiple Family are Vacation and Non-Permanent Resident Homes
MF_PCT_VAC	Percentage of Multiple Family are Vacation Homes
MF_POP	Permanent Multiple Family Population
MF_0AUTO	Multiple Family Percentage of 0 Auto-owning households
MF_1AUTO	Multiple Family Percentage of 1 Auto-owning households
MF_2AUTO	Multiple Family Percentage of 2+ Auto-owning households
HM_DU	Hotel/Motel Dwelling Units
HM_PCT_OCC	Hotel/Motel Occupancy Rate
HM_POP	Hotel/Motel Population

Along with the household data, employment and school data were also developed to form socio-economic data by TAZ. These are presented in Table 2-2.

Table 2-2 Employment and School Data Elements

Data Element	Description
TAZ	TAZ Numbers
IND_EMP	**Industrial Employment* by Place-of-Work:** All full-time and regular part-time employees, and self-employed persons, by job location, whose job is in an industry classified in Standard Industrial Classification (SIC[2] categories 01–39 (e.g., agriculture, forestry, fisheries, mining, contract construction, and manufacturing).
COM_EMP	**Commercial Employment* by Place-of-Work:** All full-time and regular part-time employees, and self-employed persons, by job location, whose job is in an industry classified in SIC categories 50–59 (e.g., retail trade and wholesale trade because both are commonly located in areas zoned for commercial land use activities).
SVC_EMP	**Service Employment* by Place-of-Work:** All full-time and regular part-time employees, and self-employed persons, by job location, whose job is in an industry classified in SIC categories 40–49 and 60–93 (e.g., transportation, communication, and utilities services; finance, insurance, and real estate services; selected personal services; tourism and recreational services, health and educational services; government services).
TOT_EMP	**Total Employment by Place-of-Work:** The total of industrial, commercial, and service employment.
SCHL_K12	Kindergarten through 12th grade (K-12) School Enrollment by School Location
SCHL_POST	Post-secondary (College and above) Enrollment

*https://www.fsutmsonline.net/images/uploads/reports/TRGEN.PDF

The summary of the socio-economic data is provided in the next subsections, followed by checks on the datasets and comparison of model estimates with some independent data sources.

2.1.1 Summary of Socio-Economic Data

Table 2-3 displays the total values of the household, employment, and school variables in ZDATA. The CFRPM region has 4.6 million people, two million jobs, and over one million students across its 11 counties.

Table 2-3 2015 Regionwide Totals

Metric	Regional Total
Number of Zones with HH/Emp data	7,102
Single Family Occupied DUs	1,375,365
Single Family Population	3,573,782
Multi Family Occupied DUs	456,248
Multi Family Population	1,023,361
Total Population	4,595,383

[2] Standard Industrial Classification (SIC) is defined in the Standard Industrial Classification Manual: 1972, Office of Federal Statistical Policy and Standards, US Department of Commerce, Washington, DC, GPO-SN 4101-0066 (1977 Supplement, SN 003-005-00176-0).

Metric	Regional Total
Total Households	1,998,681
Total Occupied DUs	1,831,613
Total Permanent DUs	1,674,263
Total Vacant DUs	167,068
Total Non-Permanent DUs	157,350
Hotel-Motel Occupied Units	164,267
Hotel-Motel Population	220,329
Total Autos	3,193,630
Occupied DUs with no autos	101,218
Industrial Employment	236,453
Commercial Employment	388,762
Service Employment	1,427,744
Total Employment	2,052,959
K-12 School Enrollment	755,710
Post-secondary Enrollment	337,871

Table 2-4 presents a selection of metrics of the ZDATA commonly used to compare across different regions.

Table 2-4 Selection of ZDATA Metrics

Derived Metrics	Regional Value
Population per Occupied DU	2.51
Employment to Population Ratio	0.45
Employment per Occupied DU	1.12
Autos per Occupied DU	1.74
Students per Occupied DU	0.60
Hotel-Motel Population per Occupied HM Units	1.34
Percent of Single Family DUs Relative to Total Occupied DUs	75%
Percent of vacant units Relative to Total Occupied DUs	9%
Percent of Seasonal Units Relative to Total Occupied DUs	9%
Percent of No Auto DUs Relative to Total Occupied DUs	6%
Percent of Industrial Employment Relative to Total Employment	12%
Percent of Commercial Employment Relative to Total Employment	19%
Percent of Service Employment Relative to Total Employment	70%

2.1.2 Land Use Checks (LUCHECK)

The socio-economic data, developed from various sources, were checked for reasonableness of aggregated metrics, and corrected for errors. The LUCHECK program (an abbreviated form of "Land Use Checks") was developed to automatically conduct these checks. The LUCHECK program has a series of checks for errors (i.e., data-entry errors, typos, and mis-codings) and reasonableness tests (i.e., that may uncover deeper issues within the data) that are performed for

each zone individually. These tests are not performed on dummy zones (i.e., zones that do not have any socio-economic data because they are reserved for future applications). In the past, dummy zones were identified as zones with a zero sum of population, dwelling units, hotel/motel units, and employment. Today, dummy zones can be omitted entirely from the socio-economic file.

LUCHECK checks the number of autos and permanent resident dwelling units (DUs), which are not directly available in the household data. These variables are derived from the ZDATA information using the following equations:

$$NumAutos = (SF1CPct/100 \times SFDU) + (SF2CPct/100 \times SFDU \times 2.5) + (MF1CPct/100 \times MFDU) + (MF2CPct/100 \times MFDU \times 2.5)$$

Where:

- $NumAutos$ is the number of autos in the TAZ
- $SF1CPct$ is the percentage of Single Family 1-car DUs
- $SF2CPct$ is the percentage of Single Family 2+-car DUs
- $SFDU$ is the number of Single Family permanent DUs
- $MF1CPct$ is the percentage of Multi-Family 1-car DUs
- $MF2CPct$ is the percentage of Multi-Family 2+-car DUs
- $MFDU$ is the number of Multi-Family permanent DUs. The value of 2.5 is the assumed average number of autos owned by 2+ car households

And,

$$PermResDU = Trunc(TotalDU \times (100 - PercentVANP))$$

Where:

- $PermResDU$ is the total number of permanent resident DUs in TAZ
- $TotalDU$ is the number of total DUs of the zone
- $PercentVANP$ is the percent of vacant and non-permanent (i.e., seasonal) DUs in the zone
- $Trunc$ is a function that truncates the result of the computation to an integer. Truncation is different from rounding: it only uses the whole number portion of the computation. For example, the truncated values of 235.9, 235.7, 235.5, 235.3, and 235.1 are all the same (235). A similar computation using the HM occupancy rate is used to calculate occupied HMUs

Table 2-5 lists the error checks performed on household data. Table 2-6 presents the list of reasonableness checks performed on household data. A TAZ that achieves the conditions for an error check is found to have "failed" the error check and was flagged for manual review.

Table 2-5 Error Checks on Household Data

Check #	Error Check
1	For single family HHs, both DU=0 and population (POP) >0
2	For single family HHs, both POP=0 and DU>0
3	For multi-family HHs, both DU=0 and POP>0
4	For multi-family HHs, both POP=0 and DU>0
5	For single family HHs, percent vacant DUs > percent vacant + non-permanent (seasonal) DUs
6	For multi-family HHs, percent vacant DUs > percent vacant + non-permanent (seasonal) DUs
7	For single family HHs, the sum of 0, 1, and 2+ auto percentages ≠ 100
8	For multi-family HHs, the sum of 0, 1, and 2+ auto percentages ≠ 100
9	For single family HHs, DU > 0 and the sum of 0, 1, and 2+ percent autos = 0
10	For multifamily HHs, DU > 0 and the sum of 0, 1, and 2+ percent autos = 0
11	Single family HH DUs < 0
12	Multi-family HH DUs < 0
13	Single family HH population < 0
14	Multi-family HH population < 0
15	Hotel/Motel units < 0
16	Hotel/Model occupancy rate < 0
17	For hotel/motels, both units>0 and occupancy rate =0
18	For hotel/motels, both units=0 and occupancy rate >0
19	For hotel/motels, both occupancy rate =100 and units >0
20	Total employment ≠ sum of Industrial, Service, and Commercial employment
21	Industrial employment < 0
22	Service employment < 0
23	Commercial employment < 0
24	Total employment < 0
25	Both hotel/motel units>0 and service employment =0
26	School enrollment < 0
27	School enrollment >0 and service employment =0
28	Single family HH non-permanent % > Multi-family non-permanent %
29	For single family HHs, DUs > POP
30	For multi-family HHs, DUs > POP
31	For hotel/motels, both units=0 and POP > 0
32	For hotel/motels, both POP=0 and units> 0
33	College enrollment < 0
34	College enrollment >0 and service employment =0

Source: LUCHECK program

Table 2-6 Reasonableness Check for Household Data

Check #	Reasonableness Check
1	Hotel/motel units are between 1–11, inclusive
2	Single family HH seasonal % > 50%
3	Multi-family HH seasonal % > 50%
4	Single family HH vacant % > 30%
5	Multi-family HH vacant % > 30%
6	Single family HH zero car % > 30%
7	Multi-family HH zero car % > 30%

Check #	Reasonableness Check
8	Single family HH POP/permanent resident DU < 2.0 and 2+ auto % > 30%
9	Multi-family HH POP/permanent resident DU < 2.0 and 2+ auto % > 30%
10	Single family HH POP per permanent resident DU < 1.00 or > 5.00
11	Single family HH autos per permanent resident DU < 1.00 or > 2.25
12	Multi-family HH POP per permanent resident DU < 1.00 or > 2.50
13	Multi-family HH autos per permanent resident DU < 1.00 or > 2.25
14	POP per permanent resident DU < 1.00 or > 3.50
15	Autos per permanent resident DU < 1.00 or > 2.20
16	Hotel/motel POP per occupied unit < 1.00 or > 2.50

Source: LUCHECK program

After performing these error and reasonableness checks, all flags were investigated. The results of the checks were then communicated with the MPO/TPOs for review and clarification. The MPO/TPOs reviewed the results and update the dataset, then the data were tested again. These communications continued until all the results were accepted by the modeling team and the MPO/TPOs.

2.1.3 Socio-Economic Data Metrics

Additional socio-economic data metrics were inspected for reasonableness at the TAZ and county level. These were additional checks, separate from LUCHECK, to establish confidence in reasonableness of the data used for trip generation. These metrics are listed in Table 2-7 and further described in this section. As with the LUCHECK, any county-level results flagged for review were manually investigated and discussed with the respective MPO/TPOs.

Table 2-7 Metrics for Household Data

Metric	Benchmark	
	Low	High
Visual inspection of population and employment and associated densities by TAZ and county	None (reasonable judgment)	
Region-wide persons/DU or persons/household	2.0	2.7
Region-wide employment/population ratio	0.35	0.75
Region-wide autos/DU or autos/household	1.75	2.10
Approximate population per TAZ	NA	3,000

Source: FDOT. 2008. Model Calibration and Validation Standards Report

To further verify ZDATA, household data were compared with other published datasets. The data sources included the Bureau of Economic and Business Research (BEBR, from the University of Florida), the United States Bureau of Economic Analysis (BEA), and American Community Survey (ACS) 2015 data.

- BEBR population projections are made for five-year intervals, based on census surveys. These projections estimate permanent residents only and do not include tourists and seasonal residents.

- BEA develops its forecasts by using data compiled by other federal agencies and conducting surveys to fill gaps. Its primary goal is to forecast economic activity, not household data alone, so the estimates vary quite a bit compared to other sources. In Florida, where seasonal residents are significant, BEA estimates tend to be higher than the actual estimates.
- ACS is a nationwide household survey that collects various demographic information. These data will be closer to the actual estimates because the sampling is carefully designed.

The following sections compare ZDATA to these datasets across five metrics at the county level. A positive number under the columns "% change" indicates that the estimated value is higher than the other sources, and vice versa for negative numbers. Indian River County was not considered in this comparison because CFRPM 7 only includes a portion of this county.

2.1.3.1 Population

The estimated total population, by county, is compared with the population obtained from BEBR and BEA 2015 data. In BEBR, the total population of a geographic area is calculated as the number of occupied household unit multiplied by the average household size, plus the group quarter population[3] and the homeless population.

The BEBR column in Table 2-8 represents only the population obtained from *BEBR Projections Report*[4] published in January 2016. The BEA column represents the population that includes the group quarter population. Because the estimated population count does not include the group quarter population, model estimates are usually lower than BEBR and BEA estimates.

Table 2-8 Population Comparison

County	Population			% Difference (CFRPM 7–BEBR)	% Difference (CFRPM 7–BEA)
	CFRPM 7	BEBR	BEA		
Brevard	555,850	561,714	566,822	-1.0	-1.9
Flagler	101,289	101,353	104,739	-0.1	-3.3
Lake	318,365	316,569	325,699	0.6	-2.2
Marion	333,186	341,205	342,757	-2.4	-2.8
Orange	1,213,443	1,252,396	1,292,008	-3.1	-6.1
Osceola	313,899	308,327	324,189	1.8	-3.2
Polk	655,197	633,052	649,644	3.5	0.8
Seminole	449,141	442,903	449,132	1.4	0.0
Sumter	108,557	115,657	117,210	-6.1	-7.4
Volusia	503,615	510,494	517,512	-1.3	-2.7
Total	**4,552,542**	**4,583,670**	**4,689,712**	**-0.7**	**-2.9**

[3] Group quarters are places where people live or stay in a group living arrangement (US Census Bureau)
[4] Rayer S, Wang Y. Projections of Florida population by county, 2020–2045, with estimates for 2016. Florida Population Studies. 2016;49:174.

Sources: CFRPM 7; BEBR; BEA

Population estimates, by county, are within 8% of the BEBR and BEA data, indicating that the population estimates match at the county level between various sources. As expected, the BEBR and BEA population data are generally higher than the model estimates, except for Lake County and Osceola County for BEBR and Polk County and Seminole County for both BEBR and BEA. Reasons for these differences are currently unknown. For future adjustment, the user needs to be cautious about local conditions that might cause these results.

2.1.3.2 Average Household Size Comparison

The estimated average household size, by county, is compared to the 2015 BEBR data. In BEBR data, households are defined as housing units occupied by the permanent residents only; no seasonally-occupied or vacant unit is included in the household. Table 2-9 compares the permanent population per permanently occupied household unit for CFRPM 7 and BEBR. The estimated population counts are expected to be lower than BEBR; therefore, it is expected that estimated household size will be higher than BEBR.

Table 2-9 Average Household Size Comparison

County	HH Size		% Difference (CFRPM – BEBR)
	CFRPM 7	BEBR	
Brevard	2.43	2.34	3.8
Flagler	2.97	2.43	22.2
Lake	2.45	2.43	0.8
Marion	2.32	2.35	-1.3
Orange	3.15	2.66	18.4
Osceola	3.53	2.95	19.7
Polk	2.76	2.61	5.7
Seminole	3.05	2.55	19.6
Sumter	2.04	2.03	0.5
Volusia	2.43	2.32	4.7

Sources: CFRPM 7; BEBR

Overall, estimated household sizes are 5% higher than those from the BEBR data, as expected. The differences are significant in Flagler (22%), Orange (18%), Osceola (20%), and Seminole (20%) counties, but within 10% of all the other counties. Reasons for these differences are currently unknown. Overall, these estimates are acceptable for long-range planning use.

2.1.3.3 Permanently Occupied DUs

In ACS data, a DU is classified as "occupied" if a person or group of people live in it permanently, or if the occupants are only temporarily absent from the residence for two months or less for vacation or a business trip. Any unit where people are staying for two months or less

is not considered to be an occupied unit. Therefore, only the permanent DUs from ZDATA are reported in Table 2-10; vacant or seasonally occupied DUs are not considered in this comparison.

Table 2-10 Total Occupied DUs

County	Total Occupied DUs		% Difference (CFRPM 7 – ACS)
	CFRPM 7	Observed	
Brevard	229,036	222,791	3
Flagler	34,071	36,950	-8
Lake	130,103	119,251	9
Marion	143,776	132,287	9
Orange	384,983	434,319	-11
Osceola	88,927	92,338	-4
Polk	236,916	221,381	7
Seminole	147,345	152,260	-3
Sumter	53,257	48,039	11
Volusia	207,592	200,180	4
Total	**1,656,014**	**1,659,796**	**0**

Sources: CFRPM 7; ACS 2015

Across the region, the difference is less than 3,500 households or 0.2%, which is within the ACS margin of error of 1%. The differences between model estimates and ACS data are less than 11% for all counties. These results are acceptable because these values lie within ACS margin of error.

2.1.3.4 Seasonally Occupied and Vacant DUs

According to the ACS variable definition, a housing unit is "vacant" if no one is living in it, or the unit is occupied entirely by persons who are staying for two months or less and have a more permanent residence elsewhere at the time of interview. Table 2-11 presents the sum of vacant and seasonal DUs in the CFRPM 7 column.

Table 2-11 Seasonally Occupied and Vacant DUs

County	Seasonally Occupied and Vacant DUs		% Difference (CFRPM 7 – ACS)
	CFRPM 7	ACS	
Brevard	46,727	48,863	-4
Flagler	8,621	12,323	-30
Lake	22,810	26,930	-15
Marion	21,562	31,400	-31
Orange	57,440	67,194	-15
Osceola	35,845	39,847	-10
Polk	44,816	60,867	-26
Seminole	29,870	32,114	-7

County	Seasonally Occupied and Vacant DUs		% Difference (CFRPM 7 – ACS)
	CFRPM 7	ACS	
Sumter	16,305	13,132	24
Volusia	39,349	55,257	-29
Total	**323,345**	**387,927**	**-17**

Sources: CFRPM 7; ACS 2015

The ACS data report more seasonal and occupied DUs compared to model estimates. The difference is less than 30%. However, these differences are relatively small in magnitude: the largest difference being 16,000 DUs in Polk County, which is less than 10% of the 237,000 occupied DUs in that county. Across the region, the difference is less than 65,000 households (17%), which is more than the ACS margin of error of 4%. These differences may be due to insufficient ACS survey data for seasonally and vacant DUs. Model estimates are acceptable for long-range planning use.

2.1.3.5 Zero Car-owning Occupied DUs

Estimated zero-car owning occupied DUs is compared with the corresponding data from the ACS 2015 data, by county, in Table 2-12. Only the occupied housing units with no auto ownership are considered.

Table 2-12 Occupied DUs with Zero Autos

County	DUs with Zero Autos		% Difference (CFRPM 7 – ACS)
	CFRPM 7	ACS	
Brevard	14,959	12,350	21
Flagler	2,030	1,589	28
Lake	5,989	6,517	-8
Marion	8,416	8,076	4
Orange	24,073	28,320	-15
Osceola	5,160	5,568	-7
Polk	16,748	15,058	11
Seminole	4,391	5,303	-17
Sumter	1,409	1,672	-16
Volusia	16,852	13,741	23
Total	**100,029**	**98,194**	**2**

Sources: CFRPM 7; ACS 2015

The differences in Table 2-12 are relatively large, up to 28%. However, in terms of magnitude, the differences are small, with less than 3,000 at the county level. Across the region, the difference is less than 2,000 households or 2%, which is within the ACS margin of error of 5%. The county-level variability can be attributed to the statistical "noise" of the ACS survey sample because all counties have household numbers within the ACS margin of error. Therefore, these model estimates are acceptable for long-range planning use.

2.1.4 Employment Data

Estimated employment is compared with the employment data obtained from the Bureau of Labor Statistics (BLS), American Community Survey (ACS), County Business Patterns (CBP), and Bureau of Economic Analysis (BEA) 2015 sources for each county. Employment is estimated as the average number of employees in peak season, by the place of work location.

There are many subtle but important differences between these data sources:

- BLS employment data[5] are summarized in quarterly reports by employers and submitted to the US BLS. This is supplemented by various surveys conducted by the BLS for other purposes. This dataset covers more than 95% of jobs in the US, but it tends to under-report self-employed individuals. BLS data are therefore usually lower than model estimates.
- The ACS is a nationwide survey that collects worker information, including residential and employment locations[6]. These data tend to be closer to actual estimates because the sampling is carefully designed and includes all types of jobs. There are no available employment data in the ACS 2015 Flagler and Sumter counties datasets.
- The BEA data include workers who have full-time jobs, part-time jobs, and self-employed workers[7]. A worker holding down two part-time jobs is counted twice in this dataset. CFRPM 7 defines employment as the average number of employees in the peak season, which should always be lower than BEA's accounting.
- The project team also compared the employment data with the Woods & Poole (W&P) employment database, which is mainly derived from data from the BEA. Due to disclosure agreements, W&P data are not presented in this report.
- The CBP data exclude self-employed individuals, employees of private households, railroad employees, agricultural production employees, and most government employees[8]. Consequently, CBP employment data are lower than model estimates.

Table 2-13 compares total employment estimated with 2015 BLS, ACS, CBP, and BEA sources for each county. No benchmarks compare the total employment: the comparison itself is the reasonableness check that relies on understanding the above noted differences among the datasets.

[5] https://www.bls.gov/data/#employment. Accessed August 15, 2020.
[6] https://www.census.gov/programs-surveys/acs. Accessed August 15, 2020.
[7] https://www.bea.gov/data/employment. Accessed August 15, 2020.
[8] https://www.census.gov/programs-surveys/cbp/data.html. Accessed August 15, 2020.

Table 2-13 Employment Comparison

County	Total Employment					% Difference			
	CFRPM 7 (1)	BLS (2)	ACS (3)	CBP (4)	BEA (5)	(1)-(2)	(1)-(3)	(1)-(4)	(1)-(5)
Brevard	252,418	194,456	241,881	169,860	272,836	30	4	49	-7
Flagler	25,805	21,175	NA	17,815	36,271	22	NA	45	-29
Lake	129,709	89,592	129,511	77,497	132,044	45	0	67	-2
Marion	111,501	96,719	111,085	80,011	141,954	15	0	39	-21
Orange	809,428	762,674	655,717	678,721	997,734	6	23	19	-19
Osceola	93,859	84,340	143,825	71,586	127,787	11	-35	31	-27
Polk	193,464	203,802	258,761	174,572	281,016	-5	-25	11	-31
Seminole	186,966	174,086	218,095	163,565	247,353	7	-14	14.	-24
Sumter	30,189	26,134	NA	19,010	40,351	16	NA	59	-25
Volusia	204,694	160,541	209,562	140,144	232,742	28	-2	46	-12
Total	**2,038,033**	**1,813,519**	**1,968,437**	**1,592,781**	**2,510,088**	**12**	**4**	**28**	**-19**

Sources: CFRPM 7; BLS; ACS 2015; CBP; BEA

The comparisons are consistent with the differences in the datasets discussed above. The estimated employment is slightly higher than BLS and CBP data and is generally similar to ACS data except for Orange, Osceola, Polk, and Seminole counties. For the Orange and Osceola counties, there may be issues with the employment estimates from ACS because they are either the lowest or highest in all data sources. The BEA employment data are higher than estimates. The model estimates are acceptable for long-range planning use.

The following sections make similar comparisons by the Florida Standard Urban Transportation Model Structure (FSUTMS) three classifications: industrial, commercial, and service.

2.1.4.1 Industrial Employment

Industrial employment includes employment in forestry, fishing and related activities, mining, quarrying and oil and gas extraction, utilities, construction, and manufacturing. The model estimated industrial employment, by county, is compared with the industrial employment data obtained from ACS, CBP, BEA, and W&P 2015 data sources for each county (see Table 2-14). W&P data are not presented due to disclosure agreements. ACS employment data were not available in the 2015 Flagler and Sumter counties datasets. In addition, BLS data are not available to download for industrial employment from the BLS data finder portal[9].

[9] https://www.bls.gov/data/#employment. Accessed August 15, 2020.

Table 2-14 Industrial Employment

County	Industrial Employment				% Difference		
	CFRPM 7 (1)	ACS (3)	CBP (4)	BEA (5)	(1)-(3)	(1)-(4)	(1)-(5)
Brevard	37,354	37,283	27,897	38,994	0	34	-4
Flagler	2,174	NA	1,987	3,689	NA	9	-41
Lake	14,415	18,377	10,005	18,523	-22	44	-22
Marion	16,695	21,524	11,678	24,002	-22	43	-30
Orange	75,670	99,245	53,827	81,164	-24	41	-7
Osceola	5,637	25,824	6,704	11,071	-78	-16	-49
Polk	28,105	47,416	26,429	43,467	-41	6	-35
Seminole	27,203	30,423	19,870	28,292	-11	37	-4
Sumter	3,902	NA	3,862	7,129	NA	1	-45
Volusia	23,093	32,234	16,848	28,612	-28	37	-19
Total	**234,248**	**312,326**	**179,107**	**284,943**	**-25**	**31**	**-18**

Sources: CFRPM 7; ACS 2015; CBP; BEA

The comparisons are consistent with the differences in the datasets discussed above. The estimated employment is slightly higher than the CBP data and is generally similar to ACS data, except for Orange, Osceola, and Polk counties. Reasons for these large differences are currently unknown. The BEA employment data are higher than estimates and indicate that model estimates can be used for long-range planning use.

2.1.4.2 Commercial Employment

Wholesale and retail trade are defined as commercial employment. The estimated commercial employment, by county, is compared with the corresponding employment data obtained from 2015 ACS, CBP, BEA, and W&P sources (see Table 2-15). W&P data are not presented due to disclosure agreements. No employment data are available in the ACS 2015 Flagler and Sumter counties datasets. BLS data are not available for commercial employment from the BLS data finder portal.

Table 2-15 Commercial Employment

County	Commercial Employment				% Difference		
	CFRPM 7 (1)	ACS (3)	CBP (4)	BEA (5)	(1)-(3)	(1)-(4)	(1)-(5)
Brevard	44,711	39,680	32,784	39,714	13	36	13
Flagler	5,584	NA	4,013	4,974	NA	39	12
Lake	25,444	18,588	16,716	21,245	37	52	20
Marion	23,393	17,853	20,181	23,446	31	16	0
Orange	128,935	72,482	109,277	131,333	78	18	-2
Osceola	17,233	15,228	17,130	19,941	13	1	-14
Polk	54,217	37,683	34,889	43,886	46	55	24
Seminole	39,914	23,832	34,199	43,080	67	17	-7
Sumter	5,117	NA	3,926	5,648	NA	30	-9
Volusia	38,934	30,513	29,679	36,395	28	31	7

County	Commercial Employment				% Difference		
	CFRPM 7 (1)	ACS (3)	CBP (4)	BEA (5)	(1)-(3)	(1)-(4)	(1)-(5)
Total	**383,482**	**255,859**	**302,794**	**369,662**	**50**	**27**	**4**

Sources: CFRPM 7; ACS 2015; CBP; BEA

The comparisons are consistent with the differences in the datasets discussed above. The estimated employment is slightly higher than the CBP data and is generally similar to ACS data, except for Orange, Polk, and Seminole counties. The BEA employment data are usually higher than model estimates but are lower for commercial employment. Reasons for these large differences are currently unknown. Overall, these comparisons indicate that the CFRPM 7 commercial employment estimates are acceptable for long-range planning applications.

2.1.4.3 Service Employment Comparison

Service employment refers to employment in:

- transportation and warehousing
- information
- finance and insurance
- real estate
- rental and leasing
- professional, scientific, and technical services
- management of companies and enterprises
- administrative services
- waste management and remediation services
- educational services
- health care and social assistance
- arts, entertainment, and recreational services
- accommodation and food services; government and government enterprises; and other services

Estimated service employment, by county, is compared with the corresponding employment data obtained from 2015 ACS, CBP, BEA, and W&P sources (see Table 2-16). W&P data are not presented due to disclosure agreements. ACS employment data are available in the 2015 Flagler and Sumter counties datasets. BLS data are not available for service employment from the BLS data finder portal.

Table 2-16 Service Employment

County	Service Employment				% Difference		
	CFRPM 7 (1)	ACS (3)	CBP (4)	BEA (5)	(1)-(3)	(1)-(4)	(1)-(5)
Brevard	170,353	164,918	109,179	194,128	3	56	-12
Flagler	18,047	NA	11,815	26,227	NA	53	-31

County	Service Employment				% Difference		
	CFRPM 7 (1)	ACS (3)	CBP (4)	BEA (5)	(1)-(3)	(1)-(4)	(1)-(5)
Lake	89,850	92,546	50,776	92,276	-3	77	-3
Marion	71,413	71,708	48,152	94,506	0	48	-24
Orange	604,823	483,990	515,617	785,237	25	17	-23
Osceola	70,989	102,773	47,752	96,775	-31	49	-27
Polk	111,142	173,662	113,254	193,663	-36	-2	-43
Seminole	119,849	163,840	109,496	175,430	-27	9	-32
Sumter	21,170	NA	11,222	25,338	NA	89	-16
Volusia	142,667	146,815	93,617	167,735	-3	52	-15
Total	**1,420,303**	**1,400,252**	**1,110,880**	**1,851,315**	**1**	**28**	**-23**

Sources: CFRPM 7; ACS 2015; CBP; BEA

The comparisons are consistent with the differences in the datasets discussed above. The estimated employment is slightly higher than the CBP data and is generally similar to ACS data, except for Orange, Osceola, Polk, and Seminole counties. Reasons for these large differences are currently unknown. The BEA employment data are higher than model estimates. These comparisons indicate that the CFRPM 7 service employment estimates are acceptable for long-range planning applications.

2.1.5 Enrollment Comparison

Table 2-17 compares the elementary, middle, and high school (K–12) enrollment from ZDATA with the 2015 ACS school enrollment by county. The ACS data are pulled from a sampled dataset and are, therefore, not a definitive source; however, these data are the only available to include public, private, and charter school K–12 enrollment.

Table 2-17 School (K–12) Enrollment

County	K–12 Enrollment		% Difference
	CFRPM 7	ACS	
Brevard	84,553	78,793	6
Flagler	15,145	14,544	4
Lake	48,608	47,095	3
Marion	47,104	47,612	-1
Orange	217,899	204,069	7
Osceola	72,466	58,368	24
Polk	108,389	107,145	1
Seminole	76,387	73,195	4
Sumter	8,650	6,815	27
Volusia	70,010	68,124	3
Total	**748,503**	**705,760**	**6**

Sources: CFRPM 7; ACS 2015

Model estimates are higher than the ACS data in all counties. The differences are less than 10% or 10,000 students in eight of the counties. There are significant differences in Osceola and Seminole counties. Although reasons for these significant differences are currently unknown, they correspond to similar differences in the employment data comparisons (see Section 2.1.4). These comparisons indicate that K-12 enrollment estimates are acceptable for long-range planning applications.

Comparisons for college enrollment are not included because a reliable data source is not available at this time. Some enrollment data exist, but they do not currently include both public and private university enrollment and are not stratified by campus.

2.2 Roadway Network Data

Verification of roadway network data is extremely important because those data are the key elements in the trip distribution and traffic assignment steps of CFRPM 7. Broadly speaking, the roadway network consists of the following characteristics:

- Nodes are elements that describe the position of intersections or shape points.
- Links are network model elements that connect the nodes and have attributes, including direction, speed, capacity, and highway functional classification.
- Centroid connectors connect the zones to the network. They represent the distance and time to be covered between a zone's center of gravity (the center of trip generating and attracting activity) and the model links serving that zone.

Each node and link have data fields that provide information on posted speed limits, number of lanes, free-flow speeds, capacity of the roadway, tolls, turn restrictions, and other descriptive information.

2.2.1 Posted Speed Limits

The project team reviewed posted speed limits for accuracy. The team obtained the Roadway Characteristics Inventory (RCI) Geographic Information Systems (GIS) file with posted speed limits from FDOT's Central Office. Other roadway files related to posted speed limits were collected from FDOT's GIS online database and other resources, including NAVTEQ data, Highway Performance Monitoring System (HPMS) data, Bing, and Waze.

The project team reviewed the posted speeds—specifically the POST_SPEED data field—which are slightly differently for SHS (State Highway System) and Off-SHS roadways because SHS speed information is readily-available in GIS.

For SHS roadways, the estimated posted speed limits in the network were compared to the corresponding data in the Transportation Data and Analytics (TDA) RCI file. If they did not agree, the network was changed to reflect the TDA value.

For Off-SHS roadways, the network posted speeds were compared against corresponding data from a variety of sources, including posted speed signs in Google Maps' Street View, NAVTEQ data, Bing maps and Waze. If the network speed did not agree with the sources, the best representative posted speed from all the sources was used to update the network values. Table 2-18 presents the number of updated segments of posted speed limits, by county.

Table 2-18 Posted Speed Adjustments Summary

County	Number of Segments	Number of Adjusted Segments	Percentage of Adjusted Segments
Brevard	8,937	319	4%
Flagler	1,732	0	0%
Indian River	943	0	0%
Lake	5,864	309	5%
Marion	7,358	295	4%
Orange	16,430	503	3%
Osceola	4,255	205	5%
Polk	9,806	1,486	15%
Seminole	5,361	304	6%
Sumter	2,117	84	4%
Volusia	10,094	0	0%
Total	**72,897**	**3,505**	**5%**

2.2.2 Estimated Free-Flow Speeds

Travel models require estimates of free-flow (FF) speeds, which are the speeds that occur during daylight hours with minimal traffic congestion. FF speeds are typically higher than posted speed on limited-access roadways, and they are lower than posted speeds on arterials and signalized roadways. Equations to estimate FF speeds[10] were developed using the observed FF speed data, based on speeds observed on Sundays between 7–8 AM. These equations were applied at an aggregate level. The resulting FF speeds were then compared to the observed FF speed data for each link.

To simplify the comparison, a ratio of estimated to observed FF speed to observed FF speeds was computed on the 20,130 links. A ratio of 1.0 means the estimated and observed values match exactly. Ratios less than 1.0 indicate the estimated speed is less than the observed speed, while

[10] See Section 3.1.6.3 of the *Model Description Report* for more details

ratios greater than 1.0 indicate the estimated speed is greater than the observed speed. The ratio was reviewed. by county, facility type, and combined county and facility type. Table 2-19 compares the estimated FF speed and observed FF speeds.

Table 2-19 Estimated/Observed Ratio for Free-Flow Speed

County	Percentage of Links with Est./Obs. FF Ratio			Number of Links
	< 0.9 (less than 10%)	0.9–1.1 (within 10%)	> 1.1 (greater than 10%)	
Brevard	12.7	73.0	14.3	3,487
Flagler	15.2	69.1	15.7	362
Indian River	23.3	65.4	11.3	335
Lake	22.7	74.0	3.3	1,157
Marion	15.8	73.6	10.6	1,857
Orange	8.4	60.9	30.6	4,274
Osceola	11.8	65.8	22.5	842
Polk	26.5	53.7	19.7	3,321
Seminole	7.3	77.8	14.9	1,252
Sumter	33.5	64.6	1.9	418
Volusia	16.5	67.8	15.7	2,825
Region	**15.7**	**66.2**	**18.0**	**20,130**

Almost two-thirds of all links are within 10% of the observed values, with the remaining links evenly divided between differences of less than -10% and greater than +10%. Table 2-20 compares estimated FF speed and observed FF speeds by facility type.

Due to technical issues with the FF speed data collected from the traffic management sites, these results do not reflect Osceola County local roads. Appendix C Comparison of Observed and Estimated Free-Flow Speedcompares estimated and observed FF speed, by county and by facility type.

There is significant variation in the results, by facility type. One reason for this variation is that the estimated FF speed equations were developed at an aggregate level, using only eight facility types: freeways [both toll and non-toll]; unsignalized arterials; Class I arterials; Class II/III/IV arterials; local roads; freeway and other on/off ramps; freeway-to-freeway; and freeway-collector/distributor ramps. When comparing the results across 35 facility types, variation is to be expected. Another reason is that the FF speed equations were developed before the roadway posted speeds could be verified.

This is the first time that estimated FF speeds are being validated for modeling, so it is difficult to fairly evaluate these results. The variability in the observed dataset, which appears even at the county level, implies that a lower level of accuracy is to be expected. The estimated speeds are accurate for limited-access facilities, less so for arterials, and not accurate for ramps. The observed data for ramp speeds are particularly variable, so inaccurate estimates are expected.

Generally, the project team concludes that the estimated FF speeds are reasonable for long-range planning use at a regional level. In subsequent updates, the observed FF speed data—especially for ramps—should be reviewed thoroughly before use and updates to the equations should be made after posted speeds are verified.

Table 2-20 Estimated and Observed Free-Flow Speed

Facility Type Code	Facility Type	Percentage of Links with Est. FF Speed / Obs. FF Speed			Total # of Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	13.2	84.5	2.3	523
21	Divided Arterial Unsignalized (Speed > 55 mph)	11.5	74.1	14.4	1,090
22	Divided Arterial Unsignalized (Speed 45 & 50 mph)	26.4	55.7	17.9	106
23	Divided Arterial Class I	11.6	66.4	22.0	5,227
24	Divided Arterial Class II	11.3	71.5	17.1	3,138
31	Undivided Arterial Unsignalized with Turn Bays	18.7	73.3	8.0	573
32	Undivided Arterial Class I with Turn Bays	16.0	65.5	18.5	2,643
33	Undivided Arterial Class II with Turn Bays	19.2	62.0	18.8	1,690
34	Undivided Arterial Class III/IV with Turn Bays	9.4	76.9	13.8	320
35	Undivided Arterial Unsignalized without Turn Bays	16.2	83.8	0.0	74
36	Undivided Arterial Class I without Turn Bays	0.0	100.0	0.0	8
37	Undivided Arterial Class II without Turn Bays	50.0	50.0	0.0	6
38	Undivided Arterial Class III/IV without Turn Bays	100.0	0.0	0.0	1
41	Major Local Divided Roadway	18.5	66.8	14.8	298
42	Major Local Undivided Roadway with Turn Bays	18.2	61.1	20.7	1,708
43	Major Local Undivided Roadway without Turn Bays	28.3	62.7	9.1	431
44	Other Local Divided Roadway	33.3	7.4	59.3	27
45	Other Local Undivided Roadway with Turn Bays	27.7	63.1	9.2	130
46	Other Local Undivided Roadway without Turn Bays	19.5	68.3	12.2	82
47	Low Speed Collector	33.7	44.8	21.5	1,085
52	External Station Connector	35.0	65.0	0.0	20
62	One-Way Facilities Class I	34.0	56.6	9.4	53
63	One-Way Facilities Class II	33.3	57.7	9.0	78
64	One-Way Facilities Class III/IV	0.0	27.6	72.4	58
68	Frontage Road Class III/IV	100.0	0.0	0.0	2
71	Freeway On/Off Ramp-Service Interchange	59.2	23.7	17.1	76
72	Freeway On/Off Loop Ramp-Service Interchange	41.7	8.3	50.0	24
73	Other On/Off Ramp-Urban Interchange	42.9	35.7	21.4	14
74	Other On/Off Loop Ramp-Urban Interchange	50.0	50.0	0.0	2
75	Freeway-to-Freeway Ramp-System Interchange	28.6	61.4	10.0	70
76	Freeway-Collector/Distributor Ramp	71.4	21.4	7.1	14
91	Toll Facility - Freeway	1.2	91.6	7.3	510
92	Toll Facility - Arterial	0.0	31.3	68.8	16

Facility Type Code	Facility Type	Percentage of Links with Est. FF Speed / Obs. FF Speed			Total # of Links
		< 0.9	0.9–1.1	> 1.1	
97	Toll On Ramp	70.6	23.5	5.9	17
98	Toll Off Ramp	68.8	31.3	0.0	16
All	**All Facility Types**	**15.8**	**66.3**	**18.0**	**20,130**

2.2.3 Number of Lanes

The project team reviewed and updated the number of lanes, using similar methods as those used to revise the posted speeds. The project team reviewed the NUM_LANES data field differently for SHS (State Highway System) and Off-SHS roadways because SHS information is readily available in GIS.

For SHS roadways, the number of lanes in the modeling network was compared to the corresponding data in the HPMS and the TDA RCI file. If they did not agree, the modeling network was updated based on aerial imagery.

For Off-SHS roadways, the modeling network was compared against corresponding data from a variety of sources, including aerial imagery from Google Maps, HPMS data, NAVTEQ data, Bing maps, and Waze. If the number of lanes did not agree, the network was updated, based on aerial imagery. Table 2-21 presents the number of updated segments, by county.

Table 2-21 Quality Control Segments with the Updated Number of Lanes

County	Number of Segments	Number of Adjusted Segments	% of Adjusted Segments
Brevard	8,937	71	0.8%
Flagler	1,732	0	0.0%
Indian River	943	0	0.0%
Lake	5,864	25	0.4%
Marion	7,358	8	0.1%
Orange	1,6430	165	1.0%
Osceola	4,255	20	0.5%
Polk	9,806	36	0.4%
Seminole	5,361	33	0.6%
Sumter	2,117	6	0.3%
Volusia	10,094	0	0.0%
Total	**72,897**	**364**	**0.5%**

Source: CFRPM 7

Only a modest number of adjustments were made, indicating the original estimates were accurate.

2.2.4 Visual Inspections

Many aspects of the roadway network are best verified through visual inspection. The project team manually reviewed the following information throughout the development of CFRPM 7: area types, facility types, and turn prohibitors. Figure 2-1 to Figure 2-4 present these visualizations. Area type and facility type codes are shown in Table 2-22 and Table 2-23.

Table 2-22 Area Type

Area Type Code	Area Type
11	Urbanized area (500,000+) primary city CBD
12	Urbanized area (<500,000) primary city CBD
13	Other urbanized area CBD & small city downtown
14	Non-urbanized area small city downtown
21	All CBD fringe areas
31	Residential area of urbanized areas
32	Undeveloped portions of urbanized areas
33	Transitioning areas/urban areas over 5,000 population
34	Beach residential
41	High density outlying business district (OBD)
42	Other OBD
43	Beach OBD
51	Developed rural areas/small cities < 5,000 population
52	Undeveloped rural areas

Source: CFRPM 7

Table 2-23 Facility Type

Facility Type Code	Facility Type
10–19	Freeway Non-Toll
20–29	Divided Arterial
30–39	Undivided Arterial
40–49	Local Roadway
50–59	Centroid Connector
60–69	One-Way Facilities
70–79	Ramp-Service Interchange
90–99	Toll Facility

Source: CFRPM 7

Figure 2-1 CFRPM 7 Area Types

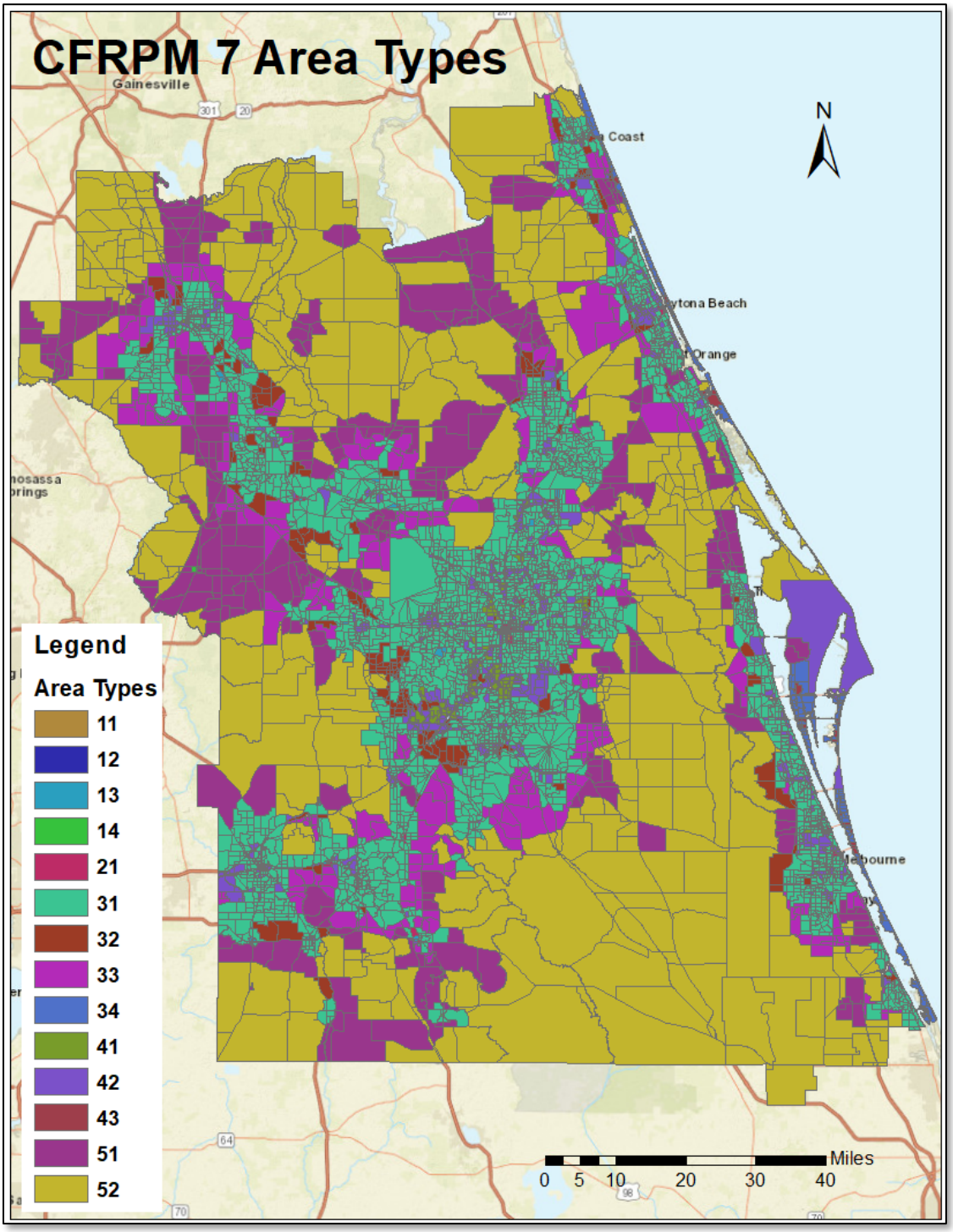


Figure 2-2 CFRPM 7 Facility Types

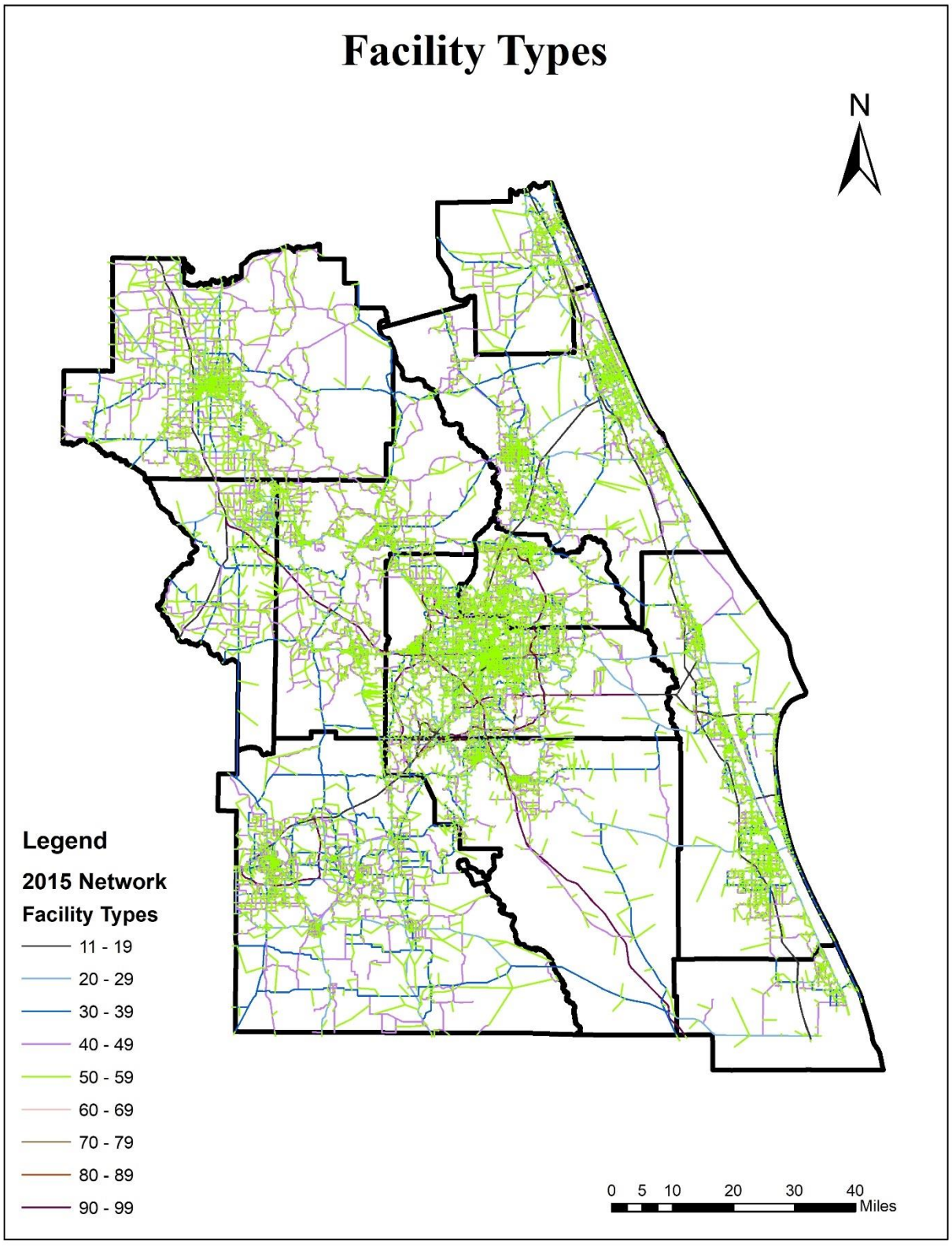


Figure 2-3 CFRPM 7 Number of Lanes

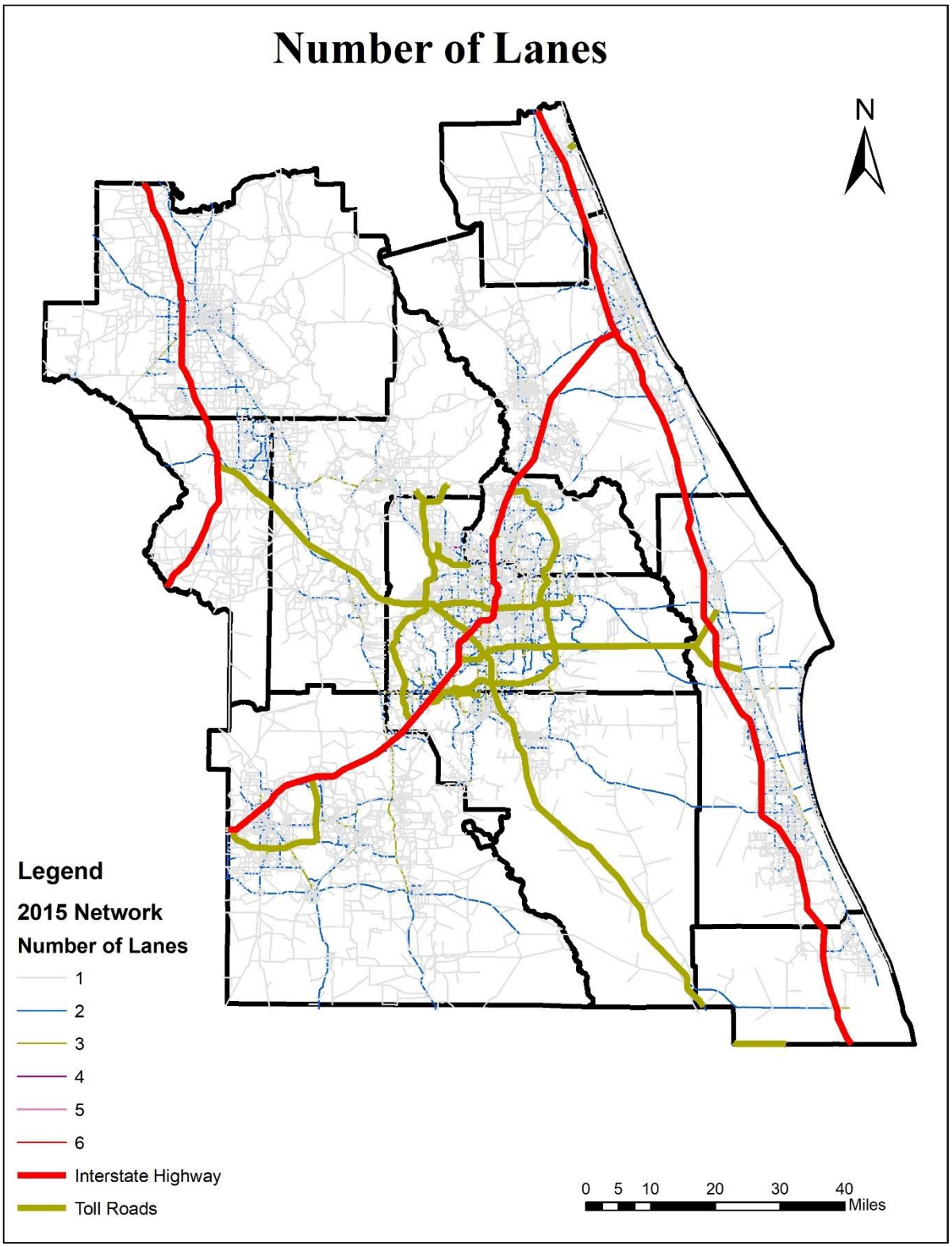
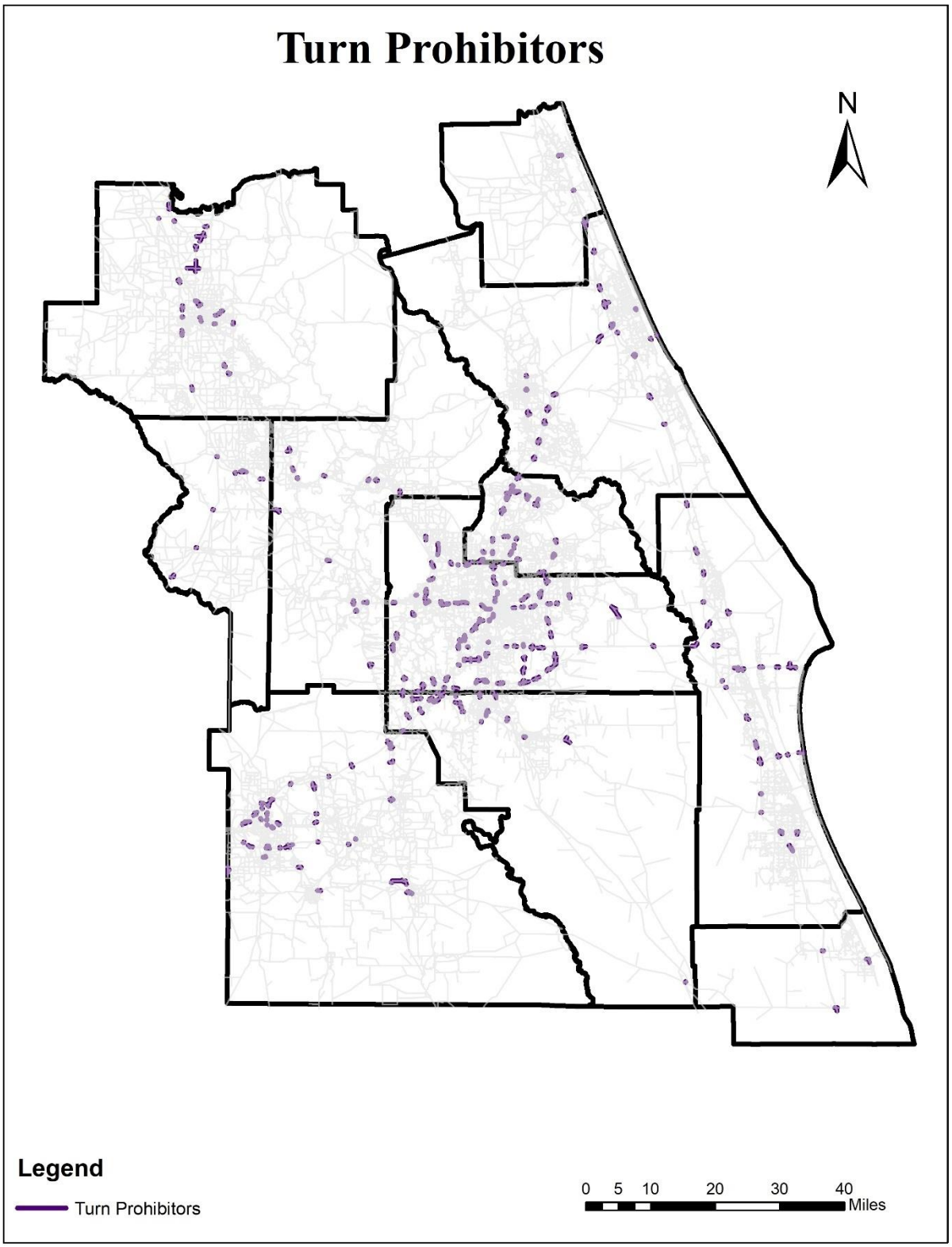


Figure 2-4 CFRPM 7 Turn Prohibitors



2.2.5 Centerline Miles

It is important to compare the newly developed network with an independent data source to validate that CFRPM 7 represents a sufficient amount of the roads, by facility type, within each county. To validate the coverage, the centerline miles estimates were compared with an independent source, the *2015 Road Mileage and Travel (DVMT) Report*. The centerline miles in Table 2-24 are taken from the *2015 Road Mileage and Travel (DVMT) Report*, while the estimates in Table 2-25 are from the CFRPM 7. Table 2-26 compares centerline miles from the DVMT report and model estimates, while Table 2-27 presents the percentage difference. The percent difference (%Delta) is defined by the relative difference between CFRPM 7 with DVMT report values.

