TREASURE COAST REGIONAL PLANNING MODEL
2000 MODEL UPDATE

TECHNICAL REPORT 1

DATA COMPILATION AND REVIEW

Contract Number: C-8770
FM Number: 233054-1-12-01

Submitted To:
Florida Department of Transportation - District IV
Indian River County Department of Planning and Environmental Protection
St. Lucie County Department of Planning and Environmental Protection
Martin County Department of Planning and Environmental Protection

Submitted by:
The Corradino Group

December 2006

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1. INTRODUCTION

The Treasure Coast Regional Model Study Area 2000 Model Update project consists of updating the year 1996 model to 2000. It consists of five main tasks.

Task 1: Data Compilation and Development
Task 2: Data Review and Update
Task 3: Model Calibration
Task 4: Model Validation
Task 5: Develop Model Application Guidelines

This report is the first of three technical reports and presents the review and development of socioeconomic data, highway network data and transit network data. This report contains ten chapters and ten appendices.

- Chapter 1, **INTRODUCTION**, contains an overview of this technical report and presents the traffic analysis zones.

- Chapter 2, **PRODUCTION DATA**, describes various production data and rates. Detailed descriptions are provided for the new items in 2000 model update.

- Chapter 3, **ATTRACTION DATA AND SPECIAL GENERATORS**, provides a description of the attraction and special generators used in 2000 model validation. All production and attraction data referenced in **Chapters 2** and **3** are presented in **Appendix A**.

- Chapter 4, **EXTERNAL TRIP DATA**, discusses the update of the highway and transit (Tri-Rail) external trip data files.

- Chapter 5, **HIGHWAY NETWORK REVIEW AND UPDATE**, discusses the review and update of highway network related files. It also discusses highway model data and parameters.

- Chapter 6, **TEMPORAL DISTRIBUTION OF TRIPS**, presents trip weighting, friction factor data sets and time-of-day factors.

- Chapter 7, **TRANSIT NETWORK AND DATA**, discusses the update of transit network, data and selected parameters used in model validation.

- Chapter 8, **SUMMARY AND CONCLUSION**, summarizes the data development and update.

- Chapter 9, **LIST OF REFERENCES**, provides a list of references on Southeast Florida, other Florida and other national resources referenced in technical reports of Treasure Coast Regional Model.

- The production and attraction data are presented in **Appendix A**.

- External station data files are presented in **Appendix B**.

- Selected highway related network data and parameters are listed in **Appendix C**.

- Results on temporal distribution of trips to develop the time-of-day model factors are presented in **Appendix E**. These results were based on an analysis of the 1999 Southeast Florida Transit On-Board and Household Travel Surveys [Reference 15].

- Selected transit related network data and parameters are listed in **Appendix G**.

- Source codes for automated turning penalty generator (MKTURN) program are presented in **Appendix I**.

The 2000 Traffic Analysis Zones (TAZs) for the Treasure Coast Area Study area were updated greatly from those used in the 1996 model update. The model has 555 internal zones, not in successive order. TAZs 701 through 731 are external stations. The TAZ structure and external stations are shown in **Figures 1-1** through **1-4**.

Table 1-1

Traffic Analysis Zone Numbering

2000 Treasure Coast Regional Planning Model

Location	Regional Numbers	MPO Numbers
Indian River County	1-154	1-154
St. Lucies County	201-495	1-295
Martin County	551-656	1-106
Externals - IR	701-706	N.A.
Externals - SL	711-713	N.A.
Externals - MA	721-731	N.A.

Figure 1-1
Traffic Analysis Zones and External Station
2000 Treasure Coast Regional Planning Model Update

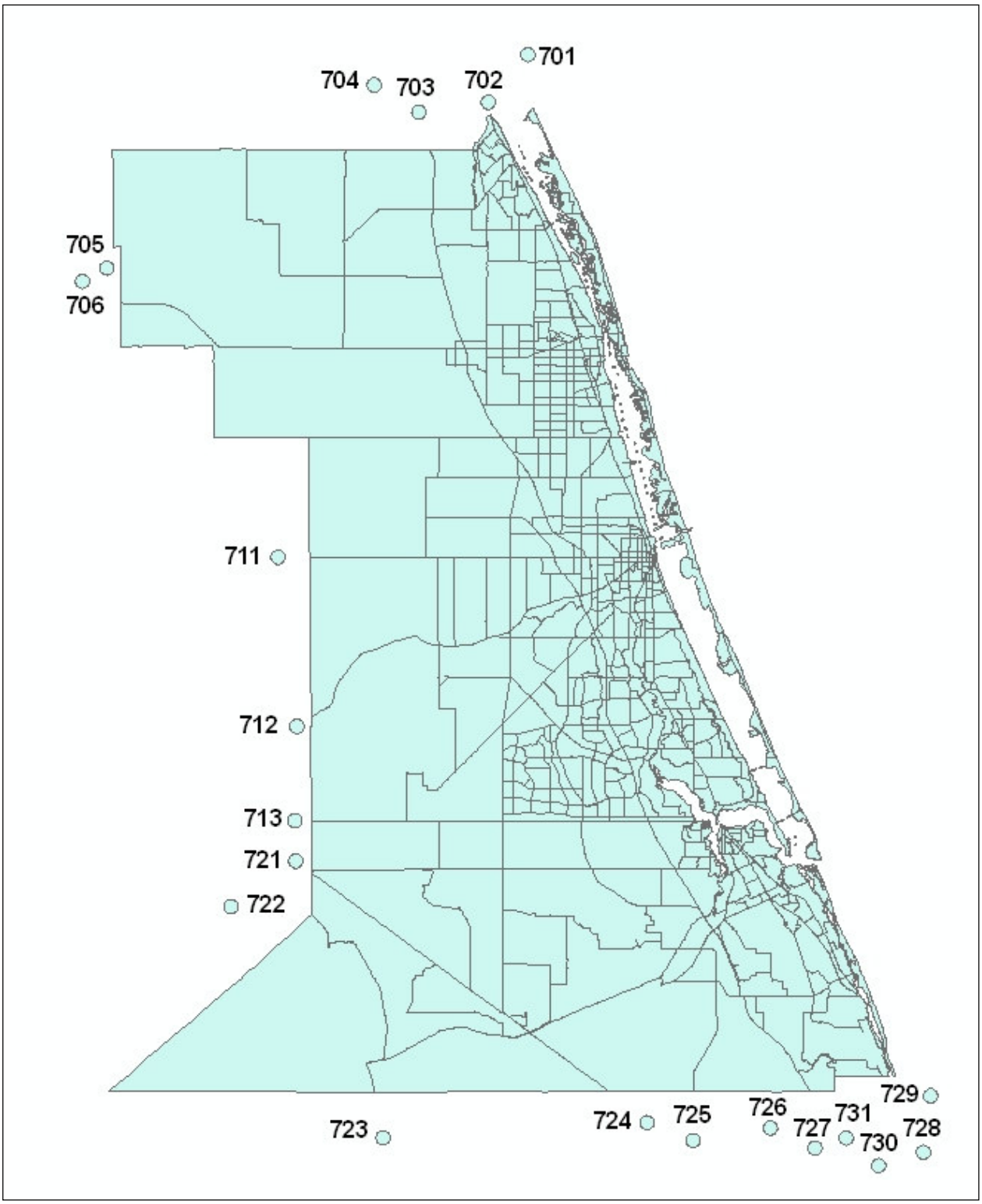


Figure 1-2
Indian River County Traffic Analysis Zones
2000 Treasure Coast Regional Planning Model Update

