



Transit Ridership Forecasting Methodology Hillsborough MPO Transit Study

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The West Central Florida Regional Planning Model (WCFRPM) was used for ridership projections during the Hillsborough County MPO Transit Study. The WCFRPM is a TRANPLAN model and covers 11 counties within Florida DOT Districts 1 and 7 (Citrus, Hernando, Pasco, Hillsborough, Pinellas, Polk, Sarasota, Manatee, Hardee, Desoto, and Charlotte). The WCFRPM was used as several proposed corridors in the MPO Transit Study include segments outside District 7, and Florida DOT District 7 developed this model for the Strategic Regional Transit Needs Assessment (SRTNA) Study to assess interregional transit ridership patterns. In addition to ridership forecasts derived from the regional model, sketch planning techniques were used to prepare *maximum potential* boarding estimates for the MPO that reflect higher land-use intensity and increased walkability within one-quarter to one-half mile of each proposed transit station.

Initial Model Runs

Cambridge Systematics, Inc. developed 2050 ridership projections for the following four concepts (excluding Trend) which have been discussed previously:¹

- Trend Scenario – Using the existing 2050 transit network;
- Urban Core;
- Urban Corridors;
- Urban Centers; and
- Urban Core, Corridors, and Centers.

After internal discussions with the Hillsborough County MPO, the project team comprised of Renaissance Planning Group (RPG), Cambridge Systematics (CS), and PB Americas developed service characteristics for the four concepts.² CS coded these concepts along with the updated population and employment projections developed from CorPlan by RPG in the WCFRPM. Since four-step models have minimal analytical capabilities in addressing issues of land use intensity and walkability, *maximum potential*

¹Hillsborough MPO Transit Study, *Transit System Concept Development: Planning Approach and Key Assumptions*, June 2007.

²Hillsborough MPO Transit Study, *Proposed Transit Corridors: Recommended Service Frequencies and Average Speeds*, July 2007.

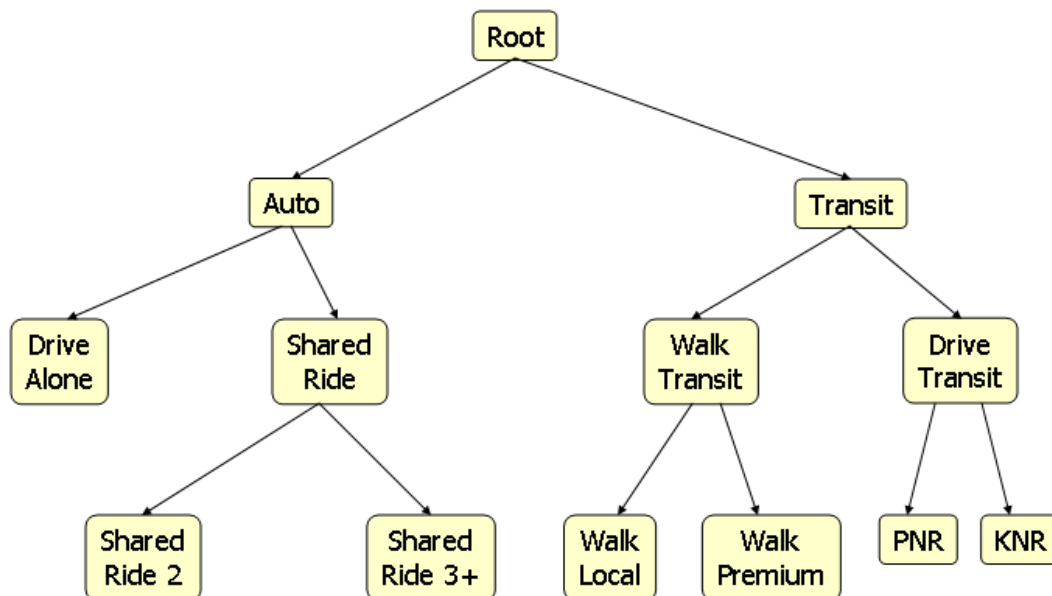
boarding estimates were prepared separately by PB and RPG using sketch planning techniques, as documented elsewhere in this report series.

Mode Choice Model

The WCFRPM uses a nested logit mode choice structure as shown in Figure 1. The modes in the WCFRPM include:

- Drive Alone;
- Shared Ride 2 – Driver and one passenger;
- Shared Ride 3+ – Driver and two or more passengers;
- Walk Local – Walk to local bus;
- Walk Premium – Walk to express bus;
- Park and Ride (PNR) – Drive and park at premium transit (rail or express bus) station; and
- Kiss and Ride (KNR) – Get dropped at premium transit (rail or express bus) station.