Overall, CFRPM 7 has accurate coverage of centerline miles for major road categories, including interstate/freeway/turnpike, principal/divided arterials, and minor/undivided arterials. However, CFRPM 7 only covers 28% of all local roadways in the region. The lowest level of geography considered in CFRPM 7 is the traffic analysis zone (TAZ): individual local roads that begin and end in a TAZ cannot be modeled. Although these local roads are represented as centroid connectors within the highway network, centroid connectors have substantially lower centerline miles.

Table 2-24 Centerline Miles from 2015 DVMT Report

Centerline Miles	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	98	244	160	318	2,727	3,548
Flagler	19	61	62	107	736	986
Lake	24	139	74	478	1,640	2,355
Marion	38	183	131	595	3,030	3,977
Orange	178	195	287	588	3,363	4,610
Osceola	78	165	84	223	975	1,526
Polk	56	244	141	568	3,407	4,416
Seminole	32	89	73	175	1,264	1,633
Sumter	40	60	62	175	712	1,048
Volusia	74	266	146	422	2,492	3,400
Total	**636**	**1,647**	**1,220**	**3,649**	**20,346**	**27,498**

Source: 2015 DVMT Report

Table 2-25 Estimated Centerline Miles

Centerline Miles	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	101	222	166	363	577	1,429
Flagler	19	42	75	133	223	492
Lake	24	101	127	525	585	1,362
Marion	38	170	149	787	768	1,912
Orange	188	446	122	626	950	2,332
Osceola	86	119	124	280	392	1,001
Polk	56	264	370	760	834	2,284
Seminole	33	121	45	252	362	813
Sumter	40	53	99	186	262	640
Volusia	73	225	185	559	645	1,687
Total	**658**	**1,763**	**1,462**	**4,471**	**5,598**	**13,952**

Source: CFRPM 7

Table 2-26 Centerline Miles Delta Between DVMT and CFRPM 7

Centerline Miles	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	3	(22)	6	45	(2,150)	(2,119)
Flagler	0	(19)	13	26	(513)	(494)
Lake	0	(38)	53	47	(1,055)	(993)
Marion	(0)	(13)	18	192	(2,262)	(2,065)
Orange	10	251	(165)	38	(2,413)	(2,278)
Osceola	8	(46)	40	57	(583)	(525)
Polk	(0)	20	229	192	(2,573)	(2,132)
Seminole	1	32	(28)	77	(902)	(820)
Sumter	0	(7)	37	11	(450)	(408)
Volusia	(1)	(41)	39	137	(1,847)	(1,713)
Total	**22**	**116**	**242**	**822**	**(14,748)**	**(13,546)**

Sources: CFRPM 7; 2015 DVMT Report

Table 2-27 Centerline Miles %Delta Between DVMT and CFRPM 7

Centerline Miles	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	3%	-9%	4%	14%	-79%	-60%
Flagler	0%	-31%	21%	24%	-70%	-50%
Lake	0%	-27%	72%	10%	-64%	-42%
Marion	0%	-7%	14%	32%	-75%	-52%
Orange	6%	129%	-57%	6%	-72%	-49%
Osceola	10%	-28%	48%	26%	-60%	-34%
Polk	0%	8%	162%	34%	-76%	-48%
Seminole	3%	36%	-38%	44%	-71%	-50%
Sumter	0%	-12%	60%	6%	-63%	-39%
Volusia	-1%	-15%	27%	32%	-74%	-50%
Total	3%	7%	20%	23%	-72%	-49%

Sources: CFRPM 7; 2015 DVMT Report

3 Trip Generation

This chapter summarizes CFRPM 7 trip generation validation results and compares them to both nationally accepted benchmarks and CFRPM 6.2 trip generation outputs.

The trip generation benchmarks were developed from the FDOT's Model Calibration and Validation Standards Report (2008), which in turn was based on a variety of national sources, census data, household travel surveys, NHTS tabulations, and federal/state guidelines on modeling practice. The trip generation benchmarks were mainly based on historical demographic and socio-economic trends that are well recognized in the social science fields. It is important for these benchmarks to remain general guidelines: any value out of these ranges does not necessarily indicate a potential error in the model.

Table 3-1 Trip Generation Benchmarks (Applied to Each County)

Metric	Benchmark	
	Low	High
Relative comparison of trip rates, by county	None (reasonableness and logic check)	
Person trips per TAZ	NA	15,000
Person trips per person	3.3	4.0
Person trips per DU or HH	8.0	10.0
HBW person trips/employee	1.20	1.55
Relative difference between unbalanced attractions to productions (all purposes)	0–10%	50% under certain conditions
Percent of HBW trips relative to all other trips	12%	24%
Percent of HBSH trips relative to all other trips	10%	20%
Percent of HBSR trips relative to all other trips	9%	12%
Percent of HBSC trips relative to all other trips	5%	8%
Percent of HBO trips relative to all other trips	14%	28%
Percent of HBNW trips relative to all other trips	45%	60%
Percent of NHB trips relative to all other trips	20%	33%
Percent of EE trips relative to all other trips	4%	21%

Source: FDOT. 2008. Model Calibration and Validation Standards Report

Section 3.1 compares CFRPM 6.2 and CFRPM 7 trip generation estimates. The purpose of this comparison is to identify errors in the CFRPM 7 trip generation estimates. For example, CFRPM 7 used the new 2017 NHTS survey data for updated production and attraction rates. The comparison may provide insights on the reasonableness of CFRPM 7 rates.

3.1 Trip Rate Level Comparison

Trip generation estimates the magnitude of person trips for each TAZ. It is derived from socio-economic land use data and travel rates. Travel generation is calculated for productions—the number of trips created by a TAZ—and attractions, the number of trips drawn to a TAZ.

The trip generation benchmarks compare the trip rates with ranges experienced in other models around the country. Estimates should fall within these ranges. Should the estimates fall outside of these ranges, it may not necessarily mean there was an error or technical issue. Data specific to a local reason may justify the results. For example, retirement communities usually produce less work trips than other areas. Counties having significant retirement communities can, therefore, be expected to have fewer work trips, compared to other models around the country.

Trip rates were examined across a variety of categories and the relative proportion of different trip purposes. The trip production and attraction rates by different socio-economic category are described in the Model Description Report, Section 4.2 and Section 4.3, respectively.

Table 3-1 compares trip generation benchmarks with the trip generation estimates from CFRPM 6.2 and CFRPM 7. The purpose of this comparison is to check the compatibility between CFRPM 6.2 and CFRPM 7 trip generation estimates to identify any inconsistencies. The values obtained from both models were compared against these benchmark ranges. The tables in the following sections are color-coded to identify which counties in CFRPM 6.2 and CFRPM 7 meet the standard; the paragraph following each table describes how well CFRPM 7 performs against the benchmark. Percent difference, or %Delta[11], is defined as the relative difference between CFRPM 7 and CFRPM 6.2 estimates.

3.1.1 Person Trips Per Person

Table 3-2 shows the person trips per person, by county. This value was obtained by dividing the total number of trips produced in a county (i.e., HBW, HBSH, HBSR, HBSC, HBCU, HBO, and NHB) by the total population of that county. The values from this analysis indicate how many trips a person generally takes daily. The trip generation benchmarks show that a person is expected to take 3.3 to 4.0 person trips daily.

Table 3-2 Person Trips Per Person

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	2.51	3.63	1.12	44%
Flagler	2.26	3.10	0.84	37%

[11] $\%Delta = \frac{CFRPM\ 7 - CFRPM\ 6.2}{CFRPM\ 6.2} * 100\%$

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Indian River	2.68	3.22	0.54	20%
Lake	2.52	3.51	0.99	39%
Marion	2.39	3.36	0.97	41%
Orange	3.50	3.25	-0.26	-7%
Osceola	3.00	3.65	0.64	21%
Polk	2.02	3.15	1.13	56%
Seminole	2.96	3.41	0.46	15%
Sumter	2.13	3.47	1.35	63%
Volusia	2.62	3.50	0.88	34%
Region	2.77	3.38	0.61	22%

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK*

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

Estimates for person trip rates per person for seven counties meet the trip generation benchmarks. For the remaining four counties, person trip rates per person estimates are within 10% of the lower bound (3.3 person trips daily). The 2015 overall regional trip rate (person trips per household) in CFRPM 7 is 3.38, which matches well with the trip generation benchmarks of 3.3 to 4.0 person trips daily. The comparisons made in Table 3-2 show that the estimated person trip rates per person are consistent with the trip generation benchmarks.

3.1.2 Person Trips per Occupied Dwelling Unit

This analysis estimates the average number of person trips generated per occupied DU, by county (see Table 3-3) and the overall person trip generation pattern per occupied DU. The total number of trips includes HBW, HBSH, HBSR, HBSC, HBCU, HBO, and NHB trips and the occupied DU refers to the living unit. Based on the trip generation benchmarks, an occupied DU is expected to generate 8.0–10.0 person trips per day.

Table 3-3 Person Trips per Occupied Dwelling Unit

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	5.37	7.72	2.35	44%
Flagler	5.44	8.14	2.70	50%
Indian River	6.10	7.90	1.80	30%
Lake	5.69	7.70	2.01	35%
Marion	5.14	7.44	2.30	45%
Orange	8.68	9.79	1.11	13%
Osceola	7.63	9.95	2.32	30%
Polk	4.86	8.13	3.27	67%
Seminole	7.15	10.15	3.00	42%
Sumter	3.99	5.61	1.62	41%
Volusia	5.41	7.68	2.27	42%
Region	**6.39**	**8.48**	**2.09**	**33%**

Blue = Less than low benchmark; Red = Greater than high benchmark; Green = OK
Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

Estimated person trip rates per occupied DU for four counties meet the trip generation benchmarks of 8.0 to 10.0. For five counties, estimated person trip rates per occupied DU are within 10% of the lower bound (8 person trips daily per occupied DU). The low rate in Sumter County may be due to the small household size (2.04 persons). The rate in Seminole County is within 10% of the upper bound, which is probably due to local travel behavior. The estimated regional person trips per occupied DU is 8.48 in CFRPM 7, which matches well with the trip generation benchmark. The comparisons made in Table 3-3 show that the person trip rates per occupied DU from CFRPM 7 are generally consistent with the benchmarks.

3.1.3 HBW Attractions Per Job

The Home-Based Work (HBW) trips per job metric measures the number of HBW person trips generated by each job. Typically, this value is between 1.20 and 1.55, meaning that 100 jobs generate, on average, between 120 and 155 HBW person trips. Table 3-4 demonstrates the number of HBW attractions per job in each county and evaluates how they behave in a mixture of industrial, commercial, and service employment categories. The last row summarizes the regional level information. HBW attractions per job for all counties in the CFRPM 7 estimates meet the trip generation benchmarks.

Table 3-4 HBW Attractions per Job

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	1.11	1.33	0.22	20%
Flagler	1.78	1.34	-0.44	-25%
Indian River	1.19	1.42	0.23	19%
Lake	1.07	1.33	0.26	24%
Marion	1.12	1.35	0.23	21%
Orange	0.73	1.31	0.58	79%
Osceola	1.49	1.32	-0.17	-11%
Polk	0.96	1.38	0.42	44%
Seminole	0.94	1.35	0.41	44%
Sumter	1.02	1.32	0.30	29%
Volusia	1.16	1.33	0.17	15%
Region	**0.96**	**1.33**	**0.37**	**39%**

Blue = Less than low benchmark; Red = Greater than high benchmark; Green = OK
Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

3.1.4 Relative Difference of Unbalanced Attractions to Productions

Travel demand models balance the total number of home-based trip attractions to the total number of home-based productions by each purpose. It is valuable to review the ratio between unbalanced attractions and productions: a large difference might indicate problems with any of population estimates, employment estimates, production calculation, or attraction calculations.

Table 3-5 lists the estimated relative difference between unbalanced attractions to productions, by each trip purpose, in the entire region. The attractions and productions were model estimated based on different perspectives. For example, employment opportunities (e.g., industry, retail, or office activities) generally influence attractions. On the other hand, productions are influenced by mainly socio-demographic factors (e.g., household size, number of autos per HH). Therefore, this comparison evaluates the consistency between the attractions and productions in the region. The relative difference is calculated by dividing the difference between unbalanced productions and attractions by the productions and taking the absolute value. The relative difference between unbalanced attractions to productions is expected be 5% to 50%, based on trip generation benchmarks.

Table 3-5 Relative Difference Between Attractions (A) to Productions (P)

Trip Purpose	Production (P)	Attraction (A)	Ratio (A/P)	Delta |P-A|	Relative Difference*
HBW	2,731,123	2,328,505	0.85	402,618	15%
HBSH	2,176,458	5,092,743	2.34	2,916,285	134%
HBSR	1,764,257	2,762,253	1.57	994,996	57%
HBO	3,865,873	5,224,071	1.35	1,358,198	35%
HBSC	1,148,096	1,002,071	0.87	146,025	13%
HBCU	113,215	185,491	1.64	72,276	64%
NHB	3,988,397	4,535,476	1.14	547,079	14%
Total	**15,787,419**	**21,130,612**	**1.34**	**5,343,193**	**34%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK*

Source: CFRPM 7 'PANDA.DBF'

The relative difference between unbalanced attractions to productions for four of the seven trip purposes meets the trip generation benchmarks. For HBSH trips, the high relative difference is the result of the attractions being run twice: once for permanent residents and again for seasonal residents. The trip attraction equations do not have distinct variables for permanent and seasonal residents, so the process must be run twice, which more than doubles the HBSH relative difference.

3.1.5 Percent of HBW Trips Relative to All Other Trips

The percent trips, by purpose, measures whether some trip production or attraction purposes are disproportionate when compared to other similar models. An HBW trip indicates that either the origin or destination of the trip is at the home or work location. Table 3-6 presents the percentage of HBW trips in each county, calculated by dividing the number of HBW trips by the sum of all seven trip types (i.e., HBW, HBSH, HBSR, HBSC, HBCU, HBO, and NHB). The percentage of HBW trips produced in a county can be used to understand the overall HBW travel pattern and economic activity. The value of the percentage of HBW trips relative to all other trips is expected to be between 12% and 24%, based on trip generation benchmarks.

Table 3-6 Percent of HBW Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	18.93	17.82	-1.17	-6%
Flagler	18.83	16.37	-2.46	-13%
Indian River	18.73	18.05	-0.68	-4%
Lake	17.08	18.04	0.96	6%
Marion	18.06	16.85	-1.21	-7%
Orange	14.59	17.05	2.46	17%
Osceola	16.97	19.87	2.90	17%
Polk	20.52	17.75	-2.77	-14%
Seminole	17.92	20.86	2.94	16%
Sumter	15.66	10.22	-5.44	-35%
Volusia	17.90	16.06	-1.84	-10%
Region	**17.06**	**17.59**	**0.53**	**0%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK*

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

CFRPM 7 estimates for percentages of HBW trips relative to all other trips meets the trip generation benchmarks for 10 counties. The low value for Sumter County may be due to an exceptionally large retirement community in that county.

3.1.6 Percent of HBSH Trips Relative to All Other Trips

A Home Based Shopping (HBSH) trip indicates that either the origin or destination of the trip is at the home or shop location. The percentage of HBSH trips in a county can be used to understand the overall HBSH travel pattern and economic activity. Table 3-7 presents the percentage of HBSH trips in each county, calculated as the number of HBSH trips divided by the total number of trips. The value of the percentage of HBSH trips relative to all other trips is expected to be 10% to 20%, based on trip generation benchmarks.

Table 3-7 Percent of HBSH Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	11.02	14.17	3.15	29%
Flagler	13.67	14.36	0.69	5%
Indian River	11.79	14.02	2.23	19%
Lake	11.54	14.09	2.55	22%
Marion	11.56	14.35	2.79	24%
Orange	12.10	13.98	1.88	16%
Osceola	12.31	13.29	0.98	8%
Polk	13.47	13.77	0.30	2%
Seminole	9.85	12.79	2.94	30%
Sumter	13.48	17.39	3.91	29%
Volusia	10.72	14.72	4.00	37%
Region	**11.75**	**14.02**	**2.27**	**0%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The CFRPM 7 estimates for percentages of HBSH trips relative to all other trips meet the trip generation benchmarks.

3.1.7 Percent of HBSR Trips Relative to All Other Trips

A Home Based Social Recreational (HBSR) trip indicates that either the origin or destination of the trip is at the home or social/recreation location. Table 3-8 presents the percentage of HBSR trips in each county, calculated as the number of HBSR trips divided by the total number of trips. The value of the percentage of HBSR trips relative to all other trips is expected to be 9% to 12%, based on trip generation benchmarks.

Table 3-8 Percent of HBSR Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	6.77	10.43	3.66	54%
Flagler	10.20	11.08	0.88	9%
Indian River	8.84	10.78	1.94	22%
Lake	9.04	10.66	1.62	18%
Marion	8.10	11.09	2.99	37%
Orange	8.77	10.68	1.91	22%
Osceola	16.83	10.45	-6.38	-38%
Polk	10.73	10.44	-0.29	-3%
Seminole	7.84	9.68	1.84	23%
Sumter	8.62	12.89	4.27	50%
Volusia	11.57	11.77	0.20	2%
Region	**9.58**	**10.71**	**1.13**	**0%**

Blue = Less than low benchmark; Red = Greater than high benchmark; Green = OK
Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The CFRPM 7 estimates for percentages of HBSR trips relative to all other trips meet the trip generation benchmarks for 10 counties. The high value in Sumter County may be due to its large number of households with retirees.

3.1.8 Percent of HBSC Trips Relative to All Other Trips

A Home Based School (HBSC) trip indicates that either the origin or destination of the trip is at the home or school location. Table 3-9 presents the percentage of HBSC trips in each county, calculated as the number of HBSC trips divided by the total number of trips. School trips were generated based on the school enrollment from kindergarten to 12th grade. The value of the percentage of HBSC trips relative to all other trips is expected to be 5% to 8%, based on trip generation benchmarks.

Table 3-9 Percent of HBSC Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	0	5.51	5.51	NA
Flagler	0	6.39	6.39	NA
Indian River	0	6.26	6.26	NA
Lake	0	5.78	5.78	NA
Marion	0	5.58	5.58	NA
Orange	0	7.34	7.34	NA
Osceola	0	8.40	8.40	NA
Polk	0	7.01	7.01	NA
Seminole	0	6.61	6.61	NA
Sumter	0	3.04	3.04	NA
Volusia	0	5.27	5.27	NA
Region	**0**	**6.45**	**6.45**	**NA**

Blue = Less than low benchmark; Red = Greater than high benchmark; Green = OK
Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

CFRPM 6.2 does not estimate HBSC trips. The CFRPM 7 estimates for percentages of HBSC trips meet the trip generation benchmarks for eight counties. The low value in Sumter County may be due its large proportion of retired households. The two other counties are within 10% of the upper bound (8.4% for Osceola County and 8.01% for Seminole County). Overall, the percentages of HBSR trips are consistent with benchmarks.

3.1.9 HBO Trips Relative to All Other Trips

A Home-Based Social Other (HBO) trip indicates that either the origin or destination of the trip is at the home or another location not shown in other home-based trip purposes. Table 3-10 presents the percentage of HBO trips in each county, calculated as the number of HBO trips divided by the total number of trips. The value of the percentage of HBO trips relative to all other trips is expected to be 14% to 28%.

Table 3-10 Percent HBO Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	29.26	26.60	-2.66	-9%
Flagler	33.89	25.98	-7.91	-23%
Indian River	30.49	23.88	-6.61	-22%
Lake	30.01	24.96	-5.05	-17%
Marion	30.29	24.95	-5.34	-18%
Orange	25.03	27.31	2.28	9%
Osceola	29.78	27.24	-2.54	-9%
Polk	37.39	24.53	-12.86	-34%
Seminole	26.60	23.04	-3.56	-13%
Sumter	32.35	32.31	-0.04	0%
Volusia	27.05	26.87	-0.18	-1%
Region	**28.51**	**26.1**	**-2.41**	**0%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK*

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The CFRPM 7 estimates for percentages of HBO trips meet trip generation benchmarks for 10 counties. The high value in Sumter County may be due to a large proportion of retirement households.

3.1.10 HBNW Trips Relative to All Other Trips

A Home-Based Non-Work (HBNW) trip indicates that either the origin or destination of the trip is at the home or non-work location. Table 3-11 presents the percentage of HBNW trips in each county. The HBNW value includes HBSH, HBSR, HBSC, HBCU, and HBO trips. The percentage of HBNW trips is calculated as the number of HBNW trips divided by the total number of trips. The value of the percentage of HBO trips relative to all other trips is expected to be 45% to 60%, based on trip generation benchmarks.

Table 3-11 Percent of HBNW Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	47.05	56.72	9.67	20%
Flagler	57.76	57.81	0.05	0%

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Indian River	51.12	54.94	3.82	7%
Lake	50.60	55.49	4.89	10%
Marion	49.96	55.96	6.00	12%
Orange	45.90	59.31	13.41	29%
Osceola	58.92	59.38	0.46	1%
Polk	61.59	55.75	-5.84	-9%
Seminole	44.29	52.12	7.83	18%
Sumter	54.45	65.64	11.19	21%
Volusia	49.33	58.62	9.29	19%
Region	**49.84**	**57.28**	**7.44**	**0%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The CFRPM 7 estimates for percentages of HBNW trips relative to all other trips meet the trip generation benchmarks for 10 counties. The higher value in Sumter County may be due to a larger proportion of retired households.

3.1.11 NHB Trips Relative to All Other Trips

A Non-Home Based (NHB) trip indicates that either the origin or destination of the trip is at a non-home location. Table 3-12 presents the percentage of NHB trips in each county, calculated as the number of NHB trips divided by the total number of trips. The percentage of NHB trips relative to all other trips is expected to be 20% to 30%, based on trip generation benchmarks.

Table 3-12 Percent of NHB Trips Relative to All Other Trips

County	CFRPM 6.2*	CFRPM 7*	Delta	%Delta
Brevard	34.02	25.53	-8.49	-25%
Flagler	23.41	25.82	2.41	10%
Indian River	30.15	27.01	-3.14	-10%
Lake	32.33	26.48	-5.85	-18%
Marion	31.98	27.18	-5.80	-15%
Orange	39.51	23.64	-15.87	-40%
Osceola	24.12	20.75	-3.37	-14%
Polk	17.89	26.49	8.60	48%
Seminole	37.80	27.02	-10.78	-29%
Sumter	29.89	24.14	-5.75	-19%
Volusia	32.76	25.32	-7.44	-23%
Region	**33.10**	**25.12**	**-7.98**	**0%**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The CFRPM 7 estimates for NHB trips relative to all other trips meet trip generation benchmarks for all counties.

3.2 Trip Purpose

The balanced productions and attractions obtained in the trip generation step are compared to CFRPM 6.2 results at a county and regional level. The special visitor, resident, and external trips are also compared, for informational purposes only. The base year for CFRPM 6.2 is 2010 and 2015 for CFRPM 7. HBCU trips are included within HBO. Table 3-13 presents the number of trips produced in the entire region, by trip purpose.

Table 3-13 Comparisons of Trip Productions

Trip Purpose	CFRPM 6.2	CFRPM 7	Delta	%Delta
HBW	2,267,581	2,731,128	463,547	20%
HBSH	1,562,055	2,176,451	614,396	39%
HBSR	1,274,017	1,663,191	389,174	31%
HBSC	0	1,002,086	1,002,086	Inf
HBO (includes HBCU trips)	3,789,948	4,051,347	261,399	7%
NHB	4,400,537	3,900,328	-500,209	-11%
Total	**13,294,138**	**15,524,531**	**2,230,393**	**17%**

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

Table 3-14 presents the number of balanced attractions, by trip purpose.

Table 3-14 Comparison of Trip Attractions

Trip Purpose	CFRPM 6.2	CFRPM 7	Delta	%Delta
HBW	2,277,077	2,731,090	454,013	20%
HBSH	1,576,891	2,176,528	599,637	38%
HBSR	1,286,116	1,759,500	473,384	37%
HBSC	0	1,002,070	1,002,070	Inf
HBO (includes HBCU trips)	3,793,142	4,051,368	258,226	7%
NHB	4,521,074	3,974,397	-546,677	-12%
Total	**13,454,300**	**15,694,953**	**2,240,653**	**17%**

Sources: CFRPM 6.2 'GEN_UBPANDA DBF'; CFRPM 7 'PANDA.DBF'

The Special Purpose trips include visitor, resident, and external trips to the Orlando International Airport (OIA), Orange County Convention Center (OCC), Universal Orlando (UNI), Sea World (SEA), Disney World (DIS), Kennedy Space Center (KSC), and Port Canaveral (PC). Visitor and resident trips were updated to reflect 2015 attendance. External trips were updated based on 2015 traffic counts. During this update, an error was identified—and corrected—in how external trips were produced in earlier versions of CFRPM. Table 3-15 presents the number of Special Purpose trips.

Table 3-15 Special Purpose Trips

Special Trip Type	CFRPM 6.2	CFRPM 7	Delta	%Delta
OIA Visitor	72,166	74,981	2,815	4%
OIA Resident	27,679	36,568	8,889	32%
OIA External	3,397	2,300	-1,097	-32%
OCC Visitor	4,375	5,991	1,616	37%
OCC Resident	4,848	6,463	1,615	33%
OCC External	3,378	148	-3,230	-96%
UNI Visitor	81,130	84,423	3,293	4%
UNI Resident	10,996	14,289	3,293	30%
UNI External	8,569	1,984	-6,585	-77%
SEA Visitor	26,516	28,612	2,096	8%
SEA Resident	6,375	8,470	2,095	33%
SEA External	4,651	458	-4,193	-90%
DIS Visitor	310,120	313,794	3,674	1%
DIS Resident	18,546	22,218	3,672	20%
DIS External	10,997	3,669	-7,328	-67%
KSC Visitor	3,952	7,694	3,742	95%
KSC Resident	587	1,536	949	162%
KSC External	551	85	-466	-85%
PC Visitor	5,654	11,431	5,777	102%
PC Resident	5,723	11,535	5,812	102%
PC External	3,958	211	-3,747	-95%

Sources: CFRPM 6.2; CFRPM 7

4 Trip Distribution

Trip distribution is the process of linking trip productions to attractions. The distribution results are compared to observed values and benchmarks across four parameters:

1. average trip lengths
2. the percentage of trips that occur within a single TAZ (i.e., intrazonal trips)
3. county-to-county flows for the main trip purposes
4. county-to-attraction flows for each of the special purposes

CFRPM 7 uses a gravity model to distribute trips between production and attraction zones for all purposes, except for External to External (EE) trips. The gravity model includes friction factors (representing travel impedance between zones) and K-factors (often referred as socio-economic adjustment factors). The gravity model was calibrated to trip length frequency distributions. Issues raised by initial distribution results were resolved by investigating issues with the roadway network, production equations, or attraction equations. Finally, K-factors were used to fine-tune county-to-county movements.

4.1 Average Trip Lengths

Benchmarks for average trip length are used to assess the CFRPM 7's ability to reflect Central Florida travel patterns. The benchmarks were taken from FDOT's Model Calibration and Validation Standards Report (2008). They are based on census data and household travel surveys from other cities. These benchmarks are general guidelines; therefore, values outside of these ranges do not necessarily indicate errors. The results from both the peak period and off-peak period distributions are compared to the benchmarks.

Table 4-1 Average Trip Length Benchmarks

Metric	Benchmark (%)	
	Low	High
HBW average trip length (minutes)	12	35
HBSH average trip length (minutes)	9	19
HBSR average trip length (minutes)	11	19
HBSC average trip length (minutes)	7	16
HBO average trip length (minutes)	8	20
NHB average trip length (minutes)	6	19
IE average trip length (minutes)	26	58

Source: FDOT. 2008. Model Calibration and Validation Standards Report

Table 4-2 lists the average trip length (in minutes), by trip purpose, for the peak period. Terminal time/intrazonal travel time is included within these trip lengths. For more details, see Section 5.3 of the Model Description Report. The HBW and NHB average trip lengths are within the benchmark values. The average trip length, in minutes, for HBSH, HBSR, and HBO trips are slightly longer (less than approximately 10%) than the upper benchmark value. Overall, these results indicate that model estimates for average trip lengths are consistent with models around the country.

Table 4-2 Estimated Average Trip Length, by Trip Purpose (Peak Period)

Trip Purpose	Avg. Trip Length (minutes)	Benchmark (%)	
		Low	High
HBW	28.40	12	35
HBSH	20.28	9	19
HBSR	20.91	11	19
HBO	20.41	8	20
NHB	17.31	6	19

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Source: CFRPM 7

For the off-peak period (see Table 4-3), the estimated average trip length for HBW, HBSH, HBO, and NHB are within the benchmark values. The estimated average trip length for HBSR is slightly higher (less than 5%) than the high-end benchmark.

Table 4-3 Estimated Average Trip Length (Off-Peak Period)

Trip Purpose	Avg. Trip Length (minutes)	Benchmark (%)	
		Low	High
HBW	18.20	9	19
HBSH	19.41	11	19
HBSR	16.63	8	20
HBO	17.43	6	19
NHB	18.20	9	19

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Source: CFRPM 7

Overall, these results indicate that estimates for the average trip length are consistent with models around the country. This is an encouraging result because the gravity model was calibrated to Tampa Bay Regional Planning Model (TBRPM) trip lengths (locally observed data were not available). However, the non-work average trip lengths are near or exceed the high-end benchmarks. One possible explanation is that CFRPM 7 may have too many interzonal trips being assigned to the network, and not enough intrazonal trips.

4.2 Percent of Intrazonal Trips

Intrazonal trips are short trips where both production and attraction are in the same zone. Although intrazonal trips do not appear in traffic volumes, they are important to correctly estimate vehicle-miles of travel and emissions. Intrazonal travel times were calculated using 50% of the minimum non-zero time from the origin zone to any other (non-external) zone. The benchmarks in Table 4-4 were developed from FDOT's Model Calibration and Validation Standards Report (2008).

Table 4-4 Intrazonal Benchmarks

Metric	Benchmark (%)	
	Low	High
Percent of intrazonal HBW trips relative to all HBW trips	1	4
Percent of intrazonal HBSH trips relative to all HBSH trips	3	9
Percent of intrazonal HBSR trips relative to all HBSR trips	4	10
Percent of intrazonal HBSC trips relative to all HBSC trips	10	12
Percent of intrazonal HBO trips relative to all HBO trips	3	7
Percent of intrazonal NHB trips relative to all NHB trips	5	9

Source: FDOT. 2008. Model Calibration and Validation Standards Report

Table 4-5 lists the estimated percentage of intrazonal trips and the corresponding benchmark. For the peak period, only the estimated percentage of intrazonal HBSH trips fall within the benchmark range. The estimated percentages of intrazonal trips for other purposes are much lower than benchmark ranges, confirming the observation in Section 4.1: CFRPM 7 estimates generally have too few intrazonal trips and therefore assigns too many interzonal trips.

Table 4-5 Estimated Intrazonal Trips (Peak Period)

Trip Purpose	Percent of Intrazonal Trips	Benchmark (%)	
		Low	High
HBW	0.43	1	4
HBSH	1.94	1	9
HBSR	3.22	4	10
HBO	2.26	3	7
NHB	2.15	5	9
Total	**1.87**	**3**	**5**

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK*

Source: CFRPM 7

Table 4-6 lists the percentage of intrazonal trips related to all trips in the off-peak period. The results are similar to the peak results.

Combined, these results might be partially explained by the new zone system, which creates smaller zones in most of the model area. Smaller TAZ sizes would decrease the percentage of intrazonal trips. Using the TBRPM trip lengths may have also contributed to this result.

Table 4-6 Estimated Intrazonal Trips (Off-Peak Period)

Trip Purpose	Percent of Intrazonal Trips	Benchmark (%)	
		Low	High
HBW	0.35	1	4
HBSH	1.78	1	9
HBSR	3.52	4	10
HBO	3.07	3	7
NHB	1.53	5	9
Total	2.10	3	5

**Blue* = Less than low benchmark; *Red* = Greater than high benchmark; *Green* = OK

Source: CFRPM 7

4.3 Average Trip Length and Percent of Intrazonal Trips

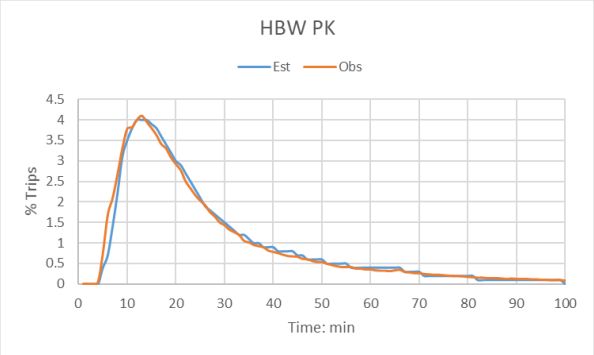
This section compares the observed and estimated trip length frequency distribution (TLFD) curves for person trips and vehicle trips. The estimated TLFD curves are calibrated using friction factor adjustments; therefore, in many situations, the observed and estimated curves will match closely. Significant differences may indicate issues with the production and attraction equations or ZDATA.

The 2017 NHTS dataset did not have enough records or location data needed for developing the observed TLFD curves. Consequently, friction factors were calibrated using TLFD from the TBRPM as an observed TLFD. After running CFRPM 7 with the calibrated friction factors, an estimated TLFD ("Est") and observed TLFD ("Obs") are compared, as shown in Figure 4-1.

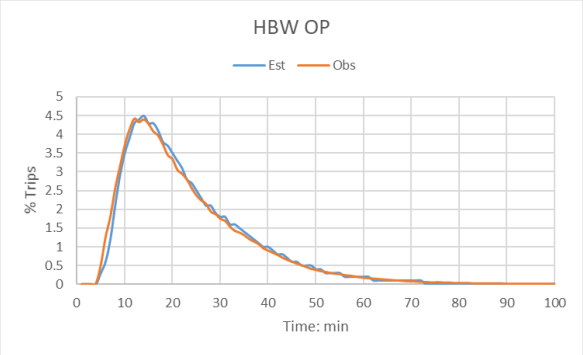
The estimated TLFD curves have a good fit with the observed curves for HBW, HBSR, HBSH, HBSC, HBCU, HBO, and NHB trip purposes. Because separate friction factors are used for the medium truck and heavy truck, they are not compared. Figure 4-1 (o) and (p) show discrepancies in TLFD for Internal to External (IE) trips due to differences in geography and land use between Tampa Bay and Central Florida.

Figure 4-1 Comparison of Estimated and Observed TLFD

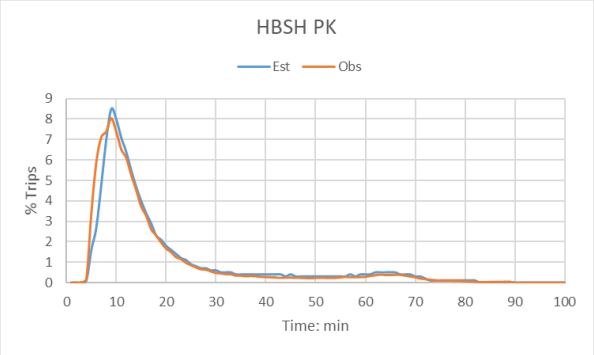
(a) HBW peak



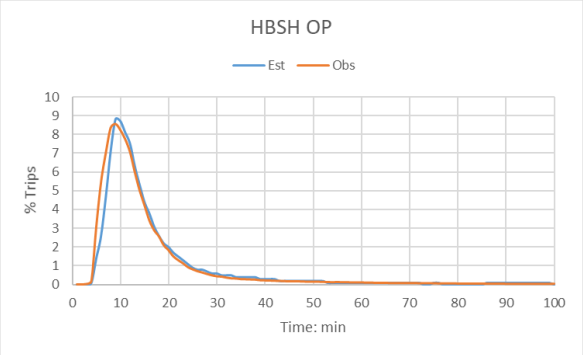
(b) HBW off-peak



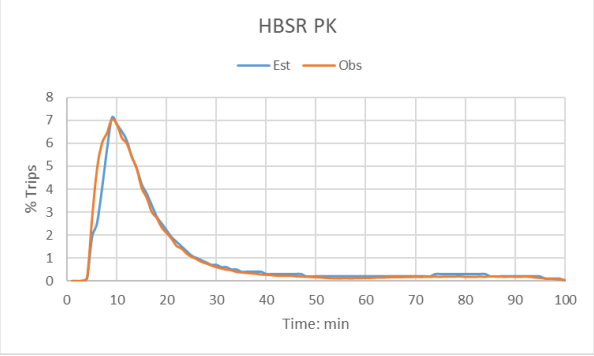
(c) HBSH peak



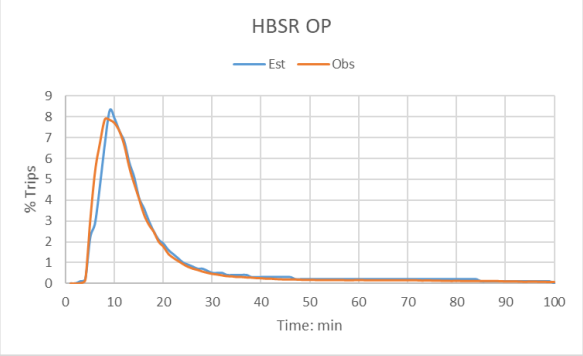
(d) HBSH off-peak



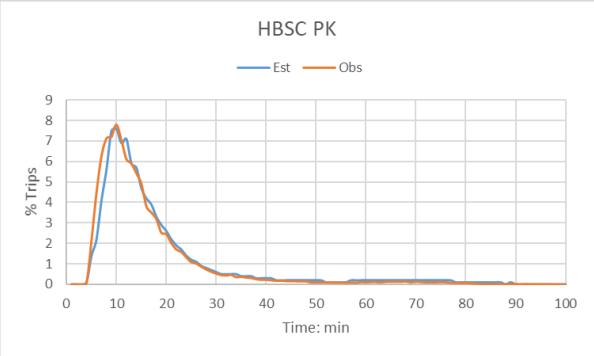
(e) HBSR peak



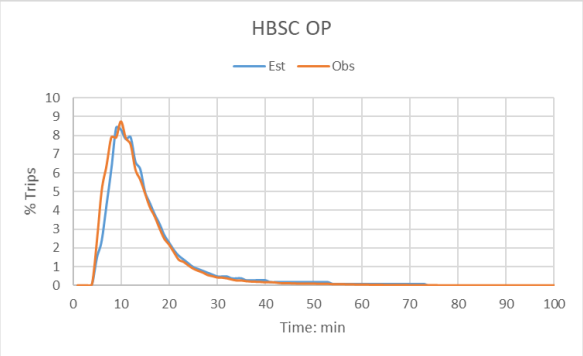
(f) HBSR off-peak



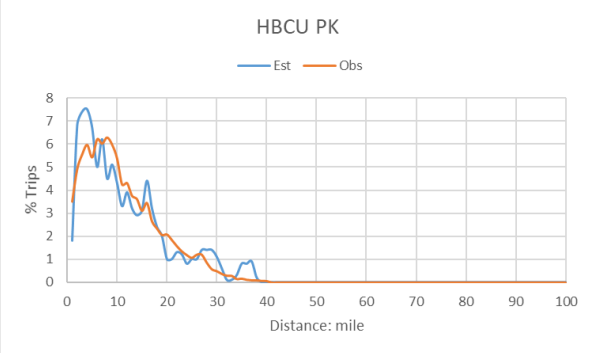
(g) HBSC peak



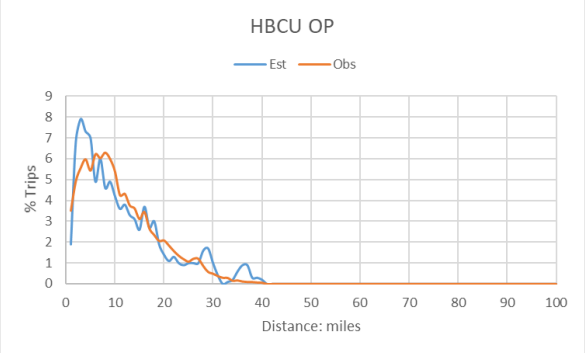
(h) HBSC off-peak



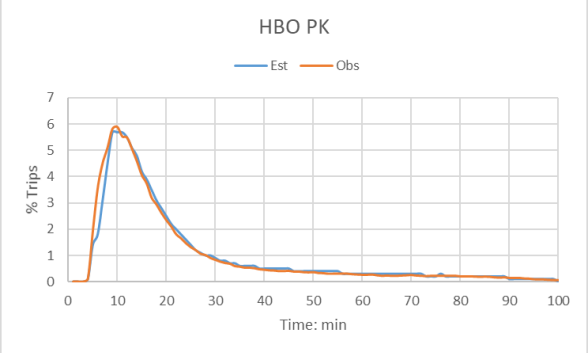
(i) HBCU peak



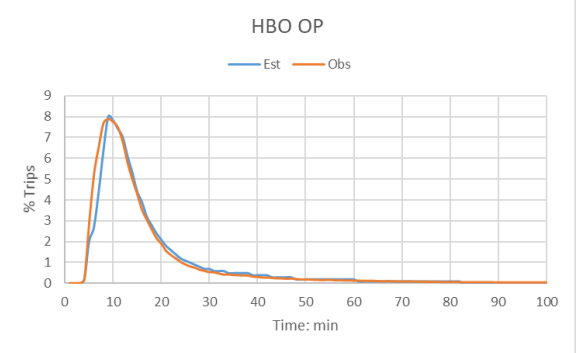
(j) HBCU off-peak



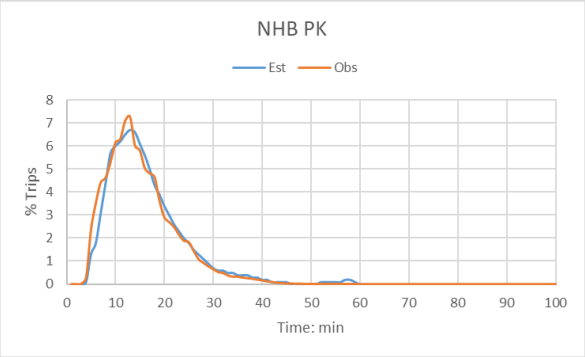
(k) HBO peak



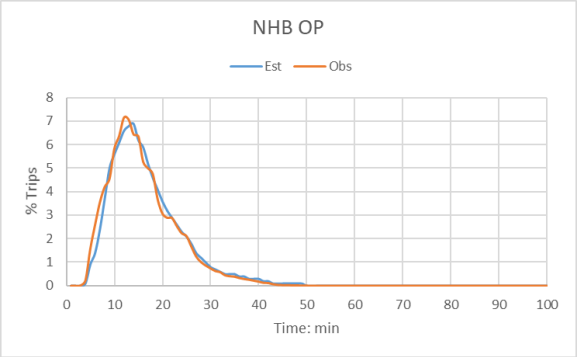
(l) HBO off-peak



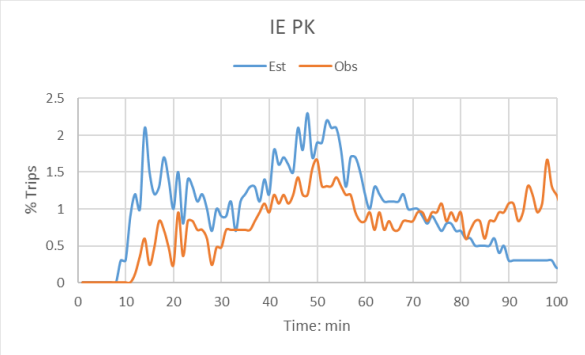
(m) NHB peak



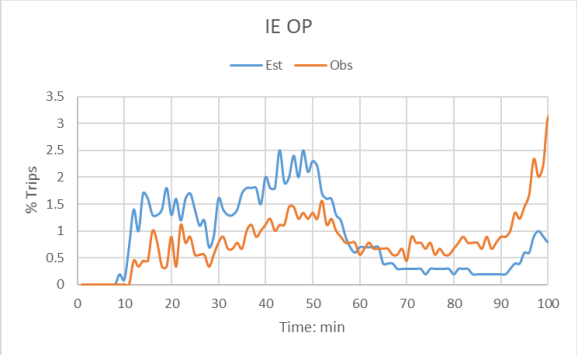
(n) NHB off-peak



(o) IE peak



(p) IE off-peak



4.4 County-to-County Flows

County-to-county travel patterns, or flows, strongly influence the amount of traffic on major arterials and limited-access roadways. In this section, estimated flows are compared to observed data from the 2015 American Community Survey (ACS) and 2009 National Household Travel Survey (NHTS) data and used to evaluate the estimated county-to-county flows for different trip purposes. The ACS data were used to verify the HBW county-to-county flows, while the NHTS data were used to verify the HBSH, HBSR, HBO, and NHB flows. The 2009 NHTS data were used because they have more records than the 2017 NHTS data and also contain the trip start and end location data. For each trip purpose, the observed county-to-county trip table was adjusted using a procedure called iterative proportional fitting (IPF) to match the total productions and attractions for each county. All data compared in this report are in the production/attraction (P/A) format.

Although estimated county-to-county flows should reasonably reflect the observed values, no standard benchmarks exist to confirm this hypothesis. Section 4.4.1–4.4.6 provide the county-to-county person trip flow comparisons, Section 4.4.7–4.4.9 provide alternate travel pattern comparisons for person trips, and Section 4.4.10–4.4.12 provide information on the vehicle trip flow comparisons.

4.4.1 County-to-County Flow Comparison for HBW Trips

The tables in this section compare the county-to-county flows for HBW trips between the ACS 2015 data and estimates: Table 4-7 shows results for ACS 2015 alone, Table 4-8 for CFRPM 7 alone, and Table 4-9 for the delta between ACS 2015 and CFRPM 7. In Table 4-10, values between 10% and 30% are colored olive and values greater than 30% are colored red. Table 4-11 summarizes the observed trips by error rate.

Table 4-7 HBW Trips from ACS 2015

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	325,818	148	907	125	12	22,174	1,162	174	2,212	0	2,464	355,196
Flagler	96	31,473	0	78	29	441	61	0	421	0	18,362	50,961
Indian River	4,985	0	20,316	0	0	1,630	48	26	164	0	99	27,268
Lake	154	161	0	121,746	947	57,823	3,751	723	6,191	5,126	2,807	199,429
Marion	0	169	0	22,883	147,503	4,124	351	120	599	9,972	1,060	186,781
Orange	1,522	67	6	7,364	161	604,014	11,842	876	38,855	184	2,613	667,504
Osceola	763	6	19	1,953	120	131,526	84,386	2,751	4,226	0	204	225,954
Polk	267	0	15	3,673	71	75,511	18,960	261,459	1,003	132	241	361,332
Seminole	680	58	3	1,409	34	137,227	941	179	171,928	229	5,463	318,151
Sumter	26	0	0	10,687	962	1,538	120	125	362	23,976	21	37,817
Volusia	846	1,850	0	1,258	105	17,475	232	147	23,714	16	234,966	280,609
Total	335,157	33,932	21,266	171,176	149,944	1,053,483	121,854	266,580	249,675	39,635	268,300	2,711,002

Source: ACS 2015

Table 4-8 HBW Trips from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	320,783	137	858	53	0	22,887	2,662	1	4,516	0	3,299	355,197
Flagler	80	29,964	0	101	4	312	0	0	511	2	19,988	50,963
Indian River	6,052	2	20,298	2	0	504	253	7	39	0	113	27,268
Lake	38	147	0	114,160	2,179	57,825	3,991	1,435	9,320	6,607	3,729	199,430
Marion	2	102	0	22,827	144,927	4,579	84	4	433	11,186	2,636	186,780
Orange	3,027	11	2	9,054	35	598,053	13,190	777	39,688	216	3,450	667,504
Osceola	1,948	0	30	2,521	2	127,759	81,320	8,099	4,077	31	169	225,955
Polk	108	0	77	7,355	20	76,953	19,051	256,197	1,238	289	44	361,332
Seminole	1,246	69	0	2,712	2	139,907	1,118	11	166,341	20	6,726	318,151
Sumter	0	0	0	10,036	2,735	3,436	92	51	159	21,259	48	37,816
Volusia	1,873	3,501	0	2,355	39	21,269	94	0	23,355	23	228,098	280,608
Total	335,157	33,933	21,264	171,177	149,944	1,053,484	121,855	266,581	249,676	39,634	268,298	2,711,004

Source: CFRPM 7

Table 4-9 Delta (ACS 2015 vs. CFRPM 7) for HBW Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	-5,035	-11	-49	-72	-12	713	1,500	-173	2,304	0	835	1
Flagler	-16	-1,509	0	23	-25	-129	-61	0	90	2	1,626	2
Indian River	1,067	2	-18	2	0	-1,126	205	-19	-125	0	14	0
Lake	-116	-14	0	-7,586	1,232	2	240	712	3,129	1,481	922	1
Marion	2	-67	0	-56	-2,576	455	-267	-116	-166	1,214	1,576	-1
Orange	1,505	-56	-4	1,690	-126	-5,961	1,348	-99	833	32	837	0
Osceola	1,185	-6	11	568	-118	-3,767	-3,066	5,348	-149	31	-35	1
Polk	-159	0	62	3,682	-51	1,442	91	-5,262	235	157	-197	0
Seminole	566	11	-3	1,303	-32	2,680	177	-168	-5,587	-209	1,263	0
Sumter	-26	0	0	-651	1,773	1,898	-28	-74	-203	-2,717	27	-1
Volusia	1,027	1,651	0	1,097	-66	3,794	-138	-147	-359	7	-6,868	-1
Total	0	1	-2	1	0	1	1	1	1	-1	-2	2

Source: CFRPM 7; ACS 2015

Table 4-10 %Delta for HBW Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	-2%	-7%	-5%	-58%	-100%	3%	129%	-100%	104%	100%	34%
Flagler	-17%	-5%	100%	30%	-85%	-29%	-100%	100%	21%	100%	9%
Indian River	21%	100%	0%	100%	100%	-69%	428%	-74%	-76%	100%	14%
Lake	-76%	-8%	100%	-6%	130%	0%	6%	98%	51%	29%	33%
Marion	100%	-39%	100%	0%	-2%	11%	-76%	-97%	-28%	12%	149%
Orange	99%	-84%	-68%	23%	-78%	-1%	11%	-11%	2%	18%	32%
Osceola	155%	-99%	55%	29%	-98%	-3%	-4%	194%	-4%	100%	-17%
Polk	-60%	100%	413%	100%	-71%	2%	0%	-2%	23%	119%	-82%
Seminole	83%	19%	-95%	92%	-94%	2%	19%	-94%	-3%	-91%	23%
Sumter	-99%	100%	100%	-6%	184%	123%	-23%	-59%	-56%	-11%	126%
Volusia	121%	89%	100%	87%	-63%	22%	-60%	-100%	-2%	46%	-3%

**Red* = Greater than 30%; *Green* = 10–30%*

Source: CFRPM 7; ACS 2015

Table 4-11 Breakdown of HBW Flow Matrix Errors

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	26	21%	2,570,524	95%
10–30%	23	19%	97,400	4%
> 30%	72	60%	43,078	2%

Source: CFRPM 7; ACS 2015

About 95% of the HBW trips have an error of less than 10%. This indicates that the estimated county-to-county flows are generally consistent with the corresponding observed flows for HBW trips.

4.4.2 County-to-County Flow Comparison for HBSH Trips

The tables in this section compare the county-to-county flows for HBSH trips between the 2009 NHTS data and estimates: Table 4-12 shows results for 2009 NHTS alone, Table 4-13 for CFRPM 7 alone, and Table 4-14 for the delta between 2009 NHTS and CFRPM 7. In Table 4-15, values between 0% and 30% are colored olive and values greater than 30% are colored red. Table 4-16 summarizes the observed trips by error rate.