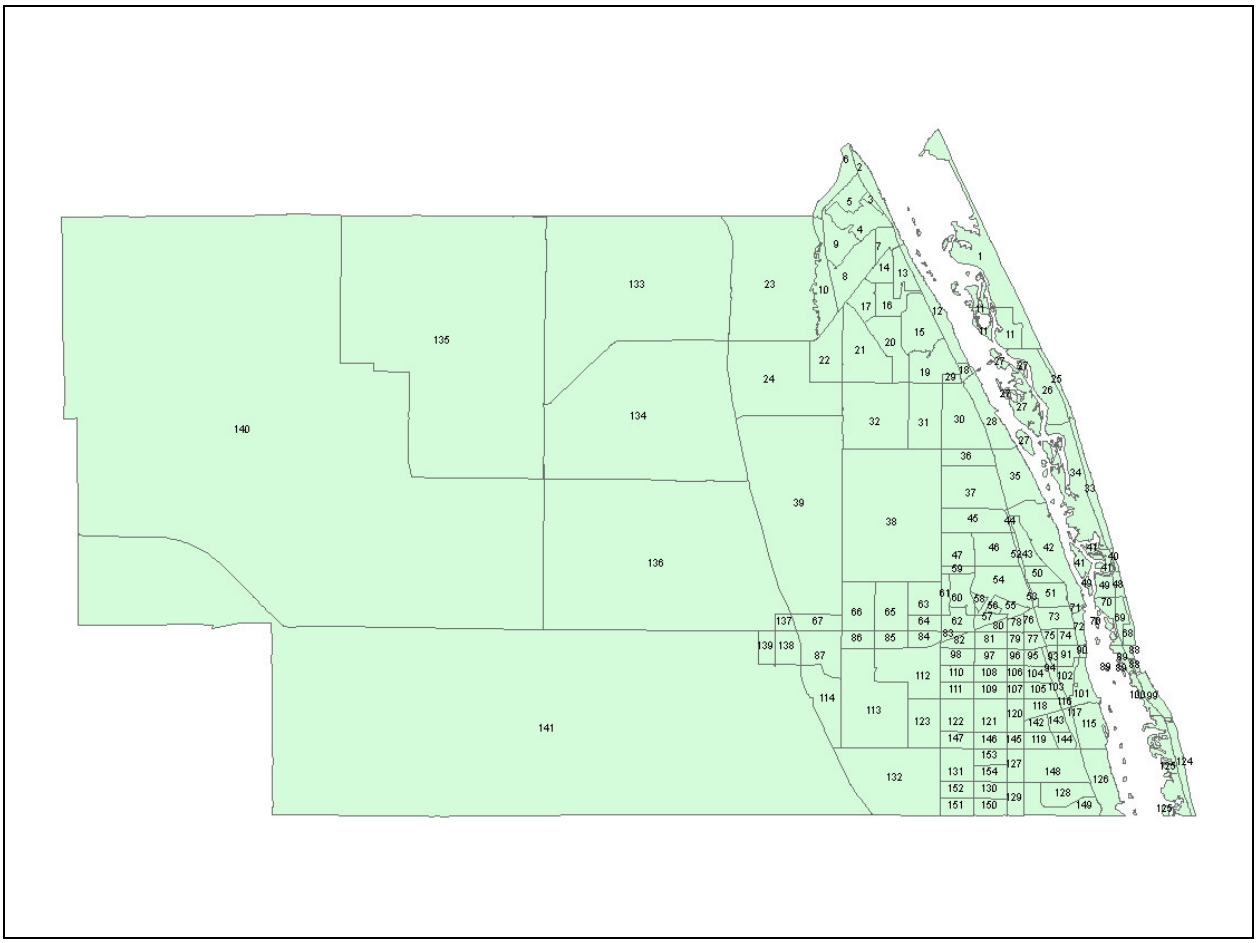


Figure 1-3

St. Lucie County Traffic Analysis Zones

2000 Treasure Coast Regional Planning Model Update

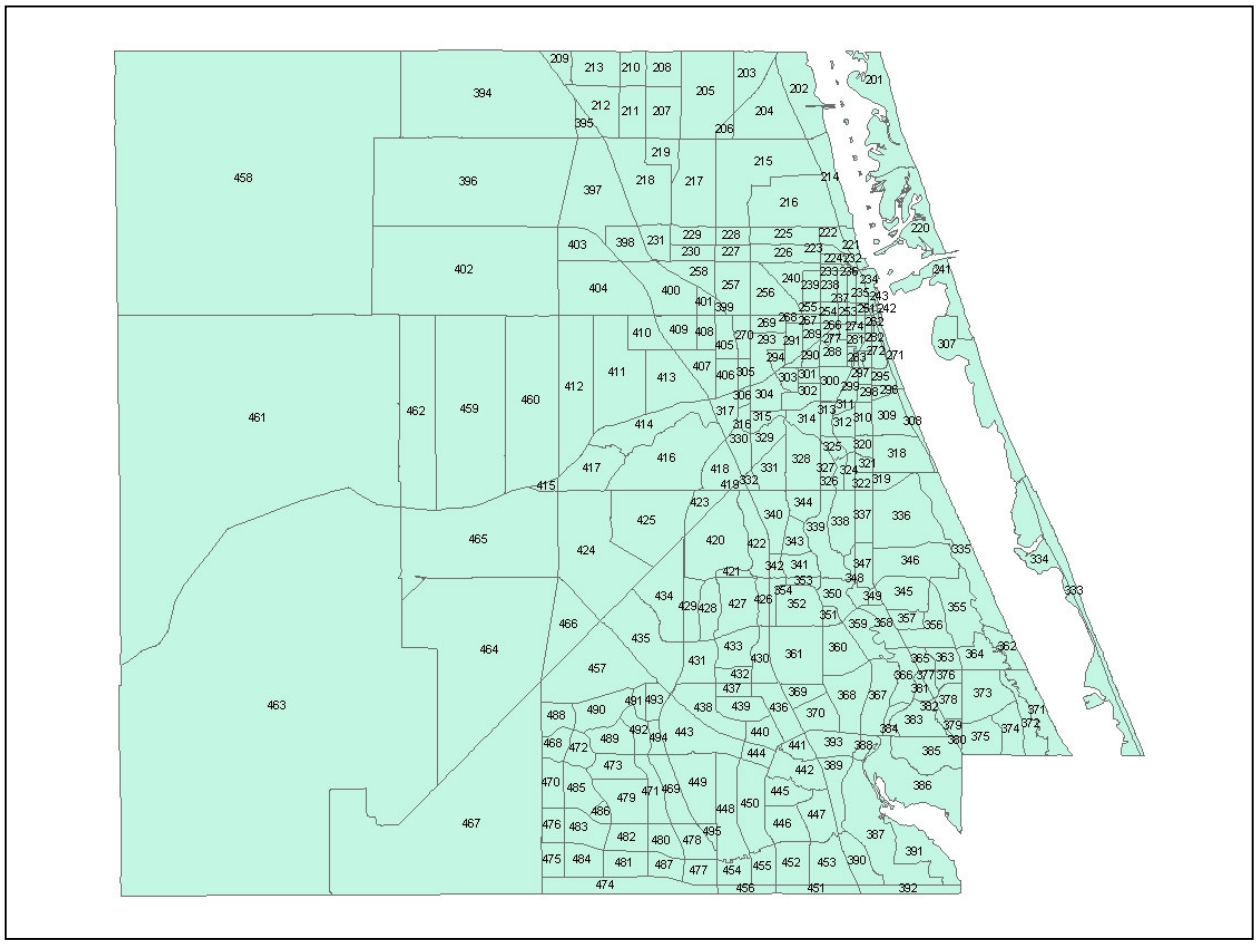
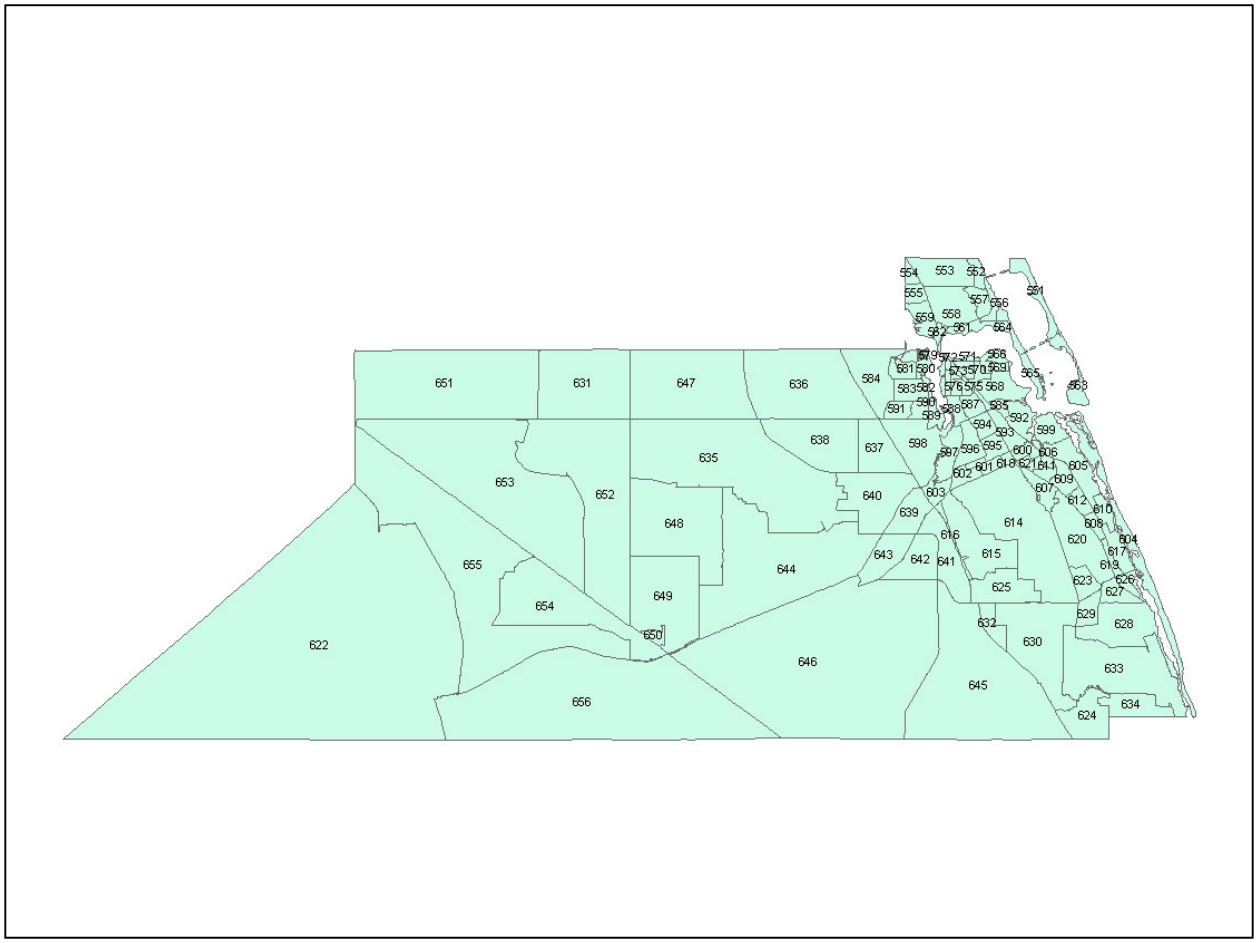


Figure 1-4

Martin County Traffic Analysis Zones

2000 Treasure Coast Regional Planning Model Update



2. PRODUCTION DATA

This chapter describes the various production data and their rates. Descriptions of visitor and airport trip rates that were included in the 1996 model update and used in 2000 model are also provided here.

2.1 PRODUCTION DATA

The production data is required by the trip generation model and are used to calculate the number of trips produced by each TAZ. The standard FSUTMS ZDATA1 file is no longer required in lifestyle trip generation model. The production data set for the modified lifestyle trip generation routine (LSTGENM2) is called ZDATA1B. **Table D-21** of **Technical report 3** (Model Application Guidelines) presents the format of the ZDATA1B file. Fields 13-22 contains ZDATA1 variables. Fields 23-25 are for hotel-motel data by type: business, leisure/resort and mixed.

The planning staff of Indian River, St. Lucie and Martin counties developed the 2000 socioeconomic data, which were based primarily on 2000 Census data. The year 2000 ZDATA1B file is presented in **Appendix A**. **Table 2-1** summarizes the 2000 production and attraction data. Summaries of population, households, vehicles and household workers are presented for both "with" and "without" children categories. The 2000 model uses only the "all" hotel/motel occupied units because data on the number of hotels/motels by type were not available. School enrollment by categories is summarized.

The ZDATA1B file allows the user to specify a reference TAZ to use as a seed matrix for the disaggregation of the TAZ by persons, autos, workers and the presence of children. This is particularly important if a TAZ has changed greatly in character since the 2000 Census. In such cases, it may be appropriate to specify another TAZ as the reference zone if the zone has changed greatly in character. Specification of a reference zone can have large effects on the number of trip productions generated by a TAZ.

2.2 PRODUCTION AND ATTRACTION RATES

The 2000 TCRPM uses a cross-classification model for the production model for most trip purposes. Both production and attraction rates are entered in the xGRATESB.SYN (x=IR, SL or MA) files for individual counties respectively. **Appendix A** presents the content of the files that are employed in the 2000 validation run. Summaries of the validated production and attraction rates of the 2000 model are shown in **Tables 2-2** and **2-3**, respectively. References 13 and 14 contain the calibrated attraction and production rates. The modified life-style trip generation program allows the user to use hotel/motel rates by type or a flat rate for all hotel motel types. The MPO staff developed the hotels/motels data in the ZDATA1B file. Separate hotel/motel rates for the following types of hotels could be used in model: (a) Primarily Business Type Hotel/Mote, (b) Primarily Leisure/Recreation Type Hotel/Motel, and (3) Mixture of Business and Leisure/Recreation Type Hotel/Motel.

The trip rates for the different hotel/motel units were developed from the 2000 Treasure Coast Travel Characteristics study. These rates were developed for the following trip purposes:

Table 2-1

Production and Attraction Data Summary

2000 Treasure Coast Regional Planning Model

Data Item		Year 2000
Population	Without Children	240,231
	With Children	193,769
	ALL	**434,000**
Households (HH)	Without Children	133,187
	With Children	48,262
	ALL	**181,449**
Population/HH (HH Size)	Without Children	1.80
	With Children	4.01
	ALL	**2.39**
Number of Vehicles	Without Children	193,723
	With Children	92,041
	ALL	**285,764**
Vehicles/HH	Without Children	1.455
	With Children	1.907
	ALL	**1.575**
Vehicles/Capita	Without Children	0.806
	With Children	0.475
	ALL	**0.658**
Number of HH Workers	Without Children	95,267
	With Children	76,820
	ALL	**172,087**
Workers/HH	Without Children	0.715
	With Children	1.592
	ALL	**0.948**
Occupied Hotel/Motel Rooms	**ALL H/M Types**	**7,281**

Data Item		Year 2000
Employment	Industrial	30,458
	Commercial	47,023
	Service	81,629
	Total	**159,110**
Total Employment per Population		0.367
Service to Total Employment Ratio		0.513
School Enrollment	Public-Elementary	12,740
	Public-Middle	7,169
	Public-High	8,507
	Private Schools	79,460
	Countywide, Private and Colleges	**107,876**
	ALL Schools	**107,876**

Table 2-2-1

Indian River County Validated Trip Production Matrices

2000 Treasure Coast Regional Planning Model

(1) Home-Based Work (HBWork)

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		1.366	2.752
	1 vehicle		1.411	2.797
	2 vehicles		1.383	2.770
	3+ vehicles		1.935	3.322
With Children	0 vehicle		0.994	2.381
	1 vehicle		1.039	2.426
	2 vehicles		1.013	2.399
	3+ vehicles		1.564	2.950
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.315	1.159	2.285	2.707
	1 vehicle	0.711	1.555	2.681	3.103
	2 vehicles	0.241	1.085	2.210	2.633
	3+ vehicles	0.625	1.469	2.595	3.018
With Children	0 vehicle		0.260	0.981	1.404
	1 vehicle		0.338	1.377	1.800
	2 vehicles		0.564	0.906	1.330
	3+ vehicles		0.166	1.292	1.714
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	1.072	1.512	1.824	1.943
	1 vehicle	0.599	1.040	1.351	1.470
	2 vehicles	0.595	1.036	1.347	1.466
	3+ vehicles	0.304	0.745	1.055	1.175
With Children	0 vehicle		1.368	1.678	1.798
	1 vehicle		0.895	1.205	1.325
	2 vehicles		0.891	1.202	1.321
	3+ vehicles		0.599	0.911	1.030
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.035	0.047	0.067	0.223
	1 vehicle	0.054	0.066	0.322	0.408
	2 vehicles	0.071	0.028	0.003	0.472
	3+ vehicles	0.096	0.054	0.028	0.498
With Children	0 vehicle		0.561	0.535	1.006
	1 vehicle		0.746	0.720	1.190
	2 vehicles		0.810	0.785	1.255
	3+ vehicles		0.836	0.810	1.280

(5) Home-Based Other (HBOther)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.315	1.185	3.549	5.096
	1 vehicle	1.323	2.193	4.556	6.103
	2 vehicles	1.483	2.354	4.717	6.263
	3+ vehicles	0.035	0.905	3.268	4.816
With Children	0 vehicle		0.619	2.981	4.529
	1 vehicle		1.625	3.989	5.536
	2 vehicles		1.786	4.149	5.697
	3+ vehicles		0.338	2.701	4.248
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBWork) Origin/Destination Controls

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		1.011	2.317
	1 vehicle		0.969	2.275
	2 vehicles		1.358	2.663
	3+ vehicles		1.103	2.409
With Children	0 vehicle		0.858	2.163
	1 vehicle		0.815	2.122
	2 vehicles		1.205	2.510
	3+ vehicles		0.950	2.255
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBOther) Origin/Destination Controls

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	1.086	2.153	2.862	4.415
	1 vehicle	1.636	2.703	3.412	4.965
	2 vehicles	0.677	1.745	2.454	4.007
	3+ vehicles	0.636	1.703	2.412	3.965
With Children	0 vehicle		2.057	2.765	4.318
	1 vehicle		2.606	3.315	4.868
	2 vehicles		1.648	2.357	3.910
	3+ vehicles		1.606	2.315	3.868
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 3.25

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.
Truck Attraction Rates are shown in Table 4-3.

Table 2-2-2

St. Lucie County Validated Trip Production Matrices

2000 Treasure Coast Regional Planning Model

(1) Home-Based Work (HBWork)

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		1.489	3.146
	1 vehicle		1.398	3.056
	2 vehicles		1.645	3.303
	3+ vehicles		2.222	3.879
With Children	0 vehicle		1.074	2.731
	1 vehicle		0.984	2.640
	2 vehicles		1.231	2.887
	3+ vehicles		1.808	3.464
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.906	1.591	1.647	2.128
	1 vehicle	0.757	1.442	1.498	1.980
	2 vehicles	0.476	1.161	1.217	1.699
	3+ vehicles	0.260	0.946	1.002	1.483
With Children	0 vehicle		1.300	1.354	1.836
	1 vehicle		1.151	1.206	1.687
	2 vehicles		0.870	0.925	1.406
	3+ vehicles		0.655	0.710	1.192
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.589	0.878	1.172	1.321
	1 vehicle	0.299	0.588	0.882	1.031
	2 vehicles	0.307	0.597	0.891	1.040
	3+ vehicles	0.150	0.440	0.734	0.882
With Children	0 vehicle		0.942	1.236	1.385
	1 vehicle		0.652	0.946	1.095
	2 vehicles	0.661	0.955	1.103	
	3+ vehicles		0.503	0.797	0.946
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.075	0.063	0.191	0.859
	1 vehicle	0.015	0.004	0.132	0.800
	2 vehicles	0.046	0.035	0.162	0.831
	3+ vehicles	0.046	0.035	0.048	0.716
With Children	0 vehicle		0.630	0.757	1.426
	1 vehicle		0.571	0.698	1.366
	2 vehicles		0.601	0.729	1.397
	3+ vehicles		0.487	0.614	1.283

(5) Home-Based Other (HBOther)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	1.214	2.250	1.561	3.429
	1 vehicle	1.364	2.399	1.711	3.579
	2 vehicles	0.852	1.888	1.198	3.067
	3+ vehicles	0.851	1.887	1.197	3.066
With Children	0 vehicle		4.002	3.313	5.181
	1 vehicle		4.152	3.463	5.331
	2 vehicles		3.640	2.950	4.819
	3+ vehicles		3.639	2.949	4.818
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBWork) Origin/Destination Controls

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		1.548	3.276
	1 vehicle		1.497	3.225
	2 vehicles		1.903	3.631
	3+ vehicles		1.588	3.317
With Children	0 vehicle		1.459	3.187
	1 vehicle		1.408	3.136
	2 vehicles		1.814	3.542
	3+ vehicles		1.499	3.228
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBOther) Origin/Destination Controls

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.595	1.977	2.035	2.802
	1 vehicle	1.402	2.784	2.842	3.608
	2 vehicles	0.321	1.703	1.762	2.528
	3+ vehicles	0.076	1.458	1.516	2.283
With Children	0 vehicle		2.584	2.643	3.408
	1 vehicle		3.390	3.449	4.215
	2 vehicles		2.310	2.369	3.135
	3+ vehicles		2.064	2.123	2.889
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 3.25

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.
Truck Attraction Rates are shown in Table 4-3.