Figure 1: Mode Choice Model Structure

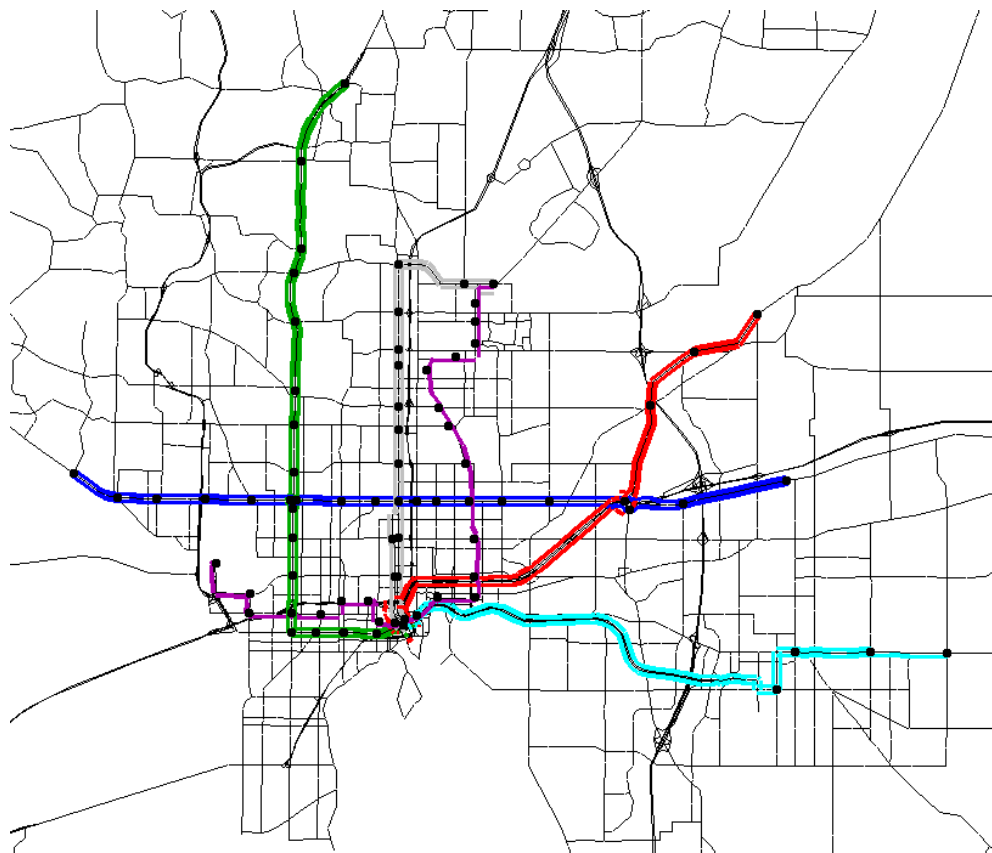


As shown in Figure 1, the model does not have the capability to distinguish between commuter, regional, and light rail modes. The mode choice model segments the market by auto ownership. In terms of auto ownership the market is segmented among households with zero cars available to households with three or more cars available.

Transit Network Coding

The transit routes in the four concepts were added to the 2050 WCFRPM highway network. As an example, Figure 2 shows the routes for the Urban Core concept along with stop and station locations as coded onto the WCFRPM model network. Transit network coding was an iterative process. After reviewing ridership forecasts, transit access connectors were reviewed, changes were made to some stop and station locations, and potentially duplicative routes were removed. Changes to stop and station locations were generally to enhance opportunities for walk access from nearby zones and transfers from local bus routes to the proposed premium transit corridors.

Figure 2: Example of Transit Network Coding



Once the transit networks and stops/stations were coded, the following files were updated to run the model and produce ridership numbers:

- The **PCWALK** file describes the proportion of a TAZ's productions or attractions located within various walk distances and periods of transit service. In the calculation of transit access, distances of **one-third** mile and **one** mile were assumed for the short- and long-walk distances, respectively. These thresholds are consistent with assumptions used in the WCFRPM and the Tampa Bay Regional Planning Model (TBRPM).
- The **STATDATA** file describes permanent park-n-ride (PNR) and kiss-n-ride (KNR) locations for rail and express bus stations. As part of this modeling effort, the maximum distance (in miles), number of available parking spaces, and peak and offpeak parking costs were revised in this file. In the initial round of transit model runs it was assumed that people would drive a maximum distance of **10** miles, each parking lot would have **100** spaces, and parking would be free. In revised model runs, the distance and parking costs were kept the same and the number of parking spaces in each parking lot was increased to **800**.
- The **OPTLNK** files contain all optional links (links not in the highway network) which are used in conjunction with the highway links in building the transit network and paths. Most of the optional links were used for the rail system. The speeds used in the optional link file were defined in the service characteristics memo³ given earlier and was not changed between the first and second round of model runs.
- The parameters (**TPARM**) file identifies the parameters used in building the transit network. In this file we assumed that the maximum average speed for express bus is 60 mph and for rail is 58 mph. In addition, it was assumed that an express bus can carry a maximum of 61 passengers and rail can carry a maximum of 660, consistent with current model (TBRPM and WCFRPM) assumptions. In addition, for express bus a layover of five minutes and for a rail a layover of two minutes was assumed. These were not changed between the first and second round of model runs.

³Ibid.

Additional Model Refinements

During the second round of model runs for the Urban Corridors concept, the new routes were tied more closely to existing transit routes by shifting stops and stations to minimize transfer time. In addition, the routes were adjusted such that more activity centers were served by the transit routes. For example, the USF-CBD line was re-routed through the USF campus rather than along the periphery. Highway network coding was reviewed to ensure consistency with the 2025 Cost Feasible Plan. Table 1 compares ridership estimates from the first and second round of the Urban Corridors run. *For each route the greater daily passenger trips between round one and two are highlighted.*

Appendix A shows the results for the four initial concepts as well as the trendline.

Preferred Scenario

The preferred scenario is shown in Figure 3 and is updated from the four concepts. In this scenario all stops from the previous four concepts were reviewed and adjustments were made to account for stops that underperformed. The light rail transit route to St. Petersburg was rerouted to provide direct access to Westshore Plaza.

In addition, the parking costs for USF and Tampa International Airport (TIA) were added to the model based on current permit rates. For USF the long-term parking cost is assumed to be \$4.00 and the short-term parking cost is assumed to be \$1.33. For USF the long-term parking cost is based on a daily visitor rate of \$4.00 and the short-term cost is assumed to be the daily visitor rate up to three hours. For TIA the long-term parking cost is assumed to be \$10.75 and the short-term parking cost is assumed to be \$3.58. The short-term TIA parking cost was arrived at by factoring the daily average rate of \$10.75 by three hours.

Updates to the TAZ socioeconomic data obtained from CorPlan were made to the ZDATA1 and ZDATA2 files for population and employment respectively. Assumptions made in forecasting land use for the preferred scenario are documented elsewhere in this report series. Parking cost data, as described above, were also added to the ZDATA2 file, as required by the regional model.

Table 1: Ridership Changes between Round 1 and 2 of Urban Concepts Scenario

	Concept B - Urban Corridors						Concept B - Urban Corridors (Updated)					
	Daily Passenger Trips			Passenger Miles			Daily Passenger Trips			Passenger Miles		
Corridor	Work	Nonwork	Total	Work	Nonwork	Total	Work	Nonwork	Total	Work	Nonwork	Total
Florida Corridor USF to CBD	1,119	1,743	2,862	7,601	10,751	18,352	1,098	1,712	2,810	7,391	10,627	18,018
Hillsborough Avenue Corridor (Town and Country to Seffner)	441	1,580	2,021	1,993	8,386	10,379	490	1,851	2,341	2,187	8,062	10,249
Dale Mabry Hwy Corridor	1,261	1,972	3,233	13,441	14,780	28,221	1,226	1,908	3,134	13,279	14,173	27,452
U.S. 301 North Corridor	278	406	684	2,603	2,277	4,880	285	417	702	2,672	2,245	4,917
Brandon to CBD			0			0	0	0	0	0	0	0
South Shore to CBD	565	579	1,144	6,179	5,606	11,785	550	566	1,116	5,960	5,504	11,464
Plant City to CBD	350	420	770	5,364	3,670	9,034	317	301	618	5,304	3,714	9,018
USF to Westshore to TIA Light Rail												
New Tampa to USF to Westshore to TIA to Westchase	3,384	3,089	6,473	26,603	14,782	41,385	3,707	3,445	7,152	28,880	16,244	45,124
St. Pete to South Shore	3,625	3,776	7,401	25,846	21,981	47,827	3,684	4,027	7,711	26,485	22,983	49,468
MacDill AFB to Brandon	3,593	4,207	7,800	17,057	14,835	31,892	3,616	4,202	7,818	16,923	14,528	31,451
Total	14,616	17,772	32,388	106,687	97,068	203,755	14,973	18,429	33,402	109,081	98,080	207,161