Table 4-12 HBSH Trips from 2009 NHTS

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	253,505	4	8,920	9	8	18,219	23	54	3,788	5	8	284,543
Flagler	39	30,090	129	32	27	509	82	193	208	19	13,482	44,810
Indian River	256	1	20,990	3	3	55	9	21	22	2	3	21,365
Lake	16	5	52	125,008	1,330	13,093	15,155	79	85	959	503	156,285
Marion	12	4	38	4,175	126,159	27,089	24	57	62	2,217	9	159,846
Orange	1	0	4	0	0	512,675	3	1,199	35,086	1	1	548,970
Osceola	6	2	20	0	0	79,116	72,339	30	32	3	5	151,553
Polk	3	1	9	348	0	809	8,038	272,480	14	1	2	281,705
Seminole	2	1	7	0	150	37,688	4	10	157,574	1	2	195,439
Sumter	23	8	76	12,055	3,317	303	49	23,408	124	25,203	599	65,165
Volusia	9	1,174	29	7	6	28,088	19	43	25,308	4	203,060	257,747
Total	253,872	31,290	30,274	141,637	131,000	717,644	95,745	297,574	222,303	28,415	217,674	2,167,428

Source: 2009 NHTS

Table 4-13 HBSH Trips from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	253,264	0	9,128	1	0	16,137	561	612	4,561	0	279	284,543
Flagler	3	30,585	0	8	0	2,378	28	0	1,911	0	9,896	44,810
Indian River	196	0	21,130	0	0	14	19	6	0	0	0	21,364
Lake	0	5	0	116,814	552	22,194	12,559	52	181	974	2,953	156,285
Marion	0	15	0	3,715	127,154	21,521	144	1,815	1,166	2,506	1,810	159,845
Orange	64	0	0	917	0	516,343	6	1,753	29,881	0	7	548,970
Osceola	40	0	11	424	0	70,752	78,096	1,929	301	0	0	151,553
Polk	0	0	1	1,075	0	682	3,896	276,021	30	0	0	281,705
Seminole	4	0	0	3	0	41,762	26	9	153,525	0	111	195,439
Sumter	0	0	0	18,581	3,292	1,632	362	15,323	1,009	24,937	29	65,165
Volusia	302	684	4	99	0	24,229	48	55	29,738	0	202,588	257,746
Total	253,872	31,289	30,275	141,637	130,999	717,644	95,745	297,574	222,303	28,417	217,672	2,167,426

Source: CFRPM 7

Table 4-14 Delta (2009 NHTS vs. CFRPM 7) for HBSH Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	-241	-4	208	-8	-8	-2,082	538	558	773	-5	271	0
Flagler	-36	495	-129	-24	-26	1,869	-54	-193	1,703	-19	-3,586	0
Indian River	-60	-1	140	-3	-3	-41	10	-15	-22	-2	-3	0
Lake	-16	0	-52	-8,194	-778	9,101	-2,596	-27	96	15	2,450	0
Marion	-12	11	-38	-460	995	-5,568	120	1,758	1,104	289	1,801	-1
Orange	63	0	-4	917	0	3,668	3	554	-5,205	-1	6	0
Osceola	34	-2	-9	424	0	-8,364	5,757	1,899	269	-3	-5	0
Polk	-3	-1	-8	727	0	-127	-4,142	3,541	16	-1	-2	0
Seminole	2	-1	-7	3	-150	4,074	22	-1	-4,049	-1	109	0
Sumter	-23	-8	-76	6,526	-25	1,329	313	-8,085	885	-266	-570	0
Volusia	293	-490	-25	92	-6	-3,859	29	12	4,430	-4	-472	0
Total	0	-1	1	0	-1	0	0	0	0	2	-2	-2

Sources: CFRPM 7; 2009 NHTS

Table 4-15 %Delta for HBSH Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	0%	-94%	2%	-93%	-100%	-11%	2,340%	1,033%	20%	-100%	3,388%
Flagler	-92%	2%	-100%	-75%	-98%	367%	-65%	-100%	819%	-100%	-27%
Indian River	-24%	-100%	1%	-100%	-100%	-74%	108%	-73%	-99%	-100%	-100%
Lake	-99%	6%	-100%	-7%	-58%	70%	-17%	-34%	113%	2%	487%
Marion	-100%	279%	-100%	-11%	1%	-21%	498%	3,084%	1,780%	13%	20,009%
Orange	6,311%	100%	-99%	100%	100%	1%	111%	46%	-15%	-100%	553%
Osceola	567%	-100%	-43%	100%	100%	-11%	8%	6,330%	841%	-100%	-96%
Polk	-100%	-100%	-88%	209%	100%	-16%	-52%	1%	115%	-100%	-98%
Seminole	83%	-100%	-100%	100%	-100%	11%	557%	-12%	-3%	-100%	5,428%
Sumter	-100%	-100%	-100%	54%	-1%	439%	639%	-35%	714%	-1%	-95%
Volusia	3,253%	-42%	-86%	1,313%	-99%	-14%	151%	29%	18%	-100%	0%

**Red* = Greater than 30%; Green = 10–30%*

Sources: CFRPM 7; 2009 NHTS

Table 4-16 Breakdown of HBSH Flow Matrix Errors

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	15	12%	1,812,284	84%
10–30%	16	13%	290,529	13%
> 30%	90	74%	64,615	3%

Sources: CFRPM 7; 2009 NHTS

About 85% of the HBSH trips are have an error of less than 10%. Another 13% have an error between 10% and 30%, compared to the observed value. These results indicate that the estimated flows are generally consistent with the observed flows.

4.4.3 County-to-County Flow Comparison for HBSR Trips

The tables in this section compare the county-to-county flows for HBSR trips between the 2009 NHTS data and estimates: Table 4-17 shows results for 2009 NHTS alone, Table 4-18 for CFRPM 7 alone, and Table 4-19 for the delta between 2009 NHTS and CFRPM 7. In Table 4-20, values between 10% and 30% are colored olive and values greater than 30% are colored red. Table 4-21 summarizes the observed trips by error rate.

Table 4-17 HBSR Trips from 2009 NHTS

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	200,126	3	1,798	1,090	16	2,967	2	2	37	21	16	206,078
Flagler	81	27,585	212	127	87	4,156	9	13	207	115	1,308	33,900
Indian River	3,454	1	12,711	7	5	13	0	1	11	6	5	16,214
Lake	13	2	34	99,436	14	14,589	1	433	34	1,961	14	116,531
Marion	415	2	21	6,283	112,185	23	1	100	21	2,901	9	121,961
Orange	5,108	1	11	6	4	401,050	24	1	8,450	6	5	414,666
Osceola	369	70	966	580	399	1,072	90,169	21,979	945	526	405	117,480
Polk	63	12	164	99	68	11,519	669	180,503	18,059	89	69	211,314
Seminole	6	1	17	10	7	32,551	1	1	112,157	9	266	145,026
Sumter	6	1	17	10,361	234	19	1	1	16	36,995	243	47,894
Volusia	3,054	816	28	478	11	12,526	1	2	2,455	15	182,752	202,138
Total	212,695	28,494	15,979	118,477	113,030	480,485	90,878	203,036	142,392	42,644	185,092	1,633,202

Source: 2009 NHTS

Table 4-18 HBSR Trips from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	196,157	94	2,183	311	4	2,953	852	187	1,820	0	1,516	206,077
Flagler	685	25,719	0	567	351	1,618	2	0	1,311	12	3,633	33,899
Indian River	2,531	0	13,286	0	0	214	88	51	25	0	19	16,213
Lake	439	111	0	95,317	12	14,221	1,957	273	2	2,062	2,140	116,533
Marion	5	93	0	4,780	108,533	3,327	125	170	594	3,371	962	121,960
Orange	5,316	84	133	2	1,452	396,016	2	0	8,568	640	2,454	414,665
Osceola	177	3	211	3,489	471	1,108	85,667	22,036	3,146	334	836	117,479
Polk	560	0	95	46	275	13,650	706	178,103	17,384	350	145	211,314
Seminole	1,386	74	24	1,461	189	32,503	440	721	105,767	100	2,361	145,025
Sumter	0	6	0	8,830	358	1	465	1,247	1,039	35,570	379	47,895
Volusia	5,440	2,310	45	3,676	1,387	14,875	574	246	2,734	204	170,646	202,139
Total	212,696	28,493	15,978	118,478	113,032	480,485	90,877	203,035	142,390	42,644	185,091	1,633,199

Source: CFRPM 7

Table 4-19 Delta (2009 NHTS vs. CFRPM 7) for HBSR Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	-3,969	91	385	-779	-12	-14	850	185	1,783	-21	1,500	-1
Flagler	604	-1,866	-212	440	264	-2,538	-7	-13	1,104	-103	2,325	-1
Indian River	-923	-1	575	-7	-5	201	88	50	14	-6	14	-1
Lake	426	109	-34	-4,119	-2	-368	1,956	-160	-32	101	2,126	2
Marion	-410	91	-21	-1,503	-3,652	3,304	124	70	573	470	953	-1
Orange	208	83	122	-4	1,448	-5,034	-22	-1	118	634	2,449	-1
Osceola	-192	-67	-755	2,909	72	36	-4,502	57	2,201	-192	431	-1
Polk	497	-12	-69	-53	207	2,131	37	-2,400	-675	261	76	0
Seminole	1,380	73	7	1,451	182	-48	439	720	-6,390	91	2,095	-1
Sumter	-6	5	-17	-1,531	124	-18	464	1,246	1,023	-1,425	136	1
Volusia	2,386	1,494	17	3,198	1,376	2,349	573	244	279	189	-12,106	1
Total	1	-1	-1	1	2	0	-1	-1	-2	0	-1	-3

Sources: CFRPM 7; 2009 NHTS

Table 4-20 %Delta for HBSR Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	-2%	3,033%	21%	-71%	-75%	0%	42,488%	9,253%	4,818%	-100%	9,374%
Flagler	746%	-7%	-100%	347%	303%	-61%	-82%	-100%	533%	-90%	178%
Indian River	-27%	-100%	5%	-100%	-100%	1,543%	100%	5,009%	129%	-100%	281%
Lake	3,273%	5,459%	-100%	-4%	-14%	-3%	195,551%	-37%	-93%	5%	15,184%
Marion	-99%	4,529%	-100%	-24%	-3%	14,365%	12,371%	70%	2,726%	16%	10,588%
Orange	4%	8,281%	1,107%	-73%	36,188%	-1%	-90%	-75%	1%	10,571%	48,979%
Osceola	-52%	-96%	-78%	502%	18%	3%	-5%	0%	233%	-36%	106%
Polk	789%	-100%	-42%	-54%	304%	18%	6%	-1%	-4%	293%	111%
Seminole	22,996%	7,299%	41%	14,513%	2,602%	0%	43,874%	71,955%	-6%	1,016%	788%
Sumter	-100%	473%	-100%	-15%	53%	-94%	46,443%	124,632%	6,391%	-4%	56%
Volusia	78%	183%	62%	669%	12,513%	19%	57,336%	12,203%	11%	1,259%	-7%

**Red* = Greater than 30%; *Green* = 10–30%*

Sources: CFRPM 7; 2009 NHTS

Table 4-21 Breakdown of HBSR Flow Matrix Errors

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	21	17%	1,563,074	96%
10–30%	10	8%	51,710	3%
> 30%	90	74%	18,418	1%

Sources: CFRPM 7; 2009 NHTS

Over 96% of the HBSR trips have an error of less than 10%. These results indicate that the estimated flows are consistent with the observed flows.

4.4.4 County-to-County Flow Comparison for HBO Trips

The tables in this section compare the county-to-county flows for HBO trips between the 2009 NHTS data and estimates: Table 4-22 shows results for 2009 NHTS alone, Table 4-23 for CFRPM 7 alone, and Table 4-24 for the delta between 2009 NHTS and CFRPM 7. In Table 4-25, values between 10% and 30% are colored olive and values greater than 30% are colored red. Table 4-26 summarizes the observed trips by error rate.

Table 4-22 HBO Trips from 2009 NHTS

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	623,318	2	2,722	13	19	18,708	8	7	608	12	8	645,425
Flagler	151	86,176	51	112	159	147	71	63	246	102	13,629	100,907
Indian River	194	20	44,312	143	204	189	91	80	315	130	92	45,770
Lake	42	4	14	286,288	45	33,746	2,110	3,688	69	15,190	20	341,216
Marion	14	1	5	13,464	316,840	14	7	6	24	9,427	7	339,809
Orange	8,172	2	8	4,103	24	1,312,126	748	9	34,589	15	11	1,359,807
Osceola	48	5	16	36	51	82,613	305,729	7,265	10,380	33	23	406,199
Polk	43	4	14	11,482	45	8,594	1,323	622,198	70	29	21	643,823
Seminole	9	1	3	148	1,008	58,266	4	4	393,051	6	4	452,504
Sumter	101	10	34	26,296	17,826	98	47	42	164	84,615	3,337	132,570
Volusia	52	369	17	38	54	12,443	24	21	15,054	35	534,878	562,985
Total	632,144	86,594	47,196	342,123	336,275	1,526,944	310,162	633,383	454,570	109,594	552,030	5,031,015

Source: 2009 NHTS

Table 4-23 HBO Trips from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	619,566	394	1,888	508	5	21,255	0	159	906	0	744	645,426
Flagler	686	84,899	0	898	417	1,431	1	0	1,946	14	10,613	100,906
Indian River	196	0	44,827	0	0	269	300	99	35	0	46	45,771
Lake	360	352	0	288,469	10	31,300	3,988	3,113	388	13,131	106	341,217
Marion	4	180	0	11,467	313,888	3,102	84	106	656	8,226	2,096	339,808
Orange	10,787	185	103	4,537	2,293	1,302,631	1,006	1	36,556	1,707	3	1,359,809
Osceola	3	2	229	20	625	82,086	300,384	11,205	9,313	724	1,609	406,200
Polk	539	0	108	11,721	422	8,654	1,767	616,827	2,684	841	260	643,823
Seminole	0	286	14	53	267	62,903	1,562	666	386,111	229	415	452,505
Sumter	0	3	0	24,445	16,575	18	503	1,109	1,061	84,481	4,376	132,571
Volusia	3	293	28	5	1,773	13,297	567	99	14,916	241	531,763	562,985
Total	632,145	86,595	47,197	342,122	336,276	1,526,945	310,163	633,383	454,571	109,593	552,031	5,031,020

Source: CFRPM 7

Table 4-24 Delta (2009 NHTS vs. CFRPM 7) for HBO Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	-3,752	392	-834	495	-14	2,547	-8	152	298	-12	736	1
Flagler	535	-1,277	-51	786	258	1,284	-70	-63	1,700	-88	-3,016	-1
Indian River	2	-20	515	-143	-204	80	209	19	-280	-130	-46	1
Lake	318	348	-14	2,181	-35	-2,446	1,878	-575	319	-2,059	86	1
Marion	-10	179	-5	-1,997	-2,952	3,088	78	100	632	-1,201	2,089	-1
Orange	2,615	183	95	434	2,269	-9,495	258	-8	1,967	1,692	-8	2
Osceola	-45	-3	213	-16	574	-527	-5,345	3,940	-1,067	691	1,586	1
Polk	496	-4	94	239	377	60	444	-5,371	2,614	812	239	0
Seminole	-9	285	11	-95	-741	4,637	1,558	662	-6,940	223	411	1
Sumter	-101	-7	-34	-1,851	-1,251	-80	456	1,067	897	-134	1,039	1
Volusia	-49	-76	11	-33	1,719	854	543	78	-138	206	-3,115	0
Total	1	1	1	-1	1	1	1	0	1	-1	1	5

Sources: CFRPM 7; 2009 NHTS

Table 4-25 %Delta Trips for HBO Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	-1%	19 599%	-31%	3 811%	-74%	14%	-100%	2 167%	49%	-100%	9 202%
Flagler	355%	-1%	-100%	702%	162%	874%	-99%	-100%	691%	-87%	-22%
Indian River	1%	-100%	1%	-100%	-100%	42%	230%	23%	-89%	-100%	-50%
Lake	758%	8 704%	-100%	1%	-78%	-7%	89%	-16%	463%	-14%	431%
Marion	-74%	17 851%	-100%	-15%	-1%	22 058%	1 107%	1 667%	2 633%	-13%	29 836%
Orange	32%	9 141%	1 189%	11%	9 456%	-1%	34%	-91%	6%	11 281%	-76%
Osceola	-94%	-61%	1 329%	-45%	1 126%	-1%	-2%	54%	-10%	2 094%	6 897%
Polk	1 154%	-99%	669%	2%	838%	1%	34%	-1%	3 734%	2 800%	1 139%
Seminole	-100%	28 531%	374%	-64%	-73%	8%	38 950%	16 540%	-2%	3 713%	10 265%
Sumter	-100%	-68%	-100%	-7%	-7%	-82%	971%	2 540%	547%	0%	31%
Volusia	-95%	-20%	67%	-87%	3 183%	7%	2 263%	372%	-1%	590%	-1%

**Red* = Greater than 30%; *Green* = 10–30%*

Sources: CFRPM 7; 2009 NHTS

Table 4-26 Breakdown of HBO Flow Matrix Errors

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	23	19%	4,921,014	98%
10–30%	9	7%	78,658	2%
> 30%	89	74%	31,343	1%

Sources: CFRPM 7; 2009 NHTS

Over 95% of the HBO trips have an error of less than 10%. These results indicate that the estimated flows are consistent with the observed flows.

4.4.5 County-to-County Flow Comparison for NHB Trips

The tables in this section compare the county-to-county flows for NHB trips between the 2009 NHTS data and estimates: Table 4-27 shows results for 2009 NHTS alone, Table 4-28 for CFRPM 7 alone, and Table 4-29 for the delta between 2009 NHTS and CFRPM 7. In Table 4-30, values between 10% and 30% are colored olive and values greater than 30% are colored red. Table 4-31 summarizes the observed trips by error rate.

Table 4-27 NHB Trips from 2009 NHTS

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	493,870	1	2,168	26	5	6,871	32	14	6,409	36	5,331	514,763
Flagler	76	61,406	80	162	31	365	198	85	255	218	18,221	81,097
Indian River	1,797	1	39,189	23	4	52	28	12	37	31	10	41,184
Lake	8	1	8	205,615	2,196	68,899	20	896	2,799	14,224	293	294,959
Marion	24	3	25	22,399	271,491	116	63	27	81	9,951	22	304,202
Orange	1,164	0	3	9,169	1	833,497	14,271	595	69,348	7	1,186	929,241
Osceola	8	1	8	16	3	65,981	168,707	2,413	26	22	7	237,192
Polk	512	1	12	23	5	53,572	3,172	485,195	37	32	10	542,571
Seminole	567	0	4	339	2	147,128	10	4	262,919	11	2,646	413,630
Sumter	14	2	15	31,107	2,003	67	36	15	47	57,520	12	90,838
Volusia	2,876	764	12	1,573	5	37,433	29	12	10,338	32	392,475	445,549
Total	500,916	62,180	41,524	270,452	275,746	1,213,981	186,566	489,268	352,296	82,084	420,213	3,895,226

Source: 2009 NHTS

Table 4-28 NHB Trips from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	495,774	0	5,018	0	0	7,476	251	0	4,280	0	1,965	514,764
Flagler	0	61,127	0	1	0	0	0	0	0	0	19,971	81,098
Indian River	4,664	0	36,502	0	0	0	19	0	0	0	0	41,185
Lake	0	37	0	208,412	1,542	62,718	94	2,642	5,589	12,363	1,561	294,958
Marion	0	0	0	21,260	270,732	7	0	0	1	11,644	557	304,201
Orange	139	0	0	8,002	0	842,291	16,650	105	62,050	0	5	929,242
Osceola	15	0	2	59	0	72,091	159,686	5,311	26	0	0	237,191
Polk	0	0	1	3,147	0	48,355	9,859	481,209	0	0	0	542,571
Seminole	7	0	0	120	0	149,245	7	0	263,021	0	1,229	413,629
Sumter	0	0	0	29,085	3,471	202	1	1	0	58,076	0	90,837
Volusia	316	1,016	0	367	1	31,597	0	0	17,327	0	394,924	445,548
Total	500,915	62,181	41,524	270,452	275,745	1,213,982	186,567	489,269	352,295	82,083	420,212	3,895,226

Source: CFRPM 7

Table 4-29 Delta (2009 NHTS vs. CFRPM 7) for NHB Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	1,904	-1	2,850	-26	-5	605	219	-14	-2,129	-36	-3,366	1
Flagler	-76	-279	-80	-161	-31	-365	-198	-85	-255	-218	1,750	1
Indian River	2,867	-1	-2,687	-23	-4	-52	-9	-12	-37	-31	-10	1
Lake	-8	36	-8	2,797	-654	-6,181	74	1,746	2,790	-1,861	1,268	-1
Marion	-24	-3	-25	-1,139	-759	-109	-63	-27	-80	1,693	535	-1
Orange	-1,025	0	-3	-1,167	-1	8,794	2,379	-490	-7,298	-7	-1,181	1
Osceola	7	-1	-6	43	-3	6,110	-9,021	2,898	0	-22	-7	-1
Polk	-512	-1	-11	3,124	-5	-5,217	6,687	-3,986	-37	-32	-10	0
Seminole	-560	0	-4	-219	-2	2,117	-3	-4	102	-11	-1,417	-1
Sumter	-14	-2	-15	-2,022	1,468	135	-35	-14	-47	556	-12	-1
Volusia	-2,560	252	-12	-1,206	-4	-5,836	-29	-12	6,989	-32	2,449	-1
Total	-1	1	0	0	-1	1	1	1	-1	-1	-1	0

Sources: CFRPM 7; 2009 NHTS

Table 4-30 %Delta for NHB Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	0%	-100%	131%	-100%	-100%	9%	684%	-100%	-33%	-100%	-63%
Flagler	-100%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	10%
Indian River	160%	-100%	-7%	-100%	-100%	-100%	-32%	-100%	-100%	-100%	-100%
Lake	-100%	3 605%	-100%	1%	-30%	-9%	372%	195%	100%	-13%	433%
Marion	-100%	-84%	-100%	-5%	0%	-94%	-100%	-100%	-98%	17%	2 432%
Orange	-88%	100%	-100%	-13%	-100%	1%	17%	-82%	-11%	-100%	-100%
Osceola	84%	-100%	-70%	272%	-100%	9%	-5%	120%	1%	-100%	-100%
Polk	-100%	-100%	-91%	13 582%	-100%	-10%	211%	-1%	-100%	-99%	-100%
Seminole	-99%	100%	-100%	-65%	-100%	1%	-30%	-100%	0%	-100%	-54%
Sumter	-100%	-100%	-100%	-7%	73%	202%	-96%	-90%	-100%	1%	-100%
Volusia	-89%	33%	-100%	-77%	-89%	-16%	-100%	-100%	68%	-100%	1%

**Red* = Greater than 30%; *Green* = 10–30%*

Sources: CFRPM 7; 2009 NHTS

Table 4-31 Breakdown of NHB Flow Matrix Errors

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	20	17%	3,686,088	95%
10–30%	8	7%	156,602	4%
> 30%	93	77%	52,536	1%

Sources: CFRPM 7; 2009 NHTS

About 95% of the NHB trips have an error of less than 10%. These results indicate that the estimated flows are consistent with the observed flows.

4.4.6 County-to-County Flow Comparison for All Five Trip Purposes

The tables in this section compare the county-to-county flows for all five trip purposes (HBW, HBSH, HBSR, HBO, and NHB) between their respective observed data—ACS 2015 or 2009 NHTS, as identified in Section 4.4.1 to Section 4.4.5—and estimates. Below is a summary of the tables in this section:

- Table 4-32 shows the sum of all five trip purposes presented in Table 4-7, Table 4-12, Table 4-17, Table 4-22, and Table 4-27
- Table 4-33 shows the sum of all five trip purposes presented in Table 4-8, Table 4-13, Table 4-18, Table 4-23, and Table 4-28
- Table 4-34 shows the sum of the delta presented in Table 4-9, Table 4-14, Table 4-19, Table 4-24, and Table 4-29
- In Table 4-35, values between 10–30% are colored olive and values greater than 30% are colored red
- Table 4-36 summarizes the observed trips by error rate

Table 4-32 Trips for All Five Trip Purposes from ACS 2015 and 2009 NHTS

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	1,896,637	158	16,515	1,263	60	68,939	1,227	251	13,054	74	7,827	2,006,005
Flagler	443	236,730	472	511	333	5,618	421	354	1,337	454	65,002	311,675
Indian River	10,686	23	137,518	176	216	1,939	176	140	549	169	209	151,801
Lake	233	173	108	838,093	4,532	188,150	21,037	5,819	9,178	37,460	3,637	1,108,420
Marion	465	179	89	69,204	974,178	31,366	446	310	787	34,468	1,107	1,112,599
Orange	15,967	70	32	20,642	190	3,663,362	26,888	2,680	186,328	213	3,816	3,920,188
Osceola	1,194	84	1,029	2,585	573	360,308	721,330	34,438	15,609	584	644	1,138,378
Polk	888	18	214	15,625	189	150,005	32,162	1,821,835	19,183	283	343	2,040,745
Seminole	1,264	61	34	1,906	1,201	412,860	960	198	1,097,629	256	8,381	1,524,750
Sumter	170	21	142	90,506	24,342	2,025	253	23,591	713	228,309	4,212	374,284
Volusia	6,837	4,973	86	3,354	181	107,965	305	225	76,869	102	1,548,131	1,749,028
Total	1,934,784	242,490	156,239	1,043,865	1,005,995	4,992,537	805,205	1,889,841	1,421,236	302,372	1,643,309	15,437,873

Sources: ACS 2015; 2009 NHTS

Table 4-33 Trips for All Five Trip Purposes from CFRPM 7

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	1,885,545	626	19,075	873	9	70,708	4,326	959	16,083	0	7,803	2,006,007
Flagler	1,455	232,295	0	1,575	773	5,739	31	0	5,679	27	64,100	311,675
Indian River	13,638	2	136,043	2	0	1,000	679	162	99	0	178	151,802
Lake	837	653	0	823,171	4,296	188,257	22,589	7,515	15,481	35,136	10,489	1,108,423
Marion	10	390	0	64,049	965,235	32,535	437	2,095	2,850	36,933	8,060	1,112,594
Orange	19,333	279	238	22,511	3,780	3,655,334	30,855	2,636	176,743	2,564	5,918	3,920,190
Osceola	2,183	5	483	6,513	1,098	353,796	705,153	48,581	16,864	1,089	2,614	1,138,378
Polk	1,207	0	282	23,343	717	148,295	35,278	1,808,357	21,336	1,480	450	2,040,746

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Seminole	2,642	429	38	4,349	458	426,319	3,153	1,406	1,074,765	349	10,841	1,524,749
Sumter	0	9	0	90,978	26,430	5,289	1,424	17,732	3,268	224,323	4,831	374,284
Volusia	7,934	7,804	78	6,502	3,200	105,267	1,283	401	88,069	469	1,528,020	1,749,027
Total	1,934,784	242,492	156,238	1,043,866	1,005,995	4,992,540	805,207	1,889,842	1,421,235	302,371	1,643,305	15,437,874

Source: CFRPM 7

Table 4-34 Delta (Observed NHTS/ACS vs. CFRPM 7) for All Five Trip Purposes Trips

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	-11,092	468	2,560	-390	-51	1,769	3,099	708	3,029	-74	-24	2
Flagler	1,012	-4,435	-472	1,064	440	121	-390	-354	4,342	-427	-902	0
Indian River	2,952	-21	-1,475	-174	-216	-939	503	22	-450	-169	-31	1
Lake	604	480	-108	-14,922	-236	107	1,552	1,696	6,303	-2,324	6,852	3
Marion	-455	211	-89	-5,155	-8,943	1,169	-9	1,785	2,063	2,465	6,953	-5
Orange	3,366	209	206	1,869	3,590	-8,028	3,967	-44	-9,585	2,351	2,102	2
Osceola	989	-79	-546	3,928	525	-6,512	-16,177	14,143	1,255	505	1,970	0
Polk	319	-18	68	7,718	528	-1,710	3,116	-13,478	2,153	1,197	107	1
Seminole	1,378	368	4	2,443	-743	13,459	2,193	1,208	-22,864	93	2,460	-1
Sumter	-170	-12	-142	472	2,088	3,264	1,171	-5,859	2,555	-3,986	619	0
Volusia	1,097	2,831	-8	3,148	3,019	-2,698	978	176	11,200	367	-20,111	-1
Total	0	2	-1	1	0	3	2	1	-1	-1	-4	1

Sources: CFRPM 7; ACS 2015; 2009 NHTS

Table 4-35 %Delta for All Five Trip Purposes

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia
Brevard	-1%	296%	16%	-31%	-85%	3%	253%	282%	23%	-100%	0%
Flagler	228%	-2%	-100%	208%	132%	2%	-93%	-100%	325%	-94%	-1%
Indian River	28%	-93%	-1%	-99%	-100%	-48%	286%	16%	-82%	-100%	-15%
Lake	259%	277%	-100%	-2%	-5%	0%	7%	29%	69%	-6%	188%
Marion	-98%	118%	-100%	-7%	-1%	4%	-2%	576%	262%	7%	628%
Orange	21%	299%	643%	9%	1,890%	0%	15%	-2%	-5%	1,104%	55%
Osceola	83%	-94%	-53%	152%	92%	-2%	-2%	41%	8%	87%	306%
Polk	36%	-100%	32%	49%	280%	-1%	10%	-1%	11%	423%	31%
Seminole	109%	603%	13%	128%	-62%	3%	228%	610%	-2%	37%	29%
Sumter	-100%	-57%	-100%	1%	9%	161%	463%	-25%	358%	-2%	15%
Volusia	16%	57%	-9%	94%	1,668%	-2%	321%	78%	15%	360%	-1%

**Red* = Greater than 30%; Green = 10–30%*

Sources: CFRPM 7; ACS 2015; 2009 NHTS

Table 4-36 Breakdown of Flow Matrix Errors for All Five Trip Purposes

Error	# Cells	% Cells	Obs. Trips	% Obs. Trips
<= 10%	35	29%	15,101,294	98%
10–30%	15	12%	228,385	1%
> 30%	71	59%	108,194	1%

Sources: CFRPM 7; ACS 2015; 2009 NHTS

About 98% of all trips have an error of less than 10%. These results indicate that the estimated flows are consistent with the observed flows.

4.4.7 Number of Counties Traveled

Table 4-37 compares the number of counties traveled during each trip presented in Section 4.4.6 (i.e., sum of all five trip purposes). This comparison helps gauge whether the model overstates intra- or inter-county travel. Overstating intra-county travel can result in underestimates for vehicle miles traveled (VMT), while overstating inter-county travel can result in overestimates for VMT.

Table 4-37 Number of Counties Traveled for All Five Trip Purposes

Num Counties Traveled	Observed Trips	Estimated Trips	Delta Trips	% Delta Trips
1	13,163,752	13,038,239	-125,513	-1%
2	1,860,219	1,924,199	63,980	3%
3	400,098	458,123	58,025	15%
4	13,499	17,314	3,815	28%
5	305	0	-305	-100%

Sources: CFRPM 7; ACS 2015, 2009

The estimated number of counties traveled are generally in line with the corresponding observations for all five trip purposes. There is a slight overestimate of 3 and 4 county trips. The model does not estimate any 5 county trips.

4.4.8 METROPLAN Orlando vs. Outer Regions

Table 4-38 compares the observed and estimated trip distributions between the METROPLAN Orlando MPO region (i.e., Orange, Osceola, and Seminole counties) and the other eight outer counties for all five trip purposes combined (HBW, HBSH, HBSR, HBO, and NHB) using the ACS 2015 and 2009 NHTS data and estimates. Compared to other MPOs, METROPLAN Orlando has the largest population and employment in the region and is the only MPO with more jobs than workers. Therefore, the METROPLAN Orlando area has a significant impact on travel patterns in the region. Over-stating travel to/from the METROPLAN Orlando area is likely to result in over-stating VMT.

Table 4-38 Trips Comparison for METROPLAN and Outer Counties

County	Observed Trips*		Estimated Trips**		Delta		%Delta	
	METRO-PLAN Orlando	Outer Counties	METRO-PLAN Orlando	Outer Counties	METRO-PLAN Orlando	Outer Counties	METRO-PLAN Orlando	Outer Counties
METROPLAN Orlando	6,485,274	98,042	6,442,980	140,337	-42,294	42,295	-1%	43%
Outer Counties	733,704	8,120,853	776,002	8,078,555	42,298	-42,298	6%	-1%

Sources: *SACS 2015; 2009 NHTS; **CFRPM 7

The estimated trips distributions within the METROPLAN Orlando MPO and the outer counties are generally consistent with the observations for all five trip purposes. Travel from the outer counties to the METROPLAN Orlando area is over-stated by 6%. The smallest market, trips from METROPLAN Orlando to outer counties, is overestimated by 43%. Overall, the estimates are consistent with observed values.

4.4.9 County-to-County Trip Distribution

Building upon the comparisons in Section 4.4.8, Table 4-39 compares the trip distribution of Orange County, the two other counties in the METROPLAN Orlando MPO region, and the other eight counties for all five trip purposes total (HBW, HBSH, HBSR, HBO, and NHB) using the ACS 2015 and 2009 NHTS data. Table 4-40 provides the estimates for the same categories.

Table 4-39 Observed Trips to Key Areas

County	To Orange	To Seminole/ Osceola	To Outer	Total	% to Orange	% to Seminole/ Osceola	% to Outer
Brevard	68,939	14,281	1,922,785	2,006,005	3%	1%	96%
Flagler	5,618	1,758	304,299	311,675	2%	1%	98%
Indian River	1,939	725	149,137	151,801	1%	0%	98%
Lake	188,150	30,215	890,055	1,108,420	17%	3%	80%
Marion	31,366	1,233	1,080,000	1,112,599	3%	0%	97%
Orange	3,663,362	213,216	43,610	3,920,188	93%	5%	1%
Osceola	360,308	736,939	41,131	1,138,378	32%	65%	4%
Polk	150,005	51,345	1,839,395	2,040,745	7%	3%	90%
Seminole	412,860	1,098,589	13,301	1,524,750	27%	72%	1%
Sumter	2,025	966	371,293	374,284	1%	0%	99%
Volusia	107,965	77,174	1,563,889	1,749,028	6%	4%	89%
Total	**4,992,537**	**2,226,441**	**8,218,895**	**15,437,873**	**32%**	**14%**	**53%**

Sources: ACS 2015; 2009 NHTS

Table 4-40 Estimated Trips to Key Areas

County	To Orange	To Seminole/ Osceola	To Outer	Total	% to Orange	% to Seminole/ Osceola	% to Outer
Brevard	70,708	20,409	1,914,889	2,006,007	4%	1%	95%
Flagler	5,739	5,711	300,225	311,675	2%	2%	96%
Indian River	1,000	778	150,024	151,802	1%	1%	99%
Lake	188,257	38,069	882,096	1,108,423	17%	3%	80%
Marion	32,535	3,286	1,076,773	1,112,594	3%	0%	97%
Orange	3,655,334	207,597	57,259	3,920,190	93%	5%	1%
Osceola	353,796	722,016	62,566	1,138,378	31%	63%	5%
Polk	148,295	56,614	1,835,837	2,040,746	7%	3%	90%
Seminole	426,319	1,077,918	20,512	1,524,749	28%	71%	1%
Sumter	5,289	4,692	364,303	374,284	1%	1%	97%
Volusia	105,267	89,352	1,554,408	1,749,027	6%	5%	89%
Total	**4,992,540**	**2,226,442**	**8,218,892**	**15,437,874**	**32%**	**14%**	**53%**

Source: CFRPM 7

Table 4-41 Delta between Observed and Estimates

County	To Orange	To Seminole/ Osceola	To Outer	Total	% to Orange	% to Seminole/ Osceola	% to Outer
Brevard	1,769	6,128	-7,896	2	1%	0%	-1%
Flagler	121	3,953	-4,074	0	0%	1%	-2%
Indian River	-939	53	887	1	0%	1%	1%
Lake	107	7,854	-7,959	3	0%	0%	0%
Marion	1,169	2,053	-3,227	-5	0%	0%	0%
Orange	-8,028	-5,619	13,649	2	0%	0%	0%
Osceola	-6,512	-14,923	21,435	0	-1%	-2%	1%
Polk	-1,710	5,269	-3,558	1	0%	0%	0%
Seminole	13,459	-20,671	7,211	-1	1%	-1%	0%
Sumter	3,264	3,726	-6,990	0	0%	1%	-2%
Volusia	-2,698	12,178	-9,481	-1	0%	1%	0%
Total	3	1	-3	1	0%	0%	0%

Sources: CFRPM 7; ACS 2015; 2009 NHTS

The estimated trips distributions are generally consistent with the observations for all five trip purposes. No major discrepancies were found in the comparison.

4.4.10 Medium Truck County-to-County Flow

Table 4-42 lists the estimated county-to-county flows for medium trucks. Medium trucks are defined as a single-unit vehicle with three or four axles. These results are provided for information only because observational data are not available.

Table 4-42 Estimated County-to-County Flows for Medium Trucks

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	28,910	0	166	0	0	898	204	0	99	0	260	30,537
Flagler	0	2,260	0	5	0	0	0	0	2	0	915	3,183
Indian River	169	0	164	0	0	0	3	0	0	0	0	336
Lake	0	4	0	18,067	1,251	4,912	463	404	504	2,486	432	28,523
Marion	0	0	0	1,392	25,703	12	0	0	1	1,975	26	29,109
Orange	646	0	0	4,468	4	188,296	12,969	1,352	16,672	54	751	225,212
Osceola	125	0	2	457	0	12,813	15,851	1,910	107	1	0	31,266
Polk	0	0	0	377	0	1,345	1,916	37,318	2	6	0	40,963
Seminole	64	1	0	464	1	16,966	106	2	14,462	0	1,984	34,050
Sumter	0	0	0	2,704	1,781	104	1	8	1	5,315	0	9,915
Volusia	233	857	0	463	18	891	0	0	2,262	0	31,082	35,806
Total	30,146	3,123	332	28,398	28,758	226,236	31,512	40,994	34,112	9,837	35,451	468,899

Source: CFRPM 7

4.4.11 Heavy Truck County-to-County Flow

Table 4-43 lists the estimated county-to-county flows for heavy trucks. Heavy trucks are defined as a truck with either a combination-unit or multiple trailers. These results are provided for information only because observational data are not available.

Table 4-43 Estimated County-to-County Flows for Heavy Trucks

County	Brevard	Flagler	Indian River	Lake	Marion	Orange	Osceola	Polk	Seminole	Sumter	Volusia	Total
Brevard	3,236	7	13	23	6	1,661	262	43	140	4	285	5,680
Flagler	7	85	0	5	6	54	0	0	17	0	197	372
Indian River	13	0	0	0	0	2	0	0	0	0	0	15
Lake	24	5	0	1,407	740	2,586	243	317	325	497	228	6,372
Marion	7	6	0	741	4,154	858	52	58	61	716	136	6,788
Orange	1,655	53	2	2,542	809	36,177	4,026	2,633	4,862	607	2,058	55,424
Osceola	257	0	0	245	49	4,017	1,339	819	263	48	54	7,091
Polk	41	0	0	319	54	2,632	812	5,346	116	68	14	9,402
Seminole	142	17	0	326	59	4,845	260	115	1,408	49	696	7,918
Sumter	5	0	0	499	708	632	49	69	50	444	33	2,491
Volusia	279	196	0	238	134	2,067	53	14	702	33	3,200	6,916
Total	5,665	371	15	6,345	6,720	55,533	7,095	9,414	7,943	2,469	6,901	108,470

Source: CFRPM 7

4.4.12 Internal to External County-to-County Flow

Table 4-44 lists the county-to-county flows for Internal to External (IE) trip purposes using estimates for 2015. IE attractions are matched with the IE productions from a group of counties near the external station. These results are provided for information only because observational data are not available.

Table 4-44 Estimated County-to-County Flows for IE Trips

County	Brevard	Flagler	Indian River	Marion	Osceola	Polk	Sumter	Volusia	Total
Flagler	4,843	7,258	0	4,217	160	0	412	39,314	56,204
Indian River	64,484	0	5,754	0	5,021	8,032	0	3,825	87,116
Marion	12	174	0	70,098	531	679	16,339	3,338	91,171
Osceola	8,800	0	1,114	0	3,669	12,763	14	96	26,457
Polk	1,625	0	47	2,384	15,950	182,330	6,746	2,066	211,147
Sumter	60	4	0	25,187	1,008	8,094	8,371	1,273	43,997
Volusia	166	276	0	950	28	7	154	2,707	4,289
Total	79,989	7,711	6,915	102,835	26,367	211,905	32,037	52,620	520,380

Source: CFRPM 7

4.5 Special Purpose

The method of estimating trips for the unique Central Florida attractions dates to the I-Drive transit projects in the mid-1990s. The method was originally applied to the Orlando Urban Area Transportation Study (OUATS) model. In CFRPM 7, this method is applied to six special activity locations: Orange County Convention Center, Disney area, Universal area, Sea World area, Kennedy Space Center (KSC) Visitors Complex, and Port Canaveral (PC). There are three types of special purposes to these activity areas: visitor-based trips to hotels, resident-based trips to homes, and external-based trips to user-specified external stations.

The model interprets production of these trips for Special Purposes as gate demand, so data are from international attraction trade reports. Attractions of these Special Purpose trips depend on hotels, homes, or user-specified external stations.

Since the method was originally designed for OUATS, it only contained Orange, Osceola, and Seminole counties plus parts of Volusia (southwestern portion), Lake (small portion), and Polk (small portion) counties. Visitor-based and resident-based trips mostly came from Orange, Osceola, and Seminole counties, and very little from other counties. The inclusion of more counties in CFRPM 7 distorted these traffic patterns substantially:

- Visitor-based and resident-based trips are mostly coming from Orange County, but at a much lower percentage than with OUATS and lower than observed data suggests.

- Most trips are attracted from counties with tourist areas (e.g., Orange, Seminole and Osceola counties), but the production and attraction rates equally produce trips from other counties based on their number of households and hotel rooms.
- Any hotel room or dwelling unit in the region has equal opportunity to produce or attract Special Purpose trips, regardless of its distance from the tourist areas. This key point was not realized in the original OUATS. Too many resident and visitor trips were from outside major tourist areas in METROPLAN Orlando.
- The model is not designed to handle KSC and PC trips because most visitor trips come from I-Drive/tourist areas.

Consequently, the distribution of Special Purpose trips in CFRPM 7 was adjusted by:

- Analyzing the 2015 AirSage[12] dataset to identify observed visitor-based, resident-based, and external-based shares, by county.
- Adjusting the trip generation equations to reflect these shares, by county.
- Updating other factors based on AirSage data to improve directionality.

The remainder of this section compares the original CFRPM 7 distributions to the adjusted distributions for visitor-based, resident-based, and external-based shares, by county. **The adjusted shares directly reflect the observed data; therefore, these figures are provided for informational purposes only.**

[12] AirSage is the only reliable source for Special Purposes data because it provides distribution patterns for theme park attendees that are not in other survey data.

Figure 4-2 shows a comparison for Orange County Convention Center, by county, between original and adjusted shares. The comparison is divided into three categories: OCCVISA (visitor-based); OCCRESA (resident-based); and OCCEXTA (external-based). Original shares are indicated by the suffix -O and adjusted shares are indicated by the suffix -A. The adjusted visitor-based and resident-based shares are reasonable: a majority share is from Orange County with reduced shares from other counties, except for resident-based shares from Osceola County. The external-based shares did not need to be adjusted.

Figure 4-2 Orange County Convention Center Trip Shares Comparison

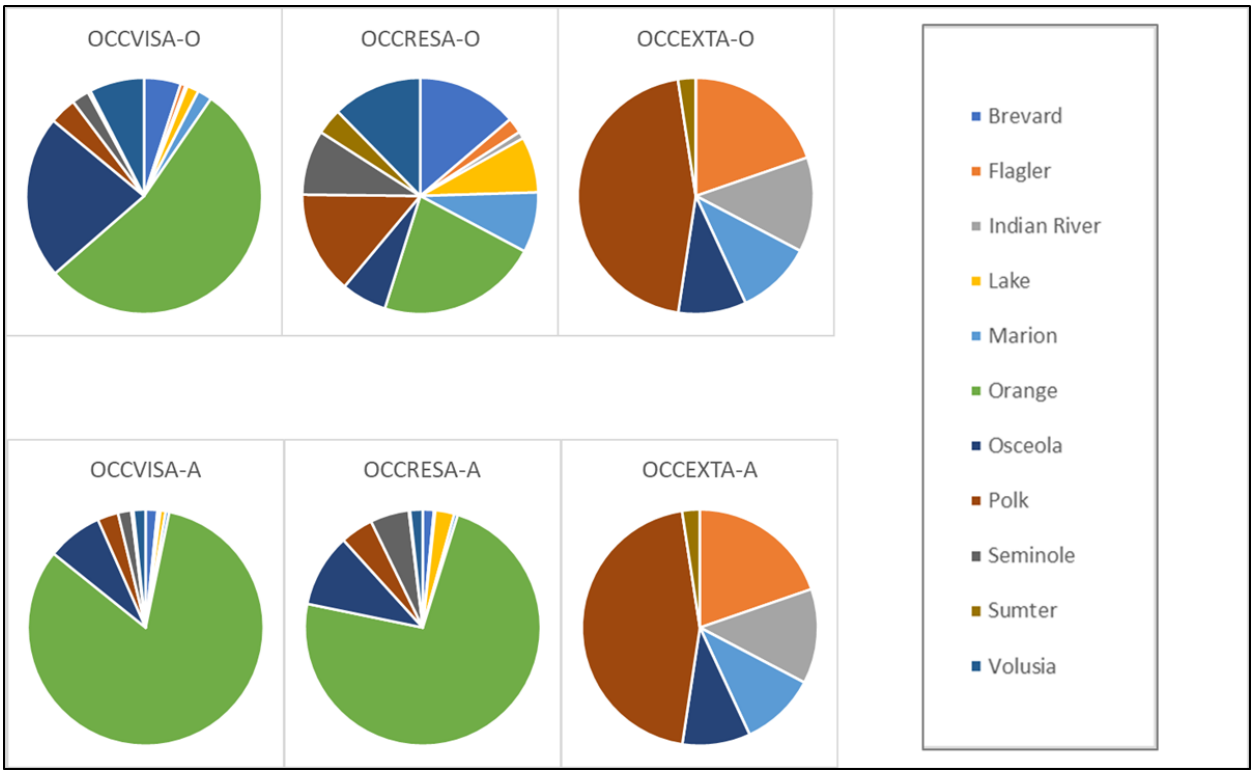


Figure 4-3 shows a similar comparison, by county, for the Disney area. The comparison is divided into three categories: DISVISA (visitor-based); DISRESA (resident-based); and DISEXTA (external-based). Original shares are indicated by the suffix -O and adjusted shares are indicated by the suffix -A. The adjusted visitor-based shares are similar to the adjusted shares of Orange County Convention Center. Resident-based adjusted shares for Orange County are less than the shares for Orange County Convention Center and the shares for Osceola County are increased. Adjusted shares from other counties are reduced by a handful; the external-based shares do not need to be adjusted.

Figure 4-3 Disney Area Trip Shares Comparison

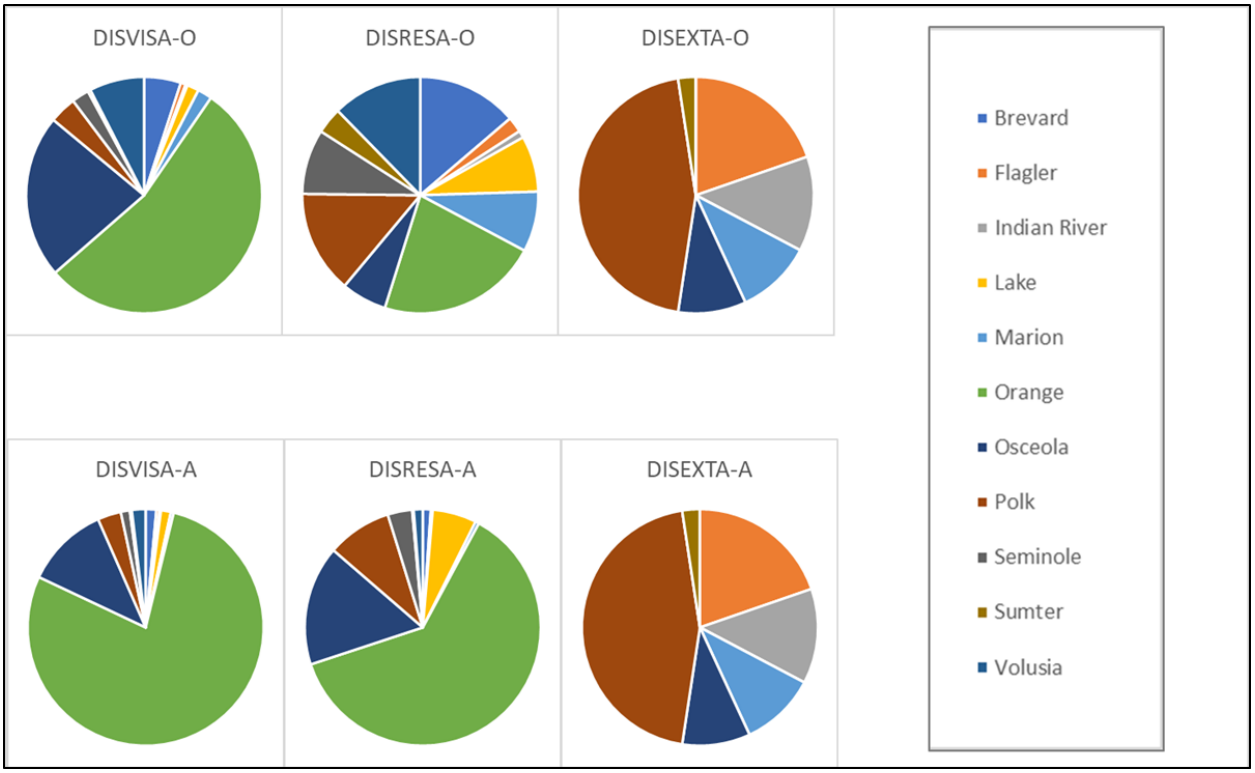


Figure 4-4 compares trips, by county, for the Universal area. The comparison is divided into three categories: UNIVISA (visitor-based); UNIRESA (resident-based); and UNIEXTA (external-based). Original shares are indicated by the suffix -O, while adjusted shares are indicated by the suffix -A. The adjusted visitor-based and resident-based shares are reasonable: the majority share is from Orange County and reduced shares are from other counties, except for visitor-based shares from Polk County and resident-based shares from Osceola County and Polk County. The external-based shares do not need to be adjusted.

Figure 4-4 Universal Area Trip Shares Comparison

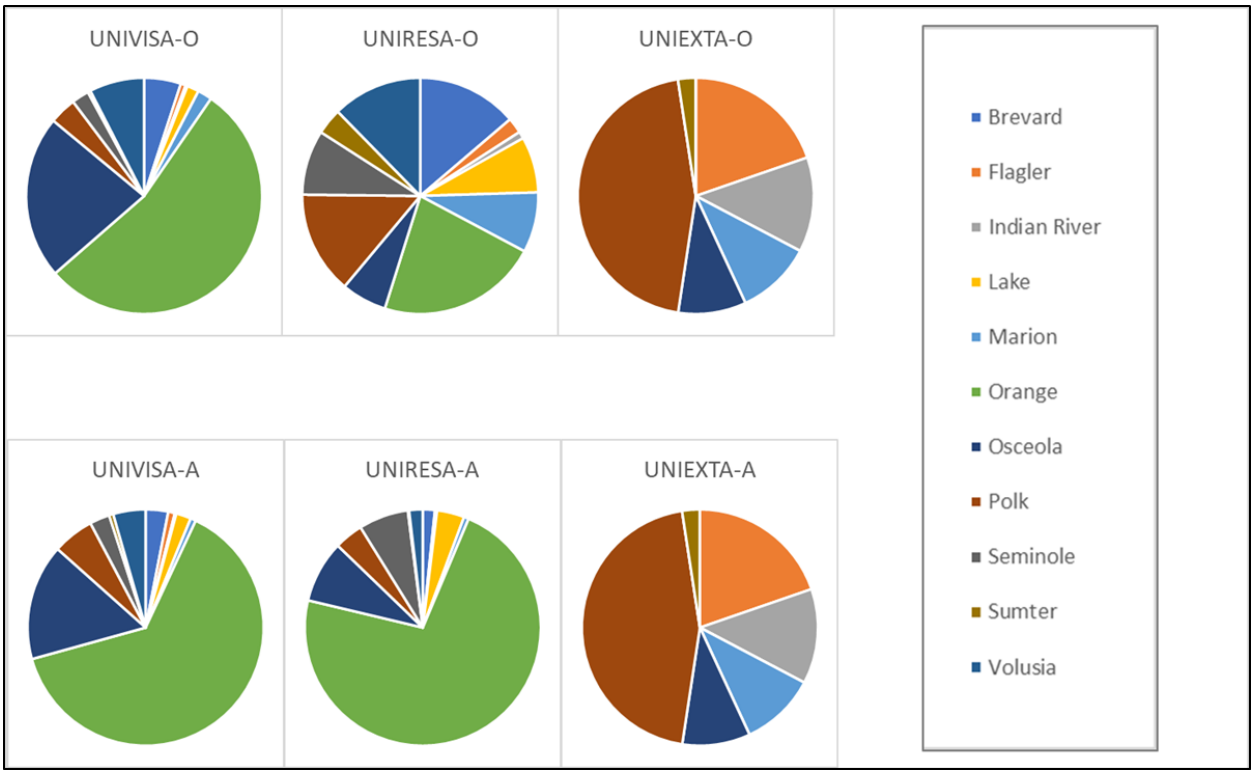


Figure 4-5 shows a comparison, by county, for Sea World area. The comparison is divided into three categories: SEAVISA (visitor-based); SEARESA (resident-based); and SEAEXTA (external-based). Original shares are indicated by the suffix -O and adjusted shares are indicated by the suffix -A. Results are similar to trip shares for the Orange County Convention Center.

Figure 4-5 Sea World Area Trip Shares Comparison

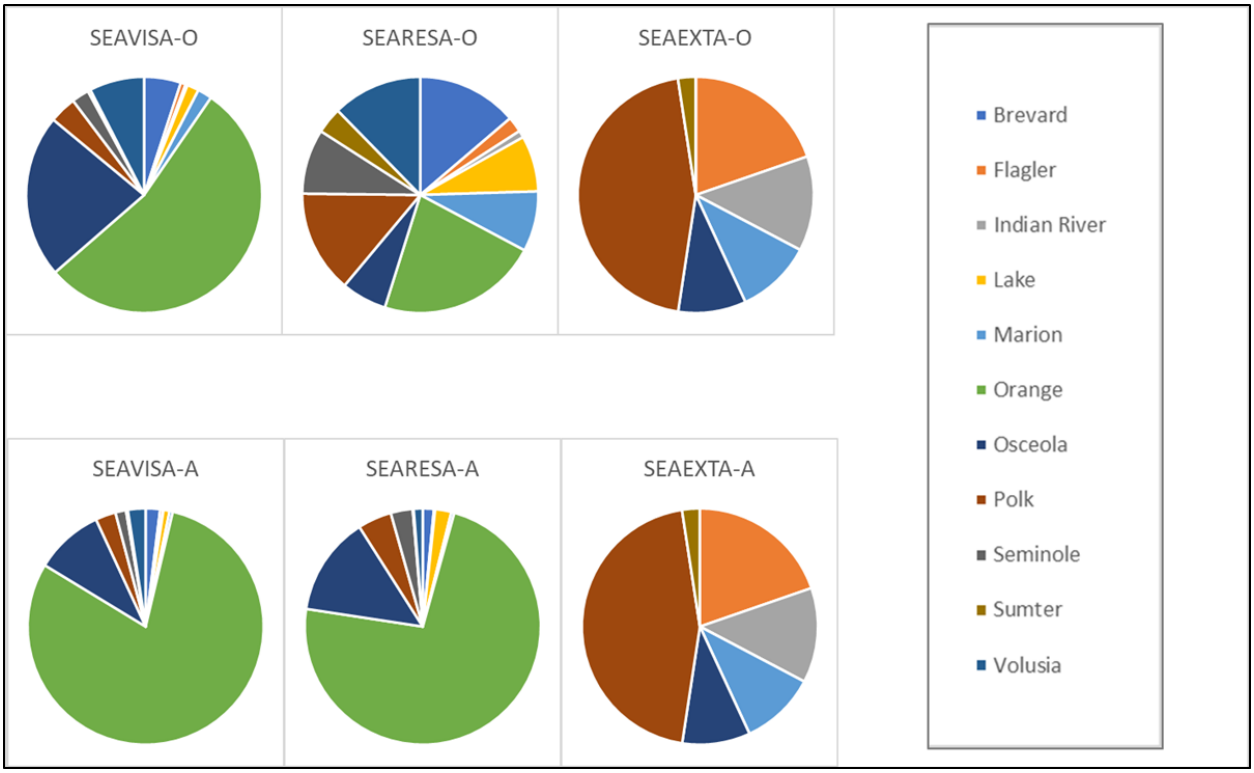


Figure 4-6 shows a comparison, by county, for the Kennedy Space Center Visitors Complex. The comparison is divided into three categories: KSCVISA (visitor-based); KSCRESA (resident-based); and KSCEXTA (external-based). Original shares are indicated by the suffix -O and adjusted shares are indicated by the suffix -A. The adjusted visitor-based and resident-based shares are reasonable; a majority share is from Brevard County and reduced shares are from other counties, except for visitor-based share from Orange County. The external-based shares do not need to be adjusted.