Table 2-2-3

Martin County Validated Trip Production Matrices

2000 Treasure Coast Regional Planning Model

(1) Home-Based Work (HBWork)

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		1.059	1.813
	1 vehicle		0.956	1.710
	2 vehicles		1.024	1.777
	3+ vehicles		1.482	2.235
With Children	0 vehicle		0.802	1.556
	1 vehicle		0.700	1.454
	2 vehicles		0.768	1.521
	3+ vehicles		1.225	1.978
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.157	0.925	1.483	1.783
	1 vehicle	0.649	1.573	2.357	2.479
	2 vehicles	0.152	1.076	1.859	1.982
	3+ vehicles	0.470	1.394	2.178	2.301
With Children	0 vehicle		0.960	1.742	1.866
	1 vehicle		0.719	1.503	1.626
	2 vehicles		0.222	1.005	1.129
	3+ vehicles		0.541	1.323	1.447
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.106	0.502	0.699	1.538
	1 vehicle	0.434	0.830	1.028	1.866
	2 vehicles	0.150	0.546	0.744	1.582
	3+ vehicles	0.030	0.367	0.564	1.402
With Children	0 vehicle		0.624	0.821	1.660
	1 vehicle		0.952	1.150	1.989
	2 vehicles		0.668	0.866	1.704
	3+ vehicles		0.488	0.686	1.525
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.000	0.023	0.047	0.592
	1 vehicle	0.008	0.031	0.055	0.600
	2 vehicles	0.034	0.057	0.080	0.626
	3+ vehicles	0.248	0.239	0.288	0.888
With Children	0 vehicle		0.755	0.779	1.325
	1 vehicle		0.763	0.787	1.332
	2 vehicles		0.789	0.813	1.359
	3+ vehicles		0.515	0.539	1.085

(5) Home-Based Other (HBOther)

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.960	1.789	2.882	5.270
	1 vehicle	1.414	2.243	3.336	5.723
	2 vehicles	1.109	1.939	3.032	5.420
	3+ vehicles	1.178	2.006	3.100	5.487
With Children	0 vehicle		1.853	2.946	5.333
	1 vehicle		2.306	3.400	5.787
	2 vehicles		2.003	3.096	5.483
	3+ vehicles		2.070	3.163	5.551
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBWork) Origin/Destination Controls

CHILDREN	VEHICLE	WORKER		
		0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.723	1.551
	1 vehicle		1.041	1.871
	2 vehicles		1.176	2.004
	3+ vehicles		1.280	2.108
With Children	0 vehicle		0.805	1.634
	1 vehicle		1.124	1.953
	2 vehicles		1.258	2.087
	3+ vehicles		1.362	2.191
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBOther) Origin/Destination Controls

CHILDREN	VEHICLE	PERSON			
		1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	2.257	3.291	4.628	5.603
	1 vehicle	2.321	3.356	4.691	5.666
	2 vehicles	1.233	3.356	4.691	5.666
	3+ vehicles	2.509	3.543	4.878	5.854
With Children	0 vehicle		3.358	4.694	5.669
	1 vehicle		3.422	4.758	5.734
	2 vehicles		2.335	3.670	4.646
	3+ vehicles		3.609	4.946	5.921
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 3.25

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.
Truck Attraction Rates are shown in Table 4-3.

Table 2-3

Validated Trip Attraction Rates

2000 Treasure Coast Regional Planning Model

		Socio-Economic Data Categories						
	Area	Employment				School	Occupied	Occupied
Purpose	Type	Industial	Commercial	Service	Total	Enrollment	Dwelling Units	H/M Units
1. HBWork	CBD	1.950	1.950	1.950				
	Fringe	1.365	1.338	1.345				
	Residential	1.844	1.806	1.816				
	OBD	1.911	1.890	1.900				
	Rural	1.911	1.838	1.908				
2. HBShop	CBD		1.749	0.059				
	Fringe		2.282	0.085				
	Residential		2.780	0.328				
	OBD		1.702	0.273				
	Rural		2.392	0.294				
3. HBSocRec	CBD		1.544	0.462			0.936	0.936
	Fringe		1.762	0.854			0.556	0.556
	Residential		0.604	0.851			0.351	0.351
	OBD		0.352	0.505			0.352	0.352
	Rural		0.532	0.715			0.352	0.352
4. HBSchool	ALL					1.850		
5. HBOther	CBD		4.181	1.120			1.705	1.705
	Fringe		1.260	3.177			0.289	0.289
	Residential		1.883	2.738			0.417	0.417
	OBD		1.230	1.438			0.535	0.535
	Rural		1.618	2.207			0.423	0.423
6a. NHBWork Origin/Production Allocation	CBD	0.999	1.922	1.709				
	Fringe	0.408	0.785	0.698				
	Residential	0.529	1.019	0.905				
	OBD	0.554	1.066	0.948				
	Rural	0.499	0.961	0.854				
6b. NHBWork Destination/Attraction Allocation	CBD	0.278	2.323	1.068			0.652	0.652
	Fringe	0.123	2.558	1.048			0.040	0.040
	Residential	0.183	1.177	0.777			0.126	0.126
	OBD	0.150	1.024	0.555			0.205	0.205
	Rural	0.160	1.133	0.709			0.135	0.135
7a. NHBOther Origin/Production Allocation	CBD	0.181	2.928	1.303			0.533	0.533
	Fringe	0.142	3.010	1.216			0.442	0.442
	Residential	0.213	2.170	1.541			0.279	0.279
	OBD	0.161	1.500	1.019			0.299	0.299
	Rural	0.192	1.995	1.389			0.294	0.294
7b. NHBOther Destination/Attraction Allocation	CBD	0.312	3.144	1.109			0.829	0.829
	Fringe	0.103	3.522	1.368			0.544	0.544
	Residential	0.166	2.680	1.201			0.290	0.290
	OBD	0.077	1.942	0.793			0.343	0.343
	Rural	0.138	2.488	1.096			0.311	0.311
8. Airport	CBD				0.075		0.050	0.825
	Fringe				0.056		0.035	0.673
	Residential				0.046		0.030	0.551
	OBD				0.056		0.035	0.673
	Rural				0.039		0.024	0.469
9. Truck - 4-tired Commercial Vehicle	ALL	0.104	0.081	0.044			0.017	
10. Truck - Single-Unit	CBD	0.092	0.077	0.028			0.023	
	Fringe	0.084	0.071	0.026			0.021	
	Residential	0.098	0.082	0.030			0.024	
	OBD	0.064	0.054	0.020			0.016	
	Rural	0.144	0.121	0.045			0.036	
11. Truck - Combinations	CBD	0.032	0.015	0.005			0.005	
	Fringe	0.027	0.012	0.004			0.004	
	Residential	0.051	0.023	0.008			0.007	
	OBD	0.020	0.009	0.003			0.003	
	Rural	0.137	0.062	0.021			0.020	

1. Home/Hotel Based Work (HBW)
2. Home/Hotel Based Shopping (HBSHOP)
3. Home/Hotel Based Social-Recreation (HBSCR)
4. Home/Hotel Based Other (HBO)
5. Non-Home/Non-Hotel Based Work (NHBW)
6. Non-Home/Non-Hotel Based Other (NHBO)

The xGRATESB.SYN (x=IR, SL or MA) files also contain data for the household stratification curves. **Table 2-4** presents these curves. These curves were calibrated for the 1996 model update study using the 1990 Census data.

2.3 SCHOOL DATA

The SCHOOL file contains data on school enrollment and zoning in the Treasure Coast Model. The lifestyle model trip generation program treats public and private school trips differently. The trip table for public school trips is developed directly by specifying origins and destinations derived from school assignment zones. Private school trips, which are not constrained by school assignment zones, are distributed by the gravity model.

The SCHOOL file includes TAZ data on enrollment and corresponding school zones (for public schools) used to estimate the home-based school productions and attractions. The format of the SCHOOL file is depicted in Table D4 of Technical Report 3.

Data on school enrollment for both public and private elementary and secondary schools was acquired from the Florida Department of Education, while enrollment data for Indian River Community college was acquired by contacting the school. In addition, MPO staff provided the names of vocational schools; enrollment data was acquired by contacting each school. The address of each school was geocoded and the corresponding enrollment was allocated to TAZs.

Information on school zone boundaries for public elementary and secondary schools in Indian River and Martin Counties was acquired by contacting the school boards of the respective counties. School zones for individual elementary, middle and high schools were allocated to TAZs using GIS.

2.4 AIRPORT TRIPS

2000 model updates include a separate airport trip purpose. Airport trip productions occur at the airport, whereas all other locations attract the trips. Currently, there are no airport trips in the Treasure Coast region. This file is a placeholder for future alternatives that may include a new airport.

Table 2-4

Households Stratification Models

2000 Treasure Coast Regional Planning Model

A. Zonal Household Vehicles of "Without-Children-Households"

X = Average Number of "without-children-household" vehicles - 1.48163

Fraction of households with zero vehicle (C0PH0V):

C0PH0V = 0.072776 -0.174903 * X +0.202600 *X^2 -0.078867 *X^3

Fraction of households with one vehicle (C0PH1V):

C0PH1V = 0.482594 -0.425940 * X -0.242545 *X^2 +0.201796 *X^3

Fraction of households with two vehicles (C0PH2V):

C0PH2V = 0.333415 +0.422258 * X -0.191951 *X^3

Fraction of households with three-or-more vehicles (C0PH3+V):

C0PH3+V = 0.091395 +0.221173 * X +0.153701 *X^2

B. Zonal Household Vehicles of "With-Children-Households"

X = Average Number of "with-children-household" vehicles - 1.87622

Fraction of households with zero vehicle (C1PH0V):

C1PH0V = 0.018540 -0.057316 * X +0.110140 *X^2 -0.072534 *X^3

Fraction of households with one vehicle (C1PH1V):

C1PH1V = 0.269781 -0.532833 * X +0.195506 *X^3

Fraction of households with two vehicles (C1PH2V):

C1PH2V = 0.573846 +0.300282 * X -0.385719 *X^2 -0.201778 *X^3

Fraction of households with three-or-more vehicles (C1PH3+V):

C1PH3+V = 0.150200 +0.343300 * X +0.198200 *X^2

C. Zonal Household Workers of "Without-Children-Households"

X = Average Number of "without-children-household" workers - 1.06366

Fraction of households with zero worker (C0PH0W):

C0PH0W = 0.296204 -0.462422 * X +0.171256 *X^2

Fraction of households with one worker (C0PH1W):

C0PH1W = 0.407592 -0.303007 *X^2 +0.094322 *X^3

Fraction of households with two workers (C0PH2W):

C0PH2W = 0.261694 +0.374844 * X -0.104689 *X^3

Fraction of households with three-or-more workers (C0PH3+W):

C0PH3+W = 0.047641 +0.072716 * X +0.059803 *X^2 +0.050610 *X^3

D. Zonal Household Workers of "With-Children-Households"

X = Average Number of "with-children-household" workers - 1.63649

Fraction of households with zero worker (C1PH0W):

C1PH0W = 0.037779 -0.105925 * X +0.165710 *X^2 -0.078987 *X^3

Fraction of households with one worker (C1PH1W):

C1PH1W = 0.385018 -0.520355 * X +0.195933 *X^3

Fraction of households with two workers (C1PH2W):

C1PH2W = 0.470920 +0.438651 * X -0.200182 *X^2 -0.181715 *X^3

Fraction of households with three-or-more workers (C1PH3+W):

C1PH3+W = 0.090592 +0.245527 * X +0.172362 *X^2

E. Zonal Household Persons of "Without-Children-Households"

X = Average Number of "without-children-household" persons - 1.84769

Fraction of households with one person (C0PH1P):

C0PH1P = 0.341007 -0.540536 * X +0.199598 *X^2

Fraction of households with two persons (C0PH2P):

C0PH2P = 0.529833 +0.198791 * X -0.442505 *X^2 -0.111906 *X^3

Fraction of households with three persons (C0PH3P):

C0PH3P = 0.109413 +0.222457 * X -0.041524 *X^3

Fraction of households with four-or-more persons (C0PH4+P):

C0PH4+P = 0.033020 +0.111846 * X +0.103744 *X^2

F. Zonal Household Persons of "With-Children-Households"

X = Average Number of "with-children-household" persons - 3.69562

Fraction of households with one person (C1PH1P):

C1PH1P = 0.000000

Fraction of households with two persons (C1PH2P):

C1PH2P = 0.060251 -0.093107 * X +0.025287 *X^2 -0.144799 *X^3

Fraction of households with three persons (C1PH3P):

C1PH3P = 0.361326 -0.600386 * X +0.283011 *X^3

Fraction of households with four-or-more persons (C1PH4+P):

C1PH4+P = 0.564017 +0.650724 * X +0.145491 *X^2

3. ATTRACTION AND SPECIAL GENERATOR DATA

This chapter describes the attraction data. 2000 TCRPM uses more elaborate trip attraction rates than earlier versions of the model, which vary by employment type and area type [Reference 13]. This treatment of the trip rates improves model accuracy.

3.1 ATTRACTION DATA

The trip generation model uses attraction data to calculate the trips attracted to TAZs. The final 2000 ZDATA2 employment at the place of work file that was used in the 2000 model was provided by the MPOs. Corradino provided the initial geo-coded data and file for review for use in 2000 model. The MPO staff reviewed and finalized the InfoUSA proprietary employment data that was geo-coded by Florida International University under contract to FDOT. The 2000 ZDATA2 file is presented in **Appendix A**, while the format is presented in **Table D-11** of **Technical Report 3**.

A summary of the employment data used in the 2000 model validation is provided in **Table 2-1** along with summaries of the other production and attraction data. They are presented by the FSUTMS employment categories: Industrial, Commercial and Service. To show the reasonableness of the production and attraction data, several indices of the socioeconomic data used by the trip generation program were developed:

- Household (HH) Size
- Vehicles/HH Ratio
- Vehicles/Capita Ratio
- Workers/HH Ratio
- Employment/Population Ratio
- Service/Total Employment Ratio

To allocate employment data to TAZs, a proprietary database developed by InfoUSA was acquired by FDOT. The database includes the address and total number of employees by SIC code for each business in the three counties. The addresses were geocoded and allocated to TAZs. The employment totals were allocated to each of the three ZDATA2 employment categories (industrial, commercial and service) using the SIC code. The TAZ employment was proportionally adjusted to match countywide employment control totals from the U.S. Department of Labor. The TAZ employment allocations were provided to MPO staff for review and comment. Employment totals for each county are summarized in Table

Summaries of the socioeconomic data (see **Table 2-1**) were presented to the technical advisory committee at the early stages of model validation. It was decided that all data were suitable for use in the 2000 TCRPM.