Figure 3: Preferred Scenario

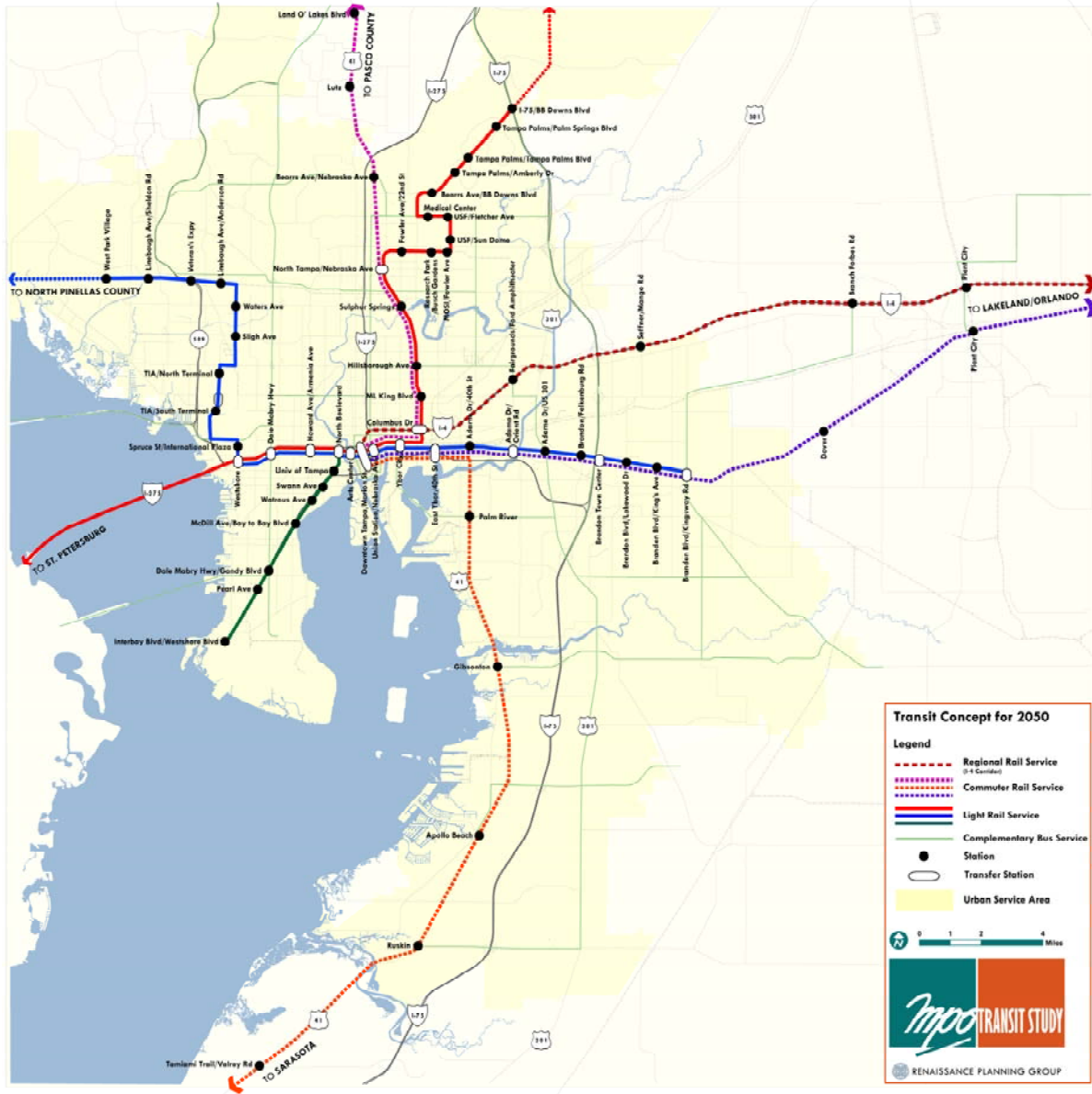


Table 2 shows the results for the preferred scenario and shows that while unlinked ridership on the rail lines is significant, most of the Bus Rapid Transit (BRT) lines are contributing minimally to the overall ridership. Based on the linked mode share totals depicted in Table 3, there is a 112 percent transit ridership increase from the 2050 trend (base) scenario to the preferred scenario.