Figure 4-6 Kennedy Space Center Visitors Complex Trip Shares Comparison

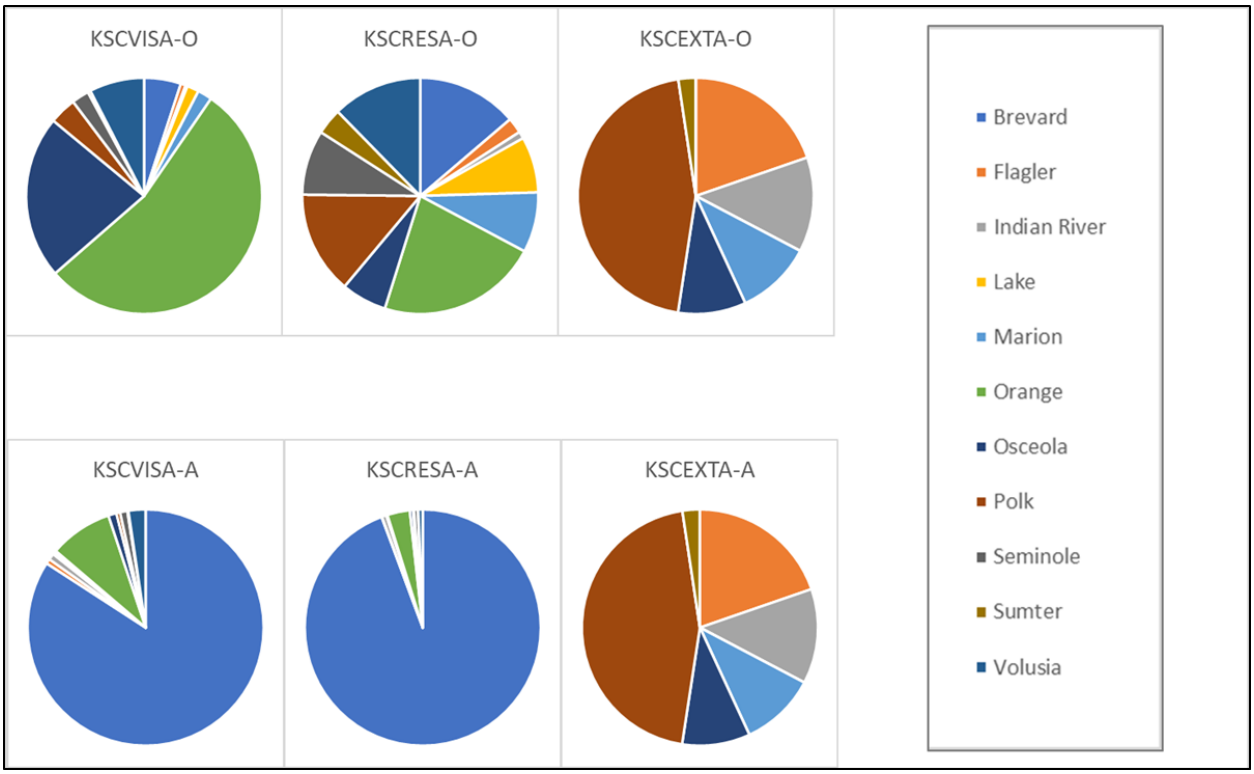
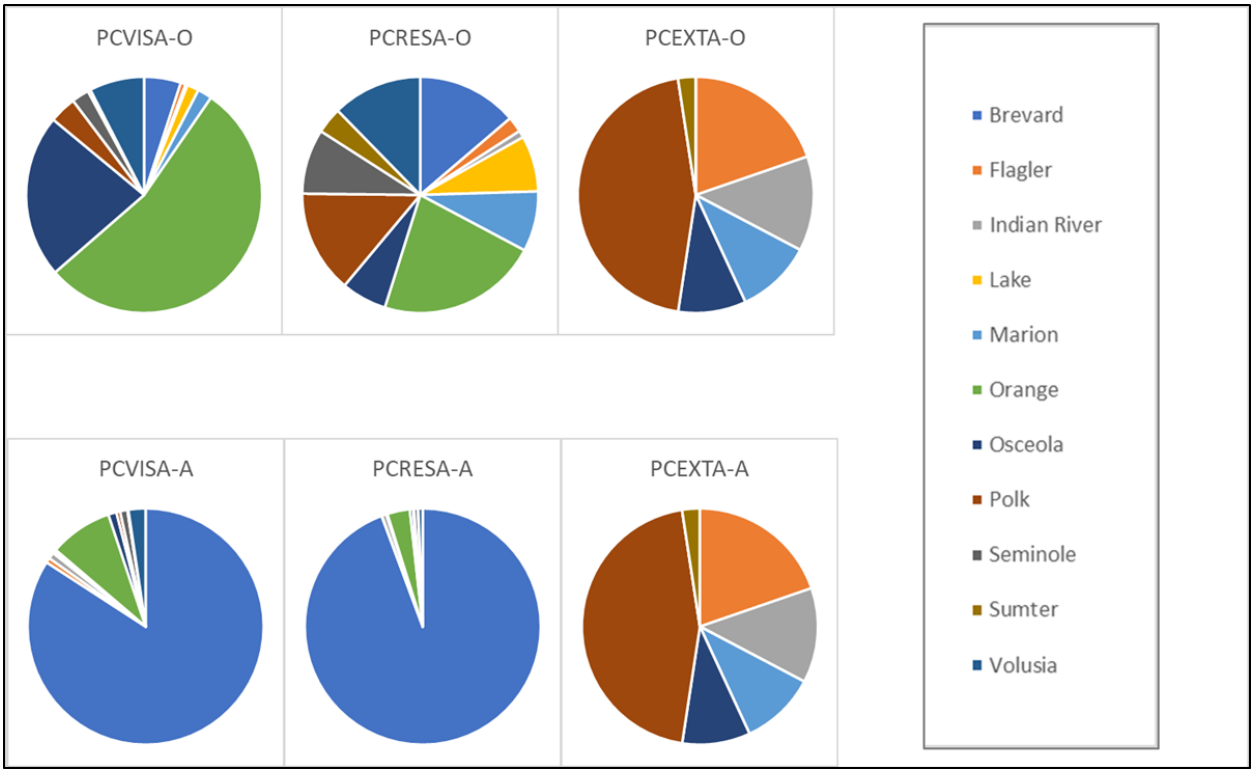


Figure 4-7 shows a comparison, by county, for Port Canaveral. The comparison is divided into three categories: PCVISA (visitor-based); PCRESA (resident-based); and PCEXTA (external-based). Original shares are indicated by the suffix -O and adjusted shares are indicated by the suffix -A. Results are similar to trip shares for the Kennedy Space Center Visitors Complex.

Figure 4-7 Port Canaveral Trip Shares Comparison



5 Mode Choice

The mode choice step performs three primary functions:

1. Estimate, separately, a) the number of regional non-motorized trips; b) person trips, by mode, traveling to and from the Orlando International Airport (OIA); and regional transit trips. The regional transit trips are estimated in CFRPM STOPS.
2. Deduce the non-motorized, OIA, and transit trips from the person trip tables in the trip distribution step. The remaining trips are person auto trips.
3. Convert the person auto trips to vehicle trips for highway assignment.

This chapter compares estimated values for each of these three functions to observed values.

5.1 Non-Motorized Trips

The project team compared three points of the non-motorized trip estimates to observed values: overall magnitude (expressed as non-motorized share of total trips), trip lengths, and demand at specific locations.

For each trip purpose, non-motorized trips are computed as a share of all trips using a utility equation that is based on the trip length and the origin and destination land uses. This equation was calibrated to match the corresponding share from the 2017 NHTS data (see Table 5-1). Consequently, the estimated non-motorized shares were compared to the observed values from the 2017 NHTS. The data error range for the 2017 NHTS is ± 22% for a 95% confidence interval. Ranges reflect the margin of error (minimum to maximum) for observed non-motorized trips. Estimated non-motorized shares are within the error margins of the NHTS data. This is to be expected because the utility equations were calibrated to produce results within the observed range of values. HBNW trips includes trips for five trip purposes (HBSC, HBCU, HBSH, HBSR, and HBO).

Table 5-1 Observed and Estimated Non-motorized Shares

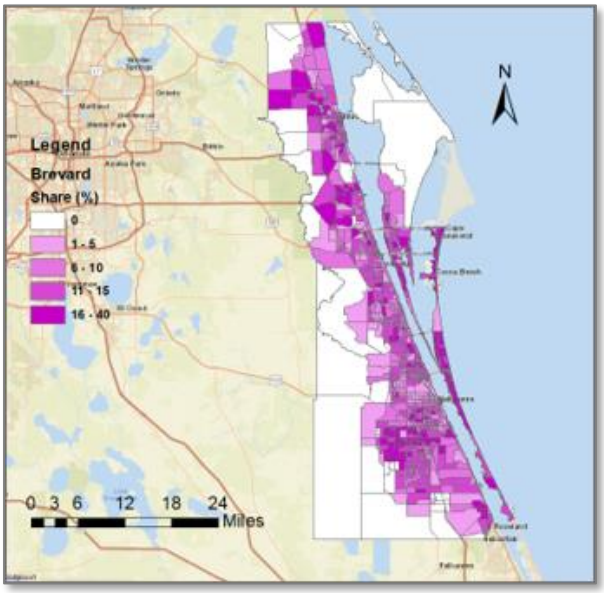
Trip Purpose	NHTS Error Range of Observed Non-Motorized Share of Total Trips	Estimated Non-Motorized Share of Total Trips
HBW	2–3%	3%
HBNW	9–15%	12%
NHB	5–9%	9%
TOTAL	**7–11%**	**9%**

Sources: CFRPM 7; 2017 NHTS

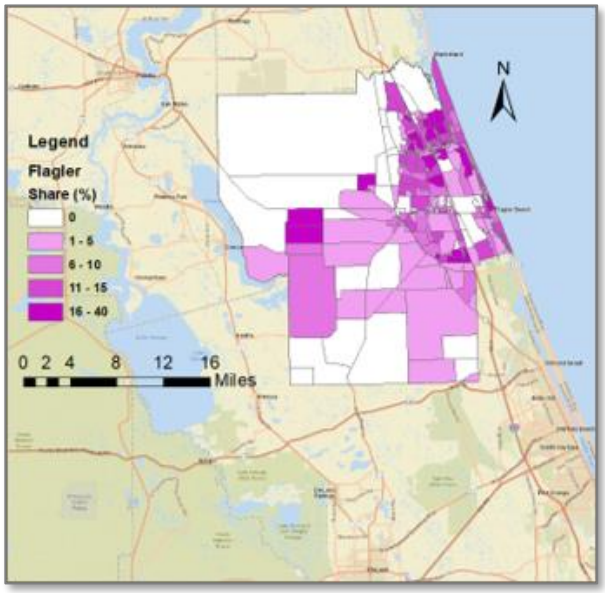
Figure 5-1 illustrates the non-motorized trip shares (visualized using attraction zone share), by zone. The darker zones have higher non-motorized trip shares than lighter zones. The structure of the utility equation estimates higher shares of non-motorized trips in dense areas such as urban, suburban, and some residential areas.

Figure 5-1 Zonal Non-Motorized Shares

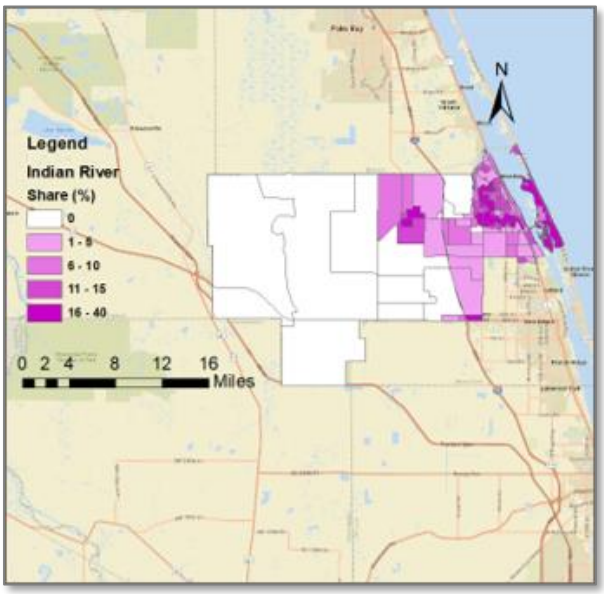
(a) Brevard County



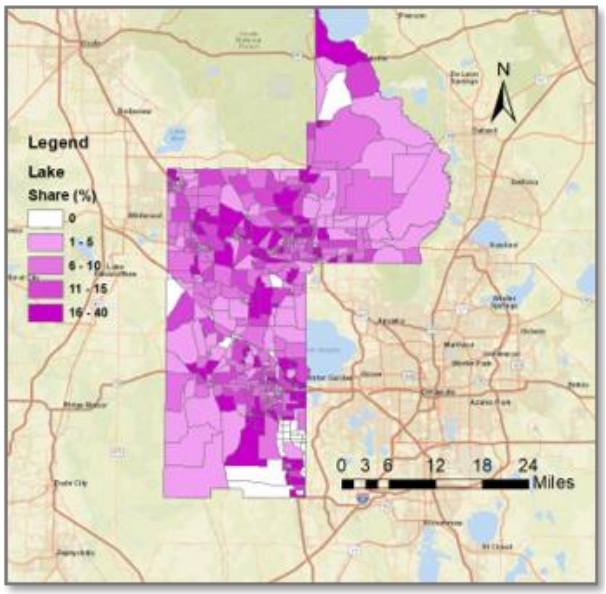
(b) Flager County



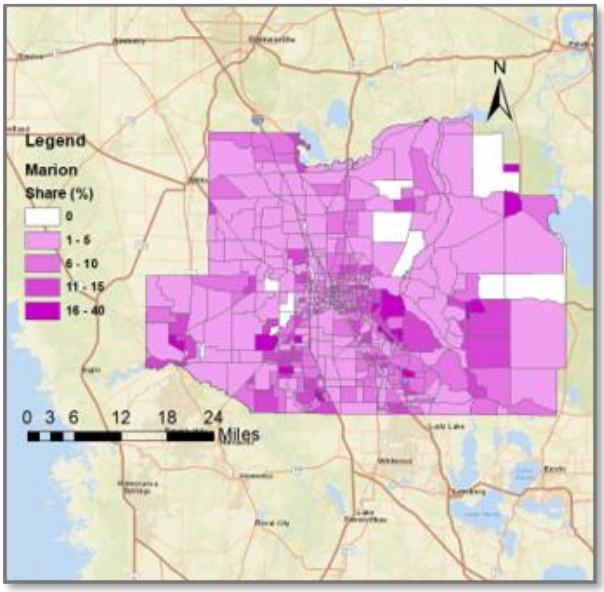
(c) Indian River County



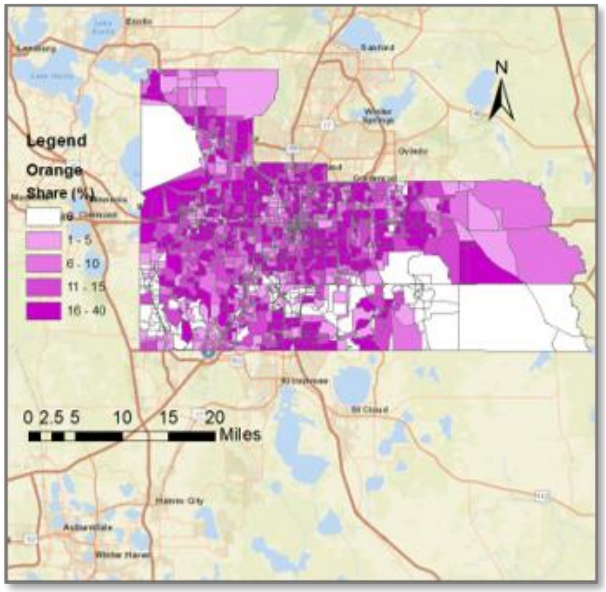
(d) Lake County



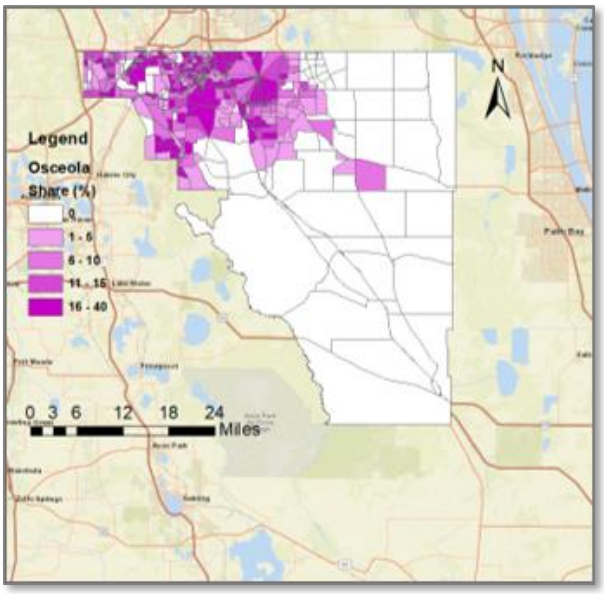
(e) Marion County



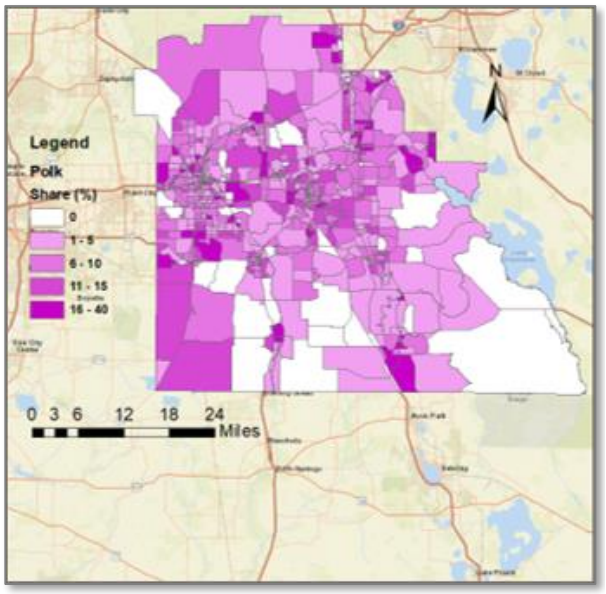
(f) Orange County



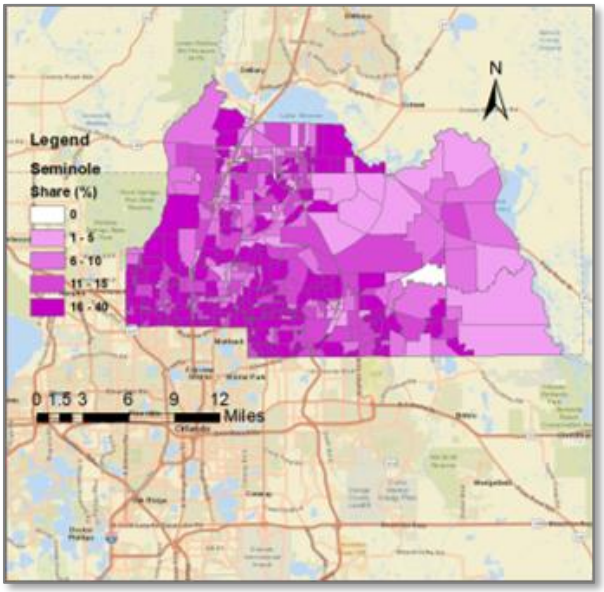
(g) Osceola County



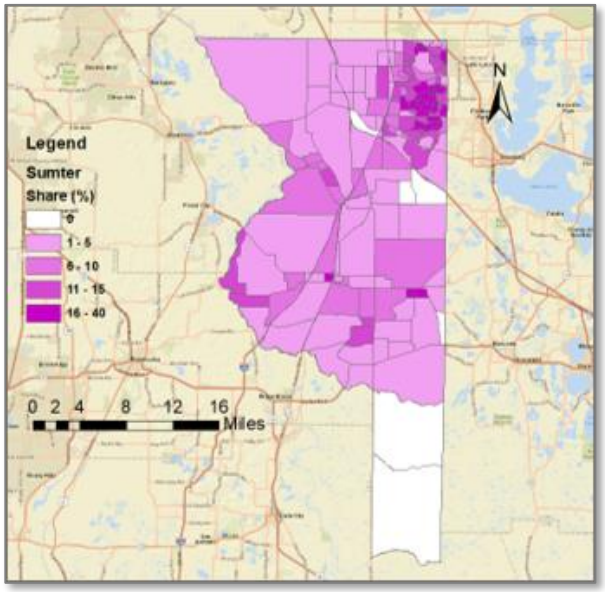
(h) Polk County



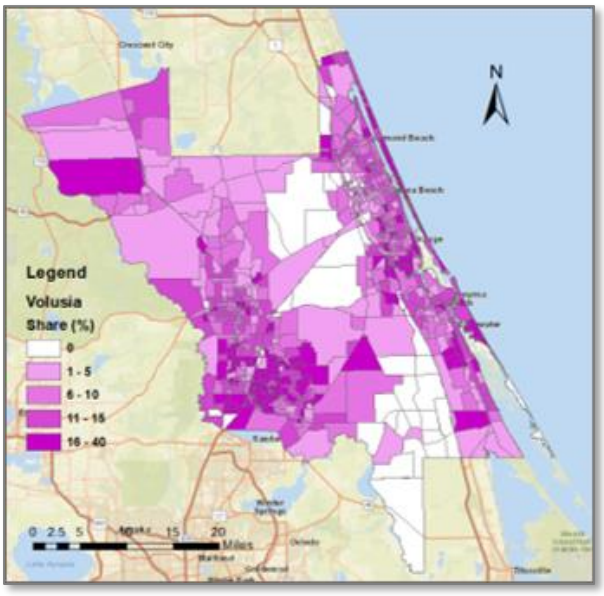
(i) Seminole County



(j) Sumter County



(k) Volusia County



The project team also compared the estimated and observed non-motorized trip length. Trip lengths were not directly calibrated, so these comparisons can be helpful in assessing the reasonableness of the model estimates. Most non-motorized trips consist of walk and bicycle trips, so their trip length should be shorter than the other trips. Figure 5-2, Figure 5-3, and Figure 5-4 present the trip lengths for non-motorized trips and total person trips, by trip purpose. For all trip purposes, all non-motorized trips are accomplished within four miles, and at least half are between one and three miles. Based on these results, estimated non-motorized trip length distributions are reasonable.

Figure 5-2 Percentage of Non-motorized and Total HBW, by Distance

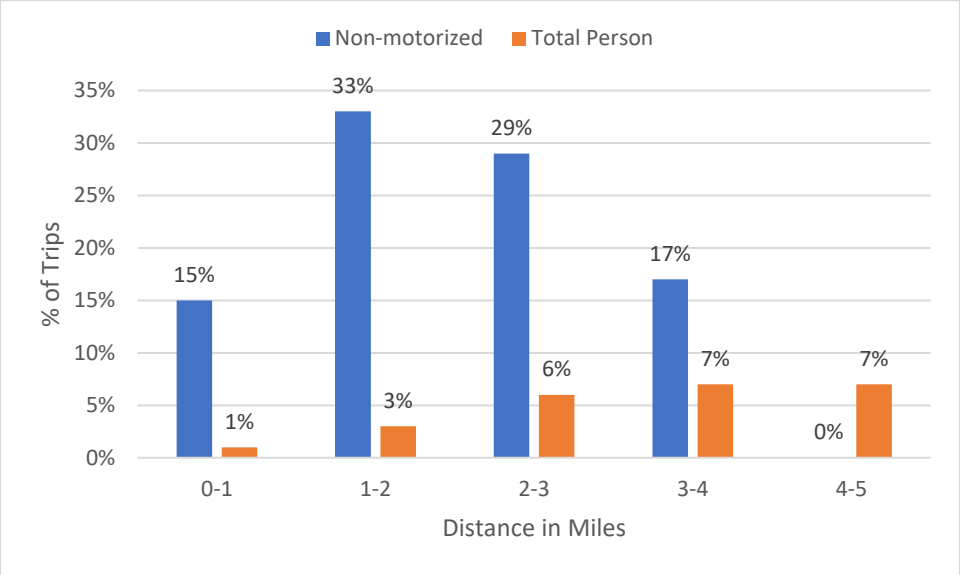


Figure 5-3 Percentage of Non-motorized and Total HBNW, by Distance

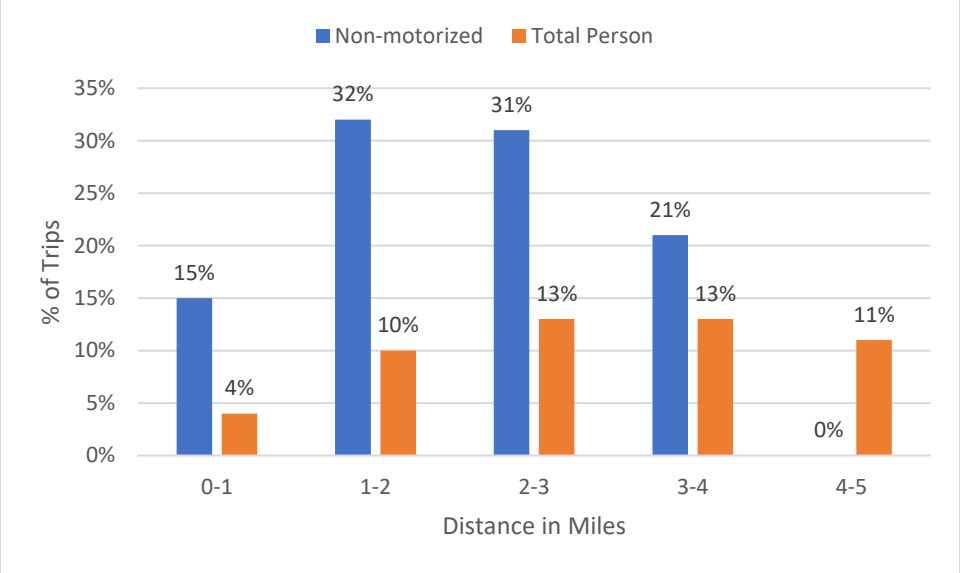
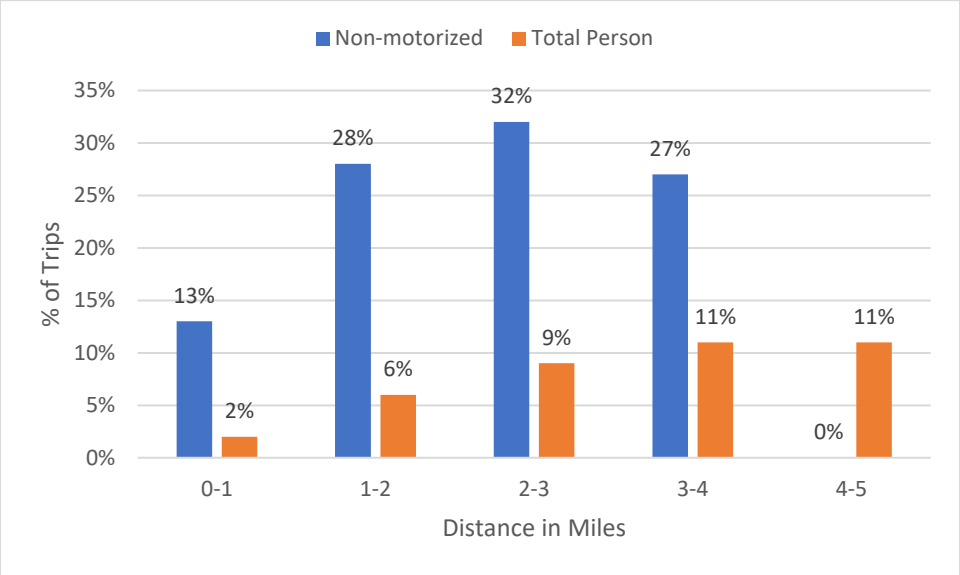


Figure 5-4 Percentage of Non-motorized and Total NHB, by Distance



The project team had intended to compare estimated non-motorized trips to the bicycle and pedestrian counts recently collected by FDOT District 5. At selected intersections throughout the District, the bicycle/pedestrian count data have daily approach and crossing volumes from each intersection leg. This proved to be challenging because CFRPM estimates non-motorized shares for each zone and does not estimate zone-to-zone flows. Zone-to-zone flows are required to compare model estimates to the observed counts.

5.2 Orlando International Airport (OIA) Trips

CFRPM 7 has separate trip generation, trip distribution, and mode choice models for the Orlando International Airport (OIA). The Greater Orlando Aviation Authority (GOAA) operates OIA and collects supplemental GOAA data, including the 2015 Air Passenger Survey, which was the observed data used for calibration. Table 5-3The mode choice observed/estimated comparisons are shown in Table 5-2 and Table 5-3. These are for informational purposes only because the mode choice model was calibrated to produce results nearly identical to the observed values.

Table 5-2 Observed and Estimated Airport Passenger Mode Shares

OBSERVED MODE SHARES									
Mode	Residents, Business - Peak	Residents, Business - Off Peak	Residents, Non-business - Peak	Residents, Non-business - Off Peak	Non-Residents, Business - Peak	Non-Residents, Business - Off Peak	Non-Residents, Non-business - Peak	Non-Residents, Non-business - Off Peak	Total
Onsite Parking	1.10%	1.40%	2.70%	4.10%	0.00%	0.00%	0.00%	0.00%	**9.20%**
Offsite Parking	0.20%	0.70%	1.40%	2.70%	0.00%	0.00%	0.00%	0.00%	**5.00%**
Dropped off	0.90%	2.10%	4.10%	7.90%	0.40%	0.60%	2.40%	3.80%	**22.20%**
Rental Car	0.00%	0.00%	0.00%	0.00%	2.70%	4.30%	9.00%	18.60%	**34.60%**
DME	0.00%	0.00%	0.00%	0.00%	0.20%	0.40%	5.00%	6.50%	**12.10%**
Taxi	0.30%	0.40%	0.80%	1.30%	1.40%	3.20%	2.80%	5.20%	**15.40%**
Walk access-local bus	0.10%	0.10%	0.10%	0.20%	0.10%	0.20%	0.20%	0.50%	**1.40%**
Walk access-premium transit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Auto access-local bus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Auto access-premium transit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Transit sub-total	0.10%	0.10%	0.10%	0.20%	0.10%	0.20%	0.20%	0.50%	**1.40%**
Total	**2.60%**	**4.70%**	**9.10%**	**16.20%**	**4.80%**	**8.50%**	**19.50%**	**34.60%**	**100.00%**
ESTIMATED MODE SHARES									
Mode	Residents, Business - Peak	Residents, Business - Off Peak	Residents, Non-business - Peak	Residents, Non-business - Off Peak	Non-Residents, Business - Peak	Non-Residents, Business - Off Peak	Non-Residents, Non-business - Peak	Non-Residents, Non-business - Off Peak	Total
Onsite Parking	1.00%	1.40%	2.60%	4.10%	0.00%	0.00%	0.00%	0.00%	**9.20%**
Offsite Parking	0.30%	0.70%	1.40%	2.70%	0.00%	0.00%	0.00%	0.00%	**5.10%**
Dropped off	0.90%	2.00%	4.10%	8.00%	0.40%	0.50%	2.40%	3.90%	**22.30%**
Rental Car	0.00%	0.00%	0.00%	0.00%	2.70%	4.30%	9.00%	18.60%	**34.60%**
DME	0.00%	0.00%	0.00%	0.00%	0.30%	0.40%	5.00%	6.40%	**12.10%**
Taxi	0.20%	0.40%	0.90%	1.20%	1.40%	3.20%	2.80%	5.10%	**15.30%**
Walk access-local bus	0.10%	0.10%	0.10%	0.20%	0.10%	0.20%	0.20%	0.50%	**1.40%**
Walk access-premium transit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Auto access-local bus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Auto access-premium transit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Transit sub-total	0.10%	0.10%	0.10%	0.20%	0.10%	0.20%	0.20%	0.50%	**1.50%**
Total	**2.60%**	**4.70%**	**9.10%**	**16.20%**	**4.80%**	**8.50%**	**19.50%**	**34.60%**	**100.00%**

Table 5-3 Difference between Observed and Estimated Shares

PERCENT DIFFERENCE (ESTIMATED - OBSERVED)									
Mode	Residents, Business - Peak	Residents, Business - Off Peak	Residents, Non-business - Peak	Residents, Non-business - Off Peak	Non-Residents, Business - Peak	Non-Residents, Business - Off Peak	Non-Residents, Non-business - Peak	Non-Residents, Non-business - Off Peak	Total
Onsite Parking	-0.01%	0.05%	-0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	**0.01%**
Offsite Parking	0.07%	-0.01%	-0.06%	0.03%	0.00%	0.00%	0.00%	0.00%	**0.03%**
Dropped off	0.02%	-0.07%	0.04%	0.01%	0.01%	-0.02%	0.01%	0.07%	**0.07%**
Rental Car	0.00%	0.00%	0.00%	0.00%	-0.02%	-0.01%	-0.01%	0.02%	**-0.02%**
DME	0.00%	0.00%	0.00%	0.00%	0.01%	0.03%	-0.01%	-0.03%	**0.00%**
Taxi	-0.09%	0.04%	0.05%	-0.08%	-0.02%	-0.02%	0.01%	-0.06%	**-0.15%**
Walk access-local bus	-0.01%	-0.01%	-0.02%	0.00%	0.01%	0.02%	0.01%	0.00%	**0.00%**
Walk access-premium transit	0.01%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Auto access-local bus	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%	**0.00%**
Auto access-premium transit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Transit sub-total	0.00%	0.00%	0.00%	0.02%	0.01%	0.01%	0.01%	0.00%	**0.05%**
Total	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Source: 2015 Air Passenger Survey

5.3 Transit Trips

CFRPM STOPS—a standalone companion transit model that is based on the FTA's STOPS model—estimates all aspects of transit demand. The results of the STOPS model are compared to observed values in this section.

Linked trips represent the complete journey from origin to destination.

Unlinked trips, or boardings, begin when a rider boards a transit vehicle and end when the rider exits the same transit vehicle. Unlinked trips are always equal to or greater than the number of linked trips. For any rider's journey, the difference in unlinked and linked trips are transfers. A journey with no transfers produces one linked and one unlinked trip. A journey with two transfers produces one linked and three unlinked trips.

For each transit agency, the observed unlinked and linked transit trips were taken from locally collected on-board surveys (if available) or assumed from nearby on-board surveys. On-board surveys were available from LYNX, SunRail, LakeXpress, and the western portion of VOTRAN. The fieldwork for these surveys was conducted in 2017.

For each of the other transit agencies, including the remaining portion of VOTRAN, their National Transit Database (NTD) Agency Profile provided the average weekday unlinked trips for 2015 fixed-route service. Citrus Connection and SunTran provided their most recent ridership (unlinked trip) information, which was used instead of the NTD data. Linked trips, by trip purpose and auto ownership, were assumed based on available on-board survey information from LakeXpress because it serves areas similar to those served by SCAT, CitrusConnection, and SunTran; their rider characteristics are likely to be similar as well.

5.3.1 Linked Transit Trips

Table 5-4 compares the observed and STOPS estimated linked trips, and Table 5-5 presents the difference between them. This is for informational purposes only because the STOPS model was calibrated to the linked trips. The differences between the total observed and estimated linked trips are minor—defined as less than 10% or 500 trips—by trip purpose and access mode. HBNW represents trips for HBSH, HBSR and HBO trip purposes.

Table 5-4 Observed and Estimated Linked Trips

Access Mode	Observed				STOPS Estimated			
	HBW	HBNW	NHB	Total	HBW	HBNW	NHB	Total
Walk	36,251	31,463	10,403	78,117	37,079	30,805	10,836	78,720
KNR	1,729	1,347	471	3,547	1,713	1,106	422	3,241
PNR	1,069	567	168	1,804	1,579	203	85	1,867
Total	**39,049**	**33,377**	**11,042**	**83,468**	**40,371**	**32,114**	**11,343**	**83,828**

Sources: CFRPM 7; County Transit Agency

Table 5-5 Delta Linked Trips (Estimated – Observed)

Access Mode	Delta (Estimated – Observed)				%Delta (Delta/Observed)			
	HBW	HBNW	NHB	Total	HBW	HBNW	NHB	Total
Walk	828	-658	433	603	2%	-2%	4%	1%
KNR	-16	-241	-49	-306	-1%	-18%	-10%	-9%
PNR	510	-364	-83	63	48%	-64%	-49%	3%
Total	**1,322**	**-1,263**	**301**	**360**	**3%**	**-4%**	**3%**	**0%**

Sources: CFRPM 7; County Transit Agency

5.3.2 Boardings, by Agency

The project team compared the boardings, by access mode and by the transit agency, to verify the STOPS estimates. The observed and estimated boardings are compared in Table 5-6 through Table 5-12. Boardings are not precisely calibrated in STOPS, so this comparison is helpful in assessing the model's ability to replicate a county's transit demand.

The following are the public transit agencies that operate in the region:

- LYNX (Orange, Seminole, and Osceola counties; limited service in Polk County),
- SunRail commuter rail (Volusia, Seminole, Orange, and Osceola counties),
- VOTRAN (Volusia County),
- LakeXpress (Lake County),
- Space Coast Area Transit (SCAT) (Brevard County),
- CitrusConnection (Polk County) and
- SunTran (Marion County).

The private I-Ride trolley provides bus transportation along the I-Drive resort area and is extensively used by tourists. The synthetic STOPS mode is designed to reflect transit travel patterns of residents only, so the I-Ride trolley is not included in this model.

For each agency, estimated trips are within ±5% of the observed trips for each agency. The differences, by access mode, are very minor, within 10% or 500 trips. PNR boardings show a high percentage of delta compared to other access modes. However, this has a minor impact on the model validity because PNR is the least-used access mode in the region.

Table 5-6 LYNX Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	87,468	86,168	(1,300)	-1%
KNR	3,180	2,675	(505)	-16%
PNR	949	1,141	192	20%

Total	**91,597**	**89,984**	**(1,613)**	**-2%**

Sources: CFRPM 7; County Transit Agency

Table 5-7 SunRail Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	1,009	1,198	189	19%
KNR	740	881	141	19%
PNR	1,498	1,166	(332)	-22%
Total	**3,247**	**3,245**	**(2)**	**0%**

Sources: CFRPM 7; County Transit Agency

Table 5-8 VOTRAN Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	3,809	3,665	(144)	-4%
KNR	190	142	(48)	-25%
PNR	15	17	2	13%
Total	**4,014**	**3,824**	**(190)**	**-5%**

Sources: CFRPM 7; County Transit Agency

Table 5-9 LakeXpress Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	1,437	1,374	(63)	-4%
KNR	71	65	(6)	-8%
PNR	6	27	21	350%
Total	**1,514**	**1,466**	**(48)**	**-3%**

Sources: CFRPM 7; County Transit Agency

Table 5-10 SCAT Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	7,773	7,871	98	1%
KNR	387	273	(114)	-29%
PNR	32	43	11	34%
Total	**8,192**	**8,187**	**(5)**	**0%**

Sources: CFRPM 7; County Transit Agency

Table 5-11 SunTran Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	1,522	1,478	(44)	-3%
KNR	80	100	20	25%
PNR	-	-	-	-
Total	**1,602**	**1,578**	**(24)**	**-1%**

Sources: CFRPM 7; County Transit Agency

Table 5-12 CitrusConnection Boardings

Access Mode	Observed	Estimated	Delta	%Delta
Walk	5,152	4,901	(251)	-5%
KNR	256	241	(15)	-6%
PNR	21	44	23	110%
Total	**5,429**	**5,186**	**(243)**	**-4%**

Sources: CFRPM 7; County Transit Agency

5.3.3 Transfer Rate

Transfers are the difference between unlinked and linked trips. Transfer rates are calculated using the following equation:

$$Transfer\ Rate = \frac{Unlinked\ Trips}{Linked\ Trips} - 1$$

Transfers are an important characteristic in transit demand because a large percentage of riders transfer within the transit system. Transfers are not precisely calibrated in STOPS, so this comparison is helpful in assessing the model's replication of each county's transit demand.

There is a 3% difference between the observed and estimated regional transfer rate, as shown in Table 5-13. This indicates that the transit model is accurate in estimating the transferring activity of Central Florida transit riders.

Table 5-13 Transfer Rate

	Linked Trips	Unlinked Trips	Transfer Rate
Observed	83,466	115,595	38%
Estimated	83,912	113,483	35%

Sources: CFRPM 7; County Transit Agency

5.4 Auto Occupancy Rates

CFRPM 7 uses average auto occupancy rates to convert auto person trips to vehicle trips; one occupancy rate is used for each trip purpose. To assess its reasonableness, three occupancy rates are compared in Table 5-14: one for "all auto trips", one that reflects only SR 2 auto trips, and another that reflects only SR 3+ auto trips. These three comparisons help ensure that the model produces a reasonable balance of drive alone and higher-occupancy vehicle trips. Overall, the all

auto occupancy rate is in the 95% confidence interval (i.e., 1.24–1.44) of the rate, derived from the 2017 NHTS data for the Orlando-Kissimmee-Sanford area[13].

Table 5-14 Estimated Average Auto Occupancy Rates

Occupancy	HBW	HBNW*	NHB	Total
All Auto Trips	1.12	1.51	1.35	1.39
SR 2**	2.22	2.36	2.37	2.35
SR 3+***	3.20	3.45	3.30	3.40

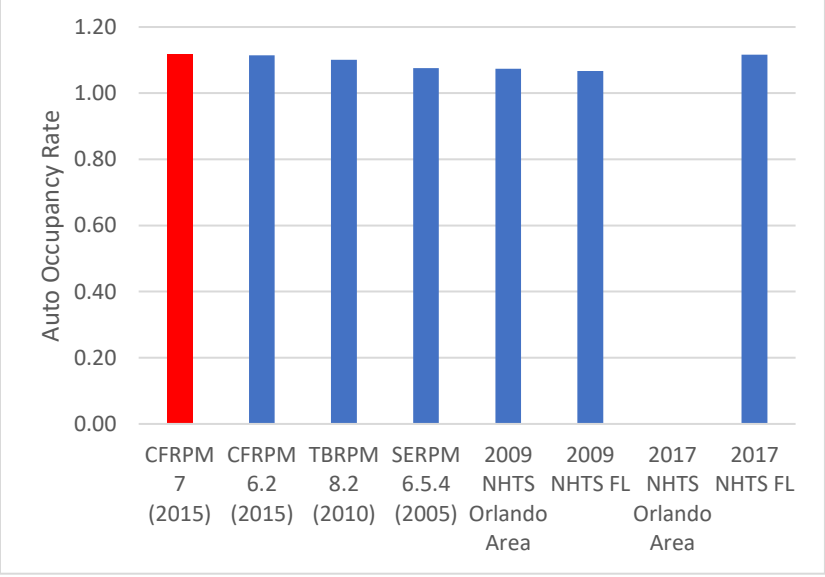
* HBNW = HBSH + HBSR + HBSC + HBCU + HBO
** Shared-Ride (SR) 2: two or more people in a vehicle while driving
*** Shared-Ride (SR) 3+: three or more people in a vehicle while driving
Source: CFRPM 7

Further comparisons were made with other Florida models and NHTS data (see Figure 5-5). Estimated auto occupancy rates were compared to the corresponding rates from other trip-based models: CFRPM 6.2, TBRPM 8.2, SERPM 6.5.4. 2009 and 2017 NHTS data were also used. 2017 NHTS HBW data for the Orlando area are insufficient to estimate.

The graphs presented in Figure 5-5 show that estimated average auto occupancy rates are consistent with rates from other models or NHTS data sources. These high-level comparisons show that CFRPM 7 uses reasonable average auto occupancy rates.

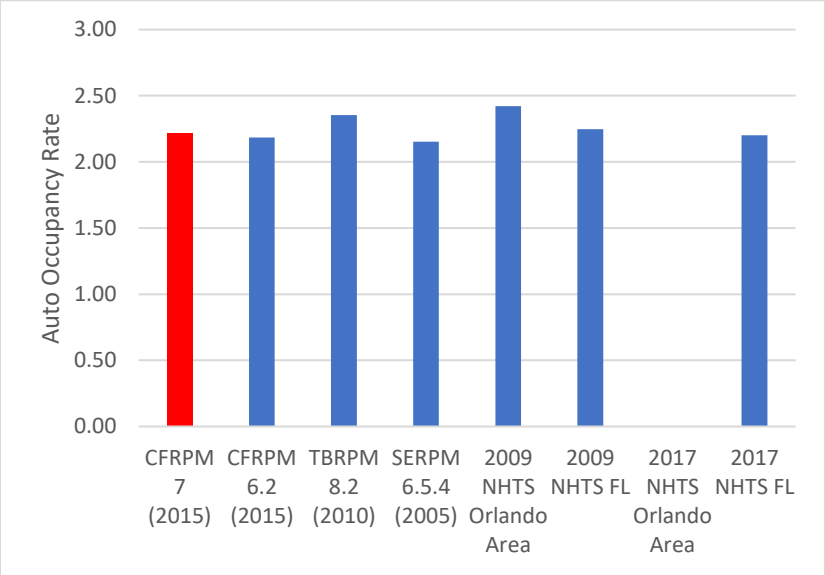
Figure 5-5 Comparison of Auto Occupancy Rate

(a) Auto occupancy rate for HBW trips: all auto trips

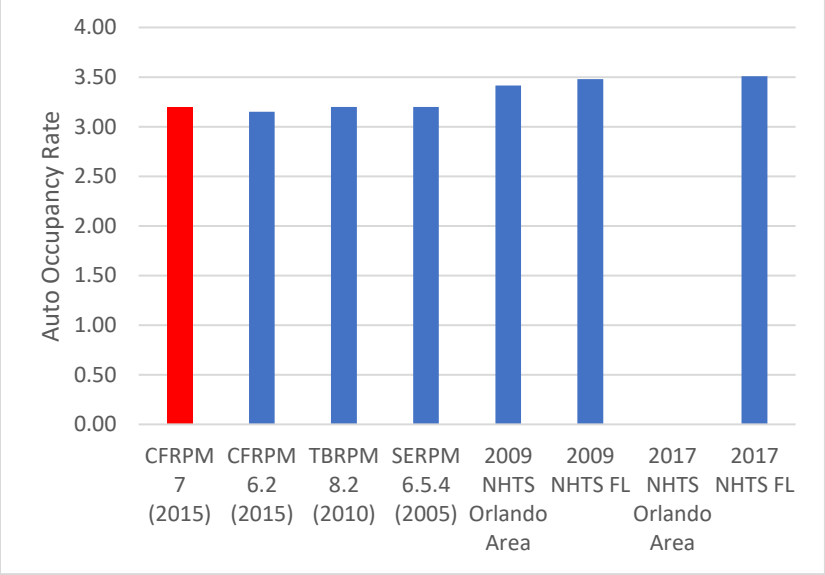


[13] NHTS table Designer (https://nhts.ornl.gov/), Federal Highway Administration, 2017 NHTS

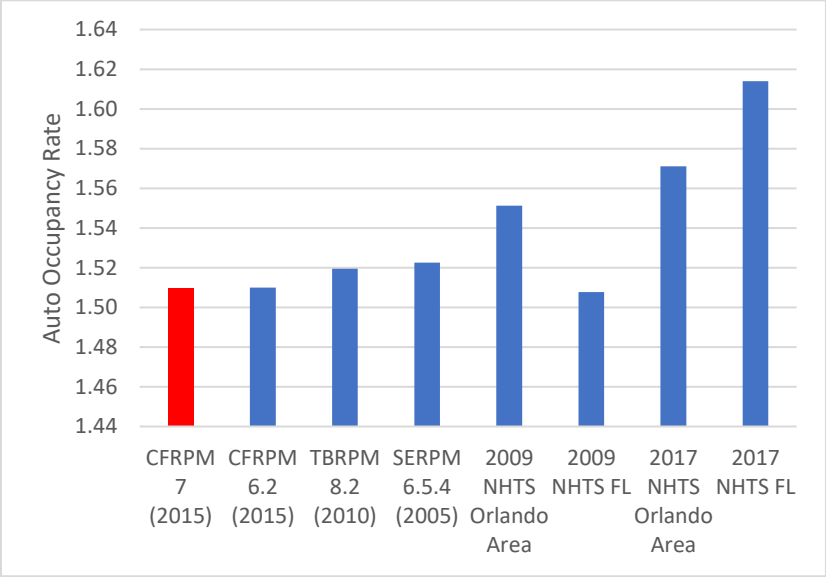
(b) Auto occupancy rate for HBW trips: SR 2



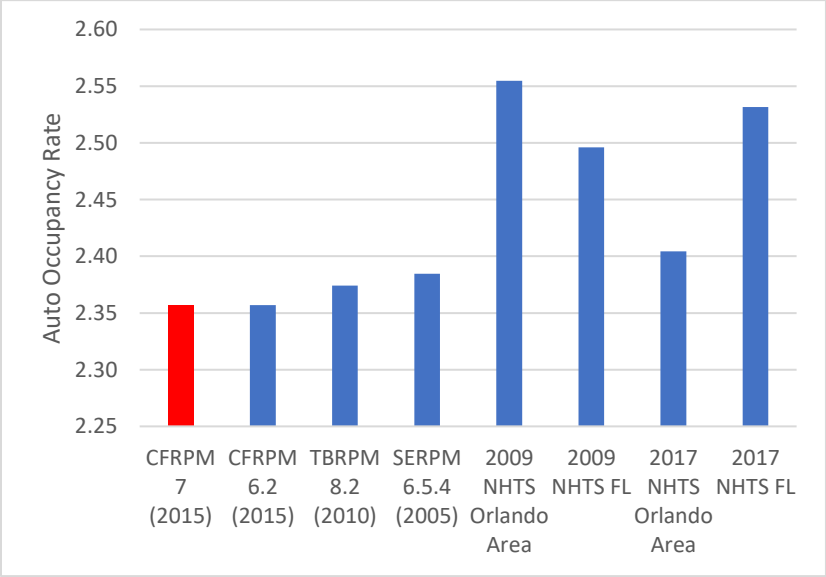
(c) Auto occupancy rate for HBW trips: SR 3+



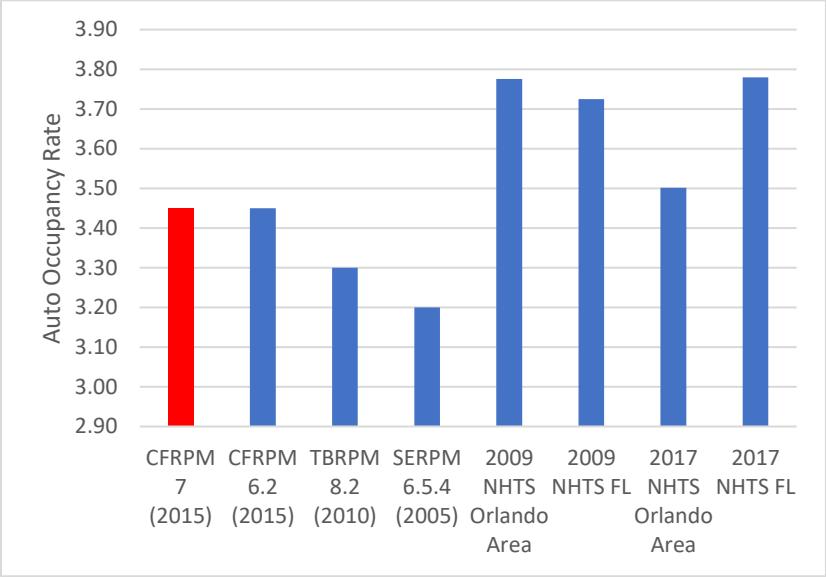
(d) Auto occupancy rate for HBNW trips: all auto trips



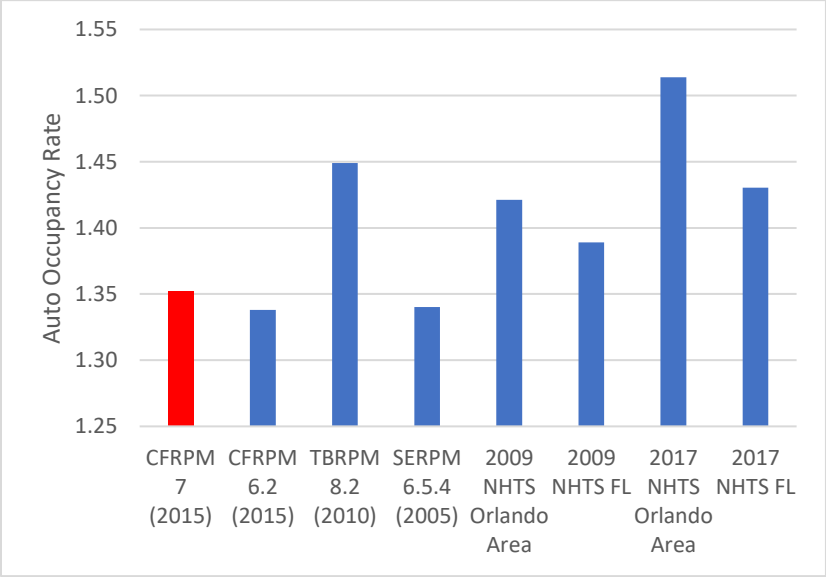
(e) Auto occupancy rate for HBNW trips: SR 2



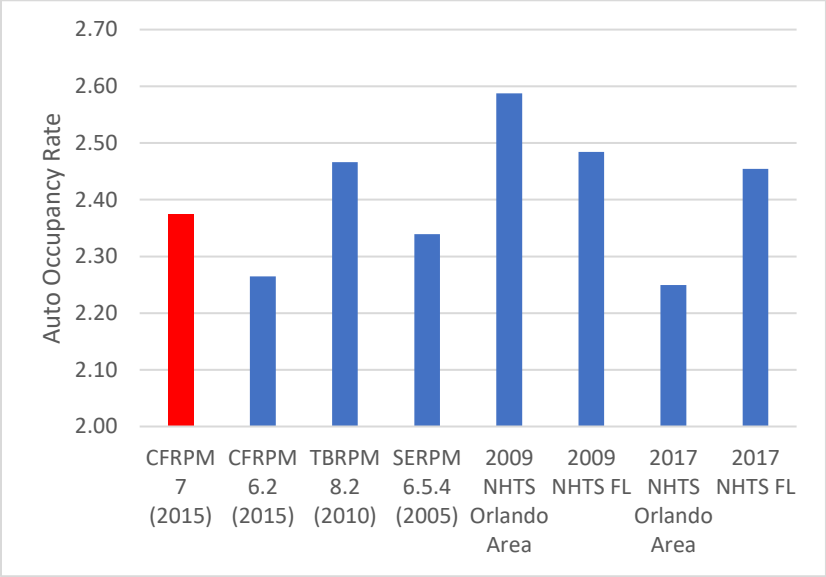
(f) Auto occupancy rate for HBNW trips: SR 3+



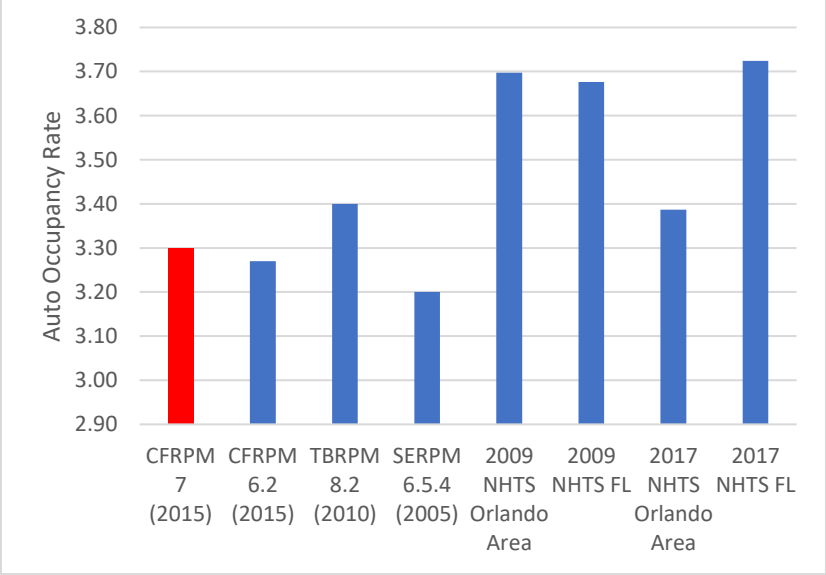
(g) Auto occupancy rate for NHB trips: all auto trips



(h) Auto occupancy rate for NHB trips: SR 2



(i) Auto occupancy rate for NHB trips: SR 3+



Another analysis compared estimated percentages of drive alone, SR 2, and SR 3+ trips (see Table 5-15) with those from other Florida models and the NHTS data (see Figure 5-6). 2017 NHTS HBW data for SR 3+ for the Orlando area are insufficient to estimate.