Table 3-1
Treasure Coast Employment Control Totals
2000 Treasure Coast Regional Planning Model

Employment Type	Indian River	St. Lucie	Martin	TCRPM
Industrial Employment [SIC 1-39]	9,479	11.577	9,402	30,458
Commercial Employment [SIC 50-59]	15,625	15,846	15,552	47,023
Service Employment [SIC 40-49, 60-69]	23,824	32,748	25,057	81,629
Total Employment	48,928	60,171	50,011	159,110

3.2 SPECIAL GENERATORS

Special generators are TAZs with land uses that exhibit trip generation characteristics that differ significantly from the averages represented by the standard trip production or attraction rates. Generally, parks, airports, colleges and universities, and shopping centers are candidates for special generators.

For this update only one special generator was used. This special generator was used to account for recreation trips across the Jensen Beach Causeway.

The special generator file format was modified to include the airport enplanement data as well as to specify percentages for 11 trip purposes. The updated file is named as ZDATA3B. **Table D-23** of **Technical Report 3** presents the format of this file.

The 2000 special generators data (ZDATA3B file) are listed in **Appendix A**.

4. EXTERNAL TRIP DATA

External trips have at least one trip end (origin or destination) outside the study area boundary. Trips with both ends outside the area are called external-external (EE) or through trips, while trips with only one end within the study area are internal-external or external-internal (IE) trips. This chapter describes the development of both highway and transit external trips. The 2000 TCRPM has a total of 20 external stations. Each station was coded with a TAZ number between 701 and 736. **Figure 4-1** shows the locations of the external stations.

4.1 HIGHWAY EXTERNAL TRIPS

The required Internal-External (IE) trip data is presented in file ZDATA4B (see **Appendix B**). It consists of the total number of trips produced and attracted to each external station and the percentage of trips by purpose. **Table D-13** of **Technical Report 3** shows the format of the ZDATA4B file. A tabular summary of this file is presented in **Table 4-1**.

It should be noted that the standard ZDATA4 file contains internal-external trips, which are modeled as a separate trip purpose. The modified process eliminates IE as a separate trip purpose. The IE trips in the modified process are modeled as part of the internal trip purpose. The modified IE process works as follows:

- Total productions and attractions and their percentages by internal trip purposes are entered in the ZDATA4B file. The initial estimates of total productions and attractions should be made from the traffic counts and an estimate of through trips.

- The productions and attractions for each trip purpose are then obtained by multiplying the percentages for each purpose by total trips.

- K factors from all external zones to all external zones are set at zero for all trip purposes. This prevents IE trips from becoming EE.

The distribution process determines the number of IE trips (they will be present in the internal trip tables). Because the gravity model ensures the distribution of all productions, but not all attractions, the production ends of the IE trips will be the same as the input value, while the attraction ends could be significantly different from the counts. Thus, some adjustment of the total attractions and/or travel time at external station connectors (see **Table 4-1**) is needed so that the model produces the desired volumes at the external stations. The travel times on the external connectors represent the average time from the station to a typical destination outside the study area. The trips produced at an external station are assumed to be equal to the attractions (a very standard assumption), which is equal to half the daily volume on that link.

Figure 4-1
External Station Locations
2000 Treasure Coast Regional Planning Model

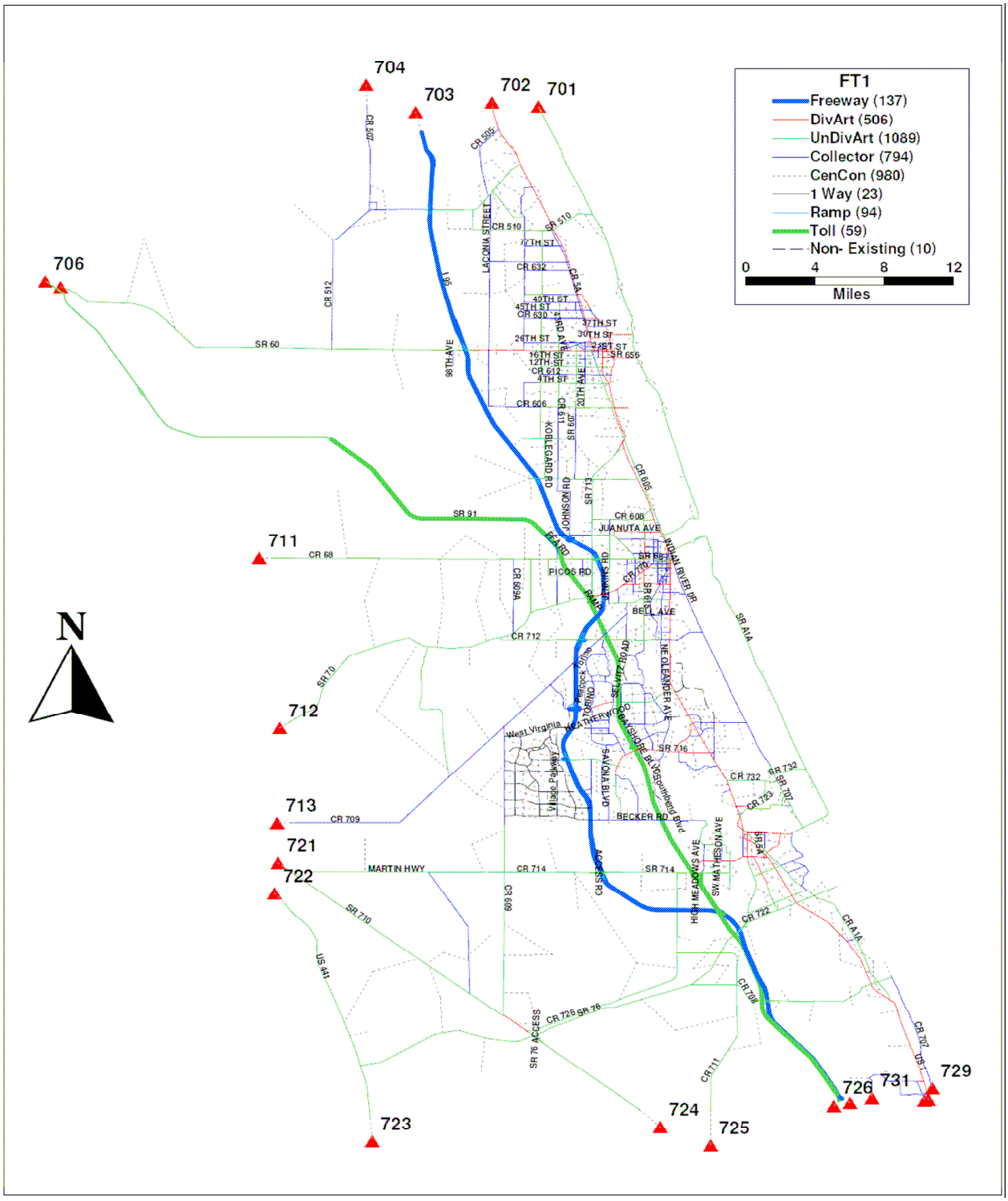


Table 4-1

External-Internal Zonal Data (ZDATA4B)

2000 Broward County Travel Model Update

			Production Percentages by Purposes												Attraction Percentages by Purposes												% HBW Trips			% Other Trips		
Card Type	Ext Station	Production	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	Attraction	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	Ext Tvl (min)	0-Auto HH	1-Auto HH	2+Auto HH	0-Auto HH	1-Auto HH	2+Auto HH
4	701	3,027	27	11	14	3	18	8	14	0	1	2	1	3,027	27	11	14	3	18	8	14	0	1	2	2	5	0	23	77	0	32	68
4	702	14,386	27	12	14	3	18	8	14	0	1	2	2	14,386	27	12	14	3	18	8	14	0	1	2	1	10	0	23	77	0	32	68
4	703	10,560	29	10	15	3	13	5	9	0	1	6	7	10,560	29	10	15	3	16	7	11	0	1	2	6	15	0	23	77	0	32	68
4	704	1,195	27	10	13	3	17	8	14	0	1	2	4	1,195	27	10	13	3	17	8	14	0	1	2	5	15	0	23	77	0	32	68
4	705	1,751	22	12	14	3	13	8	11	0	3	7	7	1,751	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	706	5,057	22	12	12	3	16	8	15	0	2	4	6	5,057	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	711	1,453	28	9	14	3	16	6	10	0	2	6	6	1,453	28	9	14	3	16	6	10	0	1	4	9	5	0	23	77	0	32	68
4	712	4,449	26	12	14	3	18	8	15	0	1	2	1	4,449	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	713	800	30	8	11	3	15	6	11	0	1	8	7	800	30	8	11	3	15	6	11	0	1	8	7	10	0	23	77	0	32	68
4	721	2,050	26	12	14	3	18	8	15	0	1	2	1	2,050	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	722	360	26	12	14	3	18	8	15	0	1	2	1	360	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	723	528	26	12	14	3	18	8	15	0	1	2	1	528	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	724	1,043	26	12	14	3	18	8	15	0	1	2	1	1,043	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	725	2,124	27	12	14	3	18	8	14	0	1	2	1	2,124	27	12	14	3	18	8	14	0	1	2	1	10	0	23	77	0	32	68
4	726	1,514	26	12	14	3	18	8	15	0	1	2	1	1,514	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	727	26,929	28	11	14	3	18	7	13	0	1	2	3	26,929	28	11	14	3	18	7	13	0	1	2	3	15	0	23	77	0	32	68
4	728	17,595	27	12	14	3	18	7	14	0	1	3	1	17,595	27	12	14	3	18	7	14	0	1	3	1	5	0	23	77	0	32	68
4	729	4,020	26	12	14	3	18	8	15	0	1	2	1	4,020	26	12	14	3	18	8	15	0	1	2	1	5	0	23	77	0	32	68
4	730	4,372	29	10	14	3	16	7	13	0	1	3	4	4,372	29	10	14	3	16	7	13	0	1	3	4	15	0	23	77	0	32	68
4	731	3,592	26	12	14	3	18	8	15	0	1	1	2	3,592	26	12	14	3	18	8	15	0	1	1	2	5	0	23	77	0	32	68

Annual Average Daily Traffic (AADT) and truck percentages for each of the external station were summarized from the 2000 and 2002 Florida Traffic Information CDROMs. **Table 4-2** presents summary results.

Several manual adjustments were made to the 2000 external trip tables as part of model validation. **Table 4-3** summarizes the 2000 validated through trip table. The zonal interchanges of the external trips are shown in this table. These data are then entered in EETRIPS file (see **Appendix B**). Input trips are represented in balanced origin/destination format. The through trips are then subtracted from the 2000 traffic count data to compute the IE trips. **Table 4-4** shows the descriptions of each external station along with 2000 traffic counts and splits of EE and IE trips. The IE trips entered in ZDATA4B file are in terms of person trips.

Table 4-2

Year 1996 and 2000 External Station Traffic Counts

2000 Treasure Coast Regional Planning Model

2000 Model External Station Number	1996 Model External Station Number	Road Description	County	2000 AADT	1996 PSAWDT	Ratio	FTI 2002 CD ROM: FTI Station	FTI 2002 CD ROM: 2000 AADT	FTI 2002 CD ROM: 1996 AADT	FTI 2002 CD ROM: Ratio	Ext-Ext Growth Factors (used)
A	B	C	D	E	F	(E/F)	G	H	I	(H/I)	(J)
651	521	SR A1A - North of IR / Brevard Co. line	Indian River	5,723	6,022	0.95	88-0009	6,400	4,900	1.31	1.20
652	522	US 1 - North of IR / Brevard Co. line	Indian River	21,136	24,460	0.86	88-0165	21,500	22,500	0.96	1.00
653	523	I 95 - North of IR / Brevard Co. line	Indian River	33,128	29,780	1.11	70-9919	33,128	33,747	0.98	1.00
654	524	CR 507 - North of IR / Brevard Co. line	Indian River	1,641	1,500	1.09					1.00
655	525	SR 60	Indian River	4,216	4,160	1.01	88-0139	4,216	3,766	1.12	1.10
656	526	SR 91 - Florida's Turnpike	Indian River	20,872	17,708	1.18	97-0421	20,873	17,037	1.23	1.20
661	531	Florida Cracker Trail / CR 68	St. Lucie	2,158	6,680	0.32	94-0144	2,593	2,750	0.94	1.00
662	532	SR 70	St. Lucie	8,000	6,740	1.19	91-0006	8,000	6,200	1.29	1.25
663	533	County Road 709 [Estimated Counts]	St. Lucie	800	700	1.14					1.00
671	541	SR 710 - Warfiled Blvd	Martin	7,200	11,860	0.61	91-0104	7,200	5,500	1.31	0.70
672	542	US 441 North / Conner's Hwy	Martin	2,561	3,380	0.76	91-0008	2,600	2,900	0.90	0.70
673	543	US 441 South / SR 15 to Palm Beach Co.	Martin	3,381	3,380	1.00	89-0067	3,600	3,000	1.20	1.05
674	544	SR 710 to Palm Beach Co.	Martin	4,382	6,244	0.70	93-0687	5,000	6,600	0.76	0.50
675	545	CR 711 to Palm Beach Co. [see Note 1]	Martin	3,000	2,416	1.24					1.00
676	546	SR 91 - Florida's Turnpike to Palm Beach Co.	Martin	20,600	23,958	0.86	97-1955	20,600	17,200	1.20	0.90
677	547	I 95 to Palm Beach Co.	Martin	64,500	56,282	1.15	93-2209	64,500	45,000	1.43	1.35
678	548	US 1 to Palm Beach Co. [see Note 1]	Martin	25,000	23,532	1.06	89-9921	18,100	16,978	1.07	1.10
679	549	SR A1A / CR 707 to Palm Beach Co.	Martin	5,600	1,902	2.94	89-0024	5,600	4,900	1.14	1.15
680	550	Old Dixie Hwy to Palm Beach Co. [see Note 1]	Martin	6,300							1.00
681	551	Island way to Palm Beach County [See Note 1]	Martin	5,000							1.00
		TOTAL (excluding Stations 680 & 681):		**233,898**	**230,704**	**1.01**		**223,910**	**192,978**	**1.16**	

Note 1: 2000 AADT values are taken from 2000 Palm Beach Travel Model.