Table 5-15 Estimated Person Trips, by Auto Occupancy and by Trip Purpose

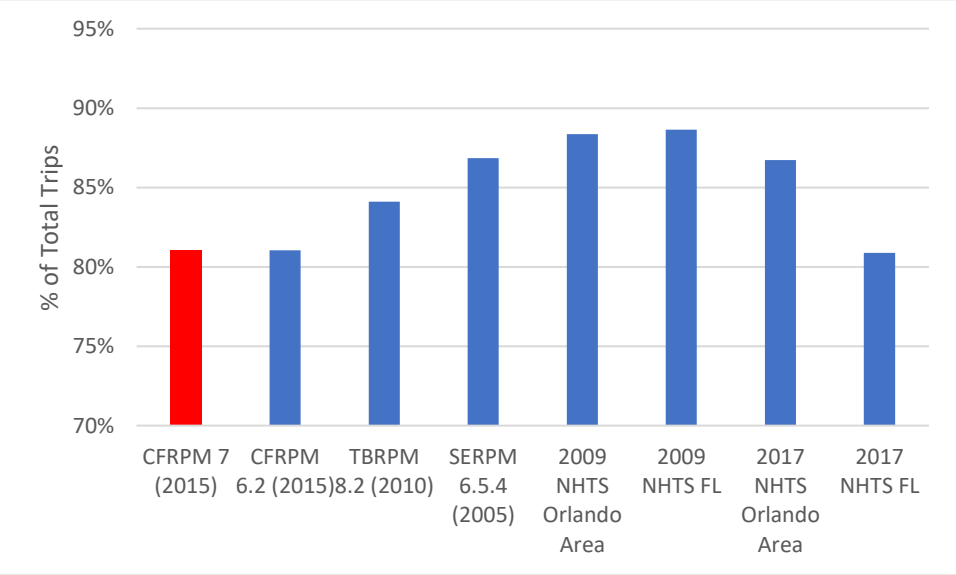
Auto Occupancy	HBW	HBNW	NHB	Total
Drive Alone	81.05%	41.34%	55.00%	52.61%
SR 2*	14.00%	37.52%	27.00%	31.63%
SR 3+**	4.95%	21.14%	18.00%	15.76%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

* Shared-Ride (SR) 2: two people in a vehicle when driving
** Shared-Ride (SR) 3+: three or more people in a vehicle when driving
Source: CFRPM 7

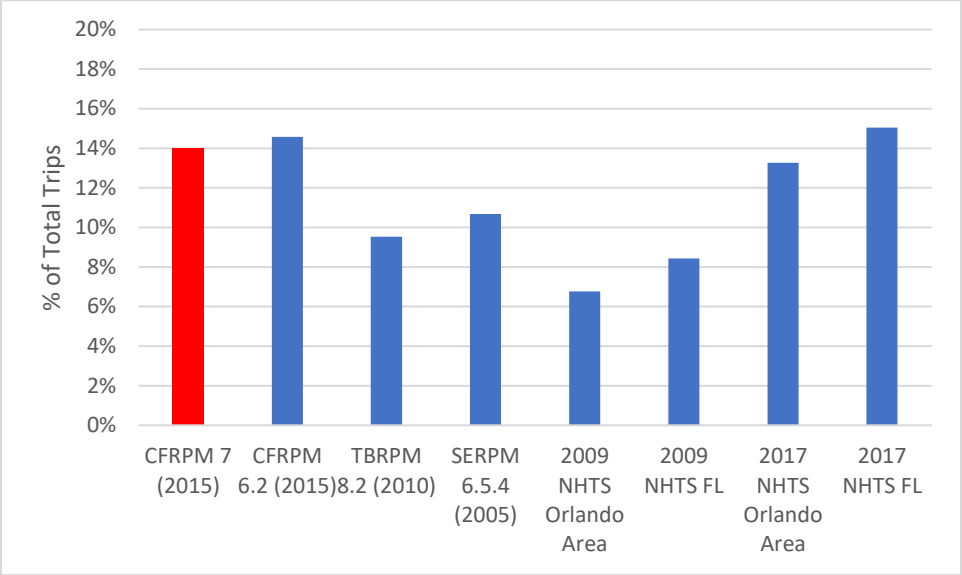
While the comparison presented in Table 5-15 does not validate CFRPM 7 values, it demonstrates that the values are not significantly incorrect.

Figure 5-6 Percentage of Person Trips, by Auto Occupancy and by Trip Purpose

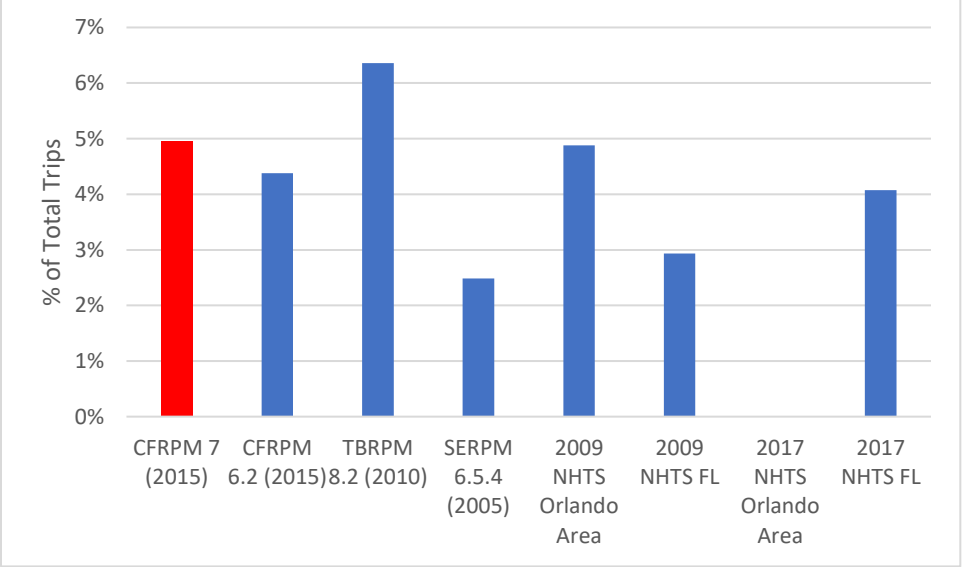
(a) HBW trips: Drive Alone



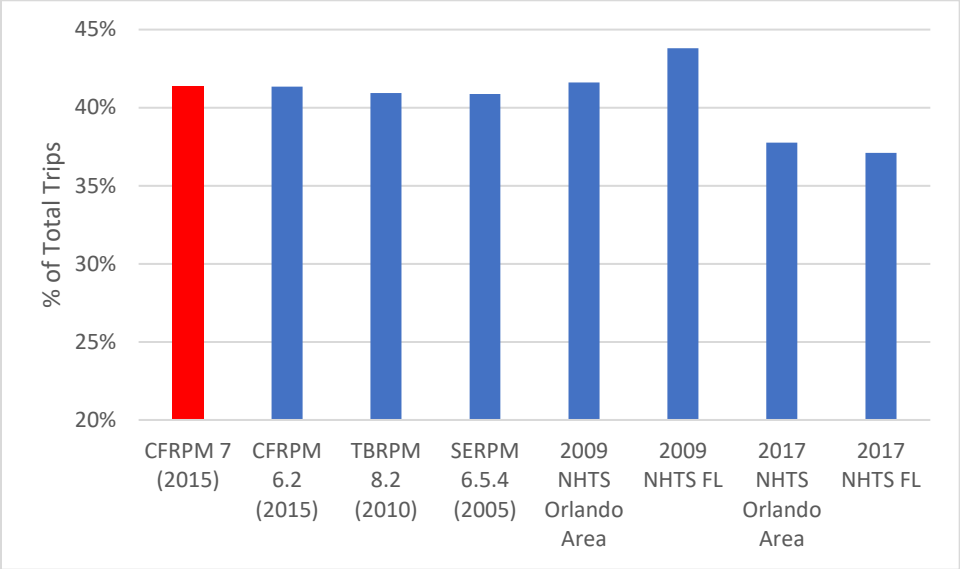
(b) HBW trips: SR 2



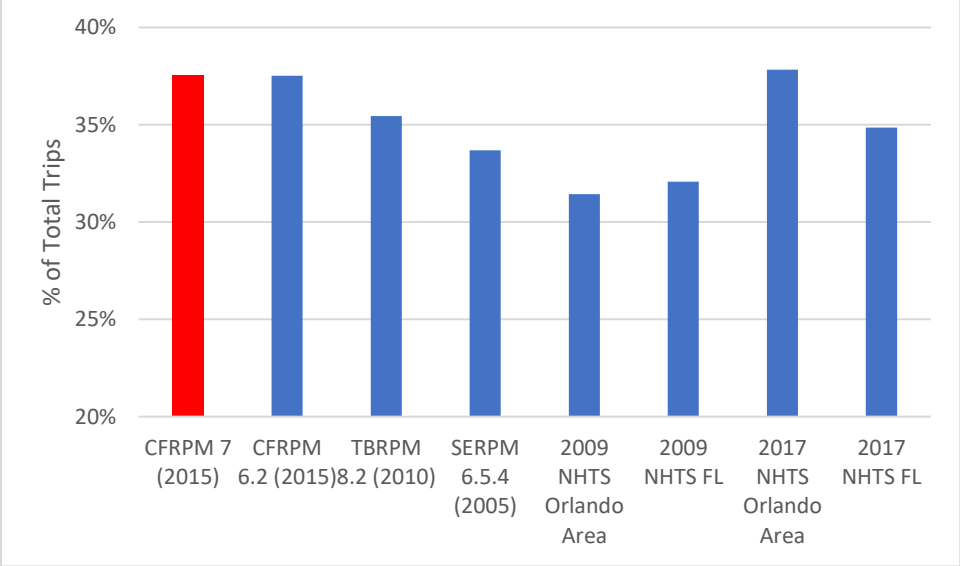
(c) HBW trips: SR 3+



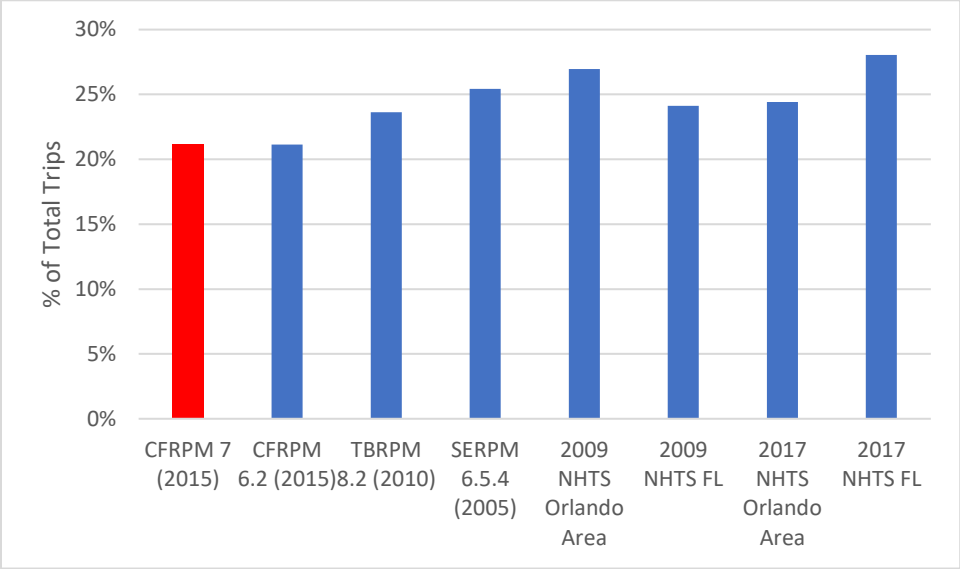
(d) HBNW trips: Drive Alone



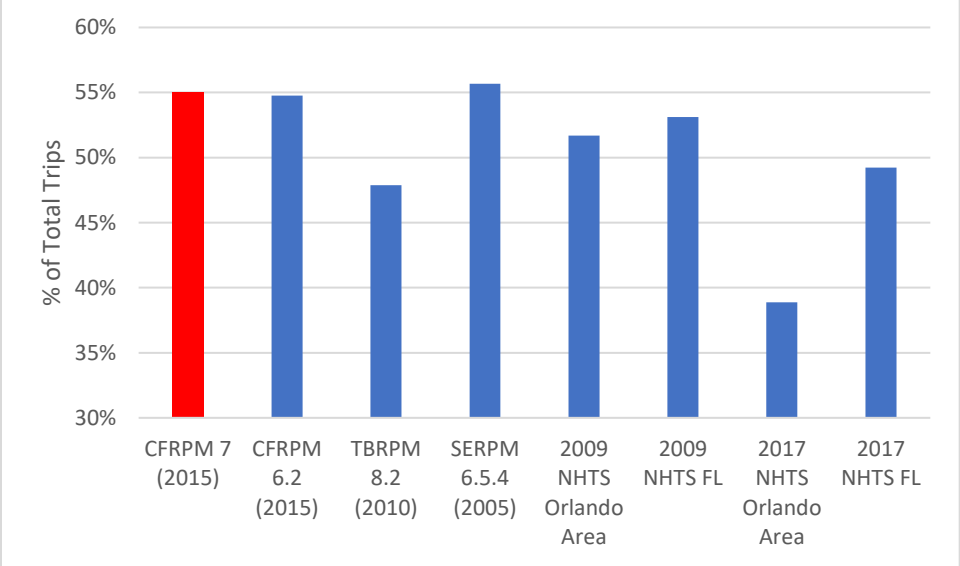
(e) HBNW trips: SR 2



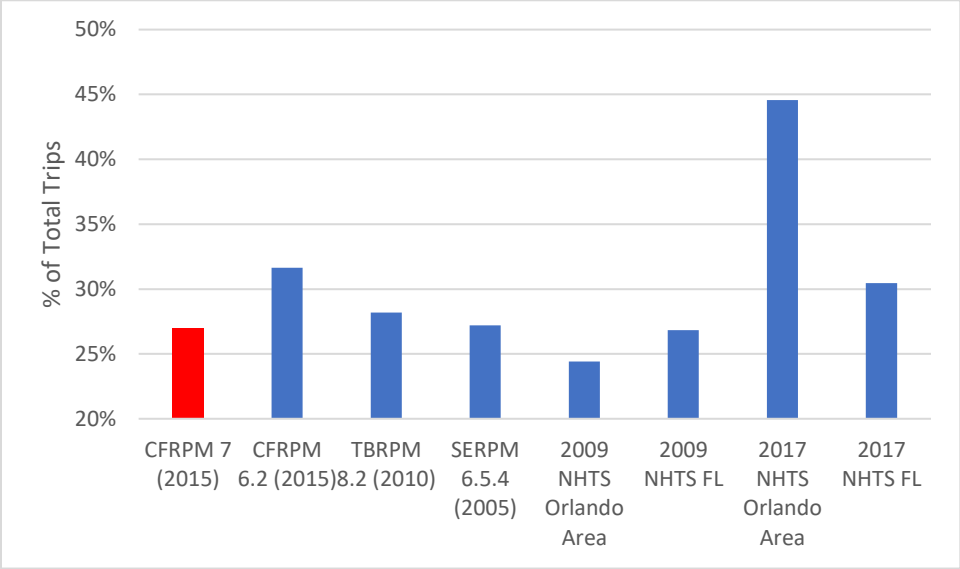
(f) HBNW trips: SR 3+



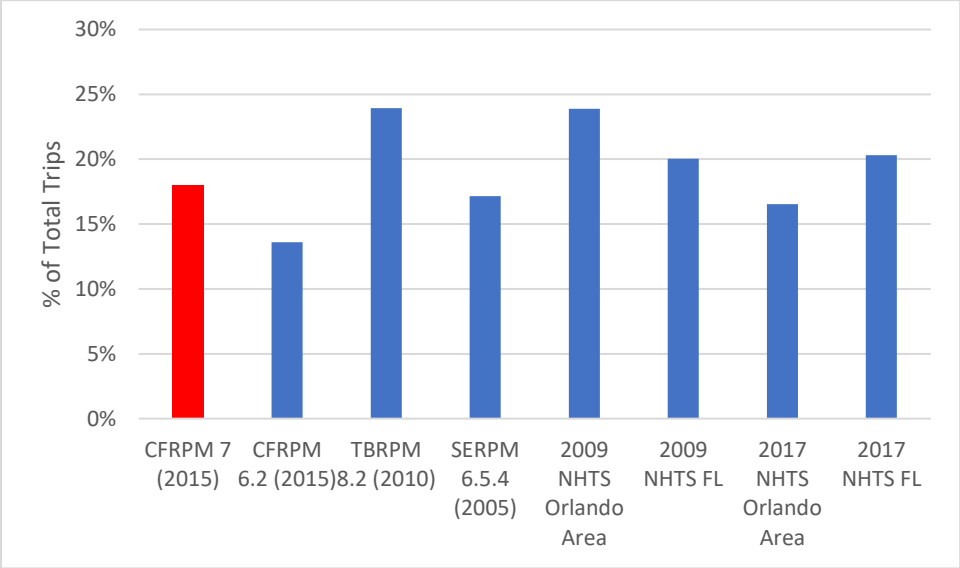
(g) NHB trips: Drive Alone



(h) NHB trips: SR 2



(i) NHB trips: SR 3+



The comparisons of percentages of trips by auto occupancy rates presented in Figure 5-6 indicate that estimates are similar to those from the NHTS datasets and other Florida models. This indicates that the model's estimates of auto trips for these purposes are reasonable, given the number of person trips produced in the trip distribution step.

6 Highway Assignment

Validating the highway (or roadway) assignment allows a check on whether CFRPM 7 reasonably reflects auto travel patterns and the demand of the roadway network. This chapter summarizes the process used to validate highway assignment and provides comparisons of observed data (traffic counts and travel time) and model estimates.

6.1 Method

The validation process began by comparing model estimates to observed data. Where significant differences existed, the root cause was identified and CFRPM 7 was adjusted accordingly. This process—compare → identify → adjust—was repeated until no significant differences remained, using professional judgement.

The primary observed datasets used for comparison are the 2015 traffic counts and travel speed observations: 11,335 directional traffic counts in 15-minute increments were collected from 6,349 count stations. Also, 20,174 15-minute travel speed observations were collected from 8,242 traffic message channels (TMCs). Both the traffic counts and observed speeds were aggregated into four time periods. The traffic counts were also converted to average peak season weekday traffic (PSWDT) levels. The observed speeds were used to verify travel time estimates.

Model estimates are considered valid if they fall within pre-specified ranges of benchmarks or metrics. These ranges are specified in a document published in 2016 for CFRPM 6.2, *Recommendations for Expanded Validation Metrics for CFRPM v6.2* and summarized in Table 6-1.

Table 6-1 Highway Assignment Benchmarks

Metric	Acceptable	Preferable
Freeway Volume/Count Ratio (FT 10s, 80s)	+/- 7%	+/- 6%
Divided Arterial Volume/Count Ratio (FT 20s)	+/- 15%	+/- 10%
Undivided Arterial Volume/Count Ratio (FT 30s)	+/- 15%	+/- 10%
Collector Volume/Count Ratio (FT 40s)	+/- 25%	+/- 20%
One-way/Frontage Road Volume/Count Ratio (FT 60s)	+/- 25%	+/- 20%
Ramps Volume/Count Ratio (FT 70s)	+/- 25%	+/- 20%
Toll Roads-Freeway Volume/Count Ratio (FT 91)	+/- 7%	+/- 6%
Toll Roads-Arterial Volume/Count Ratio (FT 92)	+/- 15%	+/- 15%
Volume/Count Ratio for External Model Cordon Lines	+/- 1%	+/- 1%
Regional Volume/Count Ratio	+/- 16%	+/- 12%
Assigned VMT/Count Ratio Regionwide	+/- 5%	+/- 2%
Assigned VHT/Count Ratio Regionwide	+/- 5%	+/- 2%
Assigned VMT/Count Ratio by FT/AT/No. of Lanes	+/- 25%	+/- 15%

Metric	Acceptable	Preferable
Assigned VHT/Count Ratio by FT/AT/No. of Lanes	+/- 25%	+/- 15%
Screenlines with greater than 70,000 AADT	+/- 10%	
Screenlines with 35,000 to 70,000 AADT	+/- 15%	
Screenlines with less than 35,000 AADT	+/- 20%	
Percent error for volume group < 10,000 AADT	50%	25%
Percent error for volume group 10,000–30,000 AADT	30%	20%
Percent error for volume group 30,000–50,000 AADT	25%	15%
Percent error for volume group 50,000–65,000 AADT	20%	10%
Percent error for volume group 65,000–75,000 AADT	15%	5%
Percent error for volume group 75,001+ AADT	10%	5%
RMSE for links with < 5,000 vehicles per day	100%	45%
RMSE for links with 5,000–9,999 vehicles per day	45%	35%
RMSE for links with 10,000–14,999 vehicles per day	35%	27%
RMSE for links with 15,000–19,999 vehicles per day	30%	25%
RMSE for links with 20,000–29,999 vehicles per day	27%	15%
RMSE for links with 30,000–49,999 vehicles per day	25%	15%
RMSE for links with 50,000–59,999 vehicles per day	20%	10%
RMSE for links with 60,000+ vehicles per day	19%	10%
RMSE regionwide	45%	35%
AM peak roadway travel times in selected travel corridors	80% of corridors within 20%	50% of corridors within 10%
Midday roadway travel times in selected travel corridors	80% of corridors within 20%	50% of corridors within 10%
PM peak roadway travel times in selected travel corridors	80% of corridors within 20%	50% of corridors within 10%

Source: FDOT.2008. Model Calibration and Validation Standards Report

Many adjustments were identified throughout the calibration and validation of the highway assignment process. These adjustments, briefly described here individually, are grouped into three perspectives:

1. Big Picture—for a particular aspect of travel demand, does the assignment correctly reflect the overall magnitude or perspective?
2. Regional Focus—for a particular aspect of travel demand, does the assignment correctly reflect the county-to-county travel demand in magnitude?
3. Localized Focus—for a particular aspect of travel demand, does the assignment correctly reflect the travel demand within each county?

This section discusses model estimates after all adjustments were made. These adjustments included:

- The CONFAC[14] values, originally defined as the number of hours within each time-period, were adjusted to reflect the ratio of peak-hour volume to time-period volume. The original definition resulted in extensive FF conditions, even during peak periods.
- HBSC trips were adjusted so that they were balanced at the county level to avoid illogically long student trips that were inflating VMT and VHT levels.
- HBCU productions were limited to occur only within 20 miles of college campuses to avoid illogically long student trips that were also inflating VMT and VHT levels.
- Some external trip productions were adjusted to match the latest external counts. They were previously adjusted to an earlier set of external counts.
- Trips to/from Special Purpose areas were modified to better represent actual travel patterns, as defined by the 2015 AirSage data collected by FDOT in 2016. These travel patterns had not been validated in previous versions of CFRPM.
- Several adjustments were made to the HBW, HBNW, and NHB trip production rates. Earlier versions produced substantially higher VMT and VHT.
- Estimated FF speeds were reduced by 5 mph to freeways and collectors. The original FF speeds led to higher VMT on these facilities.

Some model adjustments were made to improve the representation of the county-to-county travel demand magnitude or perspective:

- County-to-county K-factors were applied for the HBW, HBNW, and NHB trip purposes to better reflect the nuanced travel patterns between the Orlando urban area and the surrounding counties. Without these changes, travel to/from the Orlando urban area was over-stated.
- The truck generation rates were adjusted for each county. The original rates were consistent across the region and produced high truck volumes.
- The trip generation rates of the counties outside the METROPLAN Orlando area were reduced by 9%. The earlier rates produced significantly higher traffic in those counties.
- The rural roadway capacities were made more consistent with urban/suburban capacities. The original rural roadway capacities were substantially lower than the corresponding urban/suburban capacities.
- An additional 1–2 minutes of terminal time was added to certain area types to make them consistent with the terminal times used for the observed TLFDs.

[14] The Capacity Factors (CONFAC) are designed to convert peak-hour capacity to time-period capacity for the TOD model. The CONFAC values are determined by the time-period count to peak-hour count ratios using the traffic count database. For more details, see Section 8.1 in the Model Description Report.

- The IE trip attractions were adjusted towards the non-Orlando urban counties. The original rates resulted in most of the IE trips traveling to the Orlando urban area, resulting in significantly high volumes along I-4.

Some model adjustments were made to improve the model's representation of the demand magnitude within each county:

- The value-of-time was increased. The original values-of-time, based on the average wage rates for the Orlando area, was causing illogical paths near toll plazas. Vehicles used off- and on-ramps to avoid toll plazas in at least three different counties.
- A distance factor was applied to better reflect the demand on freeways that do not experience regular congestion (i.e., all counties except Orange County). Before applying this factor, freeway demand was much higher than arterial demand in these areas.

6.2 Traffic Volume-Related Comparisons

Estimated volumes are compared to the 2015 FDOT traffic ground counts collected on various roadways throughout the network and are summarized in the following sections.

6.2.1 Daily Comparison for Volume Overcount

Estimated assigned daily volumes from highway assignment are compared to observed daily traffic counts to confirm that the model sufficiently represents the travel patterns in the model area. The volume/count ratio is the primary metric (see Table 6-2 for this comparison).

Each facility type has acceptable and preferable ranges for the volume/count ratio and these ranges have a reciprocal relationship with the traffic count observed on the different facilities. For instance, the ratio of a facility with low traffic counts is more sensitive to change in the volume, so it has a wider range. Therefore, a freeway for the heaviest traffic has a narrower range. The range of an external station connector is the shortest. Because the production of the external station connector is calculated using the traffic counts on the connector, the volume and count should be the same. As seen in Table 6-2, the ratios of all facility types lie within the preferable benchmark range.

Table 6-2 Estimated Volume to Count Ratio, by Facility Type (Daily)

Facility Type	No. of Links	Estimated Volume	Count	Volume / Count*	Acceptable	Preferable
Freeway	119	4,181,588	4,038,151	1.04	+/- 7%	+/- 6%
Divided Arterial	3,208	48,697,255	46,397,646	1.05	+/- 15%	+/- 10%
Undivided Arterial	1,549	10,802,601	10,516,651	1.03	+/- 15%	+/- 10%
Collector	4,236	12,170,101	14,495,452	0.84	+/- 25%	+/- 20%
External Station Connector	114	619,342	618,642	1.00	+/- 1%	+/- 1%
One-way/Frontage	108	1,463,019	1,493,796	0.98	+/- 25%	+/- 20%
Ramps	802	5,204,578	5,042,715	1.03	+/- 25%	+/- 20%
Toll Road-Freeway	245	6,880,665	6,621,189	1.04	+/- 7%	+/- 6%
Toll Road-Arterial	4	36,618	38,264	0.96	+/- 15%	+/- 15%
Region	**10,385**	**90,055,767**	**89,262,506**	**1.01**	**+/- 16%**	**+/- 12%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Another key metric is the percent of root mean square error (%RMSE):

$$\%RMSE = \sqrt{\frac{\sum_{a \in A_v}\left(V^a_{assign} - V^a_{obs}\right)^2}{n-1}} * \frac{100 * n}{\sum_{a \in A_v} V^a_{obs}}$$

Where:

- V^a_{assign} and V^a_{obs} are the estimated assigned volumes and observed volumes (traffic counts) on link a
- n is the total number of links that have available link volumes
- A_v represents the set of links with available volumes

Table 6-3 presents %RMSE between the estimated volume and count. Ranges of acceptable and preferable for %RMSE is also reciprocal to the count. All the %RMSE results are within the acceptable benchmark range, with the 15,000 and 19,999 count group in the preferable range.

Table 6-3 %RMSE by Count Group (Daily)

Count Group	No. of Links	Estimated Volume	Count	%RMSE*	Acceptable	Preferable
<5,000	4,534	11,694,548	10,885,289	91%	100%	45%
5,000–9,999	2,513	18,188,826	18,203,621	44%	45%	35%
10,000–14,999	1,508	18,864,922	18,638,219	33%	35%	27%
15,000–19,999	930	16,159,719	16,005,141	24%	30%	25%
20,000–29,999	680	16,270,721	16,271,540	18%	27%	15%
30,000–49,999	177	6,143,043	6,407,725	20%	25%	15%
50,000–59,999	19	1,024,041	1,039,971	13%	20%	10%
>=60,000	24	1,709,947	1,810,999	10%	19%	10%
Region	**10,385**	**90,055,767**	**89,262,506**	**38%**	**45%**	**35%**

Green = Preferable; Blue = Acceptable; Red = Out of Range
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The volume/count and %RMSE metrics were applied to screenlines to ensure that the model reflects observed traffic demand throughout all geographic areas. Screenlines are imaginary lines across a certain boundary or along a specific road in an area. CFRPM 7 screenlines are shown in Figure 6-1. Except for Indian River County, all county boundaries are screenlines, and the other screenlines represent major movement of travel patterns.

Figure 6-1 CFRPM 7 Screenlines

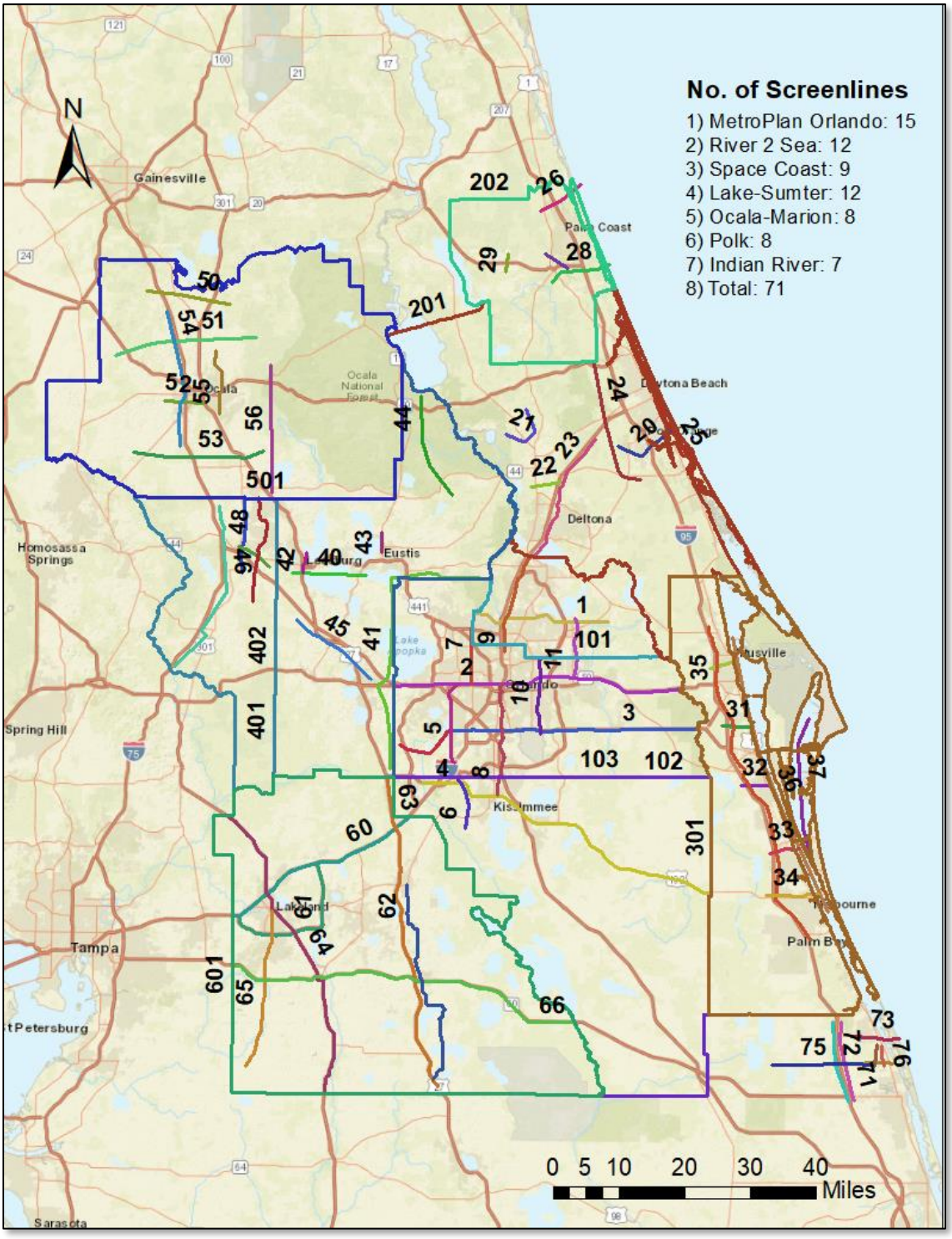


Table 6-4 shows the screenline comparisons for the volume/count ratio and %RMSE metrics. CFRPM 7 overestimates traffic across Volusia County and Flagler County boundaries and assigns more volumes on SR 60 (Indian River County), Polk Parkway (Polk County), and SR 19 (Lake County). Overall, the screenline analysis shows that CFRPM 7 reasonably reflects traffic demand throughout most areas in the region.

Table 6-4 Screenline Analysis (Daily)

#	County	Direction	Location	Volume	Count	Volume / Count	%RMSE	No. of Links
1	Seminole	East-West	SR 434	837,681	814,505	1.03	13	52
2	Orange	East-West	SR 50	1,990,449	1,844,857	1.08	20	88
3	Orange	East-West	SR 482 - SR 528	1,547,010	1,558,725	0.99	19	57
4	Osceola	East-West	US 192	1,391,060	1,354,541	1.03	12	62
5	Orange	North-South	W of Apopka Vineland	213,991	237,808	0.9	32	18
6	Osceola	North-South	E of Poinciana Blvd	83,717	89,117	0.94	30	12
7	Orange	North-South	E of Hiawassee Rd	183,337	153,400	1.2	39	16
8	Orange	North-South	E of US 441	448,064	485,099	0.92	45	35
9	Seminole	North-South	E of I-4	365,237	406,458	0.9	24	30
10	Orange	North-South	W of Goldenrod Rd	446,513	478,866	0.93	16	24
11	Seminole	North-South	E of SR 434	106,592	117,653	0.91	25	14
12	Orange	North-South	W of I-4	65,349	76,213	0.86	40	10
20	Volusia	East-West	N of SR 44	52,113	45,456	1.15	29	8
21	Volusia	East-West	SE of DeLeon Springs	29,944	21,792	1.37	67	8
22	Volusia	East-West	S of DeLand	148,000	139,772	1.06	11	8
23	Volusia	North-South	E of I-4	167,963	139,360	1.21	41	16
24	Volusia	North-South	W of I-95	92,624	59,425	1.56	59	10
25	Volusia	North-South	Intracoastal Waterway	117,571	100,851	1.17	47	11
26	Flagler	East-West	NE of Flagler	17,615	18,304	0.96	28	6
27	Flagler	North-South	W of US 1	42,344	26,464	1.6	77	4
28	Flagler	East-West	S of SR 100	113,981	107,860	1.06	30	12
30	Brevard	East-West	S of SR 406	37,498	44,474	0.84	30	6
31	Brevard	East-West	S of Fay Blvd	98,848	83,582	1.18	26	6
32	Brevard	East-West	S of SR 520	72,620	59,187	1.23	27	4
33	Brevard	East-West	S of SR 404	165,357	157,531	1.05	26	6
34	Brevard	East-West	N of US 192	139,783	156,276	0.89	20	16
35	Brevard	North-South	E of I-95	420,175	442,647	0.95	26	50
36	Brevard	North-South	E of US 1	239,391	234,196	1.02	13	14
37	Brevard	North-South	W of A1A	105,828	100,303	1.06	9	6
40	Lake	East-West	S of US 441	74,424	67,821	1.1	11	4
41	Lake	NA	Lake-Orange County Line	165,264	152,883	1.08	26	18
42	Lake	North-South	E of US 27	69,429	71,601	0.97	13	6
43	Lake	North-South	W of SR 19	26,914	29,306	0.92	31	6
44	Lake	North-South	E of SR 19	28,077	11,356	2.47	214	8
45	Lake	East-West	S of Turnpike	79,899	62,345	1.28	63	12
46	Sumter	North-South	E of I-75	59,497	45,717	1.3	82	12
47	Sumter	North-South	E of US 301	79,659	71,468	1.11	40	18
48	Sumter	North-South	W of Morse Blvd	117,201	119,820	0.98	30	26
49	Sumter	East-West	N of Turnpike	57,007	38,332	1.49	72	8
50	Marion	East-West	N of CR 316	33,696	23,156	1.46	55	4
51	Marion	East-West	N of SR 326	107,267	82,581	1.3	37	6

#	County	Direction	Location	Volume	Count	Volume / Count	%RMSE	No. of Links
52	Marion	East-West	S of SR 40	135,276	110,763	1.22	23	4
53	Marion	East-West	N of CR 484	77,480	55,163	1.4	42	6
54	Marion	North-South	W of I-75	100,898	79,316	1.27	44	6
55	Marion	North-South	E of CR 200A	82,589	84,938	0.97	11	8
56	Marion	North-South	E of SR 30 - US 441	16,941	11,317	1.5	50	2
60	Polk	East-West	I-4	767,727	747,752	1.03	18	16
61	Polk	East-West	POLK PKWY	182,544	84,526	2.16	137	8
62	Polk	North-South	SR 17	79,436	102,111	0.78	49	30
63	Polk	North-South	SR 25/US 27	638,922	443,301	1.44	50	24
64	Polk	North-South	SR 35/US 98	656,579	579,641	1.13	22	34
65	Polk	North-South	SR 37	419,534	402,431	1.04	20	30
66	Polk	East-West	SR 60	457,178	266,444	1.72	74	26
70	Indian River	East-West	N of 65th ST	0	8,495	0	100	2
71	Indian River	North-South	E of I-95	64,746	42,079	1.54	60	4
72	Indian River	North-South	W of I-95	27,645	9,543	2.9	190	2
73	Indian River	East-West	N of 85th St	71,262	49,764	1.43	74	8
74	Indian River	North-South	E of 66th Ave	29,117	16,135	1.8	100	8
75	Indian River	East-West	N of SR 60	7,401	1,908	3.88	421	4
76	Indian River	North-South	W of US 1	27,815	15,404	1.81	89	6
98	Region	NA	All External Stations	619,342	61,8642	1	8	114
99	Region	NA	All Other Counts	71,277,714	72,108,022	0.99	39	9,001
101	Seminole	NA	Seminole County Boundary	654,216	595,405	1.1	32	50
102	Orange	NA	Orange County Boundary	1,315,423	1,263,850	1.04	27	78
103	Osceola	NA	Osceola County Boundary	346,578	318,703	1.09	40	28
201	Volusia	NA	Volusia County Boundary	100,175	60,123	1.67	117	18
202	Flagler	NA	Flagler County Boundary	57,765	26,089	2.21	185	8
301	Brevard	NA	Brevard County Boundary	209,269	136,578	1.53	66	20
401	Lake	NA	Lake County Boundary	291,858	185,313	1.57	80	34
402	Sumter	NA	Sumter County Boundary	281,952	203,182	1.39	75	26
501	Marion	NA	Marion County Boundary	80,564	46,780	1.72	97	12
601	Polk	NA	Polk County Boundary	338,832	257,680	1.31	59	31
Total				**90,055,767**	**89,262,506**	**1.01**	**38**	**10,385**

Source: CFRPM 7

CFRPM 7 generates truck production estimates separately from the truck model. A passenger car equivalent (PCE) factor of 1.8 is applied to heavy trucks. Heavy trucks are restricted access to local roads in the highway assignment. Truck counts from the count sites with detectors that can distinguish vehicle classes are compared with the assigned truck volume, as seen in Table 6-5. There are no known benchmarks for truck assignments. The total truck volume/count ratio is within a reasonable range (2%), but estimated truck volumes in some areas are inaccurate: volumes in Flagler County are underestimated by 34%, but they are overestimated by 34% in Indian River County. The high %RMSE means that CFRPM 7 may not assign the truck volume to the correct roadway.

Table 6-5 Estimated Truck Volume Analysis (Daily)

County	Estimated Volume	Count	Volume/Count	%RMSE	No. of Links
Brevard	76,070	78,440	0.97	79	127
Flagler	12,149	18,527	0.66	119	156
Indian River	15,831	11,776	1.34	81	26
Lake	97,911	106,559	0.92	55	115
Marion	79,949	83,719	0.95	151	117
Orange	1,390,353	1,392,823	1.00	91	742
Osceola	87,781	92,128	0.95	96	136
Polk	480,548	493,835	0.97	66	481
Seminole	63,312	67,009	0.94	77	78
Sumter	58,942	63,637	0.93	101	72
Volusia	103,016	102,675	1.00	95	176
D5 Counties	1,969,484	2,005,517	0.98	105	1,719
Total	**2,465,864**	**2,511,128**	**0.98**	**99**	**2,226**

Source: CFRPM 7

6.2.2 Time-of-Day Comparison for Volume-Count

Assigned volumes as a result of highway assignment were compared with observed time-of-day counts; results are presented in Table 6-6 to Table 6-9. CFRPM 7 generally produces good volume/count ratios for all four time-of-day periods. However, the PM freeway volumes are slightly over assigned in CFRPM 7, which may need further investigation for traffic studies that involve the PM peak period.

Table 6-6 Estimated Volume to Count Ratio, by Facility Type (AM Peak)

Facility Type	No. of Links	Estimated Volume	Count	Volume / Count*	Acceptable	Preferable
Freeway	119	815,795	736,447	1.11	+/- 7%	+/- 6%
Divided Arterial	3,208	9,574,651	8,597,360	1.11	+/- 15%	+/- 10%
Undivided Arterial	1,549	2,168,613	2,006,541	1.08	+/- 15%	+/- 10%
Collector	4,236	2,443,589	2,710,162	0.90	+/- 25%	+/- 20%
External Station Connector	114	104,834	109,475	0.96	+/- 1%	+/- 1%
One-way/ Frontage	108	290,755	277,501	1.05	+/- 25%	+/- 20%
Ramps	802	1,066,769	1,018,275	1.05	+/- 25%	+/- 20%
Toll Road-Freeway	245	1,603,488	1,394,624	1.15	+/- 7%	+/- 6%
Toll Road-Arterial	4	9,307	6,084	1.53	+/- 15%	+/- 15%
Region	**10,385**	**18,077,801**	**16,856,469**	**1.07**	**+/- 16%**	**+/- 12%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-7 Estimated Volume to Count Ratio, by Facility Type (Mid-Day)

Facility Type	No. of Links	Estimated Volume	Count	Volume / Count*	Acceptable	Preferable
Freeway	119	1,313,583	1,279,582	1.03	+/- 7%	+/- 6%
Divided Arterial	3,208	15,167,379	15,531,035	0.98	+/- 15%	+/- 10%
Undivided Arterial	1,549	3,299,715	3,540,750	0.93	+/- 15%	+/- 10%
Collector	4,236	3,700,729	4,758,408	0.78	+/- 25%	+/- 20%
External Station Connector	114	232,032	211,592	1.10	+/- 1%	+/- 1%
One-way/Frontage	108	457,804	516,860	0.89	+/- 25%	+/- 20%
Ramps	802	1,574,177	1,537,079	1.02	+/- 25%	+/- 20%
Toll Road-Freeway	245	1,872,618	1,916,668	0.98	+/- 7%	+/- 6%
Toll Road-Arterial	4	8,917	11,856	0.75	+/- 15%	+/- 15%
Region	**10,385**	**27,626,954**	**29,303,830**	**0.94**	**+/- 16%**	**+/- 12%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-8 Estimated Volume to Count Ratio, by Facility Type (PM Peak)

Facility Type	No. of Links	Estimated Volume	Count	Volume / Count*	Acceptable	Preferable
Freeway	119	982,231	817,764	1.20	+/- 7%	+/- 6%
Divided Arterial	3,208	10,890,940	10,381,748	1.05	+/- 15%	+/- 10%
Undivided Arterial	1,549	2,549,461	2,421,607	1.05	+/- 15%	+/- 10%
Collector	4,236	2,953,932	3,424,976	0.86	+/- 25%	+/- 20%
External Station Connector	114	150,074	132,119	1.14	+/- 1%	+/- 1%
One-way/Frontage	108	323,618	330,618	0.98	+/- 25%	+/- 20%
Ramps	802	1,237,625	1,129,746	1.10	+/- 25%	+/- 20%
Toll Road-Freeway	245	1,796,355	1,598,077	1.12	+/- 7%	+/- 6%
Toll Road-Arterial	4	11,703	9,453	1.24	+/- 15%	+/- 15%
Region	**10,385**	**20,895,939**	**20,246,108**	**1.03**	**+/- 16%**	**+/- 12%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-9 Estimated Volume to Count Ratio, by Facility Type (Nighttime)

Facility Type	No. of Links	Estimated Volume	Count	Volume / Count*	Acceptable	Preferable
Freeway	119	1,069,979	1,204,347	0.89	+/- 7%	+/- 6%
Divided Arterial	3,208	13,064,285	11,875,083	1.10	+/- 15%	+/- 10%
Undivided Arterial	1,549	2,784,812	2,547,702	1.09	+/- 15%	+/- 10%
Collector	4,236	3,071,851	3,602,849	0.85	+/- 25%	+/- 20%
External Station Connector	114	132,402	166,377	0.80	+/- 1%	+/- 1%
One-way/Frontage	108	390,842	368,821	1.06	+/- 25%	+/- 20%
Ramps	802	1,326,007	1,372,472	0.97	+/- 25%	+/- 20%
Toll Road-Freeway	245	1,608,204	1,711,828	0.94	+/- 7%	+/- 6%
Toll Road-Arterial	4	6,691	10,869	0.62	+/- 15%	+/- 15%
Region	**10,385**	**23,455,073**	**22,860,349**	**1.03**	**+/- 16%**	**+/- 12%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The %RMSE between the volume and count for all four time periods are shown in Table 6-10 to Table 6-13. On time-of-day level, %RMSE meet acceptable standards for almost all volume groups.

Table 6-10 %RMSE, by Count Group (AM Peak)

Count Group	No. of Links	Estimated Volume	Count	% RMSE*	Acceptable	Preferable
<5,000	9,988	15,186,375	13,986,441	54%	100%	45%
5,000–9,999	349	2,202,059	2,214,580	27%	45%	35%
10,000–14,999	36	465,421	440,920	22%	35%	27%
15,000–19,999	9	160,474	151,672	17%	30%	25%
20,000–29,999	3	63,472	62,855	8%	27%	15%
30,000–49,999	0	0	0	0%	25%	15%
50,000–59,999	0	0	0	0%	20%	10%
>=60,000	0	0	0	0%	19%	10%
Region	**10,385**	**18,077,801**	**16,856,469**	**51%**	**45%**	**35%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-11 %RMSE, by Count Group (Mid-Day)

Count Group	No. of Links	Estimated Volume	Count	% RMSE*	Acceptable	Preferable
<5,000	8,519	14,828,954	15,479,421	56%	100%	45%
5,000–9,999	1,686	10,491,935	11,348,174	24%	45%	35%
10,000–14,999	136	1,453,658	1,596,199	25%	35%	27%
15,000–19,999	29	501,628	500,393	11%	30%	25%
20,000–29,999	13	294,328	314,169	13%	27%	15%
30,000–49,999	2	56,451	65,474	20%	25%	15%
50,000–59,999	0	0	0	0%	20%	10%
>=60,000	0	0	0	0%	19%	10%
Region	**10,385**	**27,626,954**	**29,303,830**	**42%**	**45%**	**35%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-12 %RMSE, by Count Group (PM)

Count Group	No. of Links	Estimated Volume	Count	% RMSE*	Acceptable	Preferable
<5,000	9,732	16,281,082	15,700,878	49%	100%	45%
5,000–9,999	584	3,664,732	3,655,461	26%	45%	35%
10,000–14,999	55	685,325	646,558	20%	35%	27%
15,000–19,999	14	264,800	243,211	13%	30%	25%
20,000–29,999	0	0	0	0%	27%	15%

30,000–49,999	0	0	0	0%	25%	15%
50,000–59,999	0	0	0	0%	20%	10%
>=60,000	0	0	0	0%	19%	10%
Region	**10,385**	**20,895,939**	**20,246,108**	**45%**	**45%**	**35%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-13 %RMSE, by Count Group (Nighttime)

Count Group	No. of Links	Estimated Volume	Count	% RMSE*	Acceptable	Preferable
<5,000	9,360	16,326,339	15,041,939	57%	100%	45%
5,000–9,999	888	5,567,170	5,885,384	26%	45%	35%
10,000–14,999	98	907,688	1,146,954	30%	35%	27%
15,000–19,999	22	315,040	372,832	27%	30%	25%
20,000–29,999	15	287,666	348,058	20%	27%	15%
30,000–49,999	2	51,170	65,182	31%	25%	15%
50,000–59,999	0	0	0	0%	20%	10%
>=60,000	0	0	0	0%	19%	10%
Region	**10,385**	**23,455,073**	**22,860,349**	**50%**	**45%**	**35%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

6.3 Vehicle Miles Traveled

Comparing observed and estimated vehicle miles traveled (VMT) evaluates both the demand and trip distance on roadways. The VMT estimates are compared to observed VMT in two ways:

1. Primarily from traffic counts (i.e., traffic count multiplied by link distance)
2. From FDOT's 2015 Road Mileage and Travel (DVMT) Report

6.3.1 Daily Comparison for VMT

Table 6-14 shows the VMT comparison from the count and estimated volumes, by facility type. Regionally, the estimated travel distance is 6% longer than observed VMT. This difference is slightly over the acceptable range and 4% higher than the preferable range. Except for the undivided arterial VMT, all VMTs of facility types are in the preferable range. Undivided arterials have 20% greater VMT from the estimated volume than the count, but they are still in the acceptable range. Generally, CFRPM 7 produces good results that match the observed VMTs.

Table 6-14 VMT Analysis, by Facility Type (Daily)

Facility Type	No. of Links	VMT from Count	Estimated VMT Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	6,794,827	7,619,774	1.12	+/- 25%	+/- 15%
Divided Arterial	3,208	15,529,779	16,718,482	1.08	+/- 25%	+/- 15%
Undivided Arterial	1,549	4,496,402	5,398,394	1.20	+/- 25%	+/- 15%
Collector	4,236	5,926,248	5,235,078	0.88	+/- 25%	+/- 15%
External Station Connector	114	240,620	240,885	1.00	+/- 25%	+/- 15%
One-way/Frontage	108	332,119	309,992	0.93	+/- 25%	+/- 15%
Ramps	802	2,103,610	2,201,090	1.05	+/- 25%	+/- 15%
Toll Roads-Freeway	245	5,905,659	6,662,194	1.13	+/- 25%	+/- 15%
Toll Roads-Arterial	4	33,567	32,370	0.96	+/- 25%	+/- 15%
Region	**10,385**	**41,362,831**	**44,418,260**	**1.07**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The VMT comparison, by area type, in Table 6-15 shows that the estimated vehicles in rural areas are 43% more than the traffic count. However, the other area types are within the preferable VMT ratio.

Table 6-15 VMT Analysis, by Area Type (Daily)

Area Type	No. of Links	VMT from Count	Estimated VMT Volume	VMT Ratio (VMT Volume/VMT Count)*	Acceptable	Preferable
CBD Areas	234	422,747	434,979	1.03	+/- 25%	+/- 15%
CBD Fringe Areas	211	574,138	604,379	1.05	+/- 25%	+/- 15%
Residential Areas	6,547	24,705,937	25,506,512	1.03	+/- 25%	+/- 15%
OBD Areas	2,509	10,385,462	9,920,410	0.96	+/- 25%	+/- 15%
Rural Areas	884	5,274,546	7,951,979	1.51	+/- 25%	+/- 15%
Region	**10,385**	**41,362,831**	**44,418,260**	**1.07**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The DVMT Report also includes observed VMT, by county. These data are compared to estimates in Table 6-17. Regionally, VMT estimates are within 3%. The county estimates are relatively close as well. Regionally, estimates are 10% high for interstate/freeways, 33% high for principal/divided arterials, and less than 10% low for minor/undivided arterials and collectors. CFRPM 7 has significantly lower estimates for local roadways, which is expected because it only includes 25% of all local roadways in the region.

Table 6-16 Observed Daily VMT from 2015 DVMT Report

Daily VMT	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	3,896,783	5,287,232	1,976,909	1,303,388	4,372,720	16,837,032
Flagler	1,016,859	664,401	468,339	276,749	1,253,332	3,679,680
Lake	1,039,246	3,404,809	739,165	2,138,586	1,898,870	9,220,676
Marion	2,472,547	2,927,717	1,373,460	2,249,116	2,619,873	11,642,713
Orange	12,206,387	6,870,730	7,101,497	5,035,361	5,987,285	37,201,260
Osceola	3,107,520	3,157,433	1,248,448	1,309,110	1,571,767	10,394,278
Polk	3,339,924	5,443,310	2,001,183	3,176,152	5,349,699	19,310,268
Seminole	2,680,388	2,571,239	1,529,899	1,615,164	2,255,345	10,652,035
Sumter	1,910,677	622,174	409,425	764,398	596,346	4,303,020
Volusia	4,278,609	4,674,549	1,564,926	1,614,835	3,555,594	15,688,513
Total	**35,948,940**	**35,623,594**	**18,413,251**	**19,482,859**	**29,460,831**	**138,929,475**

Source: 2015 DVMT Report

Table 6-17 Estimated Daily VMT

Daily VMT	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	5,503,888	5,020,408	2,414,770	1,126,554	1,011,576	15,077,196
Flagler	1,071,193	933,889	560,063	343,599	257,444	3,166,188
Lake	1,470,406	3,586,441	1,719,593	2,443,275	756,495	9,976,210
Marion	2,653,575	3,912,916	1,826,605	2,698,168	912,069	12,003,333
Orange	13,082,491	13,776,925	1,463,840	4,087,640	2,723,819	35,134,715
Osceola	2,688,031	3,610,860	1,566,784	1,138,977	542,117	9,546,769
Polk	3,740,848	8,321,720	3,693,340	2,622,981	1,675,999	20,054,888
Seminole	2,715,562	3,847,052	720,394	1,465,030	775,682	9,523,720
Sumter	2,173,474	985,315	1,060,286	819,894	276,761	5,315,730
Volusia	4,521,223	5,407,216	2,247,187	1,317,766	785,349	14,278,741
Total	**39,620,691**	**49,402,742**	**17,272,862**	**18,063,884**	**9,717,311**	**134,077,490**

Source: CFRPM 7

Table 6-18 %Delta Between 2015 DVMT Report and CFRPM 7 Estimates

Daily VMT	Interstate/ Freeway/ Turnpike	Principal/ Divided Arterials	Minor/ Undivided Arterials	Major/ Minor Collectors	Locals	Total
Brevard	41.24%	-5.05%	22.15%	-13.57%	-76.87%	-10.45%
Flagler	5.34%	40.56%	19.58%	24.16%	-79.46%	-13.95%
Lake	-26.01%	-23.30%	-53.43%	-57.97%	-80.58%	-43.51%
Marion	41.49%	5.33%	132.64%	14.25%	-60.16%	8.19%
Orange	7.32%	33.65%	32.99%	19.97%	-65.19%	3.10%
Osceola	7.18%	100.52%	-79.39%	-18.82%	-54.51%	-5.56%
Polk	-13.50%	14.36%	25.50%	-13.00%	-65.51%	-8.15%

Seminole	12.00%	52.88%	84.56%	-17.42%	-68.67%	3.86%
Sumter	1.31%	49.62%	-52.91%	-9.30%	-65.61%	-10.59%
Volusia	13.75%	58.37%	158.97%	7.26%	-53.59%	23.53%
Total	**5.67%**	**15.67%**	**43.60%**	**-18.40%**	**-77.91%**	**-8.99%**

Sources: CFRPM 7; 2015 DVMT Report

6.3.2 Time-of-Day Comparison for VMT

The VMT comparisons, by facility type, for four time periods are presented in Table 6-19 to Table 6-22. Generally, estimates for VMT volume/count ratios are within the acceptable benchmark range. A small category, arterial toll roads (only four links), is outside the acceptable range in three time periods. Regionally, the AM and PM peak periods are outside the acceptable benchmark range. Overall, these results indicate that CFRPM 7 produces acceptable estimates of VMT, by time period.

Table 6-19 VMT Analysis, by Facility Type (AM Peak)

Facility Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	1,228,101	1,489,403	1.21	+/- 25%	+/- 15%
Divided Arterial	3,208	2,895,011	3,300,516	1.14	+/- 25%	+/- 15%
Undivided Arterial	1,549	854,617	1,065,385	1.25	+/- 25%	+/- 15%
Collector	4,236	1,120,881	1,056,483	0.94	+/- 25%	+/- 15%
External Station Connector	114	44,350	40,822	0.92	+/- 25%	+/- 15%
One-way/Frontage	108	58,472	61,071	1.04	+/- 25%	+/- 15%
Ramps	802	424,872	459,109	1.08	+/- 25%	+/- 15%
Toll Roads-Freeway	245	1,224,071	1,530,813	1.25	+/- 25%	+/- 15%
Toll Roads-Arterial	4	5,363	8,266	1.54	+/- 25%	+/- 15%
Region	**10,385**	**7,855,738**	**9,011,867**	**1.15**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-20 VMT Analysis, by Facility Type (Mid-Day)

Facility Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	2,194,384	2,404,555	1.10	+/- 25%	+/- 15%
Divided Arterial	3,208	5,138,623	5,206,715	1.01	+/- 25%	+/- 15%
Undivided Arterial	1,549	1,491,814	1,672,995	1.12	+/- 25%	+/- 15%
Collector	4,236	1,917,544	1,585,592	0.83	+/- 25%	+/- 15%
External Station Connector	114	83,589	90,119	1.08	+/- 25%	+/- 15%
One-way/Frontage	108	114,779	97,848	0.85	+/- 25%	+/- 15%
Ramps	802	637,347	661,719	1.04	+/- 25%	+/- 15%
Toll Roads-Freeway	245	1,724,794	1,810,228	1.05	+/- 25%	+/- 15%
Toll Roads-Arterial	4	10,387	7,856	0.76	+/- 25%	+/- 15%

Region	**10,385**	**13,313,262**	**13,537,627**	**1.02**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-21 VMT Analysis, by Facility Type (PM Peak)

Facility Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	1,386,101	1,837,446	1.33	+/- 25%	+/- 15%
Divided Arterial	3,208	3,494,615	3,772,677	1.08	+/- 25%	+/- 15%
Undivided Arterial	1,549	1,024,255	1,286,922	1.26	+/- 25%	+/- 15%
Collector	4,236	1,397,722	1,281,587	0.92	+/- 25%	+/- 15%
External Station Connector	114	52,559	58,430	1.11	+/- 25%	+/- 15%
One-way/Frontage	108	72,921	68,562	0.94	+/- 25%	+/- 15%
Ramps	802	472,483	522,324	1.11	+/- 25%	+/- 15%
Toll Roads-Freeway	245	1,437,238	1,759,609	1.22	+/- 25%	+/- 15%
Toll Roads-Arterial	4	8,297	10,353	1.25	+/- 25%	+/- 15%
Region	**10,385**	**9,346,190**	**10,597,911**	**1.13**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-22 VMT Analysis, by Facility Type (Nighttime)

Facility Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	1,986,229	1,888,370	0.95	+/- 25%	+/- 15%
Divided Arterial	3,208	3,997,817	4,438,573	1.11	+/- 25%	+/- 15%
Undivided Arterial	1,549	1,125,636	1,373,092	1.22	+/- 25%	+/- 15%
Collector	4,236	1,489,979	1,311,416	0.88	+/- 25%	+/- 15%
External Station Connector	114	60,635	51,515	0.85	+/- 25%	+/- 15%
One-way/Frontage	108	85,940	82,511	0.96	+/- 25%	+/- 15%
Ramps	802	573,390	557,938	0.97	+/- 25%	+/- 15%
Toll Roads-Freeway	245	1,519,550	1,561,545	1.03	+/- 25%	+/- 15%
Toll Roads-Arterial	4	9,518	5,894	0.62	+/- 25%	+/- 15%
Region	**10,385**	**10,848,694**	**11,270,854**	**1.04**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The VMT comparison, by area type, presented in Table 6-23 to Table 6-26 show that CFRPM 7 significantly overestimates traffic demand in rural areas in all time periods. Regionally, the AM and PM peak periods are outside the acceptable benchmark range.

Table 6-23 VMT Analysis, by Area Type (AM Peak)

Area Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	81,300	88,097	1.08	+/- 25%	+/- 15%
CBD Fringe Areas	211	112,613	123,707	1.10	+/- 25%	+/- 15%
Residential Areas	6,547	4,762,033	5,241,088	1.10	+/- 25%	+/- 15%
OBD Areas	2,509	1,934,388	1,987,148	1.03	+/- 25%	+/- 15%
Rural Areas	884	965,404	1,571,828	1.63	+/- 25%	+/- 15%
Region	**10,385**	**7,855,738**	**9,011,867**	**1.15**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-24 VMT Analysis, by Area Type (Midday)

Area Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
CBD Areas	234	146,704	134,851	0.92	+/- 25%	+/- 15%
CBD Fringe Areas	211	197,177	185,033	0.94	+/- 25%	+/- 15%
Residential Areas	6,547	7,854,014	7,676,603	0.98	+/- 25%	+/- 15%
OBD Areas	2,509	3,396,863	3,044,215	0.90	+/- 25%	+/- 15%
Rural Areas	884	1,718,504	2,496,927	1.45	+/- 25%	+/- 15%
Region	**10,385**	**13,313,262**	**13,537,627**	**1.02**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-25 VMT Analysis, by Area Type (PM Peak)

Area Type	Number of Links	VMT from Count	VMT from Estimated Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
CBD Areas	234	94,002	97,356	1.04	+/- 25%	+/- 15%
CBD Fringe Areas	211	126,668	135,627	1.07	+/- 25%	+/- 15%
Residential Areas	6,547	5,697,684	6,132,392	1.08	+/- 25%	+/- 15%
OBD Areas	2,509	2,304,999	2,297,656	1.00	+/- 25%	+/- 15%
Rural Areas	884	1,122,837	1,934,879	1.72	+/- 25%	+/- 15%
Region	**10,385**	**9,346,190**	**10,597,911**	**1.13**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-26 VMT Analysis, by Area Type (Nighttime)

Area Type	Number of Links	VMT from Count	VMT Estimated from Volume	VMT Ratio (Volume/ Count)*	Acceptable	Preferable
CBD Areas	234	100,753	114,676	1.14	+/- 25%	+/- 15%

CBD Fringe Areas	211	137,672	160,012	1.16	+/- 25%	+/- 15%
Residential Areas	6,547	6,396,764	6,456,430	1.01	+/- 25%	+/- 15%
OBD Areas	2,509	2,745,560	2,591,391	0.94	+/- 25%	+/- 15%
Rural Areas	884	1,467,944	1,948,345	1.33	+/- 25%	+/- 15%
Region	**10,385**	**10,848,694**	**11,270,854**	**1.04**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

6.4 Vehicle Hours Traveled

Vehicle hours traveled (VHT) is another metric to evaluate both the demand and congestion on roadways. The estimated VHT outputs are compared to the observed values: traffic counts multiplied by the travel time needed to traverse the link.

6.4.1 Daily Comparison for VHT

The estimated VHT is 3% higher than the VHT from the count. It is out of the preferable range, but still within the acceptable range. Table 6-27 shows the results of the VHT analysis by facility type. CFRPM 7 appears to estimate VHT reasonably well across multiple dimensions, including facility and area types.

Table 6-27 VHT Analysis, by Facility Type (Daily)

Facility Type	# of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	114,723	128,605	1.12	+/- 25%	+/- 15%
Divided Arterial	3,208	407,544	432,328	1.06	+/- 25%	+/- 15%
Undivided Arterial	1,549	122,495	145,254	1.19	+/- 25%	+/- 15%
Collector	4,236	178,761	152,502	0.85	+/- 25%	+/- 15%
External Station Connector	114	4,421	4,426	1.00	+/- 25%	+/- 15%
One-way/Frontage	108	11,836	11,249	0.95	+/- 25%	+/- 15%
Ramps	802	62,257	64,305	1.03	+/- 25%	+/- 15%
Toll Roads-Freeway	245	99,224	110,474	1.11	+/- 25%	+/- 15%
Toll Roads-Arterial	4	611	589	0.96	+/- 25%	+/- 15%
Region	**10,385**	**1,001,871**	**1,049,733**	**1.05**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT.2008. Model Calibration and Validation Standards Report

The VHT analysis, by area type, is shown in Table 6-28. Similar to the VMT estimates, the VHT ratio of the rural area is out of the preferable and acceptable range, being 45% greater than the count. This result indicates that CFRPM 7 assigns more vehicles in rural areas, and the estimated travel time is longer than observed.

Table 6-28 VHT Analysis, by Area Type (Daily)

Area Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	14,400	14,829	1.03	+/- 25%	+/- 15%
CBD Fringe Areas	211	17,127	17,912	1.05	+/- 25%	+/- 15%
Residential Areas	6,547	601,109	608,443	1.01	+/- 25%	+/- 15%
OBD Areas	2,509	269,923	257,373	0.95	+/- 25%	+/- 15%
Rural Areas	884	99,312	151,175	1.52	+/- 25%	+/- 15%
Region	**10,385**	**1,001,871**	**1,049,733**	**1.05**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT.2008. Model Calibration and Validation Standards Report

Average travel speed can be calculated using the following equation:

$$Average\ travel\ speed = \frac{VMT}{VHT}$$

The estimated daily average travel speed is 39.40 mph (Table 6-29). There is no equivalent observed value to compare with this estimate. This speed is high when compared to other urban travel demand models; however, this may be reasonable because CFRPM 7 has substantial amounts of uncongested roadways outside the Orlando urban area.

Table 6-29 Estimated VMT, VHT, and Average Speed for All Links, by Time of Day

Period	VMT	VHT	Average Speed
Daily	141,839,231	3,599,559	39.40
AM	28,077,579	744,135	37.73
MD	44,152,650	1,071,623	41.20
PM	33,355,637	910,006	36.65
NT	36,253,365	873,794	41.49

Source: CFRPM 7

6.4.2 Time of Day Comparison for VHT

Estimated and observed VHT comparisons were made for the four time periods. Estimates are within the acceptable range for most time periods and facilities types. VHT is overestimated for the AM and PM peaks. The validation of speeds is discussed in Section 6.5, while the average congested speed per county by facility type is described in the Model Description Report.

Table 6-30 VHT Analysis, by Facility Type (AM Peak)

Facility Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/ Count)*	Acceptable	Preferable
Freeway	119	21,297	26,614	1.25	+/- 25%	+/- 15%
Divided Arterial	3,208	80,385	90,524	1.13	+/- 25%	+/- 15%
Undivided Arterial	1,549	24,396	30,891	1.27	+/- 25%	+/- 15%
Collector	4,236	34,409	31,795	0.92	+/- 25%	+/- 15%
External Station Connector	114	816	752	0.92	+/- 25%	+/- 15%
One-way/Frontage	108	2,126	2,205	1.04	+/- 25%	+/- 15%
Ramps	802	12,889	13,720	1.06	+/- 25%	+/- 15%
Toll Roads-Freeway	245	21,509	26,981	1.25	+/- 25%	+/- 15%
Toll Roads-Arterial	4	98	150	1.54	+/- 25%	+/- 15%
Region	**10,385**	**197,924**	**223,633**	**1.13**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-31 VHT Analysis, by Facility Type (Mid-Day)

Facility Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
Freeway	119	34,518	37,622	1.09	+/- 25%	+/- 15%
Divided Arterial	3,208	127,800	127,506	1.00	+/- 25%	+/- 15%
Undivided Arterial	1,549	38,501	41,991	1.09	+/- 25%	+/- 15%
Collector	4,236	56,349	44,533	0.79	+/- 25%	+/- 15%
External Station Connector	114	1,540	1,653	1.07	+/- 25%	+/- 15%
One-way/Frontage	108	3,958	3,501	0.88	+/- 25%	+/- 15%
Ramps	802	18,236	18,700	1.03	+/- 25%	+/- 15%
Toll Roads-Freeway	245	27,171	28,132	1.04	+/- 25%	+/- 15%
Toll Roads-Arterial	4	189	143	0.76	+/- 25%	+/- 15%
Region	**10,385**	**308,262**	**303,782**	**0.99**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-32 VHT Analysis, by Facility Type (PM Peak)

Facility Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
Freeway	119	25,628	34,809	1.36	+/- 25%	+/- 15%
Divided Arterial	3,208	100,707	107,412	1.07	+/- 25%	+/- 15%
Undivided Arterial	1,549	31,151	39,749	1.28	+/- 25%	+/- 15%
Collector	4,236	44,068	39,773	0.90	+/- 25%	+/- 15%
External Station Connector	114	975	1,076	1.10	+/- 25%	+/- 15%

One-way/Frontage	108	3,003	2,808	0.93	+/- 25%	+/- 15%
Ramps	802	14,703	16,536	1.12	+/- 25%	+/- 15%
Toll Roads-Freeway	245	25,235	31,261	1.24	+/- 25%	+/- 15%
Toll Roads-Arterial	4	151	189	1.25	+/- 25%	+/- 15%
Region	**10,385**	**245,623**	**273,612**	**1.11**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-33 VHT Analysis, by Facility Type (Nighttime)

Facility Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
Freeway	119	31,185	29,561	0.95	+/- 25%	+/- 15%
Divided Arterial	3,208	97,759	106,886	1.09	+/- 25%	+/- 15%
Undivided Arterial	1,549	27,610	32,623	1.18	+/- 25%	+/- 15%
Collector	4,236	43,296	36,401	0.84	+/- 25%	+/- 15%
External Station Connector	114	1,099	945	0.86	+/- 25%	+/- 15%
One-way/Frontage	108	2,725	2,734	1.00	+/- 25%	+/- 15%
Ramps	802	16,183	15,349	0.95	+/- 25%	+/- 15%
Toll Roads-Freeway	245	23,934	24,100	1.01	+/- 25%	+/- 15%
Toll Roads-Arterial	4	173	107	0.62	+/- 25%	+/- 15%
Region	**10,385**	**243,965**	**248,707**	**1.02**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

The VHT analysis by area type for all four time periods is shown in Table 6-34 to Table 6-37. Like the daily estimates, the VHT in rural areas is over-assigned.

Table 6-34 VHT Analysis, by Area Type (AM Peak)

Area Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	2,825	3,049	1.08	+/- 25%	+/- 15%
CBD Fringe Areas	211	3,467	3,848	1.11	+/- 25%	+/- 15%
Residential Areas	6,547	120,748	131,983	1.09	+/- 25%	+/- 15%
OBD Areas	2,509	52,381	54,072	1.03	+/- 25%	+/- 15%
Rural Areas	884	18,503	30,681	1.66	+/- 25%	+/- 15%
Region	**10,385**	**197,924**	**223,633**	**1.13**	**+/- 5%**	**+/- 2%**

**Green* = *Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-35 VHT Analysis, by Area Type (Midday)

Area Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	4,878	4,499	0.92	+/- 25%	+/- 15%
CBD Fringe Areas	211	5,660	5,256	0.93	+/- 25%	+/- 15%
Residential Areas	6,547	182,177	173,092	0.95	+/- 25%	+/- 15%
OBD Areas	2,509	84,698	75,419	0.89	+/- 25%	+/- 15%
Rural Areas	884	30,849	45,516	1.48	+/- 25%	+/- 15%
Region	**10,385**	**308,262**	**303,782**	**0.99**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-36 VHT Analysis, by Area Type (PM Peak)

Area Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	3,551	3,635	1.02	+/- 25%	+/- 15%
CBD Fringe Areas	211	4,110	4,380	1.07	+/- 25%	+/- 15%
Residential Areas	6,547	149,771	159,617	1.07	+/- 25%	+/- 15%
OBD Areas	2,509	64,798	64,752	1.00	+/- 25%	+/- 15%
Rural Areas	884	23,394	41,228	1.76	+/- 25%	+/- 15%
Region	10,385	245,623	273,612	**1.11**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Table 6-37 VHT Analysis, by Area Type (Nighttime)

Area Type	Number of Links	VHT from Count	VHT from Estimated Volume	VHT Ratio (Volume/Count)*	Acceptable	Preferable
CBD Areas	234	3,155	3,647	1.16	+/- 25%	+/- 15%
CBD Fringe Areas	211	3,801	4,428	1.16	+/- 25%	+/- 15%
Residential Areas	6,547	145,151	143,750	0.99	+/- 25%	+/- 15%
OBD Areas	2,509	66,842	63,131	0.94	+/- 25%	+/- 15%
Rural Areas	884	25,016	33,751	1.35	+/- 25%	+/- 15%
Region	10,385	243,965	248,707	**1.02**	**+/- 5%**	**+/- 2%**

**Green* = Preferable; Blue = Acceptable; Red = Out of Range*

Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

6.5 Travel Time

Travel time comparisons are used to evaluate the traffic congestion along key roadways. For each time period, the acceptable benchmark is 80% of the links to have an estimated travel time

within 20% of the observed. The preferable benchmark is 50% of the links to have an estimated travel time within 10% of the observed. Table 6-38 shows that CFRPM 7 passes this threshold for all four periods.

Table 6-38 Travel Time Analysis, Performance of CFRPM 7

Period	Acceptable Percentage*	Acceptable Standard	Preferable Percentage*	Preferable Standard
AM	88% of links are within 20%	80% of links are within 20%	62% of links are within 10%	50% of links are within 10%
MD	83% of links are within 20%	80% of links are within 20%	52% of links are within 10%	50% of links are within 10%
PM	82% of links are within 20%	80% of links are within 20%	53% of links are within 10%	50% of links are within 10%
NT	99% of links are within 20%	80% of links are within 20%	94% of links are within 10%	50% of links are within 10%

**Green* = Within Range; Red = Out of Range*
Sources: CFRPM 7; FDOT. 2008. Model Calibration and Validation Standards Report

Observed and estimated travel times of 100 roadway corridors were calculated for all time periods and are shown in Table 6-39. Using the same standards, differences within the preferable range (less than 10%) are highlighted green, while blue indicates results within the acceptable range (less than 20%).

Generally, travel times are estimated well, but often overestimates congestion along I-4.

Table 6-39 Corridor Travel Time Comparison

Road	Dir	Section	Length (mile)	AM Travel Time (min)			MD Travel Time (min)			PM Travel Time (min)			NT Travel Time (min)		
				Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ
I-4	EB	North Polk boundary to SR 408	24.9	27.2	47.8	76	27.5	29.2	6	31.5	28.5	-9	24.7	30.1	22
I-4	WB	SR 408 to North Polk boundary	24.9	25.6	27	6	25.1	29.8	19	31.6	48.1	52	25	29.5	18
I-4	EB	SR 408 to I-95	49.5	47.9	48.6	2	47.6	51	7	55.6	70.4	27	46.6	50.1	8
I-4	WB	I-95 to SR 408	48.7	50	61.6	23	45.8	49	7	49.3	50.8	3	45.5	48.5	7
SR 429	NB	I-4 to SR 441	41.4	39	38	-3	38.9	36.2	-7	38.5	37	-4	39	36.1	-7
SR 429	SB	SR 441 to I-4	41	38.2	36	-6	38.6	35.7	-7	38.2	37.2	-2	38.8	35.7	-8
SR 417	NB	I-4 to I-4	52.3	47.6	48.3	1	47.8	45.4	-5	48.7	48.6	0	48.2	45.4	-6
SR 417	SB	I-4 to I-4	51.4	46.9	45.9	-2	46.8	44.5	-5	47	47.4	1	47	44.5	-5
Florida's Turnpike	NB	West Indian River boundary to SR 417	58.7	49.8	51.2	3	49.8	50.6	2	49.9	50.4	1	50.5	50.5	0
Florida's Turnpike	SB	SR 417 to West Indian River boundary	59.7	51.1	51.2	0	51	51.5	1	51	53.4	5	51.7	51.3	-1
Florida's Turnpike	NB	SR 417 to East Lake boundary	24.1	21.5	25.4	18	21.4	21.4	0	21.4	22.9	7	21.5	21.2	-1
Florida's Turnpike	SB	East Lake boundary to SR 417	23.9	21	22.8	9	21	21.3	1	21.3	25.2	18	21.1	20.7	-2
SR 528	EB	I-4 to SR 417	14.6	16.4	15.6	-5	15.7	15.5	-1	16.8	17.4	4	16.1	15.4	-4
SR 528	WB	SR 417 to I-4	14.7	15.2	16.4	8	15.2	15.6	2	17.3	16	-7	15.4	15.6	1
SR 528	EB	SR 417 to SR A1A	38.4	36.1	34.6	-4	36.4	34.8	-4	36.1	43.9	21	36.7	34.7	-5
SR 528	WB	SR A1A to SR 417	38.2	35	43.6	25	34.9	34.6	-1	34.7	34.8	0	35.4	34.6	-2
SR 408	EB	Florida's Turnpike to SR 50	22.3	23.2	25.3	9	22.6	22.6	0	24	24.6	3	22.8	22.5	-1
SR 408	WB	SR 50 to Florida's Turnpike	21.7	23.1	23.6	2	21.6	22	2	22	25.1	14	21.7	21.9	1
SR 50	EB	SR 429 to SR 520	28.9	58	52	-10	63.2	51.2	-19	68.9	67.5	-2	47.8	49.1	3
SR 50	WB	SR 520 to SR 429	28.9	60.2	64.5	7	63.6	49.2	-23	65.3	53.9	-17	47.3	49	4
SR 436	NB	SR 528 to US 17	15.2	30.5	25.3	-17	31.4	23.2	-26	34.1	26.6	-22	24.3	22.4	-8
SR 436	SB	US 17 to SR 528	14.9	30.4	24.7	-19	31.8	23.4	-26	35	26.3	-25	24.3	22.6	-7
US 192	EB	I-4 to Florida's Turnpike	15.1	28.8	22.6	-22	32.4	23.2	-29	35.1	31.7	-10	25	22.7	-9
US 192	WB	Florida's Turnpike to I-4	15.1	29.7	30	1	32.2	23.5	-27	32.3	24.6	-24	24.4	23.1	-5
US 441	NB	US 192 to SR 50	17.2	38.1	36.6	-4	42.2	28.2	-33	45.1	28.1	-38	31.5	27.5	-12

Road	Dir	Section	Length (mile)	AM Travel Time (min)			MD Travel Time (min)			PM Travel Time (min)			NT Travel Time (min)		
				Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ
US 441	SB	SR 50 to US 192	17.2	36.6	26.9	-26	40.4	29.2	-28	45.5	37.9	-17	31.3	27.7	-11
US 17/92	NB	SR 50 to SR 46	17.5	35.2	27.5	-22	37.6	27.5	-27	40.5	35.1	-13	29.7	26.9	-10
US 17/92	SB	SR 46 to SR 50	17.6	36	33.4	-7	37.5	27.7	-26	38.2	29.2	-24	29.6	27.5	-7
I-95	NB	North Brevard boundary to South ST Johns boundary	63.9	55.1	55.7	1	55.3	55.5	0	55.1	56.6	3	56	55.4	-1
I-95	SB	South ST Johns boundary to North Brevard boundary	64.5	55.6	56.2	1	55.8	56	0	55.4	56.5	2	56.5	55.9	-1
US 17	NB	Volusia boundary to Glenwood Rd	16.4	30.5	26	-15	32.7	25.4	-22	32.7	33.9	3	26.8	25.1	-6
US 17	SB	Glenwood Rd to Volusia boundary	16.4	30.5	31	1	32.7	25.3	-23	32.3	27.1	-16	26.7	24.9	-7
US 1	NB	Halifax Ave to I-95	37.6	58.7	53	-10	61.7	52.5	-15	60.1	55.1	-8	53.5	52	-3
US 1	SB	I-95 to Halifax Ave	37.6	59.2	53.9	-9	62.3	52.5	-16	61.6	55.1	-11	53.7	52.2	-3
SR 40	EB	SR 11 to SR A1A	18.3	26	23.2	-11	27.5	21.9	-20	26.8	22.9	-15	23.2	21.9	-5
SR 40	WB	SR A1A to SR 11	18.3	26	22.4	-14	27.1	21.9	-19	26.8	24.5	-8	23.4	21.8	-7
US 92	EB	Kepler Road to SR A1A	19.4	26.4	23.6	-10	29	22.6	-22	27.9	24.1	-14	24.3	23.1	-5
US 92	WB	SR A1A to Kepler Road	19.4	27	23.4	-13	30	22.3	-26	29.6	24.7	-17	24.7	22.2	-10
SR 421	NB/ EB	Howland Blvd to SR A1A	24.4	35.2	31.9	-9	36.5	30.2	-17	35.7	30.8	-14	32	30.3	-6
SR 421	SB/ WB	SR A1A to Howland Blvd	24.4	35.5	30.6	-14	37.1	30.3	-18	36.9	33.9	-8	32.4	30.2	-7
SR 100	EB	US 1 to SR A1A	8.2	13.3	11	-18	14	10.9	-22	13.6	11.1	-19	11.7	10.9	-6
SR 100	WB	SR A1A to US 1	8.2	13.5	11	-19	14	10.9	-22	13.7	11	-20	11.9	10.9	-8
I-95	NB	SR 60 to South Volusia boundary	86.5	74.4	77.9	5	74.6	75.4	1	74.6	76.7	3	75.2	74.4	-1
I-95	SB	South Volusia boundary to SR 60	86.4	74.1	74.9	1	74.3	75.3	1	74	81.4	10	75	74.3	-1
Wickham Road	NB	SR 514 to St Andrews Blvd	15.9	31.5	32.6	3	32.8	26.3	-20	32.6	26.8	-18	26.2	26.1	0
Wickham Road	SB	St Andrews Blvd to SR 514	15.9	30.3	25.5	-16	31.7	26.6	-16	32.5	34.6	6	26	25.9	0
US 1	NB	SR 514 to US 192	5.9	8.5	10.7	26	8.5	8.4	-1	8.3	8.5	2	7.8	8.4	7
US 1	SB	US 192 to SR 514	5.9	8.5	8.3	-2	8.8	8.5	-3	8.9	11.6	30	8	8.4	5
SR 520	EB	Brevard boundary to SR A1A	16.2	24.8	23.1	-7	26.7	22.1	-17	27.1	23.8	-12	22.4	22	-2
SR 520	WB	SR A1A to Brevard boundary	16.2	24.7	23.6	-5	26.2	22.4	-15	25.9	24.5	-5	22.1	22.2	1%
US 192	EB	Deer Park Road to SR A1A	19.7	26.3	23.2	-12	28	23.3	-17	27.6	26.7	-3	24.1	23.1	-4

Road	Dir	Section	Length (mile)	AM Travel Time (min)			MD Travel Time (min)			PM Travel Time (min)			NT Travel Time (min)		
				Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ
US 192	WB	SR A1A to Deer Park Road	19.7	26.5	25.7	-3	28.6	23.2	-19	28.7	24.1	-16	24.4	23	-6
SR 404	EB	I-95 to SR A1A	6.8	10.1	8.8	-13	9.7	8.7	-10	9.7	9.6	-1	9.2	8.7	-5
SR 404	WB	SR A1A to I-95	6.8	9.2	9.2	0	9.2	8.7	-6	9.3	9	-3	8.7	8.6	-1
US 1	NB	Indian River Blvd to SR 514	22.2	28.3	31.9	13	29.2	30.8	6	28.3	33.2	17	26.9	28.6	6
US 1	SB	SR 514 to Indian River Blvd	23.8	30.2	30.5	1	31.5	32.3	3	30.4	38.6	27	28.6	30.2	6
US 1	NB	US 192 to SR 528	24.4	36.5	35.1	-4	37.3	33.2	-11	37.9	34.7	-8	33.3	33.2	0
US 1	SB	SR 528 to US 192	24.3	37.8	34.5	-8	38.3	33.4	-13	37.9	37.1	-2	33.3	33.1	-1
US 1	NB	SR 528 to SR 46	19.7	27.6	25.8	-6	28.2	25.4	-10	27.5	25.9	-6	25.7	25.4	-1
US 1	SB	SR 46 to SR 528	19.7	28.5	25.5	-11	29.7	25.1	-16	29.1	25.8	-12	26.3	25.1	-5
Florida's Turnpike	NB	I-75 to Orange boundary	34.6	30	29.7	-1	30.3	32.2	6	30.1	48.9	62	30.4	30.5	0
Florida's Turnpike	SB	Orange boundary to I-75	34.5	30.3	39.7	31	30.4	31	2	30.2	30.7	2	30.8	29.8	-3
US 27	NB	Florida's Turnpike to CR 466	17.1	24.7	25.3	2	25.9	24.7	-5	25	29.4	17	22.7	24.1	6
US 27	SB	CR 466 to Florida's Turnpike	17.3	25.2	27.8	10	26.7	25.3	-5	26.3	27.9	6	23	24.4	6
US 50	EB	Sumter boundary to Florida's Turnpike	20	30.9	39.9	29	31	30.2	-2	30.3	29.1	-4	27.7	28.5	3
US 50	WB	Florida's Turnpike to Sumter boundary	19.3	28.5	25.9	-9	29.2	29.9	3	29.6	42.6	44	26.3	27.6	5
US 441	EB	US 27 to US 46	18.3	27.9	31.1	12	29.7	26	-13	29.1	28.8	-1	25.4	25.7	1
US 441	WB	US 46 to US 27	18.3	28.6	26.6	-7	30.2	26.3	-13	30	33.4	11	25.5	26.1	2
US 19	NB	US 441 to CR 445	15.7	22.7	21.4	-5	23.3	21.7	-7	23	24.4	6	21.3	21.6	2
US 19	SB	CR 445 to US 441	15.4	22.2	23	3	23.1	20.9	-10	22.7	20.9	-8	20.9	20.8	0
I-75	NB	North Hernando boundary to South Alachua boundary	61.3	52.6	52.9	1	53.4	53.3	0	53.1	56.1	6	53.5	52.6	-2
I-75	SB	South Alachua boundary to North Hernando boundary	59.9	51.6	52.8	2	51.7	52.4	1	51.8	53.9	4	52.1	51.4	-1
SR 200	NB	Citrus boundary to US 301	18.4	27.2	25.8	-5	30.5	23.7	-22	29.2	24.3	-17	24.5	23.1	-6
SR 200	SB	US 301 to Citrus boundary	18.4	26.6	23.3	-12	30	24	-20	29.3	27.9	-5	24.4	23.2	-5
SR 40	EB	Hwy 328 to US 301	10.4	15.5	23.1	49	15.8	17.1	8	15.9	20.8	31	13.7	14.5	6
SR 40	WB	US 301 to Hwy 328	10.4	15.6	14.6	-6	15.7	18.2	16	15.9	26.5	67	13.7	14.9	8
SR 464	EB	SR 200 to SE 110th	14	22.9	18.9	-18	23.3	19.4	-17	23.2	22.3	-4	20	19	-5
SR 464	WB	SE 110th to SR 200	14	22.5	21.4	-5	23.1	19.2	-17	23.3	19.8	-15	20.2	18.9	-6

Road	Dir	Section	Length (mile)	AM Travel Time (min)			MD Travel Time (min)			PM Travel Time (min)			NT Travel Time (min)		
				Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ	Obs.	Est.	%Δ
US 27	NB	SE Highway 42 to SR 464	16.5	24.3	22.6	-7	25.1	21.7	-14	24.9	25.1	1	21.1	20.9	-1
US 27	SB	SR 464 to SE Highway 42	16.5	24.3	23.3	-4	24.9	21.8	-12	24.7	24.3	-2	21	21.4	2
US 41	NB	Citrus boundary to Levy boundary	12.9	16.6	14.7	-11	17.6	16.2	-8	17.3	22.2	29	15.4	14.9	-4
US 41	SB	Levy boundary to Citrus boundary	10.8	13.5	13.6	1	14.4	13.5	-6	14	14.2	2	12.5	12.5	0
SR 40	EB	US 301 to Hwy 314	10.8	16.8	16.1	-4	18.1	17.6	-3	17.9	18.3	2	15.6	16.2	4
SR 40	WB	Hwy 314 to US 301	10.8	17.1	17.9	5	18.1	17.4	-4	17.5	17.5	0	15.5	15.9	3
I-4	EB	East Hillsborough boundary to West Osceola boundary	32	27.8	38.1	37	27.9	29.1	4	27.9	30.1	8	28.1	29.2	4
I-4	WB	West Osceola boundary to East Hillsborough boundary	32	27.7	28.1	2	27.9	29.1	4	27.8	43.3	56	27.8	28.2	1
SR 570	EB	I-4 to I-4	23.8	23.8	22.8	-4	23.8	22.8	-4	23.6	23.2	-2	23.7	22.6	-4
SR 570	WB	I-4 to I-4	23.7	23.6	22.8	-3	23.8	22.8	-4	23.6	23.1	-2	23.6	22.6	-4
US 98	NB	South Polk boundary to North Polk boundary	49	71.9	73	1	74.3	75.4	2	73.8	78.6	7%	63.6	67.7	6
US 98	SB	North Polk boundary to South Polk boundary	48.4	69	69.5	1	70.7	73.3	4	70.8	80.4	14	61.4	65.2	6
SR 37	NB	SR 674 to US 98	24.5	35.7	33.2	-7	38.1	31.6	-17	38	32.6	-14	32.4	31.3	-4
SR 37	SB	US 98 to SR 674	24.5	36	31.3	-13	37.7	31.7	-16	37.4	35	-6	32.5	31.2	-4
SR 60	EB	West Polk boundary to East Polk boundary	55.2	63.3	60	-5	64.5	63.3	-2	63.1	71.6	14	59.5	59.1	-1
SR 60	WB	East Polk boundary to West Polk boundary	55.9	63.9	64.8	1	64.6	64.1	-1	63.2	68.8	9	60	59.8	0
US 27	NB	South Polk boundary to North Polk boundary	49.8	62.1	65.8	6	64.3	56.4	-12	63.8	55.2	-14	56.9	57.9	2
US 27	SB	North Polk boundary to South Polk boundary	49.8	61.7	53.5	-13	63.5	56.4	-11	63.7	71.5	12	56.9	54.7	-4
CR 580	EB	Power Line Rd to Old Pleasant Hill Rd	10	14.7	15.9	8	15.2	15.5	2	15	83.1	454	13.3	15.2	14
CR 580	WB	Old Pleasant Hill Rd to Power Line Rd	10	14	78.2	459	14.5	15	3	15.3	36.8	141	13	14	7
SR 512	EB	I-95 to US 1	6.4	10.7	9.2	-15	10.7	9.2	-14	10.5	12	14	9.4	9	-4
SR 512	WB	US 1 to I-95	6.5	11.3	10	-11	11.3	9.3	-18	11.2	10	-11	10.1	9.2	-8
			2,648	3,264	3,294	1	3,363	3,073	-9	3,396	3,507	3	3,032	3,000	-1

**Green* = Preferable; *Blue* = Acceptable; *Red* = Out of Range*

Sources: CFRPM 7; HERE Observed Travel Time

6.6 Volume Delay Functions

Volume delay functions (VDFs) are used in highway assignment to estimate speeds and travel times degraded (delayed) by auto congestion (volume/capacity). Generally, VDFs do not degrade travel speeds when the volume is significantly below capacity. As volume approaches capacity, speeds are assumed to degrade. Speeds are assumed to degrade rapidly when volume exceeds capacity.

It is difficult to verify VDFs at a link level. However, by analyzing the results of observed/estimated comparisons of volume, VMT, VHT, and travel times, it can be broadly concluded that CFRPM 7 estimated VDFs are reasonable. The VDFs used for I-4 may need to be revised in future versions because the volumes are accurate, but the congested travel times are overestimated for some roadway facilities.

7 Longitudinal Tests

The tests and benchmarks in this report in previous chapters have focused on snapshot data: how close is CFRPM 7 to observed data in 2015? While it is important that CFRPM 7 reasonably reflect 2015 conditions—the latest year with all available input data—it is equally important that the model provides reasonable forecasts when there are changes to the input data.

A helpful method to assess CFRPM 7's forecast ability is to conduct longitudinal tests. Longitudinal tests evaluate how the results from demand model responds to changes in the transportation system and changes in socio-economic conditions over time. Two longitudinal tests were performed for CFRPM 7. The stronger test was a backcast to 2010 conditions. The other test evaluated changes to an estimated 2045 "no action" scenario.

7.1 2010 Backcast

This longitudinal test compared 2010 socio-economic data and roadway network to model results with respect to:

- changes in the model inputs
- 2010 traffic counts used for CFRPM 6.2 validation
- CFRPM 6.2 model outputs

The 2010 roadway network was developed by using the 2015 roadway network as a base and then revising the number of lanes for limited-access facilities and major arterials to match 2010 conditions. Changes in these facilities were identified by reviewing the current transportation improvement program (TIP) and past LRTP for projects constructed between 2010 and 2015. This network was then compared to CFRPM 6.2 estimates for the 2010 network and the 2011 Highway Performance Monitoring System (HPMS) roadway GIS file.

The 2010 socio-economic data were developed by scaling down the 2015 socio-economic data to the 2010 population and employment control totals, by county, according to CFRPM 6.2 outputs. However, the 2010 total population in Volusia and Flagler counties from CFRPM 6.2 is higher than the census, so adjustments were made to match the population control totals using the 2010 census minus the group quarter population for these two counties. The Special Purpose input data use the same attendance levels as were used in CFRPM 6.2's 2010 base year, except for OIA. The 2010 OIA passenger levels were scaled back by using the compound annual growth rate (CAGR) and transfer rate from the GOAA Traffic Summary Report[15].

[15] All inputs were the same for trucks, diurnal factor, external trips, IE trips between 2010 backcast and 2015 base year. Also, all the number of transit trips are the same. So, the STOPS files used in 2010 are the same as 2015. No 2010 STOPS files were created.

7.1.1 Major Inputs and Outputs

Table 7-1 compares the major inputs (population and employment) and outputs (VMT and VHT) for 2010 and 2015. The table shows that estimated traffic levels decreased by the same level as the population and employment levels, although VHT decreases at a greater amount. This indicates there was more auto congestion in 2015 than 2010.

Table 7-1 Comparison of Major Inputs and Outputs from CFRPM 7

Year	Input		Output	
	Population	Employment	VMT	VHT
2015	4,814,794	2,054,592	139,771,874	3,822,669
2010	4,574,959	1,927,363	136,095,549	3,398,093
Growth%	**-5%**	**-6%**	**-3%**	**-11%**

Source: CFRPM 7

7.1.2 2010 Traffic Counts

The next longitudinal test compared the estimated 2010 results against the 2010 daily traffic counts used for the CFRPM 6.2 validation. Only 5,572 of CFRPM 6.2's 6,859 (81%) 2010 daily traffic counts were used for this comparison. The count site IDs for the remaining 19% could not be matched with CFRPM 7 sites. Count site IDs for 613 truck counts for 2010 could be matched. CFRPM 6.2 documentation was unclear whether the 2010 traffic counts reflected peak season weekday traffic.

The assignment results are shown in Table 7-2. Overall, CFRPM 7 produces more traffic than is reflected in the daily traffic counts. Assuming the traffic count issues described above are not contributing to these results, they suggest that estimated trip lengths are longer than observed in 2010. The amount of traffic appears to be correct given the results in Table 7-1.

Table 7-2 Comparison of Backcast Results to 2010 Traffic Counts

Category	CFRPM 7 Backcast to 2010
Regional Volume/Count Ratio (%RMSE), Daily	1.08 (37%)
Volume/Count Ratio (%RMSE), Freeways	1.10 (23%)
Volume/Count Ratio (%RMSE), Trucks	0.90 (83%)
VMT Volume/Count Ratio	1.17
VHT Volume/Count Ratio	1.14

Source: CFRPM 7

7.1.3 Comparison with CFRPM 6.2 Results

The longitudinal backcast test compared the 2010 CFRPM 7 backcast results with the corresponding results from CFRPM 6.2. This comparison would identify whether there are major differences between CFRPM 6.2 and CFRPM 7, beyond model characteristics.

CFRPM 6.2 consisted of two different models: one producing daily traffic volumes and another for time-of-day traffic (TOD). The daily model was used to produce the official validation metrics. Only a selected number of CFRPM 6.2 time-of-day metrics were documented. CFRPM 6.2 had slightly different time period settings, making direct time period comparisons difficult. Table 7-3 summarizes the differences between CFRPM 6.2 and CFRPM 7.

Table 7-3 Differences between CFRPM 6.2 and CFRPM 7 Estimates

Category	CFRPM 6.2 (both TOD and daily models)	CFRPM 7	%Delta
Traffic Analysis Zones (TAZs) (includes zone numbers reserved for future use)	5,406	9,057	+68%
Roadway network links: Not including centroid connectors Including centroid connectors	 40,503 60,980	 46,784 72,898	 +16% +20%
Total lane-miles (not including centroid connectors)	22,263	24,911	+12%
Lines of code	34,000	12,000	-65%
Traffic Counts (Time-of-Day)	5,665	10,335	+82%
Traffic Counts (Daily)	6,859	10,426	+52%
Truck Traffic Counts (Daily)	613	2,216	+260%
% of links with traffic counts (TOD)	9%	14%	+56%
% of links with traffic counts (daily)	11%	14%	+27%
Base year	2010	2015	--

Sources: CFRPM 7; CFRPM 6.2

Table 7-4 compares the 2010 results of CFRPM 6.2 daily model, CFRPM 6.2 time-of-day model, and backcast results from CFRPM 7.

Table 7-4 Comparison of CFRPM 6.2 (daily and TOD) and CFRPM 7 Estimates

Category	CFRPM 6.2 (Daily)	CFRPM 6.2 (TOD)	CFRPM 7 Backcast (TOD)
Regional Volume/Count Ratio (%RMSE), Daily	1.03 (35%)	1.06 (40%)	1.08 (37%)
Volume/Count Ratio (%RMSE), Freeways	0.97 (13%)	1.17 (34%)	1.10 (23%)
Volume/Count Ratio (%RMSE), Trucks	1.11 (44%)	NA*	0.90 (83%)
Regional Vehicle Miles Traveled (VMT) VMT Volume/Count Ratio	110M 1.03	110M 1.08	136M 1.17
Regional Vehicle Hours Traveled (VHT) VHT Volume/Count Ratio	3.1M 1.04	2.5M 1.09	3.4M 1.14
Regional Vehicle Trips (daily)	12M	12M	11M

Category	CFRPM 6.2 (Daily)	CFRPM 6.2 (TOD)	CFRPM 7 Backcast (TOD)
Average congested speed	36.5 mph	41.0 mph	40.0 mph

* CFRPM 6.2 combined LOV, LTRK, and HTRK trips together in assignment

Sources: CFRPM 7; CFRPM 6.2

If the structural and traffic count differences between CFRPM 6.2 and CFRPM 7 are not significant, the results indicate that CFRPM 7 produces more traffic than CFRPM 6.2 at a slightly higher average speed. The VMT comparisons in Section 6.3 indicate that CFRPM 7 has approximately the right level of traffic demand (as VMT). These results indicate that the trip lengths might be longer than what might be observed. It is interesting that CFRPM 7's results are similar to CFRPM 6.2 TOD model results: this may indicate that neither TOD models correctly reflect travel lengths or patterns throughout the day. Overall, these results show that CFRPM 7 produces volume/count metrics similar to those of CFRPM 6.2.

7.2 2045 E+C Forecast

This longitudinal test involved developing the 2045 socio-economic data and roadway network forecast and comparing the model results to changes in the model inputs.

The 2045 roadway network reflects only existing and committed (E+C) projects, such as the I-4 Ultimate and Wekiva Parkway. Table 7-5 shows the assumed growth in lane-miles between 2015 and 2045. Lane-miles increase by 11% regionally, with limited-access roadway capacity growing by 26%.

Table 7-5 Expected 2045 Network Changes (Lane-miles)

County	Limited-access			Arterial Road			Local Road			Total		
	2015	2045	Growth%	2015	2045	Growth%	2015	2045	Growth%	2015	2045	Growth%
Brevard	567	614	8%	1,379	1,644	19%	765	815	7%	2,712	3,074	13%
Flagler	119	120	1%	340	360	6%	277	279	1%	736	760	3%
Indian River	67	87	30%	232	264	14%	135	151	12%	434	502	16%
Lake	102	242	137%	748	888	19%	1,076	1,082	1%	1,926	2,211	15%
Marion	239	240	0%	1,012	1,142	13%	1,639	1,661	1%	2,891	3,043	5%
Orange	1,199	1,541	29%	2,385	2,703	13%	1,503	1,643	9%	5,087	5,887	16%
Osceola	395	528	34%	792	945	19%	620	660	6%	1,806	2,133	18%
Polk	337	393	17%	1,916	2,055	7%	1,598	1,630	2%	3,851	4,078	6%
Seminole	201	296	47%	662	747	13%	570	582	2%	1,434	1,626	13%
Sumter	183	253	38%	413	484	17%	393	417	6%	989	1,154	17%
Volusia	391	480	23%	1,321	1,442	9%	1,150	1,170	2%	2,861	3,093	8%
Total	**3,799**	**4,795**	**26%**	**11,201**	**12,675**	**13%**	**9,726**	**10,090**	**4%**	**24,726**	**27,560**	**11%**

Source: CFRPM 7

The 2045 population and employment were developed from the 2045 LRTPs currently being conducted by the MPO/TPOs. The changes between 2015 and 2045 are shown in Table 7-6. The population and employment in the region are expected to grow significantly: increases are 51% and 79%, respectively.

Table 7-6 2045 ZDATA Changes from 2015

County	Population			Employment		
	2015	2045	Growth%	2015	2045	Growth%
Brevard	555,850	705,162	27%	252,418	371,095	47%
Flagler	101,289	182,148	80%	25,805	50,167	94%
Indian River	47,391	66,824	41%	14,926	18,653	25%
Lake	318,365	511,433	61%	129,709	252,743	95%
Marion	333,186	444,911	34%	111,501	174,481	56%
Orange	1,213,443	1,973,025	63%	809,785	1,364,337	68%
Osceola	313,899	655,186	109%	93,859	276,410	194%
Polk	655,197	917,301	40%	194,740	434,262	123%
Seminole	449,141	588,820	31%	186,966	364,489	95%
Sumter	108,557	223,979	106%	30,189	71,336	136%
Volusia	503,615	698,777	39%	204,694	305,529	49%
Total	**4,599,933**	**6,967,566**	**51%**	**2,054,592**	**3,683,502**	**79%**

Source: CFRPM 7

Like the 2010 backcast, the 2045 forecast also uses 2045 Special Purpose areas productions used for CFRPM 6.2. OIA passengers for 2045 were based on GOAA's Traffic Summary Report. Estimates for Universal Studio's third theme park were also included.

The resulting person trips, VHT, and average speed for 2015 and 2045 are shown in Table 7-7. CFRPM 7 generates person trips, by county, at a rate similar to the population growth rate. VHT and average speed changes are indicators for congestion of the roadways. For example, an increase in the VHT or a decrease in the average speed means that traffic condition is worse than before. Congestion increases regionally because the demand growth is greater than the supply growth: a 56% increase in person trips is five times higher than the 11% increase in capacity.

The growth rate of the VHT and average speed may look remarkable, given the growth rate of demand for some counties. However, considering that the relationship between volume and delay is exponential, this trend is reasonable.

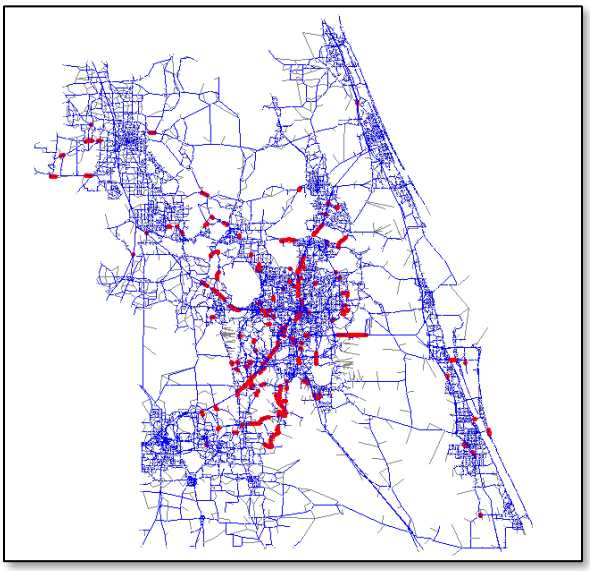
Table 7-7 2045 Forecast Results Compared to 2015 Observations

County	Person Trips			VHT			Average Speed (mph)		
	2015	2045	Growth%	2015	2045	Growth%	2015	2045	Growth%
Brevard	2,044,259	2,569,511	26%	369,955	499,333	35%	42	41	-2%
Flagler	315,197	567,622	80%	65,438	106,634	63%	49	43	-12%
Indian River	153,521	207,492	35%	54,934	63,864	16%	47	48	1%
Lake	1,121,694	1,758,176	57%	265,249	507,613	91%	39	32	-17%
Marion	1,133,548	1,495,334	32%	295,910	407,177	38%	41	36	-12%
Orange	4,309,078	7,458,100	73%	1,003,944	1,817,046	81%	37	33	-11%
Osceola	1,214,634	2,810,861	131%	263,951	785,555	198%	38	22	-41%
Polk	2,069,806	3,024,242	46%	533,877	853,036	60%	39	36	-8%
Seminole	1,567,474	2,043,435	30%	277,665	455,755	64%	36	33	-7%
Sumter	376,805	757,429	101%	120,503	1,587,060	1217%	45	6	-87%
Volusia	1,766,730	2,459,456	39%	348,133	610,245	75%	42	36	-15%
Total	**16,072,744**	**25,151,658**	**56%**	**3,599,559**	**7,693,316**	**114%**	**39**	**28**	**-29%**

Heavily congested roads with a volume to LOS C capacity ratio higher than 1.5 are shown in Figure 7-1 and Figure 7-2 for 2015 and 2045, respectively. Congestion is expected to increase throughout the Orlando urban area, along I-75 into Marion County, and along I-4 into Polk and Volusia counties.