Table 4-3

Through (External-External) Vehicle Trip Table

2000 Treasure Coast Regional Planning Model

FROM STATION	TO STATION 701	702	703	704	705	706	711	712	713	721	722	723	724	725	726	727	728	729	730	731	Total Origin	Total Destination	Total Through Veh
701					400										236	192					828	829	1,657
702					100			1							183	448					732	732	1,464
703								1				2			2,624	7,000					9,627	9,638	19,265
704																					0	0	0
705	400	100													46	398					944	944	1,888
706								1							4,466	2,065					6,532	6,531	13,063
711																					0	0	0
712	1	1													929						931	932	1,863
713																					0	0	0
721											1	75	89		770	1,254					2,189	2,188	4,377
722										1		1,021	12								1,034	1,035	2,069
723			2							75	1,021		232								1,330	1,330	2,660
724										89	13	232				1,137					1,471	1,470	2,941
725																					0	0	0
726	236	183	2,636		46	4,466		929		769											9,265	9,254	18,519
727	192	448	7,000		398	2,065				1,254			1,137				140				12,634	12,634	25,268
728																140					140	140	280
729																					0	0	0
730																					0	0	0
731																					0	0	0
Total Destination	829	732	9,638	0	944	6,531	0	932	0	2,188	1,035	1,330	1,470	0	9,254	12,634	140	0	0		47,657	47,657	95,314

Station (TC2000)	Road Name	Station (TC2000)	Road Name
701	SR-A1A (North)	721	Warfield Highway / SR-710 (North)
702	US-1 (North)	722	US-441 / Conner's Highway (North)
703	I-95 (North)	723	US-441 / SR 15 (South)
704	SR-60	724	Warfield Highway / SR-710 (South)
705	Florida's Turnpike (North)	725	Florida's Turnpike (South)
712	SR-70 / Okeechobee Road	726	I-95 (South)
		727	US-1 (South)

Table 4-4

External Station Traffic Counts and IE and EE Splits

2000 Treasure Coast Regional Planning Model

External Station	Highway Name	County	Vehicle Trips					
			Year 2000	External-External Trips		Internal-External Trips		Truck
			AADT	Total	Percent	Total	Percent	Percentage
701	SR-A1A (North)	Indian River	5,723	1,657	28.95%	4,066	71.05%	4.0%
702	US-1 (North)	Indian River	21,136	1,464	6.93%	19,672	93.07%	5.0%
703	I-95 (North)	Indian River	33,128	19,265	58.15%	13,863	41.85%	19.0%
704	CR-507	Indian River	1,641	0	0.00%	1,641	100.00%	7.0%
705	SR-60	Indian River	4,216	1,888	44.78%	2,328	55.22%	32.0%
706	Florida's Turnpike (North)	Indian River	20,872	13,063	62.59%	7,809	37.41%	12.0%
711	Florida Cracker Trail / CR-68	St. Lucie	2,158	0	0.00%	2,158	100.00%	20.0%
712	SR-70 / Okeechobee Road	St. Lucie	8,000	1,863	23.29%	6,137	76.71%	15.0%
713	*Glades Cutoff Road / CR-709*	*St. Lucie*	*800*	0	0.00%	800	100.00%	5.0%
721	Warfield Highway / SR-710 (North)	Martin	7,200	4,377	60.79%	2,823	39.21%	18.0%
722	US-441 / Conner's Highway (North)	Martin	2,561	2,069	80.79%	492	19.21%	20.0%
723	US-441 / SR-15 (South)	Martin	3,381	2,660	78.67%	721	21.33%	18.0%
724	Warfield Highway / SR-710 (South)	Martin	4,382	2,941	67.12%	1,441	32.88%	20.0%
725	SR-711	Martin	3,000	0	0.00%	3,000	100.00%	5.0%
726	Florida's Turnpike (South)	Martin	20,600	18,519	89.90%	2,081	10.10%	10.0%
727	I-95 (South)	Martin	64,500	25,268	39.18%	39,232	60.82%	10.0%
728	US-1 (South)	Martin	25,000	280	1.12%	24,720	98.88%	4.0%
729	SR-A1A / CR-707 (South)	Martin	5,600	0	0.00%	5,600	100.00%	3.0%
730	Old Dixie Highway to Palm Beach County	Martin	6,300	0	0.00%	6,300	100.00%	3.0%
731	Island way to Palm Beach County	Martin	5,000	0	0.00%	5,000	100.00%	3.0%
	ALL STATION:		245,198	95,314	38.87%	149,884	61.13%	

5. HIGHWAY NETWORK REVIEW AND UPDATE

The 2000 TCRPM incorporated the Florida Department of Transportation Model Task Force (MTF) endorsed 2-digit coding. **Appendix E** of **Technical Report 3** provides definitions of the two-digit codes. The network was reviewed and numerous edits and updates were made. **Tables 5-1** and **5-2** lists the 2-digit facility and area types along with the number of 2000 links that in each of these groups.

5.1 HIGHWAY NETWORK

The highway network has undergone extensive updating. Using the 1996 base-year as a starting point, roadway improvements implemented in 2000 were incorporated. In addition to the construction of new facilities, and improvements of existing ones, a geocoding effort was conducted. Using ArcView, the model networks were adjusted to match the street network map. A summary of the improvements included in the new base year (2000) networks is provided next.

An early review of the Treasure Coast network, performed by overlaying the network and the County's street centerline coverage in TransCAD, since this model was first converted using TransCAD, revealed that the street centerline map closely matched the FSUTMS network. The 1996 network was then updated to reflect added lanes and new roadways that were constructed between 1996 and 2000. 2000 aerial photographs were examined where necessary to ascertain whether projects had been completed. After the needed updates were identified and highlighted on a 1996 network, network edits were made to update the facility type, area type and posted speed information. The MPO staff were actively involved in this network update process.

The centroid locations and centroid connectors were next to be developed. The extensive street network of the region was used as the underlying layer while developing the centroids and centroid connector locations. The centroid were chosen to accurately reflect the position of the street network centroid. Facility type maps with an added traffic signal locations theme were created for the study area, as well as area type maps and TAZ boundary with highway network (centroids and connectors highlighted) maps.

The signal location were coded on the highway network along with coding "Signalized Segments. Staff from individual counties provided the necessary signal location information. The 2000 network includes an improvement in specifying the initial free-flow speed. The initial free-flow speeds are based on posted speed and signal data. **Chapter 4** of **Technical Report 3** has detailed description of this process.

Table 5-1

FDOT Adopted Two-Digit Facility Type

2000 Treasure Coast Regional planning Model

		No of Links
FT 1	**Freeways and Expressways**	**111**
FT 11	Freeway Group 1 (City of 500,000+)	
FT 12	Other Freeway (Group 2)	109
FT 15	Collector/Distributor Lanes	
FT 16	Controlled-Access Expressway	2
FT 17	Controlled-Access Parkway	
FT 2	**Divided Arterial**	**1175**
FT 21	Divided Arterial 55 mph	46
FT 22	Divided Arterial 45 mph	20
FT 23	Divided Arterial Class Ia	893
FT 24	Divided Arterial Class Ib	200
FT 25	Divided Arterial Class II/III	16
FT 3	**Undivided Arterial**	**2205**
FT 31	Undivided Arterial 45 mph (TB)	335
FT 32	Undivided Arterial Class Ia (TB)	576
FT 33	Undivided Arterial Class Ib (TB)	91
FT 34	Undivided Arterial Class II/III (TB)	20
FT 35	Undivided Arterial 45 mph (NTB)	231
FT 36	Undivided Arterial Class Ia (NTB)	684
FT 37	Undivided Arterial Class Ib (NTB)	256
FT 38	Undivided Arterial Class II/III (NTB)	12
FT 4	**Collector**	**1847**
FT 41	Major Divided Collector	28
FT 42	Major Undivided Collector (TB)	433
FT 43	Major Undivided Collector (NTB)	944
FT 44	Other Divided Collector	
FT 45	Other Undivided Collector (TB)	70
FT 46	Other Undivided Collector (NTB)	324
FT 47	Low Speed Collector	12
FT 48	Very Low Speed Collector	36
FT 5	**Centroid Connector**	**1932**
FT 51	Centroid Connector	1892
FT 52	External Centroid Connector	40
FT 6	**One Way Facilities**	**110**
FT 61	One-Way Street 45 mph	
FT 62	One-Way Street Class Ia	10

		No of Links
FT 6	**One Way Facilities**	
FT 63	One-Way Street Class Ib	25
FT 64	One-Way Street Class II/III	
FT 65	Frontage Roads 45 mph	
FT 66	Frontage Roads Class Ia	75
FT 67	Frontage Roads Class Ib	
FT 68	Frontage Roads Class II/III	
FT 7	**Ramps**	**95**
FT 71	Freeway On-Ramp	41
FT 72	Freeway Loop On-Ramp	3
FT 73	Other On-Ramp	3
FT 74	Other Loop On-Ramp	
FT 75	Freeway Off-Ramp	43
FT 76	Freeway Loop Off-Ramp	2
FT 77	Other Off-Ramp	3
FT 78	Other Loop Off-Ramp	
FT 79	Freeway - Freeway Ramp	
FT 8	**Exclusive HOV Lanes**	**0**
FT 81	HOV Lane Grp. 1 (Separated)	
FT 82	HOV Lane Grp. 2 (Separated)	
FT 83	HOV Lane Grp. 1 (Non-Separated)	
FT 84	HOV Lane Grp. 2 (Non-Separated)	
FT 85	Non-Freeway HOV Lane	
FT 86	AM&PM Peak HOV Ramp	
FT 87	AM Peak Only HOV Ramp	
FT 88	PM Peak Only HOV Ramp	
FT 89	All Day HOV Ramp	
FT 9	**Toll Facilities**	**121**
FT 91	Toll Freeway Group 1	
FT 92	Other Toll Freeway	71
FT 93	Toll Expressway/Parkway	
FT 94	Toll Divided Arterial	
FT 95	Toll Undivided Arterial	
FT 97	Toll On-Ramp	23
FT 98	Toll Off-Ramp	27
FT 99	Toll Plaza	
	TOTAL Number of Links:	**7,596**

Table 5-2
FDOT Adopted Two-Digit Area Type
2000 Treasure Coast Regional Planning Model

		No. of Links
AT 1	**CBD Areas**	**219**
AT 11	Urbanized Area (over 500,000) Primary City Central Business District	
AT 12	Urbanized Area (under 500,000) Primary City Central Business District	
AT 13	Other Urbanized Area Central Business District & Small City Downtown	219
AT 14	Non-Urbanized Area Small City Downtown	
AT 2	**CBD Fringe Areas**	**227**
AT 21	All Central Business District (CBD) Fringe Areas	227
AT 3	**Residential Area**	**4,377**
AT 31	Residential Area of Urbanized Areas	3945
AT 32	Undeveloped Portions of Urbanized Areas	50
AT 33	Transitioning Areas/Urban Areas over 5,000 Population	382
AT 34	Beach Residential (per SERPM)	
AT 35	Residental Duvided Arterial with a speed limit of 35 mph (BROWARD only case)	
AT 4	**OBD Areas**	**1325**
AT 41	High Density Outlying Business District	48
AT 42	Other Outlying Business District	1192
AT 43	Beach OBD (per SERPM)	74
AT 45	OBD Divided Arterial with a speed limit of 35 mph (BROWARD only case)	11
AT 5	**Rural Areas**	**1477**
AT 51	Developed Rural Areas/Small Cities under 5,000 Population	
AT 52	Undeveloped Rural Areas	1477
	TOTAL Number of Links:	**7,625**

- * Some discrepancy between total links in table 5-1 and 5-2 is because of presence of some transit only links that have not been listed in Table 5-1.

Another significant area of facility type changes was related to "divided arterial versus major local divided roadway" issues. Some facilities that had arterial characteristics, but were coded as major local divided roadways, were upgraded to divided arterial status. Many roadways that were relatively short in length (typically not an arterial characteristic) were coded as divided arterials. These roadways were modified to major local divided roadway status. These changes resulted in the application of a consistent philosophy with respect to the coding of arterials versus collectors in all Treasure Coast counties.

Area type coding modifications were less extensive. The new process of free-flow estimation (see description in **Chapter 4** of **Technical Report 3**) has reduced the burden of accurate representation of area types. However, adequate care was taken to code the area type since it is still a primary determinant for the capacity. It is also used in many other modeling steps (for example, terminal time determination, trip attractions and model evaluation summary).

Numerous plots were made at the early stages of this study to allow for the review and update of facility type, area type and number of lanes coding. Plots showing the highway network facility and area type designations are shown in **Figures 5-1** and **5-2**, respectively.

Screenlines and cutlines define groups of roadways that travel in the same direction, and carry traffic considered significant within the study area. The following characteristics are considered during the review (addition/deletion) of screenline and cutline locations:

- Availability of traffic counts
- Representative of travel patterns
- Minimized duplication of travel patterns.

The screenline and cutlines, as shown in **Figure 5-3**, cover all major regional and local travel movements in sufficient detail. The screenline and cutline codes established for the 1999 network were also preserved in the 2000 network.

Listings of highway network data and parameters are presented in **Appendix C**.

Figure 5-1
Main Facility Type Designation
2000 Treasure Coast Regional Planning Model

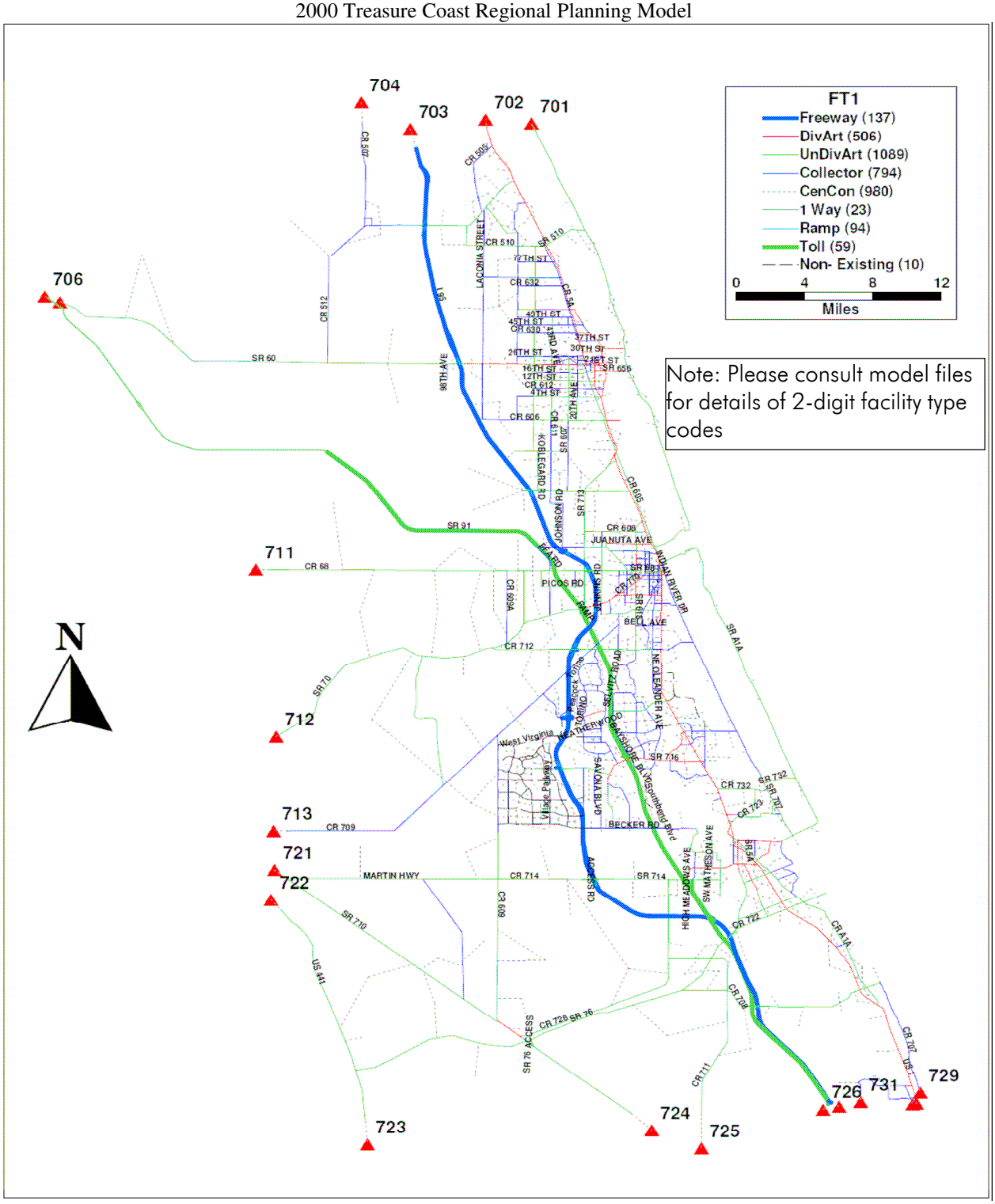


Figure 5-2
Main Area Type Designation
2000 Treasure Coast Regional Planning Model