Figure 7-1 2015 Congestion (Volume to LOS C Capacity Ratio > 1.5)

(a) AM



(b) PM

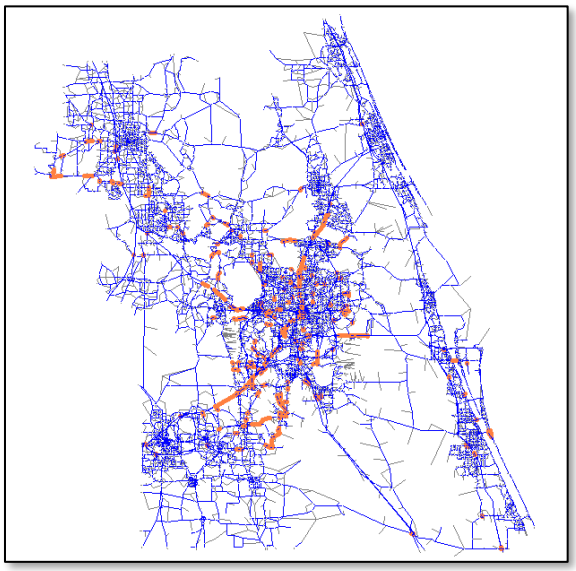
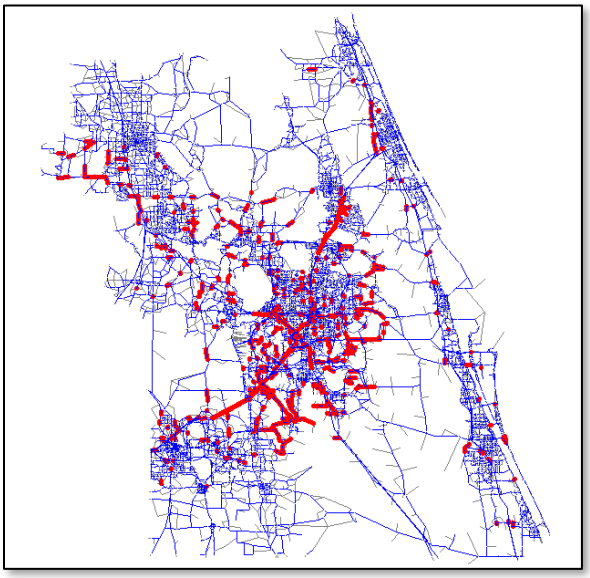


Figure 7-2 2045 Congestion (Volume to LOS C Capacity Ratio > 1.5)

(a) AM



(b) PM

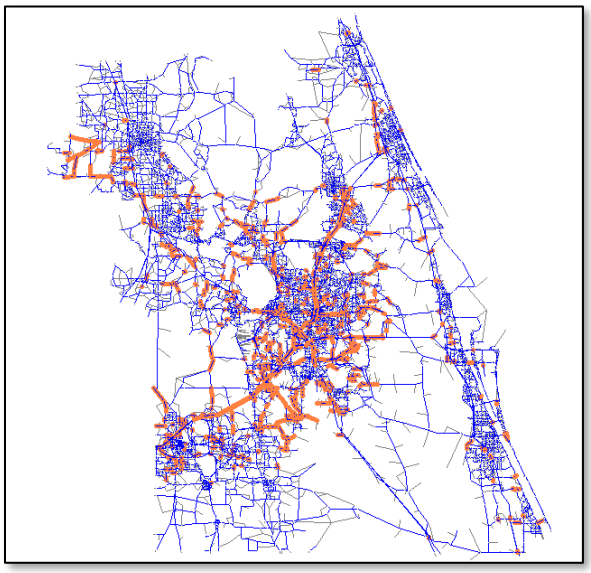


Figure 7-3 AM Volume Change Between 2015 and 2045

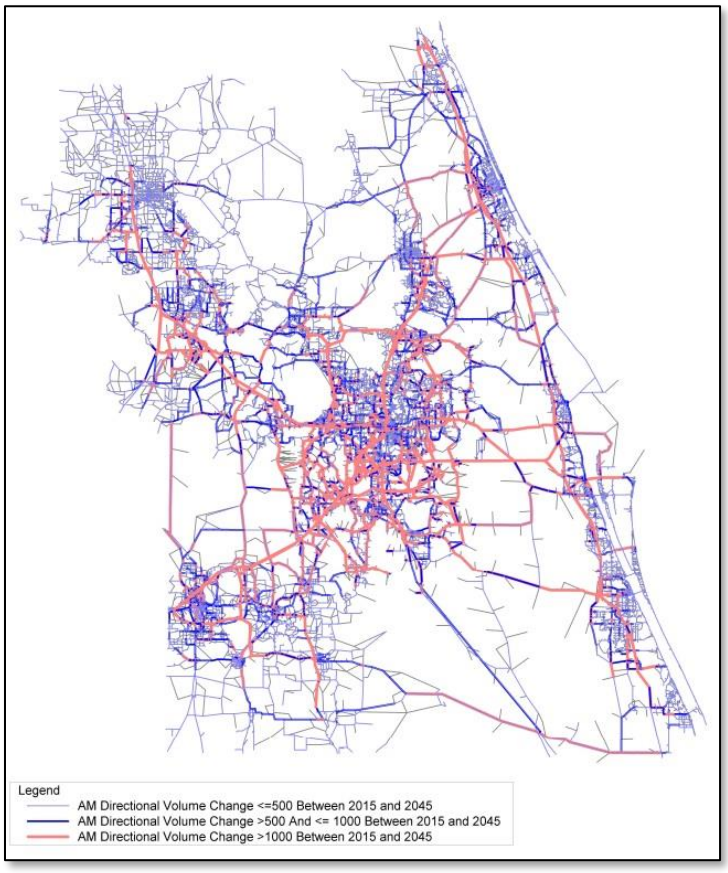
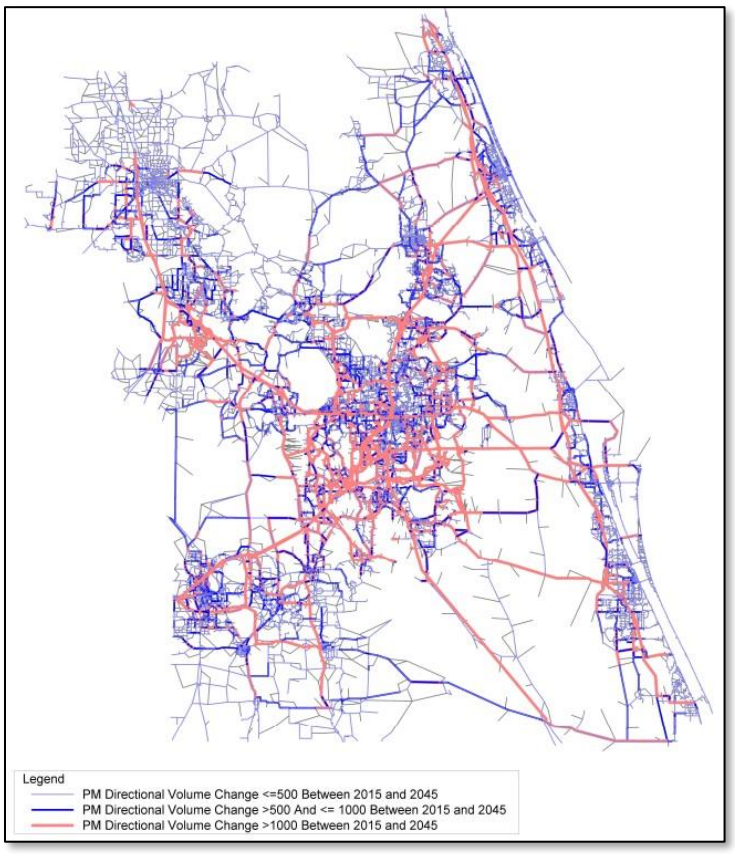


Figure 7-4 PM Volume Change Between 2015 and 2045



8 Summary of CFRPM 7

Each component of CFRPM 7 has been tested against a broad range of tests, benchmarks, and metrics. Where possible, estimates are compared to observed data. If observed data were not available, estimates are compared against benchmarks and manual reviews. Taken together, CFRPM 7 has undergone the most comprehensive review so far—more than any previous version.

Initially, ZDATA (socio-economic data) was run through 53 error and reasonableness tests. Zones that failed to achieve positive results were manually inspected for reasonableness, then separate tests and comparisons were conducted for the household, employment, and K-12 school ZDATA data.

The household data compares favorably to alternate data sources such as the Bureau of Economic and Business Research (BEBR), the Bureau of Economic Analysis (BEA), and the American Community Survey (ACS).

Employment data are generally consistent with data from Bureau of Labor Statistics (BLS), ACS, County Business Patterns (CBP), Woods & Poole (W&P), and BEA 2015. One issue is that BEA has significantly more employment in Orange, Osceola, Polk, and Seminole counties; the reasons for these strong differences are unknown at this time.

CFRPM 7 estimates higher K-12 school enrollment than the ACS data, the only data available during model development, in all counties. Most differences are minor, but there are significant differences in Osceola and Seminole counties. The reasons for these significant differences are unknown, but they correspond to similar differences in the employment data comparisons.

The roadway network is the biggest component of CFRPM 7. The posted speeds of all 46,784 links were verified against FDOT data and available maps and GPS data. Adjustments were made to 5% of all links. The number of lanes was verified using similar data, with less than 1% of links requiring corrections. Several other roadway network data, including area types, facility types, and turn prohibitors, were reviewed and adjusted by visual inspection.

The estimated FF speeds were compared to observed speeds during an average Sunday, from 7AM to 8 AM. There is a significant variation in the results by facility type. One reason for this variation is that the estimated FF speed equations were developed at an aggregate level due to high variability in the observed dataset. Another reason is that FF speed equations were developed before the roadway posted speeds could be verified. Generally, the project team concludes that the estimated FF speeds, at a regional level, are reasonable for long-range planning use. In subsequent updates, the observed FF speed data—especially for ramps—should be reviewed thoroughly before use and updates to the equations should be made after posted speeds are verified.

The trip generation results are mostly within national benchmarks. Sumter County has a lower number of work trips than the benchmarks and higher numbers of non-work trips. This may be due to a larger proportion of retired households in that county. Overall, the trip generation results are superior to those from the previous versions of CFRPM.

The trip distribution results are reviewed at a regional level using benchmarks. The average trip lengths are longer than mid-point of the benchmark values, but mostly within the ranges. The percentage of intrazonal trips are generally much lower than the benchmarks. These results may imply that CFRPM 7 might be slightly overestimating traffic, but the new zone system—which produced, on average, smaller area zones—might be contributing to the results.

The county-to-county trip flows were reviewed manually, by trip purpose. Across all trip purposes, over 85% of county-to-county movements have errors of less than 10%. This indicates that the estimated county-to-county flows are generally consistent with the observed flows. The estimated trip flows within METROPLAN Orlando MPO and the outer counties are generally consistent with the corresponding observations for all five trip purposes.

The trips computed in CFRPM's mode choice step were also reviewed for reasonableness. The number of non-motorized trips and their trip lengths are reasonable and consistent with the corresponding NHTS data. The calibrated OIA trip results match the observed values.

The transit results indicate that the CFRPM 7 STOPS model accurately represents the transit travel patterns of Central Florida. The differences between the total observed and estimated linked trips are minor—defined as less than 10% or 500 trips—by trip purpose and access mode. For each agency, total estimated trips are within ± 5% of the observed trips. PNR boardings show a high percentage of delta compared to other access modes. However, this has a slight impact on the model validity because this is the least-used access mode in the region. There is only 3% difference between the observed and model-estimated regional transfer rate, indicating that the transit model accurately represents the transferring activity of Central Florida transfer riders.

The comparisons of auto occupancy rates and percentages of trips by auto occupancy indicate that CFRPM 7 estimates are similar to those from the NHTS datasets and other Florida models. This indicates that estimates of auto trips for these purposes are reasonable, given the number of person trips produced in the Trip Distribution step.

The highway assignment results were compared using benchmarks for traffic volume, VMT, VHT, and travel time. The daily results are all within the acceptable or preferable benchmark ranges. The screenline results indicate overestimated traffic across Volusia County and Flagler County boundaries and SR 60 (Indian River), Polk Parkway (Polk), and SR 19 (Lake). However, overall, the screenline analysis shows that CFRPM 7 reasonably reflects traffic demand throughout most areas in the region. Comparisons of VMT to the DVMT Report indicate that CFRPM 7 produces VMT that are within 3% of observed values.

There was a common theme across the time-of-day assignment results: traffic demand in the AM and PM peak periods tended to be higher than the acceptable benchmark, but within the acceptable or preferable benchmarks for the midday and evening periods. Overall, CFRPM 7 produces time-of-day estimates that generally meet acceptable standards, and it estimates travel times well, but tends to overestimate congestion along I-4.

It is difficult to verify VDFs at a link-level. However, by comparing the results of observed/estimated comparisons of volume, VMT, VHT and travel times, a broad conclusion can be made that estimated VDFs do appear to be reasonable. The VDFs used for I-4 may need to be revised in future versions because the volumes are accurate, but the congested travel times are overestimated.

Although CFRPM 7 reflects 2015 conditions, it is also important that it provide reasonable forecasts given changes to the input data. Two longitudinal tests were performed for CFRPM 7 to help assess this ability. First, In the 2010 backcast, CFRPM 7 produces more traffic than is reflected in the daily traffic counts. This suggests that estimated trip lengths are longer than observed in 2010. The results also indicate that estimated traffic is more than in CFRPM 6.2, and at a slightly higher average speed. The VMT comparisons indicate that CFRPM 7 has approximately the correct level of traffic demand (as VMT). It is interesting that CFRPM 7's results are similar to CFRPM 6.2 TOD model results. This may indicate that neither time-of-day models correctly reflect travel lengths or patterns throughout the day. Overall, these results show that CFRPM 7 produces volume/count metrics similar to those from CFRPM 6.2.

Second, In the 2045 "no action" forecast, CFRPM 7 generates person trips, by county, at a rate similar to the population growth rate. Congestion increases regionally because the demand growth is greater than the supply growth: a 56% increase in person trips is five times higher than the 11% increase in capacity. The growth rate of the VHT and average speed may look remarkable given the growth rate of demand for some counties. However, considering that the relationship between volume and delay is exponential, this trend is reasonable.

Through this extensive review, CFRPM 7 has been shown to reasonably reflect Central Florida transportation demand and travel patterns and is a reliable technical tool for long-range planning analyses, given the above specific exceptions.

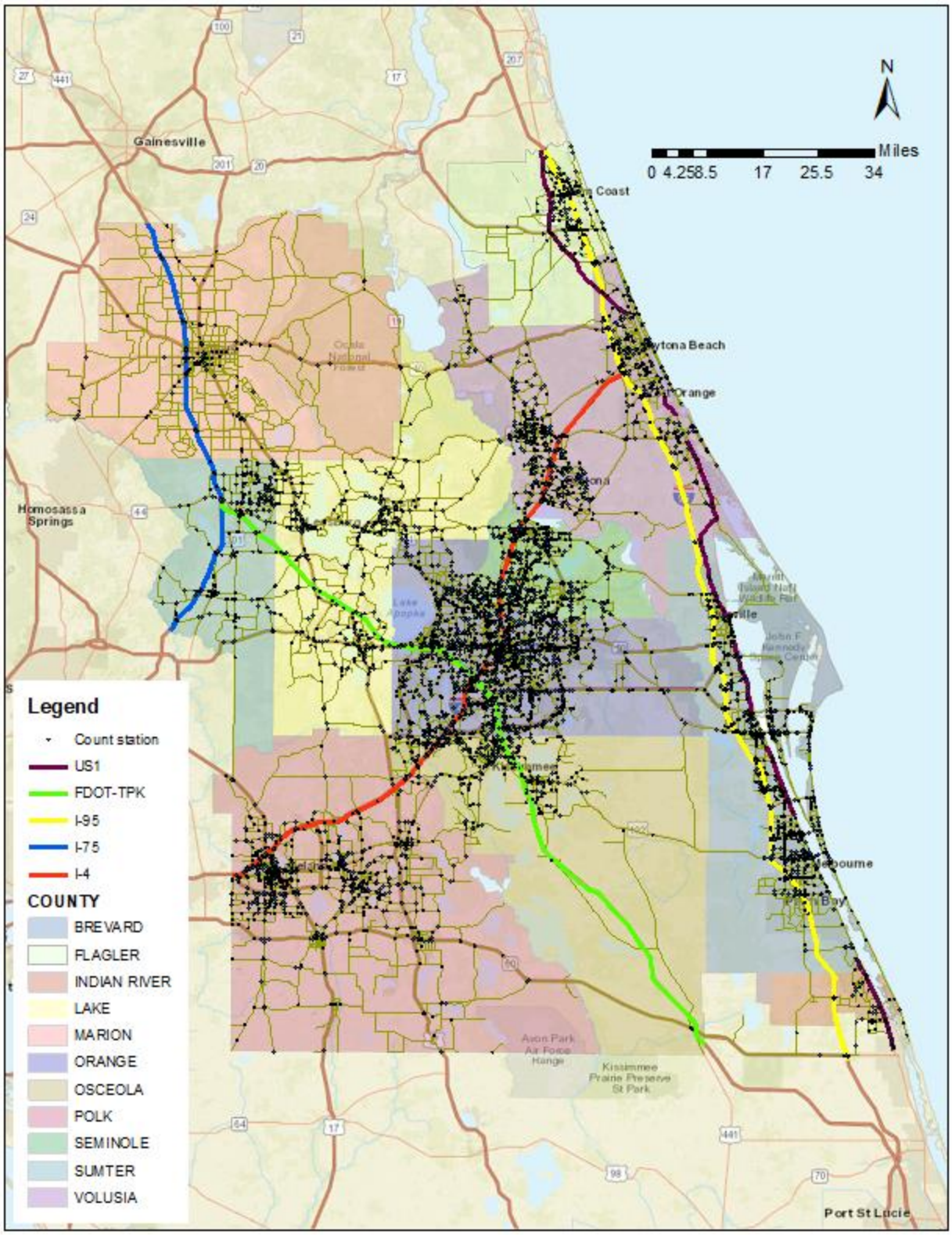
Appendix A Average Annual Daily Traffic Development

Traffic count data are key pieces of data used to validate the Central Florida Regional Planning Model (CFRPM). In the Central Florida region, traffic counts are collected by different sources, including the Florida Department of Transportation (FDOT), Florida's Turnpike (FDOT-TPK), Central Florida Expressway Authority (CFX), Reedy Creek Improvement District (RCID), Greater Orlando Aviation Authority (GOAA), and numerous cities, municipalities, and counties. Multiple count data may therefore exist for the same facility.

A master count database was developed for CFRPM validation and other applications. All counts are in 15-minute increments by direction and reflect 2015 conditions, although some counts were collected as early as 2014 and as recent as 2017. The original count data were merged into a common format and converted to Peak Seasonal Weekday Average Daily Traffic (PSWADT). Duplicate records and anomalous values were then removed from the database. The counts are then linked to the model's highway network for model validation.

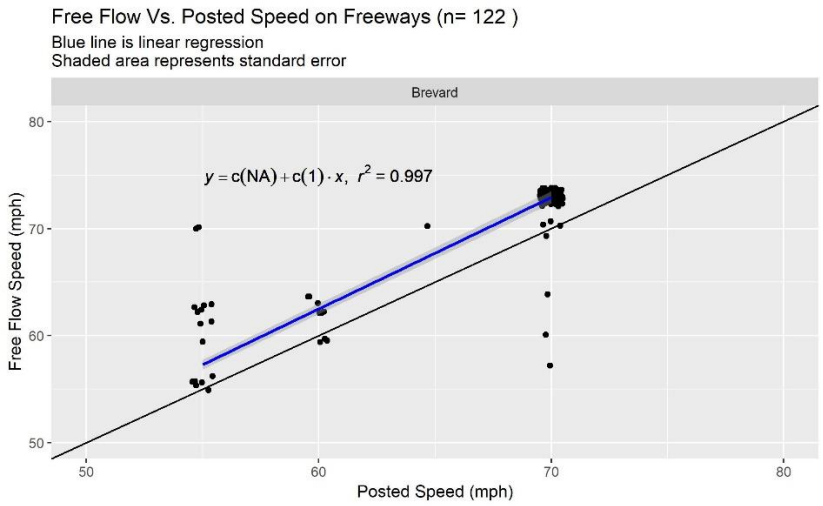
The assembled data came from 6,349 count stations and represent 11,335 counts by direction, each by 15-minute increments. The count stations are shown in Figure A-1.

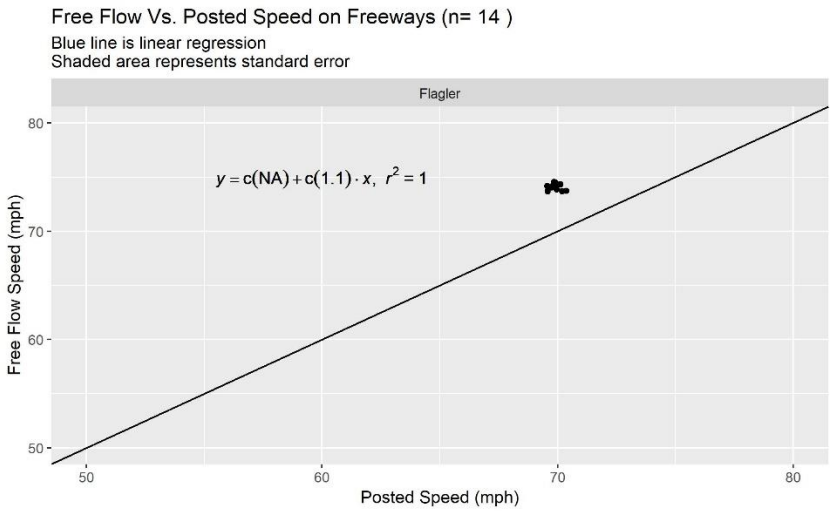
Figure A-1 Count Locations in CFRPM Area

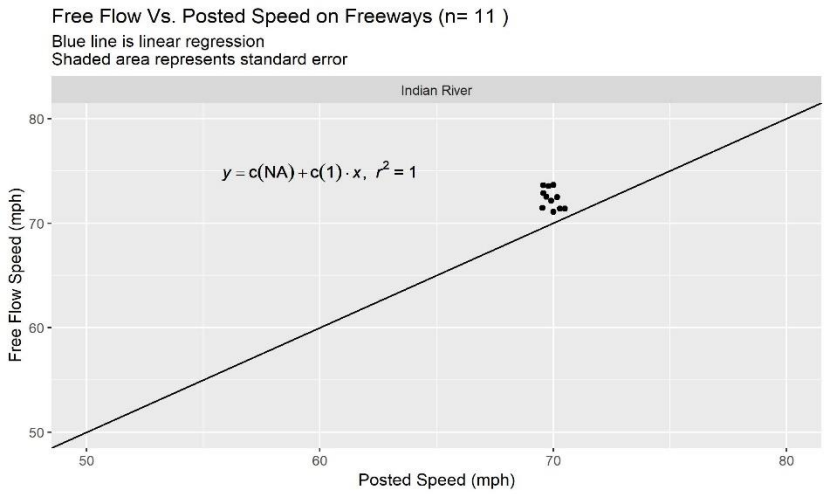


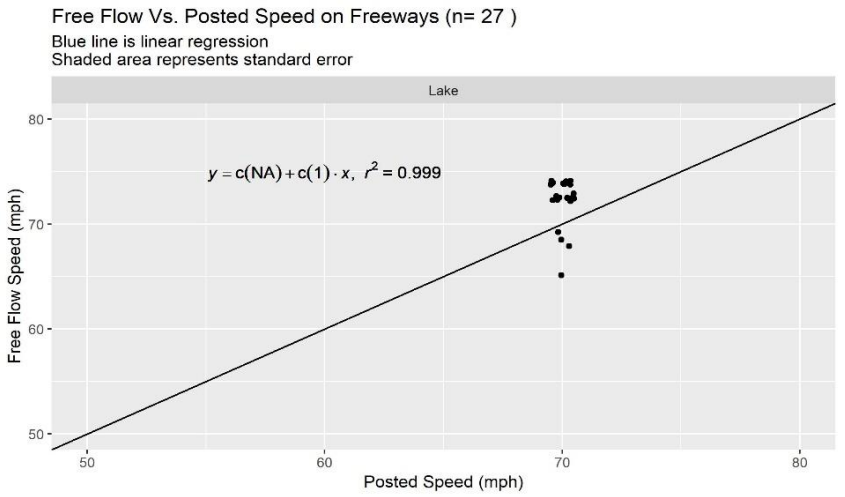
Appendix B Regression Analysis of Posted and Free-Flow Speeds

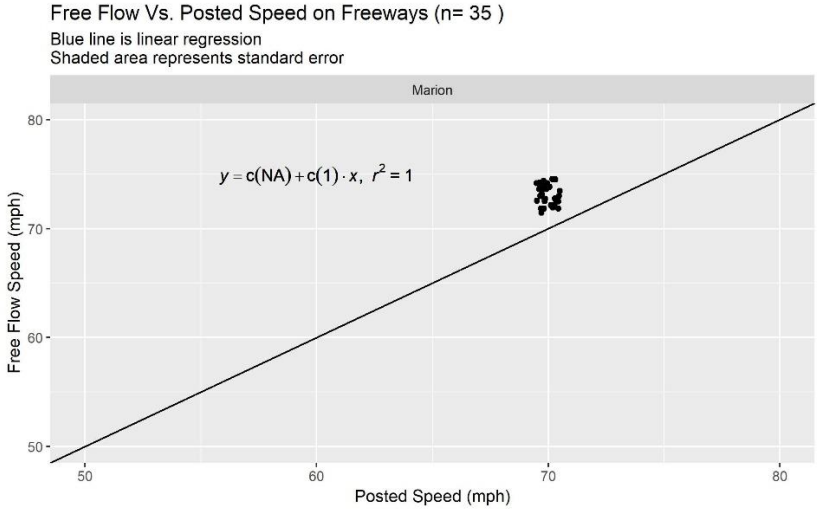
Free-Flow Speed vs. Posted Speed on Freeways

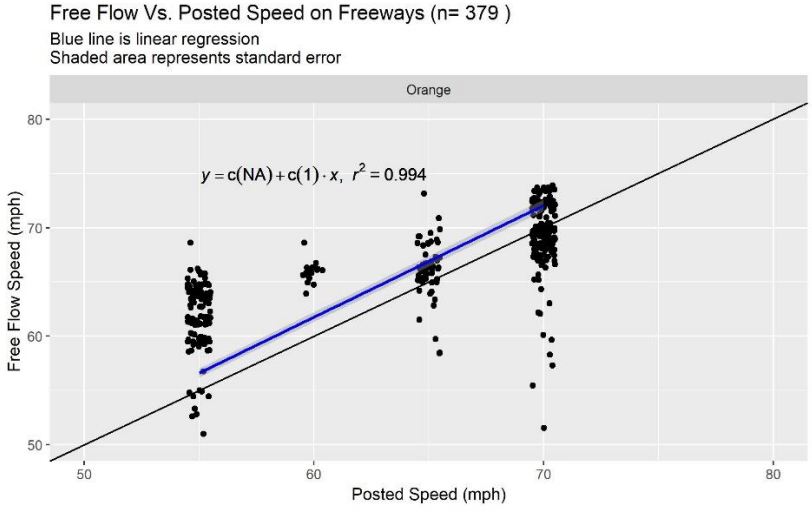




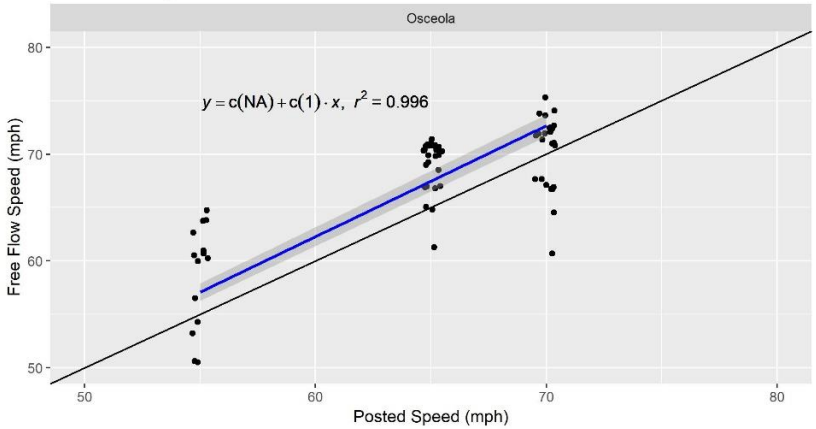

Free Flow Vs. Posted Speed on Freeways (n= 11)
Blue line is linear regression
Shaded area represents standard error
Indian River
$y = c(NA) + c(1) \cdot x,\ r^2 = 1$
Free Flow Speed (mph)
Posted Speed (mph)
50
60
70
80


Free Flow Vs. Posted Speed on Freeways (n= 27)
Blue line is linear regression
Shaded area represents standard error
Lake
$y = c(NA) + c(1) \cdot x,\ r^2 = 0.999$
Free Flow Speed (mph)
Posted Speed (mph)
50
60
70
80

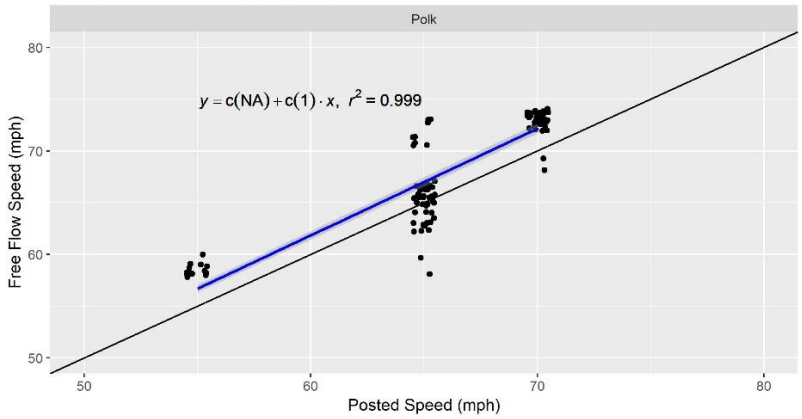

Free Flow Vs. Posted Speed on Freeways (n= 35)
Blue line is linear regression
Shaded area represents standard error
Marion
$y = c(NA) + c(1) \cdot x,\ r^2 = 1$
Free Flow Speed (mph)
Posted Speed (mph)
50
60
70
80


Free Flow Vs. Posted Speed on Freeways (n= 379)
Blue line is linear regression
Shaded area represents standard error
Orange
$y = c(NA) + c(1) \cdot x,\ r^2 = 0.994$
Free Flow Speed (mph)
Posted Speed (mph)
50
60
70
80

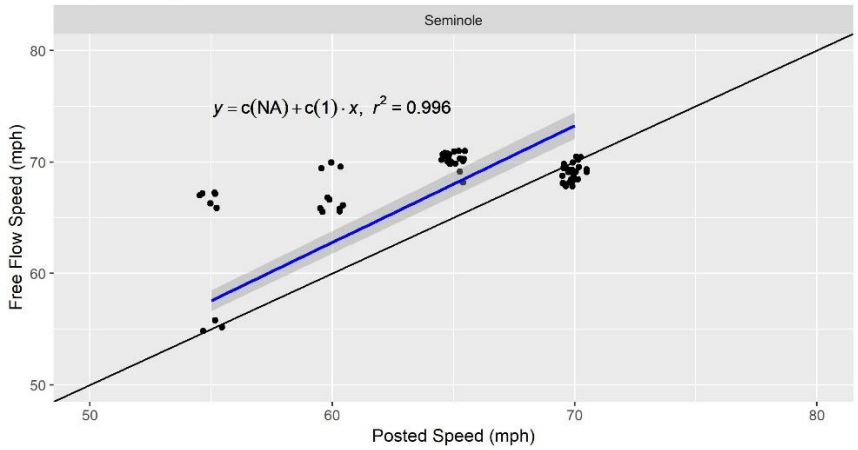
Free Flow Vs. Posted Speed on Freeways (n= 68)
Blue line is linear regression
Shaded area represents standard error



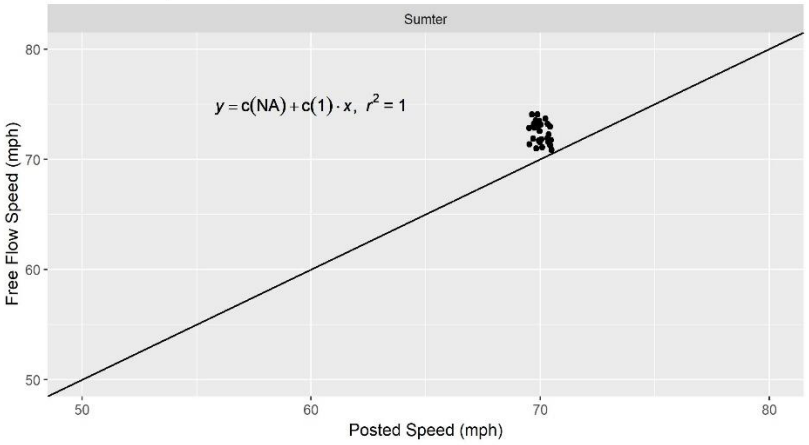
Free Flow Vs. Posted Speed on Freeways (n= 115)
Blue line is linear regression
Shaded area represents standard error

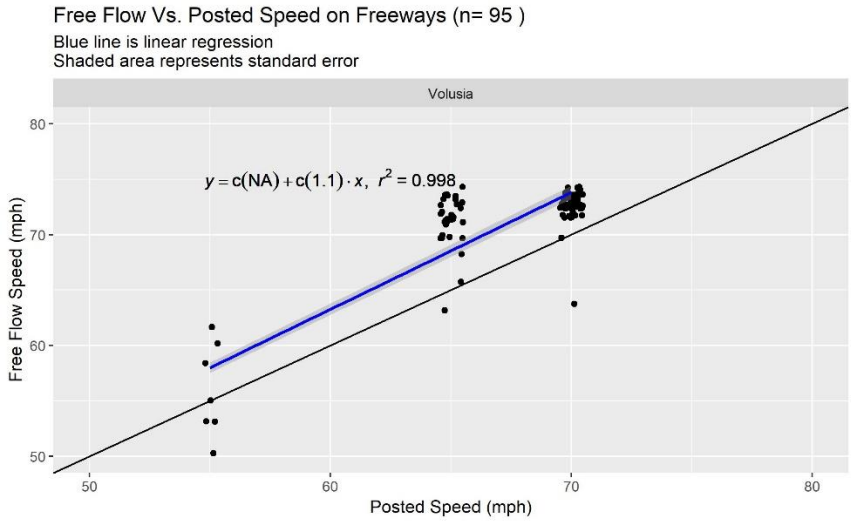


Free Flow Vs. Posted Speed on Freeways (n= 68)
Blue line is linear regression
Shaded area represents standard error

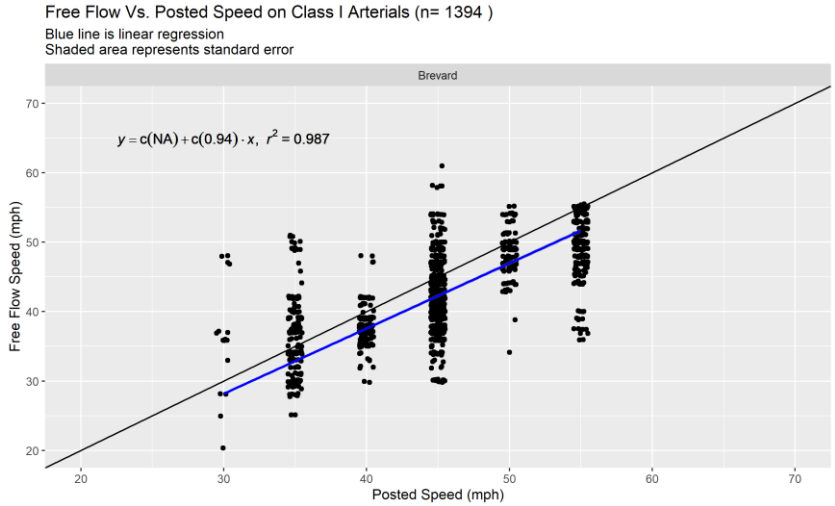


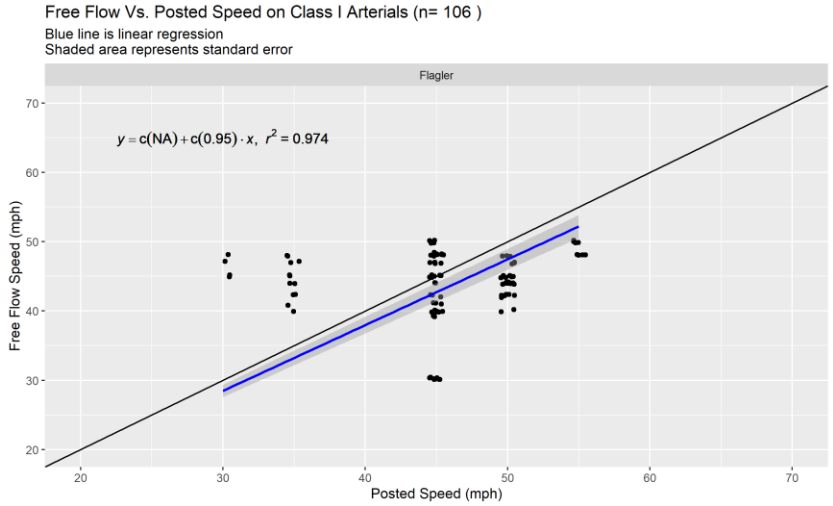
Free Flow Vs. Posted Speed on Freeways (n= 30)
Blue line is linear regression
Shaded area represents standard error

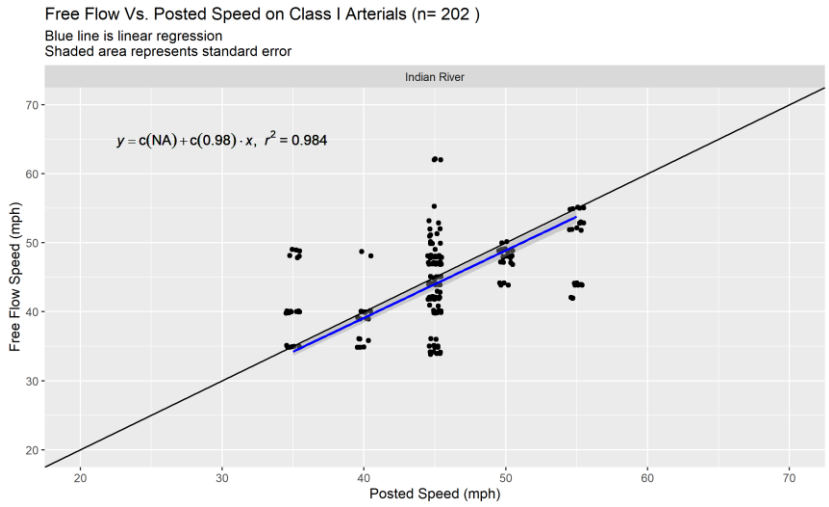


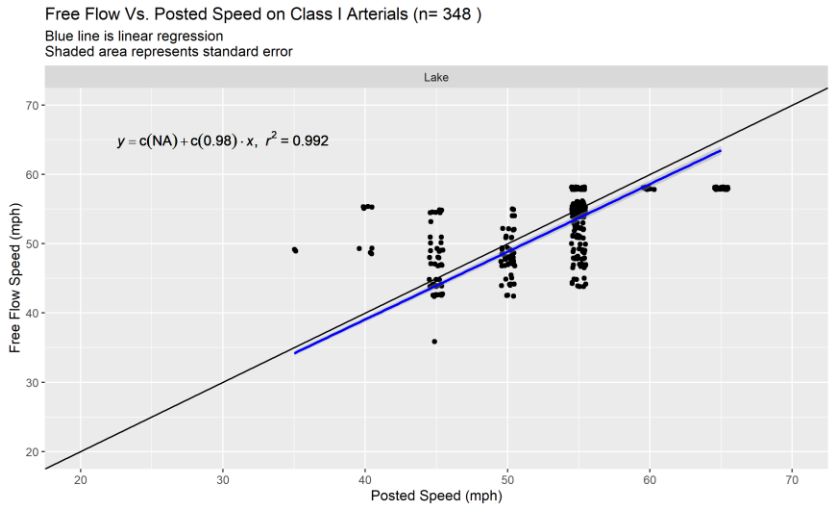

Free Flow Vs. Posted Speed on Freeways (n= 95)
Blue line is linear regression
Shaded area represents standard error
Volusia
$y = c(NA) + c(1.1) \cdot x,\ r^2 = 0.998$
Free Flow Speed (mph)
Posted Speed (mph)
80
70
60
50
50
60
70
80

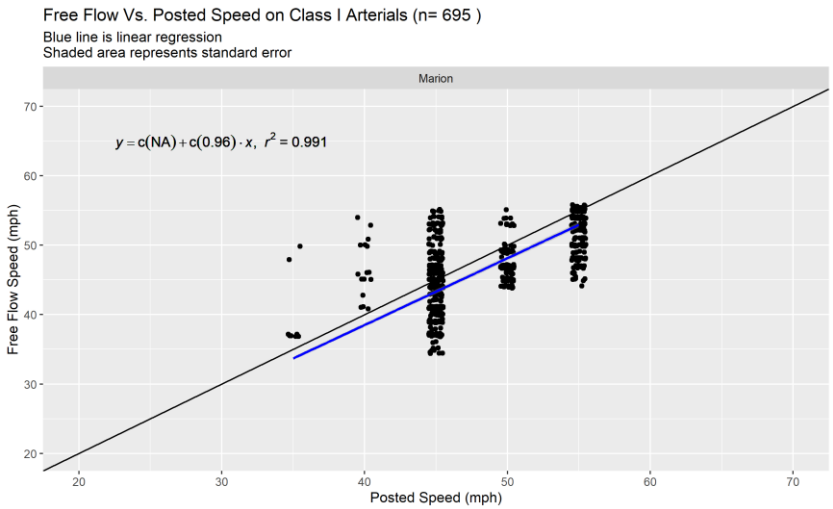
Free-Flow Speed vs. Posted Speed on Class I Arterials

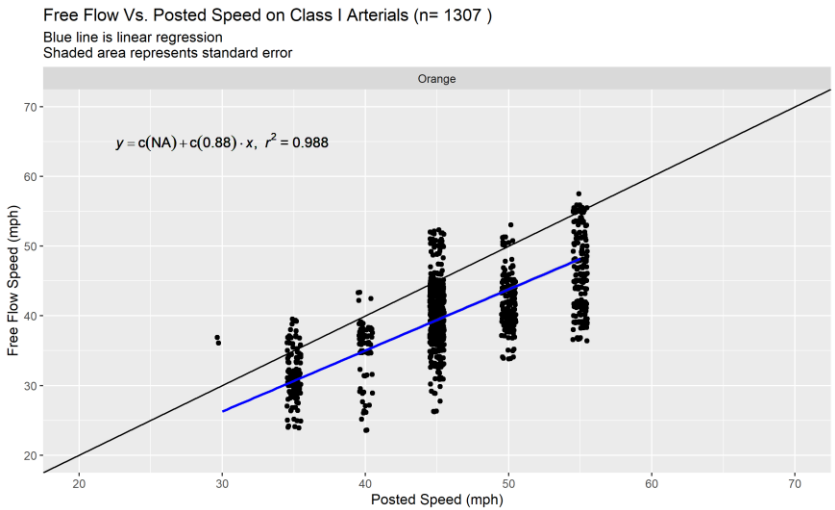


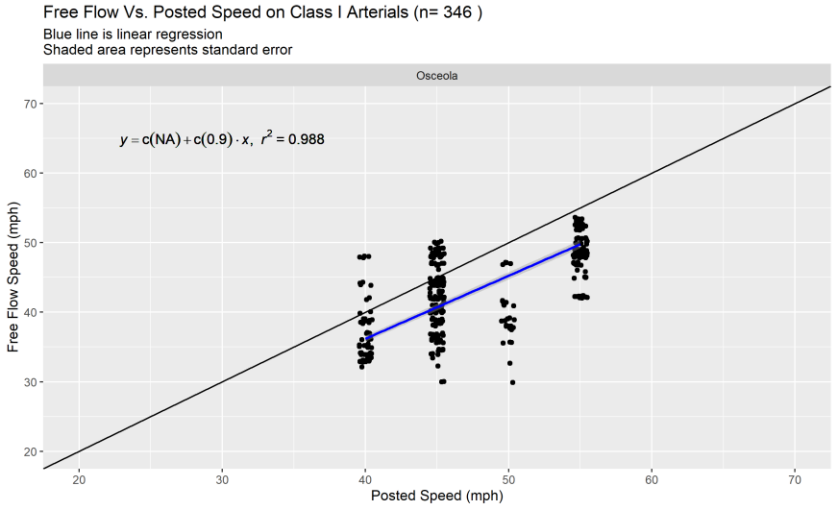


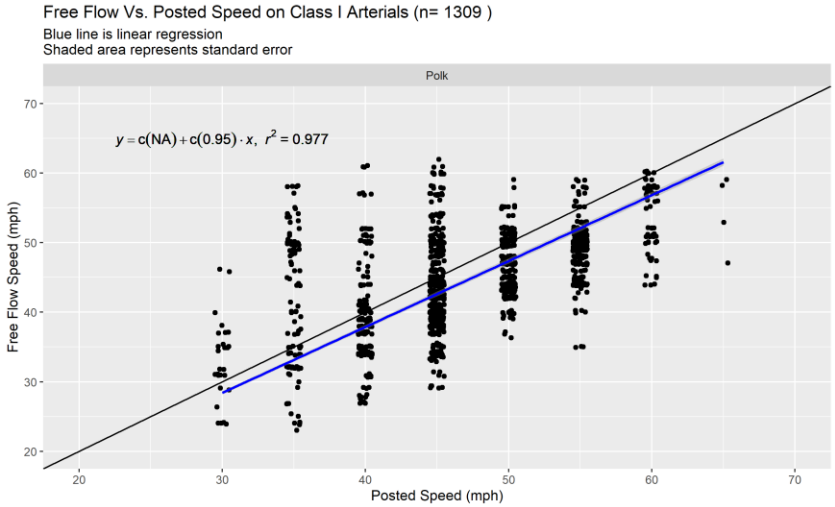




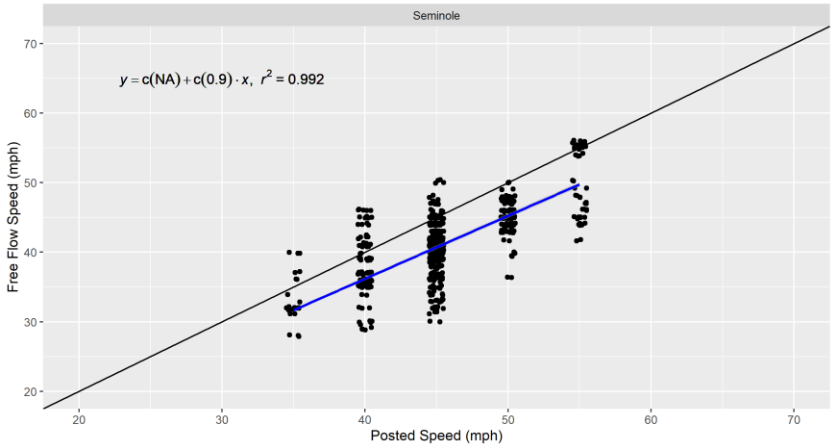

Free Flow Vs. Posted Speed on Class I Arterials (n= 695)
Blue line is linear regression
Shaded area represents standard error
Marion
$y = c(NA) + c(0.96) \cdot x,\ r^2 = 0.991$
Free Flow Speed (mph)
Posted Speed (mph)
20
30
40
50
60
70


Free Flow Vs. Posted Speed on Class I Arterials (n= 1307)
Blue line is linear regression
Shaded area represents standard error
Orange
$y = c(NA) + c(0.88) \cdot x,\ r^2 = 0.988$
Free Flow Speed (mph)
Posted Speed (mph)
20
30
40
50
60
70

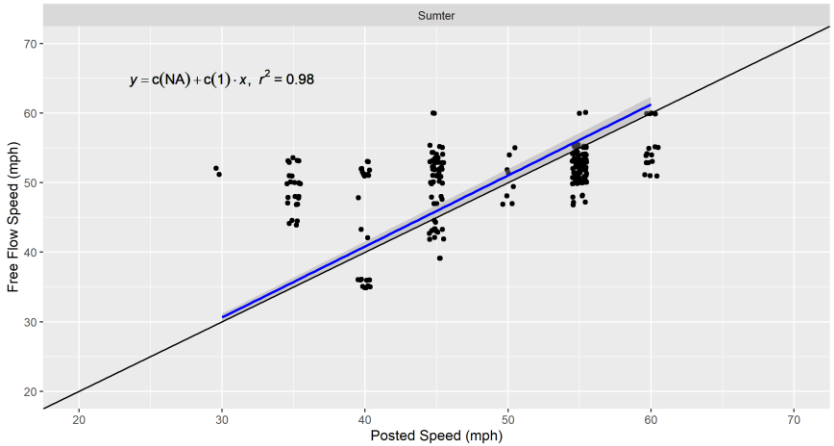

Free Flow Vs. Posted Speed on Class I Arterials (n= 346)
Blue line is linear regression
Shaded area represents standard error
Osceola
$y = c(NA) + c(0.9) \cdot x,\ r^2 = 0.988$
Free Flow Speed (mph)
Posted Speed (mph)
20
30
40
50
60
70


Free Flow Vs. Posted Speed on Class I Arterials (n= 1309)
Blue line is linear regression
Shaded area represents standard error
Polk
$y = c(NA) + c(0.95) \cdot x,\ r^2 = 0.977$
Free Flow Speed (mph)
Posted Speed (mph)
20
30
40
50
60
70

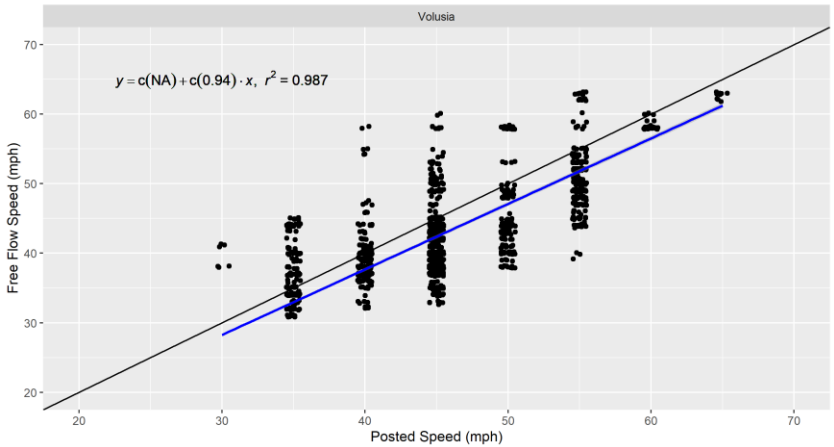
Free Flow Vs. Posted Speed on Class I Arterials (n= 624)
Blue line is linear regression
Shaded area represents standard error



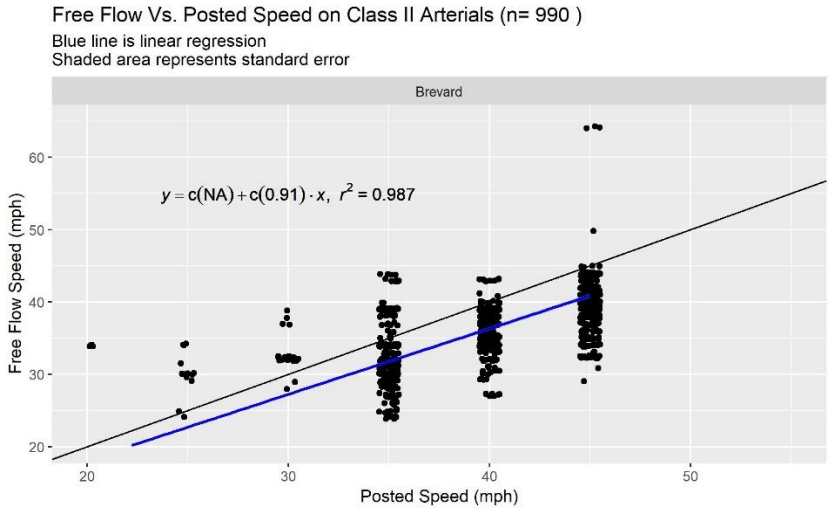
Free Flow Vs. Posted Speed on Class I Arterials (n= 248)
Blue line is linear regression
Shaded area represents standard error

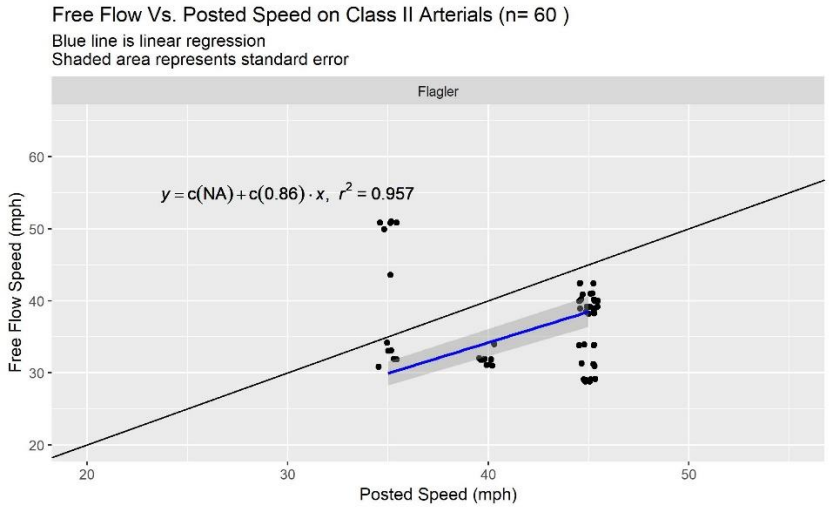


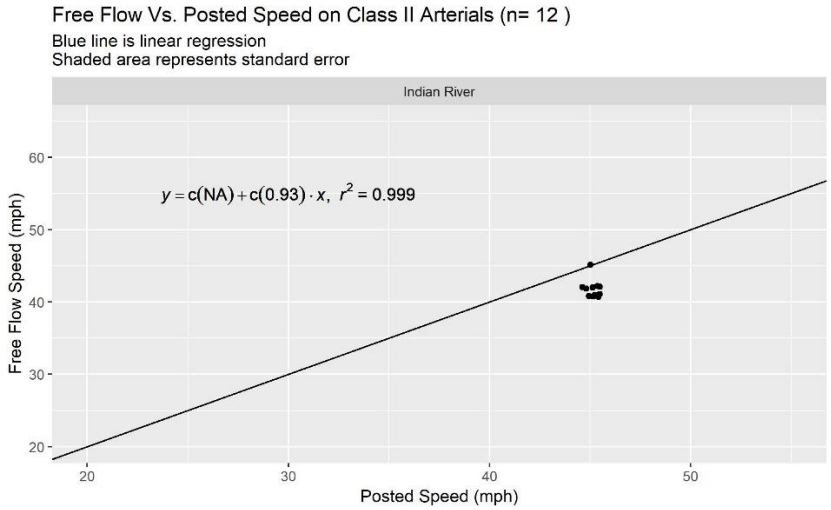
Free Flow Vs. Posted Speed on Class I Arterials (n= 1314)
Blue line is linear regression
Shaded area represents standard error

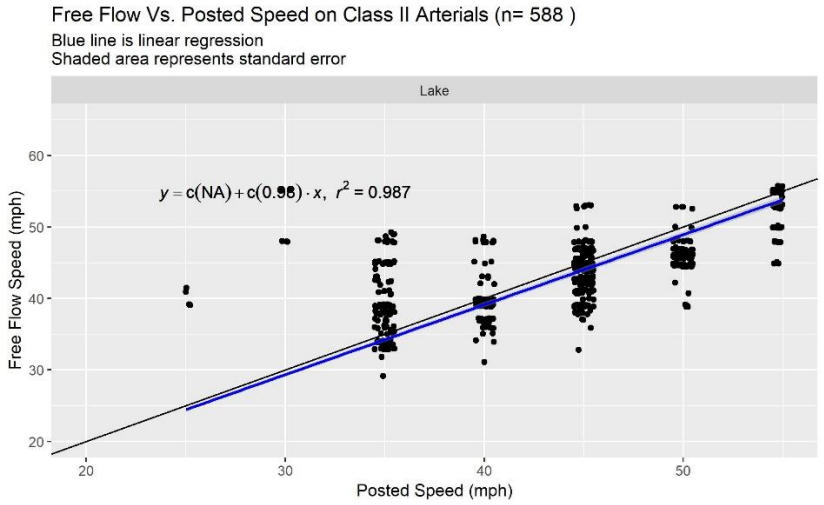


Free-Flow Speed vs. Posted Speed on Class II Arterials

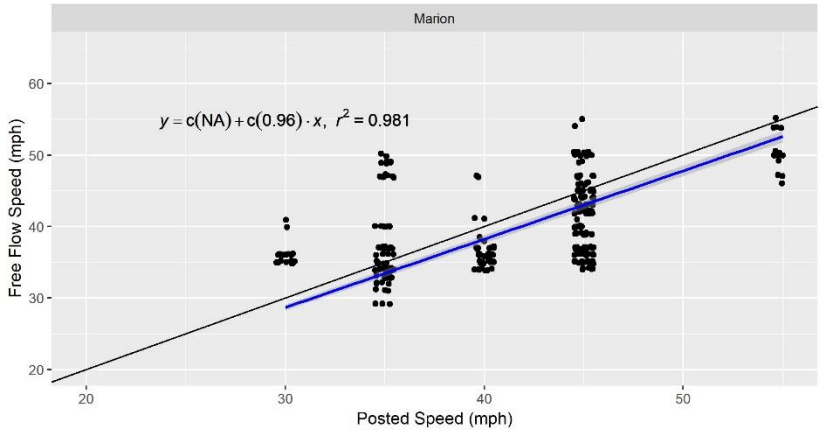




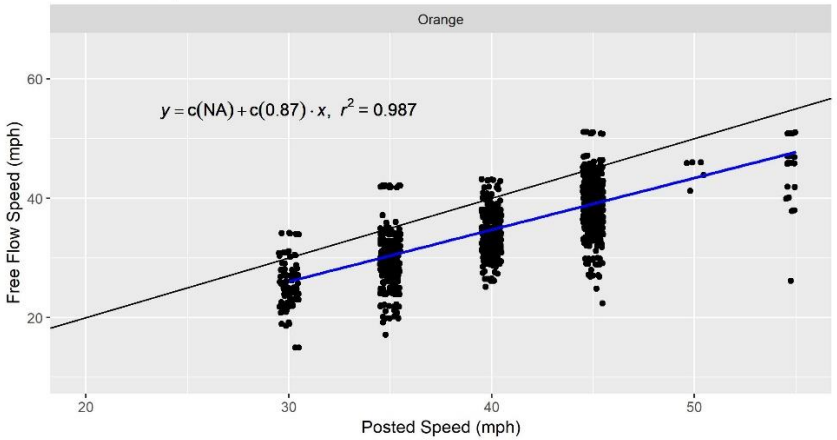




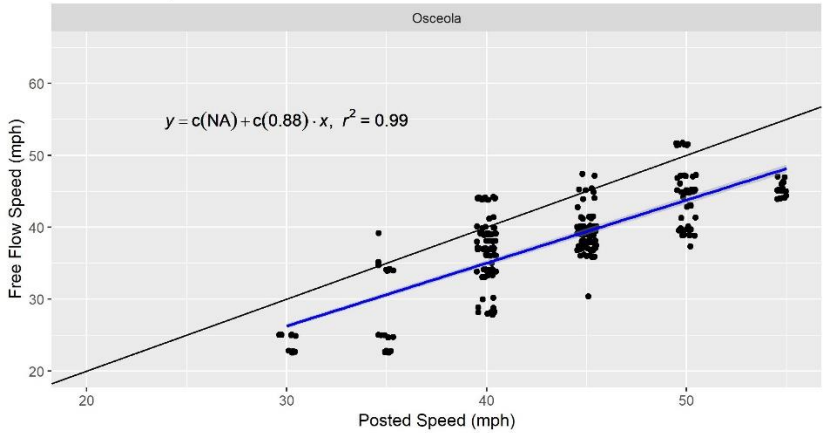
Free Flow Vs. Posted Speed on Class II Arterials (n= 321)
Blue line is linear regression
Shaded area represents standard error