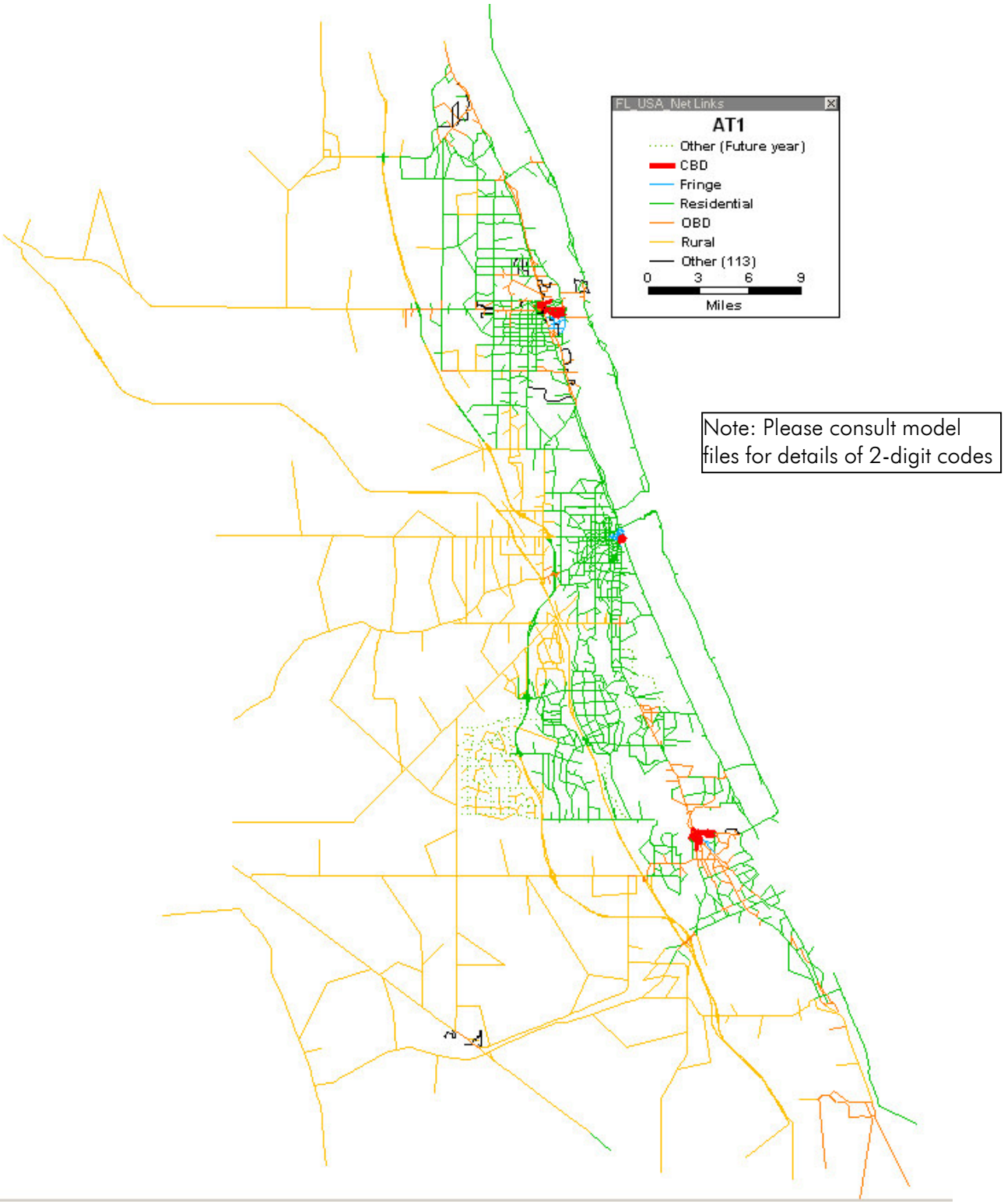
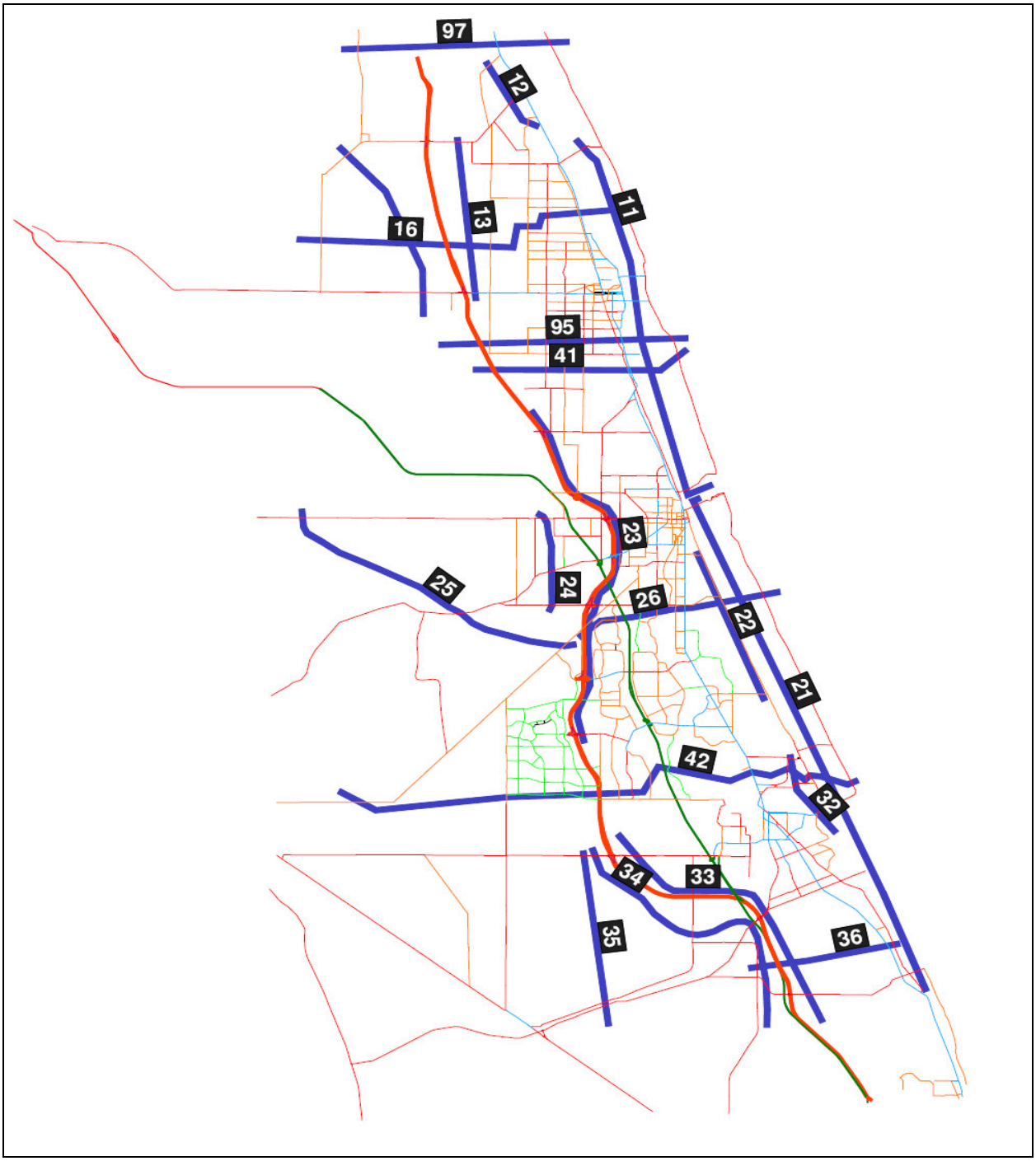


Figure 5-3
Screenline and Cutline Locations
2000 Treasure Coast Regional Planning Model



5.2 TRAFFIC COUNT DATA

Counts were obtained from FDOT. These counts were then used to calculate the Annual Average Daily Traffic (AADT). For the purpose of this revalidation effort, AADT counts (not the peak-season counts) were used. Raw counts were adjusted for the number of axles and the seasonal adjustment factors. FDOT routinely makes classification counts at designated locations. The FDOT staff provided the seasonal and axle adjustment factors. These factors were applied to the raw counts to derive the AADT.

Freeway counts were provided by FDOT as AADTs. The counts were obtained from FDOT's Florida Traffic Information compact-disk.

The counts were reviewed for reasonableness and edits were done where necessary. The traffic count data are needed for model validation. Care was taken to ensure that enough count data are available for model validation. **Table 5-3** presents a summary of the links by main facility and area types with traffic counts. Overall 26 percent of the links have traffic counts. The count statistics in this table are not weighted. To determine the "true" exposure of traffic counts, a weighted summary of link miles with traffic counts was made. **Table 5-4** presents this summary. For the 2000 TCRPM about 38 percent of link miles have traffic count. This was determined to be sufficient for model validation.

Table 5-3

Link Count Summary by Facility and Area Type Combinations

2000 Treasure Coast Regional Planning Model

1. Number of Links

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			32		76	108
2. Divided Arterial (21-26)	60	29	250	268	8	615
3. Undivided Arterial (31-38)	13	30	626	163	360	1,192
4. Collector (41-48)	3	25	689	95	112	924
6. One-Way & Frontage (61-68)	13		6	8		27
7. Ramps (71-79, 97-98)			61	21	64	146
8. HOV (81-85)						0
9. Toll Facility (91-95)			5		61	66
TOTAL	89	84	1,669	555	681	3,078

2. Percentage of Links with Counts

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			46.88		34.21	**37.96**
2. Divided Arterial (21-26)	20.00	34.48	21.20	36.94	25.00	**28.62**
3. Undivided Arterial (31-38)	15.38	33.33	25.72	30.06	18.33	**24.16**
4. Collector (41-48)	33.33	12.00	25.11	27.37	15.18	**23.81**
6. One-Way & Frontage (61-68)	53.85		50.00	37.50		**48.15**
7. Ramps (71-79, 97-98)						
8. HOV (81-85)						
9. Toll Facility (91-95)					70.49	**65.15**
TOTAL	**24.72**	**27.38**	**24.27**	**31.89**	**22.61**	**25.37**

3. Number of Links With Traffic Counts

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			15		26	41
2. Divided Arterial (21-26)	12	10	53	99	2	176
3. Undivided Arterial (31-38)	2	10	161	49	66	288
4. Collector (41-48)	1	3	173	26	17	220
6. One-Way & Frontage (61-68)	7		3	3		13
7. Ramps (71-79, 97-98)			0	0	0	0
8. HOV (81-85)						
9. Toll Facility (91-95)			0		43	43
TOTAL	22	23	405	177	154	781

Table 5-4

Link Miles Count Summary by Facility and Area Type Combinations

2000 Treasure Coast Regional Planning Model

1. Total Link Miles (*)

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			33.43		111.82	145.25
2. Divided Arterial (21-26)	6.94	3.46	70.57	60.05	8.01	149.03
3. Undivided Arterial (31-38)	1.24	4.34	203.69	38.43	290.45	538.15
4. Collector (41-48)	0.45	2.35	232.25	26.17	111.39	372.61
6. One-Way & Frontage (61-68)	1.49		0.85	1.05	14.92	18.31
7. Ramps (71-79, 97-98)			15.42	3.55		18.97
8. HOV (81-85)						0.00
9. Toll Facility (91-95)			1.64		112.73	114.37
TOTAL	10.12	10.15	557.85	129.25	649.32	1,356.69

2. Total Link Miles With Traffic Counts

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			15.27		53.92	69.18
2. Divided Arterial (21-26)	1.90	1.88	19.54	29.83	3.08	56.23
3. Undivided Arterial (31-38)	0.16	1.92	71.67	12.76	78.96	165.47
4. Collector (41-48)	0.28	0.42	76.27	7.80	30.49	115.26
6. One-Way & Frontage (61-68)	0.54		0.41	0.28	0.00	1.23
7. Ramps (71-79, 97-98)						0.00
8. HOV (81-85)						0.00
9. Toll Facility (91-95)					96.27	96.27
TOTAL	2.88	4.22	183.16	50.67	262.71	503.63

2. Percentage of Link Miles with Counts

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			45.66		48.22	47.63
2. Divided Arterial (21-26)	27.38	54.34	27.69	49.68	38.45	37.73
3. Undivided Arterial (31-38)	12.90	44.24	35.19	33.20	27.18	30.75
4. Collector (41-48)	62.22	17.87	32.84	29.81	27.37	30.93
6. One-Way & Frontage (61-68)	36.24		48.24	26.19	0.00	6.69
7. Ramps (71-79, 97-98)			0.00	0.00		0.00
8. HOV (81-85)						
9. Toll Facility (91-95)			0.00		85.39	84.17
TOTAL	28.46	41.58	32.83	39.20	40.46	37.12

(*) Freeways and other directionally coded represent bidirectional miles, otherwise centerline miles.

5.3 NETWORK SPEEDS AND CAPACITIES

An enhancement to the initial free-flow speeds in the 2000 model was incorporated through a new process, implemented as a Cube-Voyager (CV) application. **Chapter 4** of **Technical Report 3** (Model Application Guidelines) has a detailed description of this process.

The speeds in the SPDCAP table for all non-centroid facilities (FT2=10-49, 60-99) were entered as "zero". The two-digit coding still allows enough flexibility to represent the variation in model capacities. The SPDCAP table is used only to determine the speeds on the centroid links.

Speeds and capacities may need to be adjusted during the validation process. The adjustments to the capacities were made in the SPDCAP table, whereas the adjustments to the speeds were made through the SPDADJ.DBF file. The "adjustment" records of the SPDCAP tables were used to adjust the capacities. **Appendix C** presents a sample listing of the SPDCAP table.

The CV application uses the SPDADJ.DBF file to derive the initial free-flow speeds of all non-centroid links. Very minor adjustments were required to adjust the speeds. It was only in one that a speed adjustment was applied. **Table 4-3 of TR3** (Model Application Guidelines) presents these adjustment factors. In all but one case, the values are 1.00, which means that no adjustments were made to the mathematical formulae derived free-flow speed values. Three speed data items (in mph) are presented for each of the 2-digit facility and area type combinations:

- POSTSPD – Posted Speed
- SPEED – Calculated Free-Flow Speed based on Mathematical Formulae

Data from the HEVAL summary were used to check the hierarchy of the speeds and capacities. The original speeds were also compared to the model generated congested speeds. **Table 5-5** presents these summaries. The logical hierarchies of speeds are evident in this table.

A summary of the systemwide capacities (in vehicle-per-lane-per-hour) was made from the HEVAL report in the "ANALYSIS" mode. This summary was made for each combination of the main facility and area type combinations. **Table 5-6** presents the summary capacities reported in vehicles per hour per lane. The speeds and capacities in **Tables 5-5** and **5-6** conform to the expected hierarchies among the facility and area types, and the reported values are reasonable.

Table 5-5

HEVAL Speed Statistics by Facility and Area Type Combinations

2000 Treasure Coast Regional Planning Model

1. Original Speeds in MPH

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			66.99		75.31	**73.20**
2. Divided Arterial (21-26)	34.70	35.01	42.95	44.05	59.89	**43.34**
3. Undivided Arterial (31-38)	35.43	32.70	42.48	41.44	54.24	**47.61**
4. Collector (41-48)	33.54	32.83	36.09	35.18	42.27	**37.64**
6. One-Way & Frontage (61-68)	39.56		41.13	38.16	29.45	**39.34**
7. Ramps (71-79, 97-98)			28.79	32.18		**29.40**
8. HOV (81-85)						
9. Toll Facility (91-95)			48.24		74.80	**74.23**
TOTAL	**35.14**	**33.50**	**39.66**	**40.86**	**53.67**	**44.67**

2. Congested Speeds in MPH

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			66.54		74.52	**72.50**
2. Divided Arterial (21-26)	34.35	33.40	41.23	40.82	58.79	**41.12**
3. Undivided Arterial (31-38)	30.43	29.36	40.84	38.29	53.91	**46.25**
4. Collector (41-48)	32.73	31.51	34.99	33.76	42.11	**36.73**
6. One-Way & Frontage (61-68)	39.56		41.13	38.16	26.67	**39.34**
7. Ramps (71-79, 97-98)			28.31	26.62		**27.39**
8. HOV (81-85)						
9. Toll Facility (91-95)			48.24		52.98	**52.91**
TOTAL	**34.11**	**31.17**	**38.32**	**38.09**	**51.50**	**42.86**

3. Change (Congested-Original) in Speeds in MPH

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			-0.45	0.00		**-0.70**
2. Divided Arterial (21-26)	-0.35	-1.61	-1.72	-3.23	-1.10	**-2.22**
3. Undivided Arterial (31-38)	-5.00		-1.64	-3.15		**-1.36**
4. Collector (41-48)	-0.81	-1.32	-1.10	-1.42		**-0.91**
6. One-Way & Frontage (61-68)			0.00	0.00		**0.00**
7. Ramps (71-79, 97-98)	0.00		-0.48	-5.56		**-2.01**
8. HOV (81-85)						
9. Toll Facility (91-95)			0.00			**-21.32**
TOTAL	**-1.03**	**-2.33**	**-1.34**	**-2.77**	**-2.17**	**-1.81**

4. Percent Change [(Congested-Original)/Original] in Speeds

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			-0.67%	#DIV/0!		**-0.96%**
2. Divided Arterial (21-26)	-1.01%	-4.60%	-4.00%	-7.33%	-1.84%	**-5.12%**
3. Undivided Arterial (31-38)	-14.11%		-3.86%	-7.60%		**-2.86%**
4. Collector (41-48)	-2.42%	-4.02%	-3.05%	-4.04%		**-2.42%**
6. One-Way & Frontage (61-68)			0.00%	0.00%		**0.00%**
7. Ramps (71-79, 97-98)	#DIV/0!		-1.67%	-17.28%		**-6.84%**
8. HOV (81-85)						
9. Toll Facility (91-95)			0.00%			**-28.72%**
TOTAL	**-2.93%**	**-6.96%**	**-3.38%**	**-6.78%**	**-4.04%**	**-4.05%**

Table 5-6

Link Capacities by Facility and Area Type Combinations

2000 Treasure Coast Regional Planning Model

1. Systemwide Number of Lane Miles

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			119.96		506.68	**626.64**
2. Divided Arterial (21-26)	25.80	14.66	316.76	258.92	31.96	**648.10**
3. Undivided Arterial (31-38)	3.74	10.17	481.93	73.46	650.14	**1,219.44**
4. Collector (41-48)	0.90	5.00	613.38	57.72	270.30	**947.30**
6. One-Way & Frontage (61-68)	6.53		3.89	5.18		**15.60**
7. Ramps (71-79, 97-98)			12.28	0.68	11.24	**24.20**
8. HOV (81-85)						
9. Toll Facility (91-95)			3.36	1.36	547.25	**551.97**
TOTAL	**36.97**	**29.83**	**1,551.56**	**395.96**	**2,017.57**	**4,033.25**

2. Systemwide Hourly Capacity-Miles

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			234457		998721	**1,233,178**
2. Divided Arterial (21-26)	41768	11245	293457	224267	45523	**616,260**
3. Undivided Arterial (31-38)	2864	7250	377540	59870	686787	**1,134,311**
4. Collector (41-48)	549	4255	391281	38182	195798	**630,064**
6. One-Way & Frontage (61-68)	11460		3836	4662		**19,957**
7. Ramps (71-79, 97-98)			16967	968	13449	**31,383**
8. HOV (81-85)						
9. Toll Facility (91-95)			5544	2414	899334	**907,292**
TOTAL	**56,641**	**22,750**	**1,323,082**	**330,362**	**2,839,611**	**4,572,446**

3. Estimated Systemwide Capacity in Vehicle-Per-Lane-Per-Hour

Facility Type	Area Type: CBD (11-14)	Fringe (21)	Residential (31-35)	OBD (41-45)	Rural (51-52)	TOTAL
1. Freeway (11-17)			1,954		1,971	**1,968**
2. Divided Arterial (21-26)	1,619	767	926	866	1,424	**951**
3. Undivided Arterial (31-38)	766		783	815	1,056	**930**
4. Collector (41-48)	610	851	638	661	724	**665**
6. One-Way & Frontage (61-68)			986	900		**1,279**
7. Ramps (71-79, 97-98)			1,382	1,423	1,197	**1,297**
8. HOV (81-85)						
9. Toll Facility (91-95)			1,650	1,775	1,643	**1,644**
TOTAL	**1,532**	**763**	**853**	**834**	**1,407**	**1,134**

6. TEMPORAL DISTRIBUTION OF TRIPS

This chapter presents the purpose specific trip table weighting factors and the calibrated friction factor data sets for the distribution models using uncongested and congested travel times. In addition, half-hour interval motion travel distribution data from the 1999 SEFTCS [Reference 15] are presented. The time-of-day (TOD) factors from these distributions are also summarized in several tables. The TOD factors data will be very useful for future model updates involving time-of-day models. The current 2000 travel models are all day (24-hour) models.

6.1 TRIP WEIGHTING FACTORS

The trip distribution process for the 2000 model update study uses weighted trips from the uncongested (free-flow) and congested skim distributions. This process was modified in the 2000 model update study. In two prior update studies (1996 and 2000), a combination of uncongested and congested time was used in the final phase of the distribution. In the 2000 model update, the trip tables from the uncongested and congested distributions are weighted. The weights used to combine the trip tables also vary by trip purpose. The distribution model process of the 2000 model works as follows:

- Distribute trip using uncongested (or free-flow) times
- Run a highway-only mode choice analysis using default values for transit shares
- Run highway assignment
- Get congested times
- Redistribute trips using congested time
- Combine the trips using purpose-specific weights from the output trip tables using uncongested and congested times.

The TCRPM trip distribution model differs from the conventional FSUTMS distribution models in that it considers both free-flow and congested times and then takes a weighted measure of trips rather than simply using the trips a free-flow highway travel time distribution between origin and destination zones. The reason for this approach is to properly account for influence of present and future congestion during different time periods.

This modified process takes into account that the amount of traffic varies by hour and trip purpose. As urban roadways become congested during peak hours, some trips shift to other less congested hours. This in turn causes the network to be congested during a longer portion of time. This is true of most major urban areas and is rapidly becoming so even in smaller urban areas. A distribution based on only uncongested time would understate the level of congestion on the process of trip distribution. On the other hand, use of congested time would overstate the level of congestion. The use of both times in the distribution process is a more appropriate simulation of the trip distribution phenomenon. The composite trip interchanges follows the following equation:

$$\{ CWGT_i \times \text{Congested Trip Table} \} + \{ (1 - CWGT_i) \times \text{Free Flow Trip Table} \}$$

where, $CWGT_i$ represents fraction of trips occurring during congested hours for purpose i.

As can be seen from this equation, each purpose uses a different weighting factor. The CWGT will be closer to 1 as a larger fraction of trips occurs during congested time periods. The weighting factors were based on the trip starting time of the household travel logs of the Treasure Coast Travel Characteristics Survey.

In order to develop the purpose specific weighting factors for mixing free-flow and congested-flow trip tables, data from the 1999 travel logs were used. A SPSS script was used to generate a frequency tabulation of trip start time. **Table 6-1** presents the hourly distribution of trips as well as the congested trip table weighting factors by purpose. The sums of frequencies of trips during the hours that started at 7 and 8 AM and 2-5 PM were assumed as weights for the congested trip tables.

Table 6-1
Calibrated Gamma Function Parameters
2000 Treasure Coast Regional Planning Model

PURPOSE	a_p	b_p	c_p
1. HB Work	4544694	-0.33	0.20
2. HB Shopping	1587980	1.10	0.16
3. HB SocRec	111421638	1.28	0.14
4a. HB School -Non Public	55574	0.43	0.35
5. HB Other	111421638	1.28	0.12
6. Non Home Based Work	111421638	1.28	0.08
7. Non Home Based Other	111421638	1.28	0.10
8. Airport	1	0.00	0.00
9. Truck (4-tired)	1	0.00	0.13
10. Truck (Single Unit)	1	0.00	0.09
11. Truck (Combination)	1	0.00	0.07

By subtracting the constrained trip weights from one, the free-flow trip weights were developed. These weights were used to combine the trip tables distributed by the free-flow and congested skims.

6.2 FRICTION FACTORS

One set (free-flow/congested flow) of friction factors are used in TCRPM. For this model [see **Chapter 6** of **Reference 1**] survey data from Treasure Coast Travel Characteristic Study was used to calibrate the friction factors using trip length frequency data [Reference 15]. Calibration of friction factors often involves manual steps in addition to running the standard calibration program of the modeling software. A set of gamma parameters were developed for each trip purpose.

The calibrated gamma function parameters for friction factors are shown in **Table 6-1** for internal trips. To simulate the truck trip distribution for the three trucks purposes (4-tired, Single Unit and Combination), the exponential functions recommended in the Quick Response Freight Manual (QRFM) [Reference 24] were used with some modifications during the calibration and validation process. **Table 6-2** presents these functions as well as the friction factors. Friction factor data is listed in **Appendix C**.

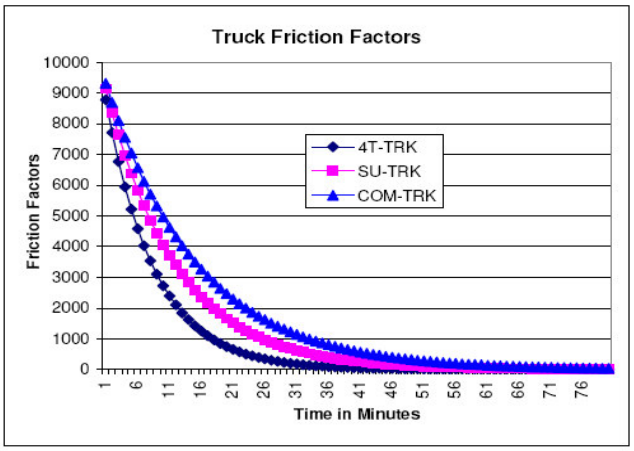
Table 6-2

Truck Trip Friction Factors

2000 Treasure Coast Regional Planning Model

Time in minutes	Four-Tire Commercial Vehicles	Single Unit Trucks (6+ Tires)	Combinations
1	8,781	9,139	9,324
2	7,711	8,353	8,694
3	6,771	7,634	8,106
4	5,945	6,977	7,558
5	5,220	6,376	7,047
6	4,584	5,827	6,570
7	4,025	5,326	6,126
8	3,535	4,868	5,712
9	3,104	4,449	5,326
10	2,725	4,066	4,966
11	2,393	3,716	4,630
12	2,101	3,396	4,317
13	1,845	3,104	4,025
14	1,620	2,837	3,753
15	1,423	2,592	3,499
16	1,249	2,369	3,263
17	1,097	2,165	3,042
18	963	1,979	2,837
19	846	1,809	2,645
20	743	1,653	2,466
21	652	1,511	2,299
22	573	1,381	2,144
23	503	1,262	1,999
24	442	1,153	1,864
25	388	1,054	1,738
26	340	963	1,620
27	299	880	1,511
28	263	805	1,409
29	231	735	1,313
30	202	672	1,225
31	178	614	1,142
32	156	561	1,065
33	137	513	993
34	120	469	926
35	106	429	863
36	93	392	805
37	81	358	750
38	72	327	699
39	63	299	652
40	55	273	608
41	48	250	567
42	43	228	529
43	37	209	493
44	33	191	460
45	29	174	429
46	25	159	400
47	22	146	373
48	19	133	347
49	17	122	324
50	15	111	302

Time in minutes	Four-Tire Commercial Vehicles	Single Unit Trucks (6+ Tires)	Combinations
51	13	102	282
52	12	93	263
53	10	85	245
54	9	78	228
55	8	71	213
56	7	65	198
57	6	59	185
58	5	54	172
59	5	49	161
60	4	45	150
61	4	41	140
62	3	38	130
63	3	34	122
64	2	32	113
65	2	29	106
66	2	26	99
67	2	24	92
68	1	22	86
69	1	20	80
70	1	18	74
71	1	17	69
72	1	15	65
73	1	14	60
74	1	13	56
75	1	12	52
76	1	11	49
77	0	10	46
78	0	9	43
79	0	8	40
80	0	7	37



Note: In QRFM, the following exponential functions are recommended for truck friction factors:

Four-tire commercial vehicles: $F_{ij} = e^{(-0.13 * t_{ij})}$

Single unit trucks (6+ tires): $F_{ij} = e^{(-0.09 * t_{ij})}$

Combinations: $F_{ij} = e^{(-0.07 * t_{ij})}$

7. TRANSIT NETWORKS AND DATA

As a first task in developing the transit network, year 2000 transit network shape files were obtained from individual MPOs. Using these shape files as the background layer, the transit networks were developed in Cube Voyager. There were certain transit lines with routes on links that were not part of this update. For such conditions special transit only routes were coded. Extra links were coded to provide additional detail. These special links were given a facility type code of 59. The developed transit routes were presented to the MPO staff for their approval. Certain revisions were made to the coded routes based on their comments. Ridership data of year 2000 also was used to verify the existence of new routes.