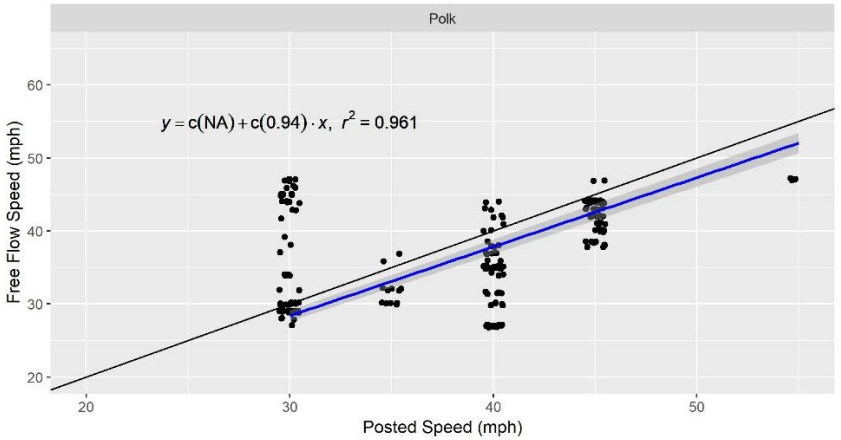
Free Flow Vs. Posted Speed on Class II Arterials (n= 1351)
Blue line is linear regression
Shaded area represents standard error



Free Flow Vs. Posted Speed on Class II Arterials (n= 291)
Blue line is linear regression
Shaded area represents standard error

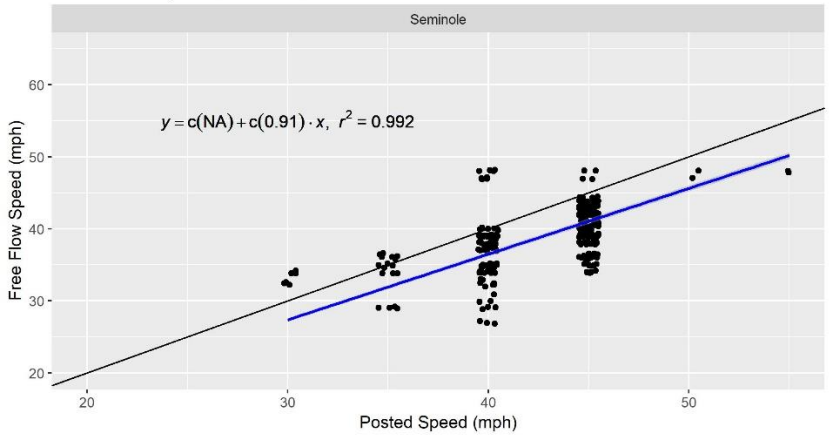


Free Flow Vs. Posted Speed on Class II Arterials (n= 210)
Blue line is linear regression
Shaded area represents standard error



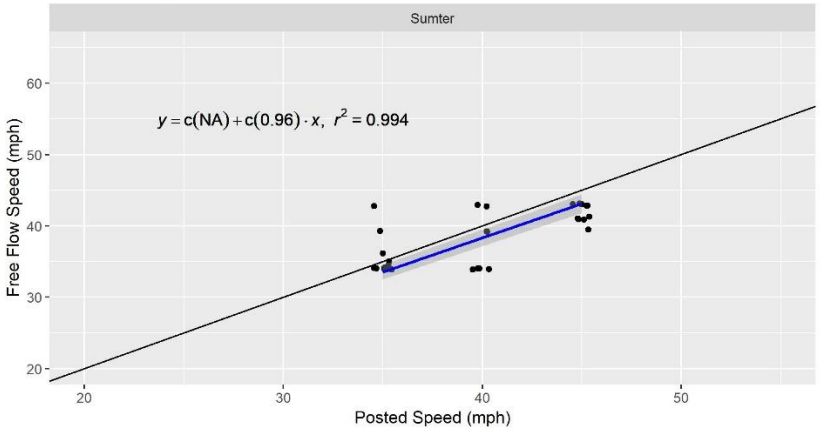
Free Flow Vs. Posted Speed on Class II Arterials (n= 355)

Blue line is linear regression
Shaded area represents standard error



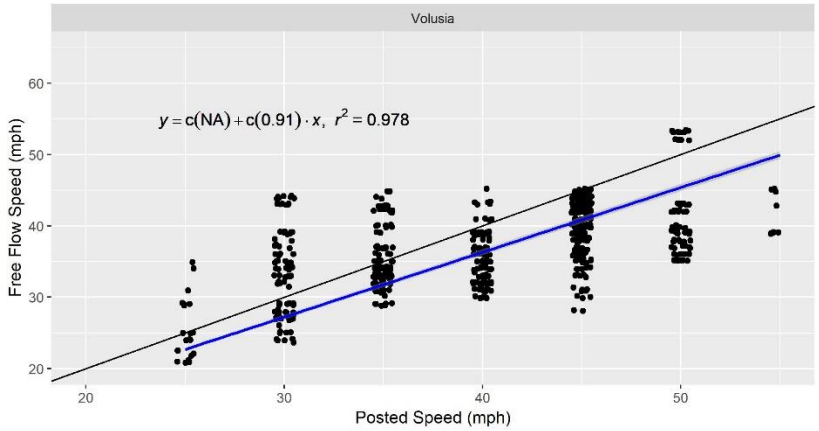
Free Flow Vs. Posted Speed on Class II Arterials (n= 30)

Blue line is linear regression
Shaded area represents standard error

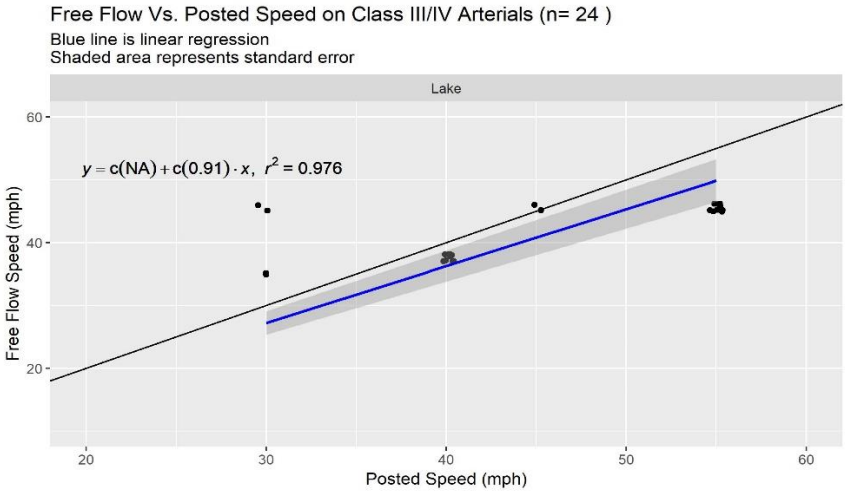


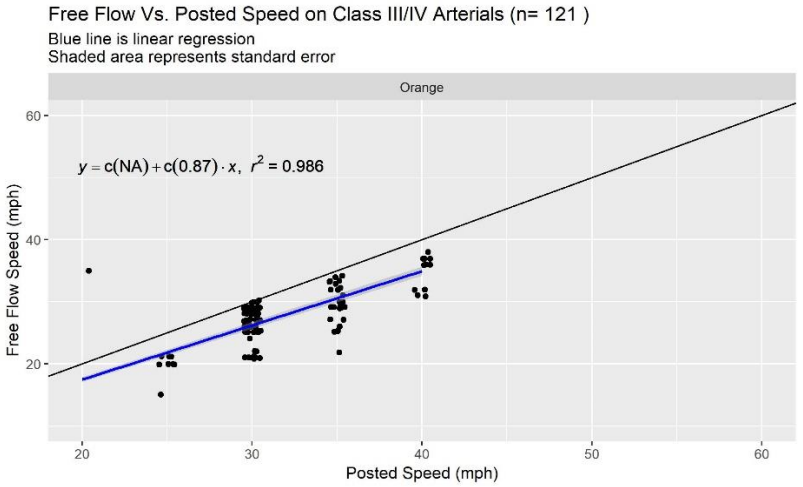
Free Flow Vs. Posted Speed on Class II Arterials (n= 668)

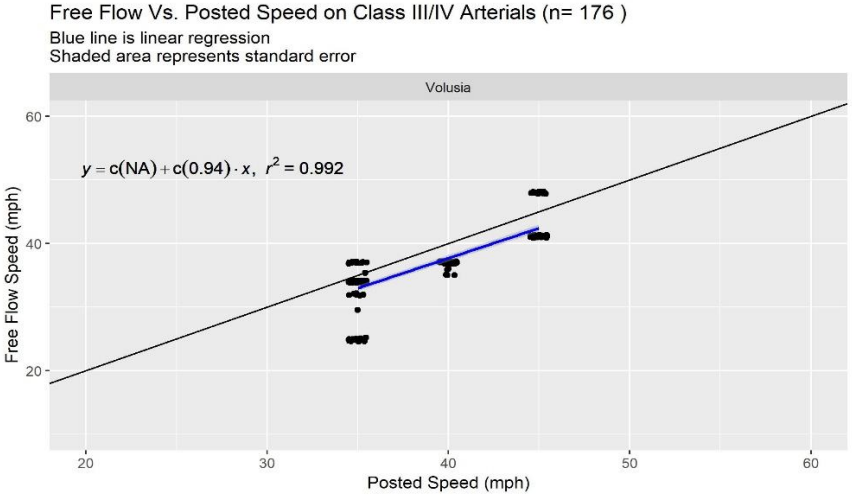
Blue line is linear regression
Shaded area represents standard error



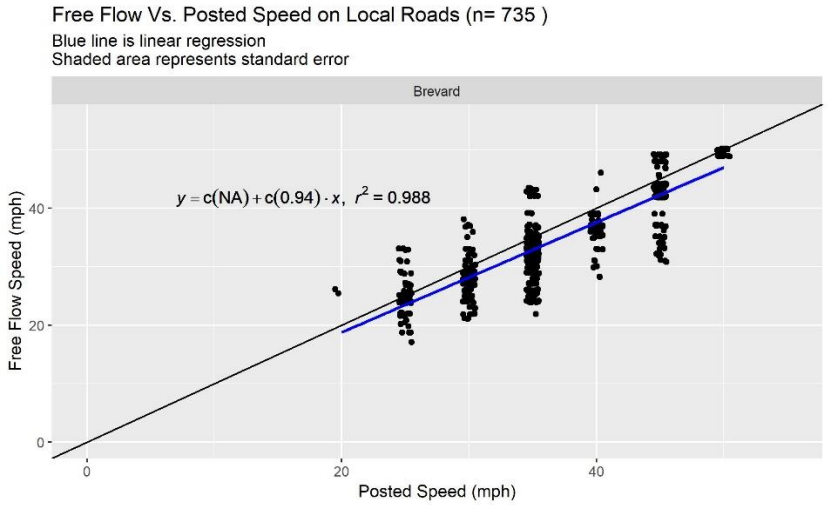
Free-Flow Speed vs. Posted Speed on Class III/IV Arterials

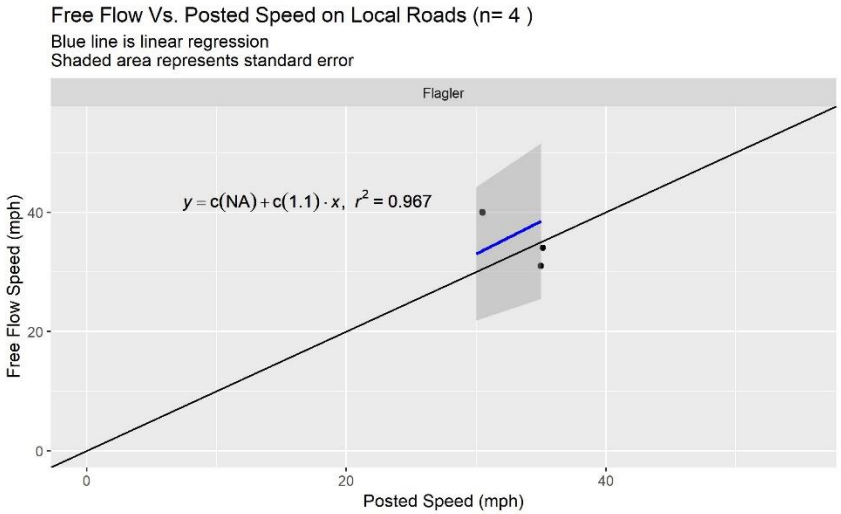


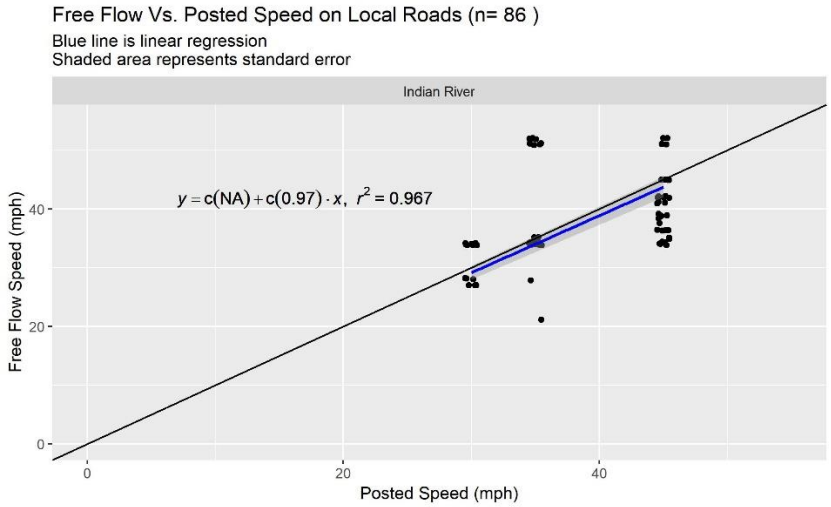


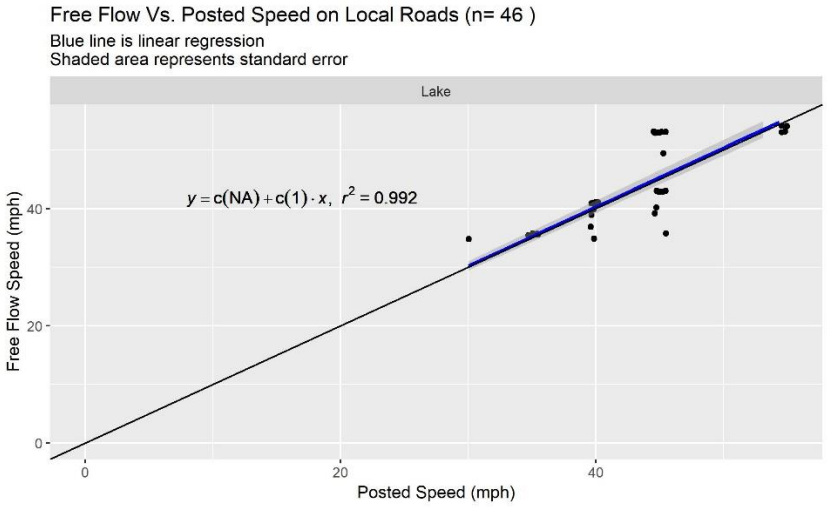


Free-Flow vs. Posted Speed on Local Roads

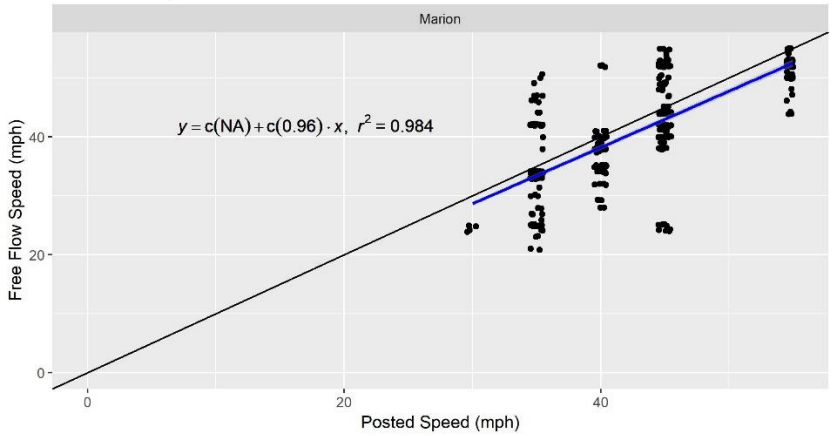




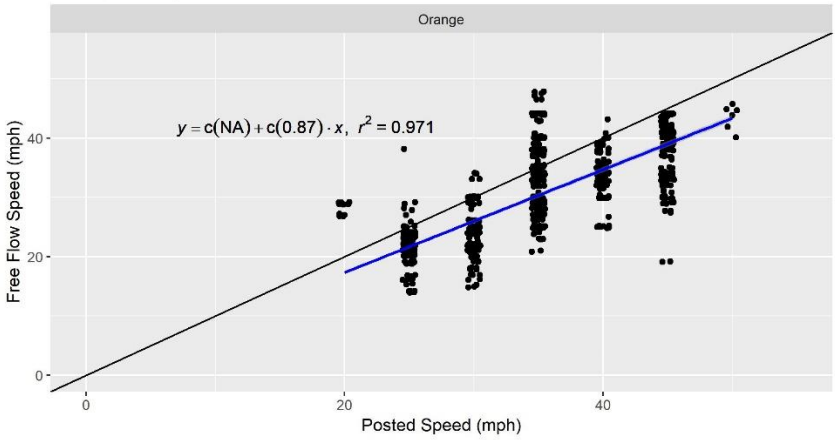




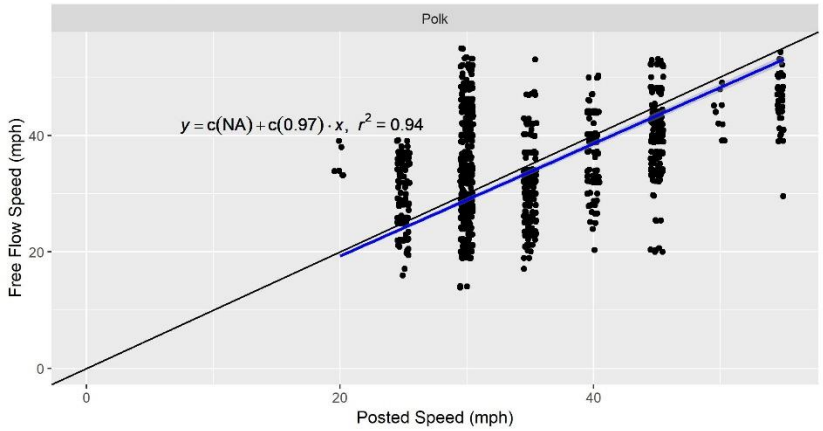
Free Flow Vs. Posted Speed on Local Roads (n= 478)
Blue line is linear regression
Shaded area represents standard error



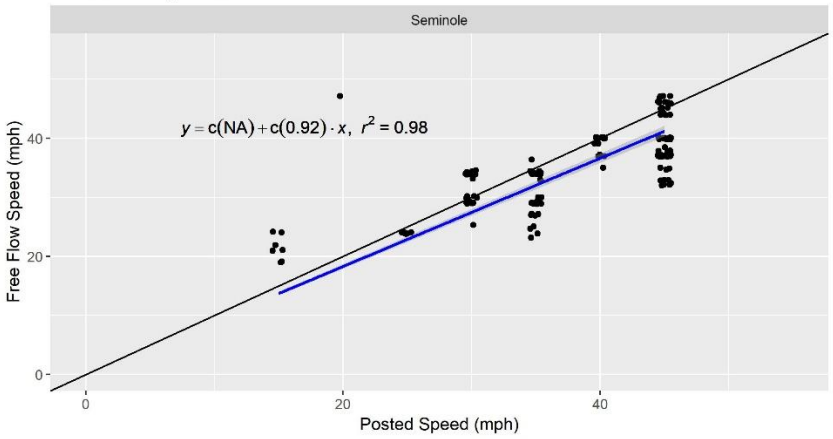
Free Flow Vs. Posted Speed on Local Roads (n= 758)
Blue line is linear regression
Shaded area represents standard error

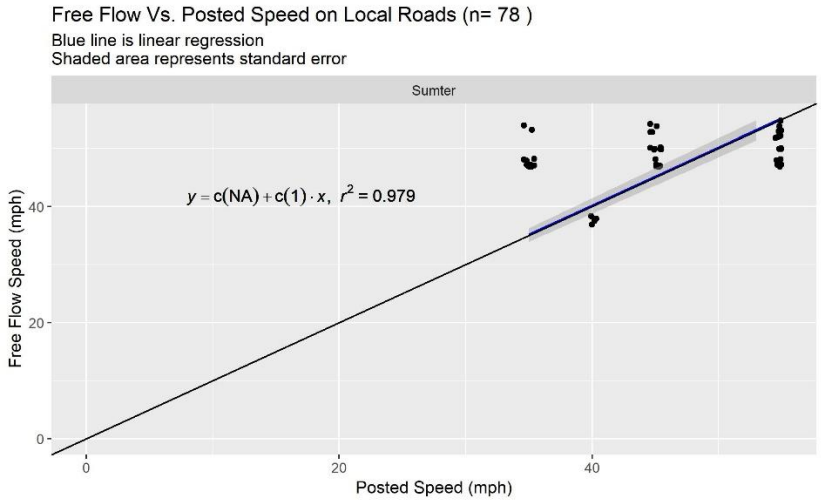


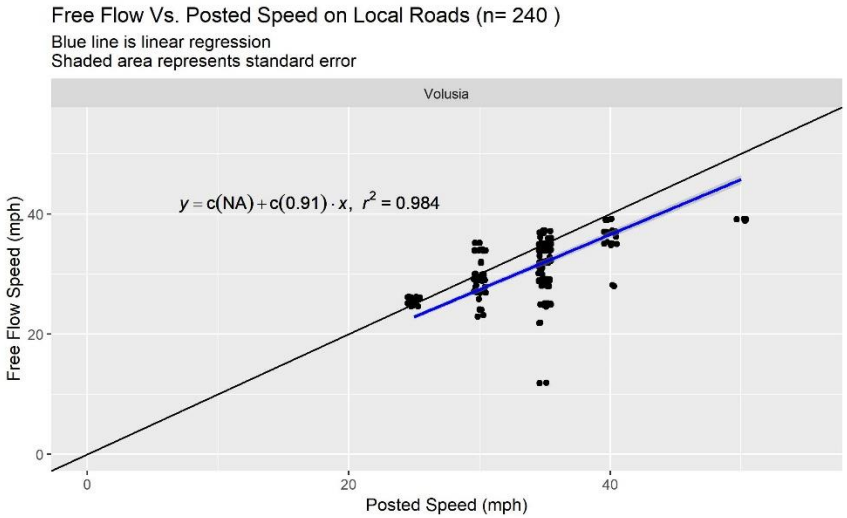
Free Flow Vs. Posted Speed on Local Roads (n= 1162)
Blue line is linear regression
Shaded area represents standard error



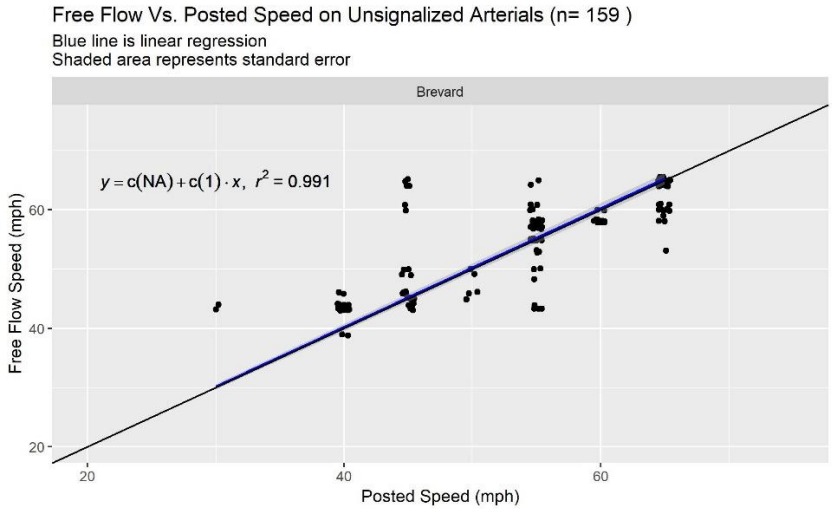
Free Flow Vs. Posted Speed on Local Roads (n= 168)
Blue line is linear regression
Shaded area represents standard error

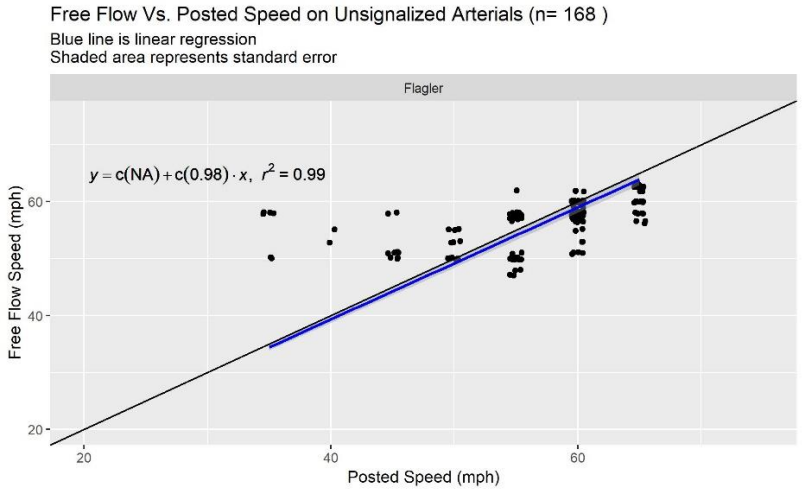


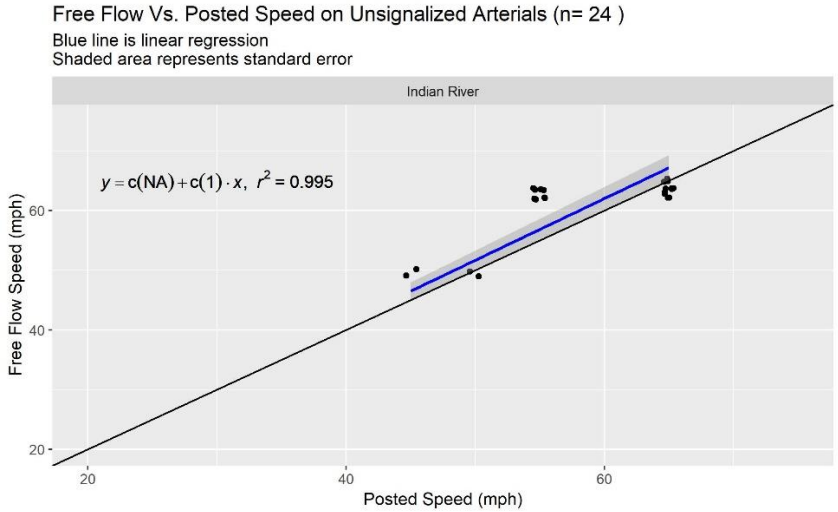

Free Flow Vs. Posted Speed on Local Roads (n= 78)
Blue line is linear regression
Shaded area represents standard error
Sumter
$y = c(NA) + c(1) \cdot x,\ r^2 = 0.979$
Free Flow Speed (mph)
Posted Speed (mph)
0
20
40

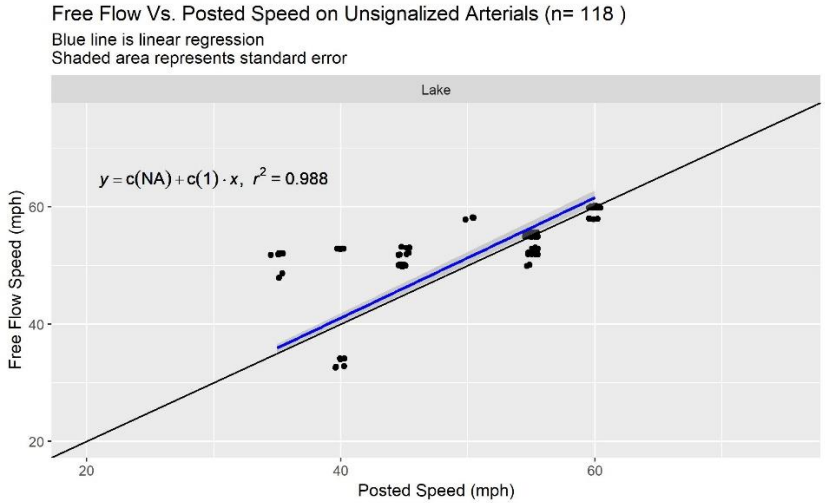

Free Flow Vs. Posted Speed on Local Roads (n= 240)
Blue line is linear regression
Shaded area represents standard error
Volusia
$y = c(NA) + c(0.91) \cdot x,\ r^2 = 0.984$
Free Flow Speed (mph)
Posted Speed (mph)
0
20
40

Free-Flow Speed vs. Posted Speed on Unsignalized Arterials

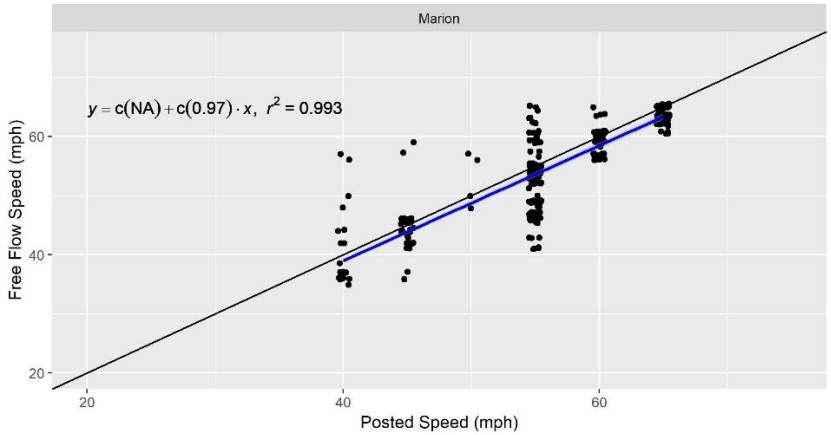








Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 324)
Blue line is linear regression
Shaded area represents standard error



Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 74)
Blue line is linear regression
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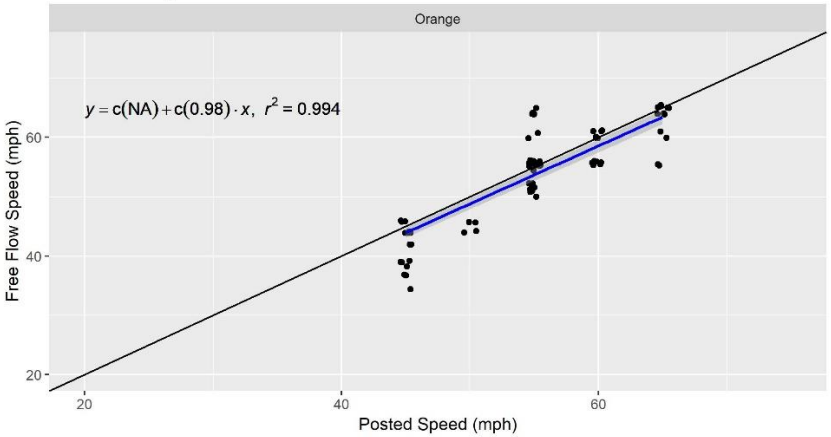
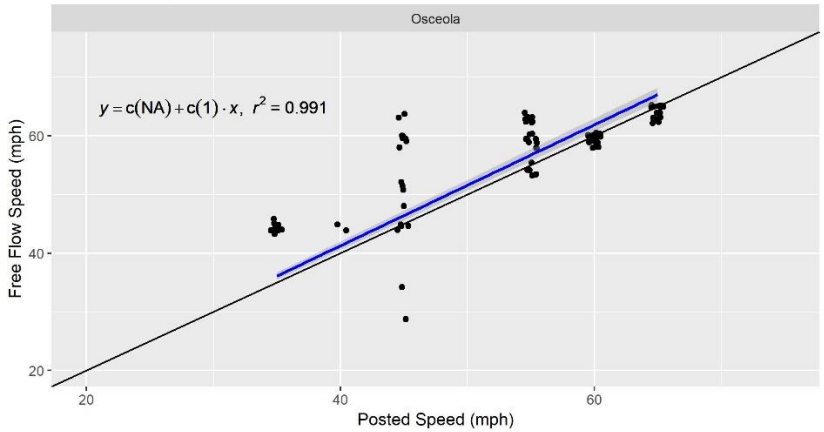
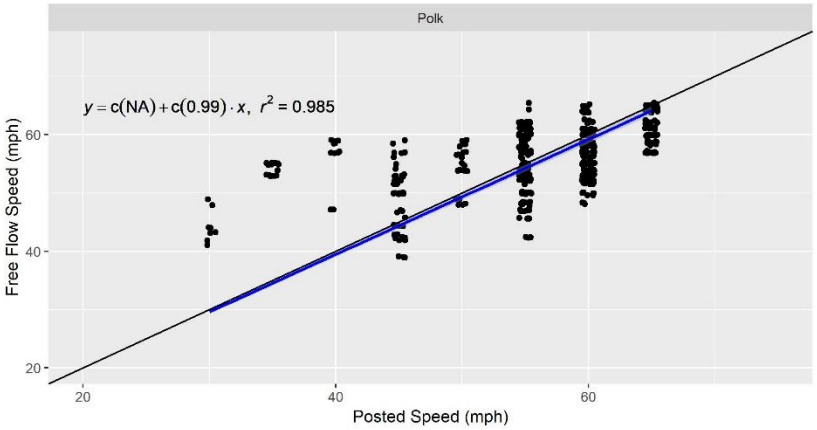


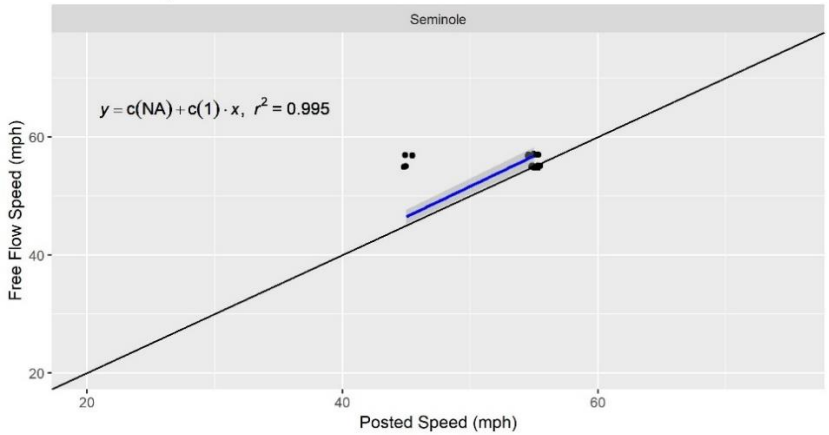
Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 118)
Blue line is linear regression
Shaded area represents standard error



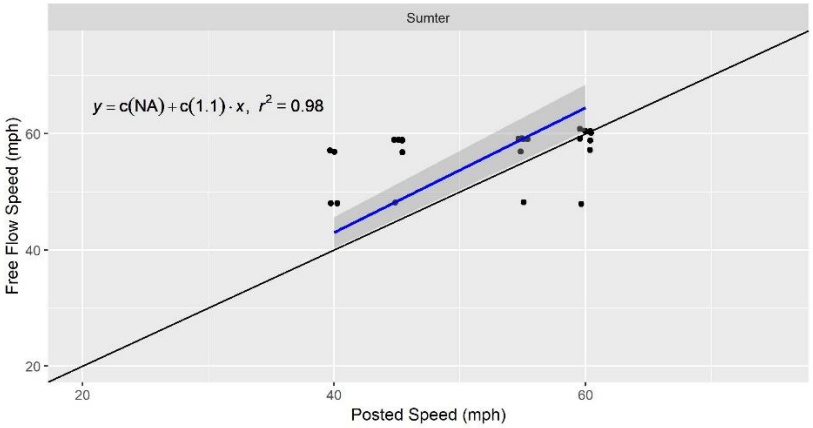
Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 506)
Blue line is linear regression
Shaded area represents standard error



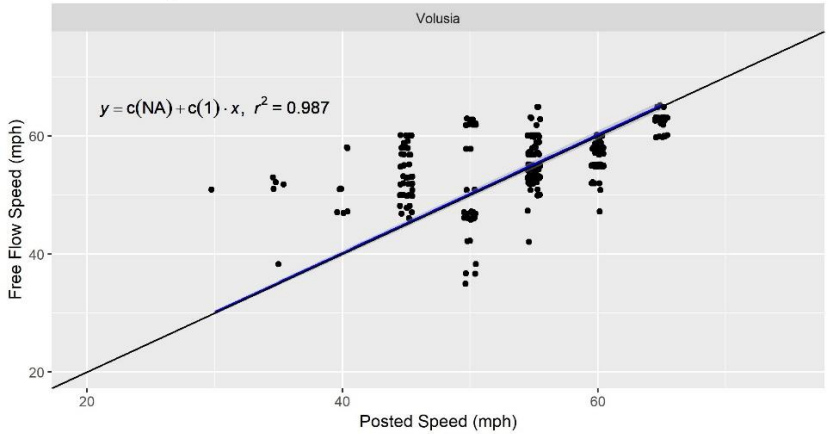
Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 30)
Blue line is linear regression
Shaded area represents standard error



Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 24)
Blue line is linear regression
Shaded area represents standard error



Free Flow Vs. Posted Speed on Unsignalized Arterials (n= 324)
Blue line is linear regression
Shaded area represents standard error



Appendix C Comparison of Observed and Estimated Free-Flow Speed

Estimated vs. Observed Free-Flow Speed by Facility Type in Brevard County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	2.31	91.54	6.15	130
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	8.79	86.81	4.40	91
22	Divided Arterial Unsignalized (Speed = 45 & 50 mph)	25.00	75.00	0.00	8
23	Divided Arterial Class I	14.10	72.83	13.07	773
24	Divided Arterial Class II	9.43	75.09	15.47	530
31	Undivided Arterial Unsignalized with Turn Bays	3.45	86.21	10.34	58
32	Undivided Arterial Class I with Turn Bays	9.79	67.26	22.95	623
33	Undivided Arterial Class II with Turn Bays	15.65	70.00	14.35	460
41	Major Local Divided Roadway	0.00	100.00	0.00	58
42	Major Local Undivided Roadway with Turn Bays	5.63	81.79	12.58	302
43	Major Local Undivided Roadway without Turn Bays	27.20	64.80	8.00	125
44	Other Local Divided Roadway	75.00	0.00	25.00	12
45	Other Local Undivided Roadway with Turn Bays	0.00	20.00	80.00	10
46	Other Local Undivided Roadway without Turn Bays	0.00	100.00	0.00	8
47	Low Speed Collector	18.52	71.30	10.19	216
62	One-Way Facilities Class I	8.33	91.67	0.00	12
63	One-Way Facilities Class II	52.27	43.18	4.55	44
71	Freeway On/Off Ramp-Service Interchange	28.57	57.14	14.29	7
72	Freeway On/Off Loop Ramp-Service Interchange	25.00	0.00	75.00	8
73	Other On/Off Ramp-Urban Interchange	0.00	100.00	0.00	2
76	Freeway-Collector/Distributor Ramp	80.00	20.00	0.00	10
All	**All Facility Types**	**12.70**	**72.96**	**14.34**	**3,487**

Estimated vs. Observed Free-Flow Speed by Facility Type in Flagler County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	100.00	0.00	16
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	7.58	75.76	16.67	66
23	Divided Arterial Class I	20.00	70.00	10.00	80
24	Divided Arterial Class II	14.29	47.62	38.10	42
31	Undivided Arterial Unsignalized with Turn Bays	7.14	82.14	10.71	56
32	Undivided Arterial Class I with Turn Bays	31.82	50.00	18.18	44
33	Undivided Arterial Class II with Turn Bays	0.00	50.00	50.00	4
35	Undivided Arterial Unsignalized without Turn Bays	21.43	78.57	0.00	28
42	Major Local Undivided Roadway with Turn Bays	0.00	100.00	0.00	2
46	Other Local Undivided Roadway without Turn Bays	100.00	0.00	0.00	2
52	External Station Connector	33.33	66.67	0.00	6
63	One-Way Facilities Class II	0.00	64.29	35.71	14
92	Toll Facility - Arterial	0.00	50.00	50.00	2
All	**All Facility Types**	**15.19**	**69.06**	**15.75**	**362**

Estimated vs. Observed Free-Flow Speed by Facility Type in Indian River County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	100.00	0.00	11
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	40.00	60.00	0.00	20
23	Divided Arterial Class I	29.69	59.38	10.94	128
31	Undivided Arterial Unsignalized with Turn Bays	0.00	100.00	0.00	4
32	Undivided Arterial Class I with Turn Bays	16.22	70.27	13.51	74
33	Undivided Arterial Class II with Turn Bays	0.00	100.00	0.00	12
42	Major Local Undivided Roadway with Turn Bays	0.00	75.00	25.00	32
43	Major Local Undivided Roadway without Turn Bays	42.86	35.71	21.43	28
45	Other Local Undivided Roadway with Turn Bays	14.29	85.71	0.00	14
47	Low Speed Collector	50.00	50.00	0.00	12
All	**All Facility Types**	**23.28**	**65.37**	**11.34**	**335**

Estimated vs. Observed Free-Flow Speed by Facility Type in Lake County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
22	Divided Arterial Unsignalized (Speed = 45 & 50 mph)	0.00	100.00	0.00	2
23	Divided Arterial Class I	7.09	85.04	7.87	254
24	Divided Arterial Class II	26.90	72.08	1.02	394
31	Undivided Arterial Unsignalized with Turn Bays	20.93	72.09	6.98	86
32	Undivided Arterial Class I with Turn Bays	18.48	80.43	1.09	92
33	Undivided Arterial Class II with Turn Bays	37.21	61.63	1.16	172
34	Undivided Arterial Class III/IV with Turn Bays	20.83	79.17	0.00	24
35	Undivided Arterial Unsignalized without Turn Bays	20.00	80.00	0.00	30
37	Undivided Arterial Class II without Turn Bays	50.00	50.00	0.00	6
42	Major Local Undivided Roadway with Turn Bays	48.48	48.48	3.03	33
43	Major Local Undivided Roadway without Turn Bays	0.00	100.00	0.00	6
46	Other Local Undivided Roadway without Turn Bays	100.00	0.00	0.00	6
47	Low Speed Collector	100.00	0.00	0.00	1
63	One-Way Facilities Class II	15.00	85.00	0.00	20
73	Other On/Off Ramp-Urban Interchange	0.00	50.00	50.00	2
91	Toll Facility - Freeway	0.00	89.66	10.34	29
All	**All Facility Types**	**22.73**	**73.98**	**3.28**	**1,157**

Estimated vs. Observed Free-Flow Speed by Facility Type in Marion County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	100.00	0.00	33
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	5.63	75.00	19.37	284
23	Divided Arterial Class I	12.50	75.60	11.90	336
24	Divided Arterial Class II	15.12	72.67	12.21	172
31	Undivided Arterial Unsignalized with Turn Bays	0.00	71.43	28.57	28
32	Undivided Arterial Class I with Turn Bays	16.71	77.23	6.05	347
33	Undivided Arterial Class II with Turn Bays	43.62	54.36	2.01	149
35	Undivided Arterial Unsignalized without Turn Bays	0.00	100.00	0.00	12
36	Undivided Arterial Class I without Turn Bays	0.00	100.00	0.00	8
41	Major Local Divided Roadway	0.00	66.67	33.33	24
42	Major Local Undivided Roadway with Turn Bays	12.75	71.08	16.18	204
43	Major Local Undivided Roadway without Turn Bays	32.47	66.23	1.30	154
45	Other Local Undivided Roadway with Turn Bays	7.69	84.62	7.69	52
46	Other Local Undivided Roadway without Turn Bays	11.36	88.64	0.00	44
47	Low Speed Collector	0.00	50.00	50.00	4
52	External Station Connector	16.67	83.33	0.00	6
All	**All Facility Types**	**15.78**	**73.61**	**10.61**	**1,857**

Estimated vs. Observed Free-Flow Speed by Facility Type in Orange County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	60.00	39.05	0.95	105
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	9.62	86.54	3.85	52
22	Divided Arterial Unsignalized (Speed = 45 & 50 mph)	0.00	54.55	45.45	22
23	Divided Arterial Class I	3.51	58.05	38.44	1,168
24	Divided Arterial Class II	5.54	70.62	23.84	885
32	Undivided Arterial Class I with Turn Bays	1.52	49.24	49.24	132
33	Undivided Arterial Class II with Turn Bays	4.53	58.84	36.64	464
34	Undivided Arterial Class III/IV with Turn Bays	0.00	76.67	23.33	120
38	Undivided Arterial Class III/IV without Turn Bays	100.00	0.00	0.00	1
41	Major Local Divided Roadway	16.94	62.90	20.16	124
42	Major Local Undivided Roadway with Turn Bays	12.89	49.86	37.25	357
43	Major Local Undivided Roadway without Turn Bays	0.00	83.33	16.67	12
44	Other Local Divided Roadway	0.00	100.00	0.00	2
45	Other Local Undivided Roadway with Turn Bays	100.00	0.00	0.00	26
46	Other Local Undivided Roadway without Turn Bays	50.00	0.00	50.00	2
47	Low Speed Collector	1.27	48.95	49.79	237
62	One-Way Facilities Class I	20.00	60.00	20.00	25
64	One-Way Facilities Class III/IV	0.00	27.59	72.41	58
71	Freeway On/Off Ramp-Service Interchange	64.58	18.75	16.67	48
72	Freeway On/Off Loop Ramp-Service Interchange	66.67	33.33	0.00	6
73	Other On/Off Ramp-Urban Interchange	62.50	25.00	12.50	8
75	Freeway-to-Freeway Ramp-System Interchange	25.45	65.45	9.09	55
76	Freeway-Collector/Distributor Ramp	33.33	33.33	33.33	3
91	Toll Facility - Freeway	0.61	90.88	8.51	329
92	Toll Facility - Arterial	0.00	0.00	100.00	4
97	Toll On Ramp	66.67	26.67	6.67	15
98	Toll Off Ramp	71.43	28.57	0.00	14
All	**All Facility Types**	**8.45**	**60.90**	**30.65**	**4,274**

Estimated vs. Observed Free-Flow Speed by Facility Type in Osceola County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	3.45	93.10	3.45	29
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	16.00	84.00	0.00	50
22	Divided Arterial Unsignalized (Speed = 45 & 50 mph)	65.00	35.00	0.00	20
23	Divided Arterial Class I	10.69	58.28	31.03	290
24	Divided Arterial Class II	9.36	68.54	22.10	267
31	Undivided Arterial Unsignalized with Turn Bays	16.67	79.17	4.17	48
32	Undivided Arterial Class I with Turn Bays	9.26	53.70	37.04	54
33	Undivided Arterial Class II with Turn Bays	0.00	81.82	18.18	22
71	Freeway On/Off Ramp-Service Interchange	50.00	16.67	33.33	6
72	Freeway On/Off Loop Ramp-Service Interchange	40.00	0.00	60.00	5
75	Freeway-to-Freeway Ramp-System Interchange	75.00	25.00	0.00	4
91	Toll Facility - Freeway	0.00	94.59	5.41	37
92	Toll Facility - Arterial	0.00	40.00	60.00	10
All	**All Facility Types**	**11.76**	**65.80**	**22.45**	**842**

Estimated vs. Observed Free-Flow Speed by Facility Type in Polk County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	100.00	0.00	52
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	13.90	66.00	20.10	403
22	Divided Arterial Unsignalized (Speed 45 & 50 mph)	20.00	65.00	15.00	20
23	Divided Arterial Class I	16.99	60.60	22.41	665
24	Divided Arterial Class II	7.69	73.85	18.46	130
31	Undivided Arterial Unsignalized with Turn Bays	36.36	48.05	15.58	77
32	Undivided Arterial Class I with Turn Bays	21.71	55.47	22.82	631
33	Undivided Arterial Class II with Turn Bays	42.50	47.50	10.00	80
41	Major Local Divided Roadway	58.62	37.93	3.45	58
42	Major Local Undivided Roadway with Turn Bays	31.01	47.19	21.81	587
43	Major Local Undivided Roadway without Turn Bays	0.00	54.17	45.83	24
44	Other Local Divided Roadway	0.00	0.00	100.00	1
46	Other Local Undivided Roadway without Turn Bays	100.00	0.00	0.00	2
47	Low Speed Collector	52.66	29.71	17.62	488
62	One-Way Facilities Class I	75.00	25.00	0.00	16
71	Freeway On/Off Ramp-Service Interchange	50.00	30.00	20.00	10
72	Freeway On/Off Loop Ramp-Service Interchange	50.00	0.00	50.00	2
75	Freeway-to-Freeway Ramp-System Interchange	75.00	25.00	0.00	4
91	Toll Facility - Freeway	0.00	94.03	5.97	67
97	Toll On Ramp	100.00	0.00	0.00	2
98	Toll Off Ramp	50.00	50.00	0.00	2
All	**All Facility Types**	**26.53**	**53.72**	**19.75**	**3,321**

Estimated vs. Observed Free-Flow Speed by Facility Type in Seminole County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	5.88	94.12	0.00	34
23	Divided Arterial Class I	2.29	74.43	23.28	481
24	Divided Arterial Class II	0.68	89.08	10.24	293
31	Undivided Arterial Unsignalized with Turn Bays	13.33	86.67	0.00	30
32	Undivided Arterial Class I with Turn Bays	8.45	85.21	6.34	142
33	Undivided Arterial Class II with Turn Bays	37.10	41.94	20.97	62
41	Major Local Divided Roadway	0.00	73.53	26.47	34
42	Major Local Undivided Roadway with Turn Bays	15.07	83.56	1.37	73
46	Other Local Undivided Roadway without Turn Bays	0.00	50.00	50.00	18
47	Low Speed Collector	53.49	46.51	0.00	43
73	Other On/Off Ramp-Urban Interchange	0.00	0.00	100.00	1
75	Freeway-to-Freeway Ramp-System Interchange	0.00	60.00	40.00	5
91	Toll Facility - Freeway	11.11	88.89	0.00	36
All	**All Facility Types**	**7.35**	**77.80**	**14.86**	**1,252**

Estimated vs. Observed Free-Flow Speed by Facility Type in Sumter County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	100.00	0.00	20
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	35.71	50.00	14.29	14
23	Divided Arterial Class I	33.33	63.10	3.57	84
24	Divided Arterial Class II	0.00	100.00	0.00	8
31	Undivided Arterial Unsignalized with Turn Bays	40.00	60.00	0.00	10
32	Undivided Arterial Class I with Turn Bays	37.80	60.37	1.83	164
33	Undivided Arterial Class II with Turn Bays	22.73	77.27	0.00	22
42	Major Local Undivided Roadway with Turn Bays	50.00	50.00	0.00	12
43	Major Local Undivided Roadway without Turn Bays	39.39	60.61	0.00	66
52	External Station Connector	66.67	33.33	0.00	6
91	Toll Facility - Freeway	0.00	100.00	0.00	12
All	**All Facility Types**	**33.49**	**64.59**	**1.91**	**418**

Estimated vs. Observed Free-Flow Speed by Facility Type in Volusia County

Facility Type Code	Facility Type	% of Links with Est. FF Speed / Obs. FF Speed			Total # Links
		< 0.9	0.9–1.1	> 1.1	
11	Freeway Non-Toll	0.00	97.85	2.15	93
21	Divided Arterial Unsignalized (Speed ≥ 55 mph)	12.73	85.45	1.82	110
22	Divided Arterial Unsignalized (Speed = 45 & 50 mph)	26.47	55.88	17.65	34
23	Divided Arterial Class I	16.22	66.63	17.15	968
24	Divided Arterial Class II	19.66	58.51	21.82	417
31	Undivided Arterial Unsignalized with Turn Bays	22.16	74.43	3.41	176
32	Undivided Arterial Class I with Turn Bays	12.65	68.24	19.12	340
33	Undivided Arterial Class II with Turn Bays	16.87	62.55	20.58	243
34	Undivided Arterial Class III/IV with Turn Bays	14.20	76.70	9.09	176
35	Undivided Arterial Unsignalized without Turn Bays	0.00	100.00	0.00	4
42	Major Local Undivided Roadway with Turn Bays	5.66	83.02	11.32	106
43	Major Local Undivided Roadway without Turn Bays	0.00	50.00	50.00	16
44	Other Local Divided Roadway	0.00	0.00	100.00	12
45	Other Local Undivided Roadway with Turn Bays	14.29	85.71	0.00	28
47	Low Speed Collector	42.86	51.19	5.95	84
52	External Station Connector	0.00	100.00	0.00	2
68	Frontage Road Class III/IV	100.00	0.00	0.00	2
71	Freeway On/Off Ramp-Service Interchange	80.00	20.00	0.00	5
72	Freeway On/Off Loop Ramp-Service Interchange	33.33	0.00	66.67	3
73	Other On/Off Ramp-Urban Interchange	100.00	0.00	0.00	1
74	Other On/Off Loop Ramp-Urban Interchange	50.00	50.00	0.00	2
75	Freeway-to-Freeway Ramp-System Interchange	0.00	100.00	0.00	2
76	Freeway-Collector/Distributor Ramp	100.00	0.00	0.00	1
All	**All Facility Types**	**16.50**	**67.82**	**15.68**	**2,825**