Transit speeds are assumed to be a function of transit mode, highway facility speed and area types. The highway to transit speed conversion process uses fifteen segmented linear curves that explain the relationship between highway and transit speeds. These data were carefully reviewed. **Table 7-1** presents the highway to transit speed conversion curves.

Transit network files (TROUTEAM, TROUTEMD) were developed for 2000 conditions. All transit related files used in the 2000 model validation are listed in **Appendix G**. Summaries of all transit routes (see **Tables 7-2** and **7-3**) were prepared separately for peak and midday networks. The following route data were summarized:

- Company
- Mode
- Line Number
- Headway in minute

Table 7-4 presents the summary for each mode and company of the 2000 transit networks.

Table 7-1

Highway to Transit Speed Conversion Curves

2000 Treasure Coast Regional Planning Model

PART I - Curve Number for Each Mode, Area Type, and Facility Type

Mode 1								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	1	1	1	1	1	1	1	1
20-29	1	1	1	1	1	1	1	1
30-39	1	1	1	1	1	1	1	1
40-49	1	1	1	1	1	1	1	1
50-59	1	1	1	1	1	1	1	1

Mode 2								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	2	2	2	2	2	2	2	2
20-29	2	2	2	2	2	2	2	2
30-39	2	2	2	2	2	2	2	2
40-49	2	2	2	2	2	2	2	2
50-59	2	2	2	2	2	2	2	2

Mode 3								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	80-89	90-99
10-19	1	1	1	1	1	1	1	1
20-29	1	1	1	1	1	1	1	1
30-39	1	1	1	1	1	1	1	1
40-49	1	1	1	1	1	1	1	1
50-59	1	1	1	1	1	1	1	1

Mode 4								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	6	6	13	4	6	3	3
20-29	4	6	6	6	5	6	4	4
30-39	4	8	8	8	6	8	4	4
40-49	4	10	10	10	7	10	4	4
50-59	5	12	12	12	15	12	5	5

Mode 5								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	6	6	13	4	6	3	3
20-29	4	6	6	6	5	6	4	4
30-39	4	8	8	8	6	8	4	4
40-49	4	10	10	10	7	10	4	4
50-59	5	12	12	12	15	12	5	5

Mode 6								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	6	6	13	4	6	3	3
20-29	4	7	7	8	5	7	4	4
30-39	4	9	9	9	6	9	4	4
40-49	4	9	9	9	7	9	4	4
50-59	5	11	11	11	15	11	5	5

Mode 7								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	3	4	4	4	4	3	3
20-29	3	3	5	5	5	5	3	3
30-39	3	3	6	6	6	6	3	3
40-49	3	3	7	7	7	7	3	3
50-59	3	3	8	8	15	8	3	3

Mode 8								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	3	4	4	4	4	3	3
20-29	3	3	5	5	5	5	3	3
30-39	3	3	6	6	6	6	3	3
40-49	3	3	7	7	7	7	3	3
50-59	3	3	8	8	15	8	3	3

Mode 12								
Area	Facility Type							
Type	10-19	20-29	30-39	40-49	50-59	60-69	70-89	90-99
10-19	3	6	6	13	4	6	3	3
20-29	4	6	6	6	5	6	4	4
30-39	4	8	8	8	6	8	4	4
40-49	4	10	10	10	7	10	4	4
50-59	5	12	12	12	15	12	5	5

Table 7-1 (cont'd)

Highway to Transit Speed Conversion Curves

2000 Treasure Coast Regional Planning Model

PART II - Highway to Transit Curves (speeds in mph)

Low Highway Speed (X1), Low Transit Speed (Y1)
High Highway Speed (X2), High Transit Speed (Y2)

1	
30.0	2.5
70.0	2.5

2	
30.0	30.0
70.0	70.0

3	
26.0	26.0
43.0	35.0

4	
26.0	26.0
50.0	45.0

5	
42.0	42.0
55.0	50.0

6	
18.0	***11.0***
32.0	*20.0*

7	
22.0	13.0
35.0	22.0

8	
18.0	***12.0***
37.0	***24.0***

9	
18.0	14.0
36.0	***28.0***

10	
18.0	11.0
36.0	***22.0***

11	
24.0	16.0
48.0	29.0

12	
24.0	***15.0***
48.0	***24.0***

13	
10.0	6.0
26.0	***14.0***

14	
7.0	7.0
40.0	20.0

15	
30.0	30.0
70.0	70.0

LEGEND:

Mode
1 = Walk (Centroid Connector)
2 = Auto Connector
3 = Sidewalk
4 = Local Bus (Palm Beach & Broward)
5 = Local Bus (Miami-Dade)
6 = Express Bus
7 = Metro-Rail
8 = Tri-Rail
12 = Local Bus (Tri-Rail Feeder)

Facility Type
10-19 = Freeway
20-29 = Divided Arterial
30-39 = Undivided Arterial
40-49 = Collector
50-59 = Local (Centroid Connector)
60-69 = One Way
70-79 = Ramps
80-89 = HOV
90-99 = Toll Links

Area Type
10-19 = CBD
20-29 = Fringe
30-39 = Residential
40-49 = OBD
50-59 = Rural

Table 7-2
Peak and Off-Peak Period Transit Route Summary
2000 Treasure Coast Regional Planning Model

Route Name	County	Headway (mins)	Mode	Number of Stops	Distance (miles)
ROUTE 5	Indian River	60	4	52	20.18
ROUTE 9	Indian River	60	4	17	23.74
ROUTE 1	Indian River	60	4	29	9.39
ROUTE 2	Indian River	60	4	32	10.24
ROUTE 3	Indian River	60	4	37	10.84
ROUTE 4	Indian River	60	4	31	8.02
ROUTE 6	Indian River	60	4	39	15.25
ROUTE 7	Indian River	60	4	15	6.05
ROUTE 8	Indian River	60	4	47	12.63
STLCON	St. Lucie	60	4	29	19.87
MART 1	Martin	60	4	15	9.78
MART 2	Martin	90	4	27	12.88

7.1 TRANSIT RIDERSHIP

Transit ridership data are needed for validation of the base year transit model. Weekday transit ridership was obtained from individual MPOs. These data are presented in **Table 7-3**. There are 12 routes in the Treasure Coast region.

Table 7-3
Daily Survey Passenger Trips by Route
2000 Treasure Coast Regional Planning Model

Transit Route	Daily Passenger Trips	County
Mart 1	22	Martin
Mart 2	61	Martin
STLCON	111	St Lucie, Martin
Route 1	43	Indian River
Route 2	58	Indian River
Route 3	285	Indian River
Route 4	87	Indian River
Route 5	0	Indian River
Route 6	16	Indian River
Route 7	9	Indian River
Route 8	34	Indian River
Total	726	

7.2 TRANSIT SURVEY RESULTS

The survey responses and onboard transit survey were used to develop the ridership estimates. The household travel characteristics survey was used for the purpose of developing transit trip targets. [Reference 15].

The above results taken from transit and household surveys and ridership information from **Section 7.2** were used to estimate the targets for transit validation. Transit targets by mode, access and purposes are presented in **Technical Report 2** (Model Calibration and Validation) and model estimates were compared against the target values.

7.3 OTHER TRANSIT DATA AND PARAMETERS

Table 7-4 summarizes all the transit path building parameters (maximum transfer, maximum time, wait time weight, transfer wait time weight, minimum wait penalty, maximum wait penalty, and run time factors) that were used in transit path building module. Transit fare information was assembled from the transit providers in the region for use in the 2000 model update.

Table 7-4
Transit Path Building Parameters
2000 Treasure Coast Regional Planning Model

```
/* WALK TO LOCAL BUS */
/*For Route Enumeration*/
MAXFERS=4
EXTRAXFERS1 = 1
EXTRAXFERS2 = 1
SPREADFACT = 1.00001
SPREADFUNC=1
SPREADCONST = 0
REWAITMIN = 3.0
REWAITMAX = 10.0
LOOKBACK=0.0

/*For Route Enumeration and Evaluation*/
RUNFACTOR[1]=2.25
RUNFACTOR[101]=2.25
RUNFACTOR[2]=9.99
RUNFACTOR[3]=2.25
RUNFACTOR[4]=1.00
RUNFACTOR[5]=1.00
RUNFACTOR[6]=9.99
RUNFACTOR[7]=9.99
RUNFACTOR[8]=9.99
RUNFACTOR[9]=9.99
RUNFACTOR[10]=9.99
RUNFACTOR[11]=9.99
RUNFACTOR[12]=1.00

WAITFACTOR=2.25   NODES=1000-99999

XFERCONST=1, FROM=4, TO=4
XFERCONST=1, FROM=4, TO=5
XFERCONST=1, FROM=4, TO=6
XFERCONST=1, FROM=4, TO=7
XFERCONST=1, FROM=4, TO=8
XFERCONST=1, FROM=4, TO=12
XFERCONST=1, FROM=5, TO=4
XFERCONST=1, FROM=5, TO=5
XFERCONST=1, FROM=5, TO=6
XFERCONST=1, FROM=5, TO=7
XFERCONST=1, FROM=5, TO=8
XFERCONST=1, FROM=5, TO=12
XFERCONST=1, FROM=8, TO=12
XFERCONST=5, FROM=12, TO=4
XFERCONST=5, FROM=12, TO=5
XFERCONST=5, FROM=12, TO=6
XFERCONST=5, FROM=12, TO=7
XFERCONST=1, FROM=12, TO=8
XFERCONST=5, FROM=12, TO=12


/*For Route Evaluation*/
ALPHA = 1.0
LAMBDAW = 0.2
LAMBDAA = 0.2
CHOICECUT=0.05
IWAITCURVE=1, NODES=1000-99999
```

8. SUMMARY AND CONCLUSION

This study updated and validated the Treasure Coast travel model for both highway and transit to 2000 conditions. The model will provide the Treasure Coast Study area with full weekday multimodal transportation system modeling capabilities including high occupancy vehicle (HOV) lanes, trucks and transit.

The Treasure Coast Model Update Study includes the application of many new and innovative modeling techniques. Key among these are a new process to estimate the free-flow speeds, a modified lifestyle based trip production model with expanded trip purposes and enhanced trip attraction rates, use of 2000 TCTC survey to calibrate the trip generation and distribution parameters, use of both uncongested and congested flow trip distribution and update of 2-digit highway networks codes.

Both highway and transit networks have been updated to 2000 conditions. Using GIS based routines, the model networks were adjusted to match the street network map. Zonal data were assembled to support the updated lifestyle based program. External model data were updated to reflect 2000 conditions. Transit ridership and surveys were used to develop the new targets for transit model validation. Survey data were also used to develop the factors for future TOD models.

In support of all model enhancements, the Indian River, St. Lucie and Martin MPOs and FDOT District 4 staffs have collected the most current and accurate data available. The development, collection, analysis and review of these data are presented in numerous tables, figures and appendices of this report. The data and parameters presented in this report were used in model calibration and validation.

9. LIST OF REFERENCES

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17. **Highway Network (HNET) Procedural Enhancement Study, Executive Summary, Technical Report and User's Manual**, System Planning Office, FDOT, Prepared by PBS&J, March 1998.

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21. **Tri-Rail On-Board Survey Analysis**, Tri-County Commuter Rail Authority, Prepared by Center for Urban Transportation Research - University of South Florida, October 1991.

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23. **Model Validation and Reasonableness Checking Manual**, Travel Model Improvement Program, Federal Highway Administration, February 1997.

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27. **NCHRP 187 – Quick Response Urban Travel Estimation Techniques and Transferable Parameters: User's Guide**, Transportation Research Board, National Research Council, 1978.

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Appendix A

PRODUCTION AND ATTRACTION DATA

[**A Note:** For format, see the table (shown in parenthesis) of *Technical Report 3, Model Application Guidelines*]

- xxGRATESB.SYN [For Format, see Table D-2 of TR3]
- SCHOOL.00T [For Format, see Table D-4 of TR3]
- ZDATA1B.00T [For Format, see Table D-10 of TR3]
- ZDATA2.00T [For Format, see Table D-11 of TR3]
- ZDATA3B.00T [For Format, see Table D-12 of TR3]

Appendix B

EXTERNAL STATION DATA

[**A Note:** For format, see the table (shown in parenthesis) of *Technical Report 3, Model Application Guidelines*]

- EETRIPS.DBF [For Format, see Table D-12 of TR3]
- ZDATA4B.00B [For Format, see Table D-13 of TR3]

Appendix C

SELECTED HIGHWAY NETWORK DATA AND PARAMETERS

[**A Note:** For format, see the table (shown in parenthesis) of *Technical Report 3, Model Application Guidelines*]

- HELABELS.SYN
- HESCREEN.SYN
- PROFILE.MAS
- RMSE.SYN
- SPDCAP.00T (*)
- VFACTORS.00T

(*) Sample listings are provided in this report for these voluminous files.

Appendix D

SELECTED TRANSIT NETWORK DATA AND PARAMETERS

[**A Note:** For format, see the table (shown in parenthesis) of *Technical Report 3, Model Application Guidelines*]

- SDLAYUPD [For Format, see Table D-4 of TR3]
- STATDATA [For Format, see Table D-6 of TR3]
- TROUTE.LIN