Table 2: Preferred Scenario Ridership

Corridor	Preferred Scenario (10/9/07) - New ZDATA, Parking Cost, Station Access					
	Daily Passenger Trips			Passenger Miles		
	Work	Nonwork	Total	Work	Nonwork	Total
South Shore BRT	71	245	316	216	748	964
Plant City BRT	31	35	66	45	51	96
BRT Lutz - CBD	390	1,176	1,566	3,269	9,420	12,689
Gibsonton BRT	16	120	136	81	710	791
South Shore to I-4	121	523	644	673	3,022	3,695
Bloomington Ave BRT	23	121	144	126	642	768
Bell Shoals BRT	4	8	12	14	19	33
Lithia to I-4 BRT	174	565	739	724	2,364	3,088
Gandy Boulevard BRT	157	212	369	1,387	1,847	3,234
22nd Causeway BRT	104	478	582	639	3,147	3,786
56th St N BRT	85	103	188	243	330	573
I-75 BRT	87	129	216	624	1,140	1,764
SR 60 BRT	332	738	1,070	3,488	6,292	9,780
Fletcher Nebraska BRT	179	332	511	791	1,876	2,667
Veterans Expy Busch Blvd BRT	211	595	806	1,808	5,774	7,582
Veterans-Dale Mabry Connector BRT	116	321	437	505	1,487	1,992
New Tampa-USF-Westshore-St. Pete	5,339	2,267	7,606	45,909	15,149	61,058
Tampa CBD-Brandon-Plant City-Lakeland	598	345	943	7,013	1,152	8,165
Tampa CBD-Lutz-LoL-Brooksville	975	61	1,036	13,677	551	14,228
Tampa CBD-South Shore-Ruskin-Sarasota	2,018	211	2,229	27,878	1,792	29,670
Lakeland-Plant City-Tampa CBD	438	180	618	5,416	2,121	7,537
Dunedin-Tampa CBD-Brandon	10,190	6,721	16,911	79,403	38,438	117,841
MacDill AFB-Tampa CBD	1,922	904	2,826	7,379	2,821	10,200
Downtown Tampa Streetcar	1,963	2,756	4,719	4,832	7,407	12,239
Unlinked Total	25,544	19,146	44,690	206,140	108,300	314,440

Table 3: Hillsborough County Mode Shares
Preferred versus Trend Scenario

Hillsborough County Trips					Transit Share*	Percent Increase
Trip Purpose	Trend 2050		Preferred Scenario (10/9/07)			
		Auto	Transit*	Auto	Transit*	Trend 2050 versus Preferred Scenario (10/1/07)
HBW	1,612,163	16,420	1,571,671	34,946	58%	113%
HBSH	1,467,734	5,660	1,440,922	11,377	54%	101%
HBSR	701,808	1,586	684,028	3,808	79%	140%
HBO	1,648,938	5,027	1,611,973	10,415	60%	107%
NHB	1,805,650	5,767	1,901,723	12,401	46%	115%
Total	7,236,293	34,460	7,210,317	72,947	57%	112%

Hillsborough County Percent Mode Splits

Trip Purpose	Trend 2050		Preferred Scenario (10/9/07)	
	Auto	Transit*	Auto	Transit*
HBW	98.99%	1.01%	97.82%	2.18%
HBSH	99.62%	0.38%	99.22%	0.78%
HBSR	99.77%	0.23%	99.45%	0.55%
HBO	99.70%	0.30%	99.36%	0.64%
NHB	99.68%	0.32%	99.35%	0.65%
Overall	99.53%	0.47%	99.00%	1.00%

Trip Purposes:

- HBW (Home-Based Work)
- HBSH (Home-Based Shop)
- HBSR (Home-Based Social/Recreation)
- HBO (Home-Based Other)
- NHB (Nonhome-Based)

*These statistics include local bus.

HBW trips represent approximately 57 percent of the transit boardings on routes recommended for the preferred concept, with the remaining 43 percent nonwork. The total 2050 unlinked rail boardings are estimated to be around 37,000 (excluding proposed BRT routes). The split between walk and drive access, respectively, is in the range of 64/36 for HBW to 54/46 for nonwork purposes for the preferred concept. Drive access includes PNR and KNR for premium transit modes only while walk access is allowed for both local bus and premium. The maximum drive distance is 10 miles for PNR and KNR, per defaults in the WCFRPM station data file.

Ridership forecasts were compared with the SRTNA, HARTLine Major Investment Study, and the Tampa Bay Intermodal Centers Study. While the transit corridors and operating characteristics are different from the earlier studies, it is felt that the

WCFRPM ridership forecasts are reasonable in terms of general magnitude when compared to these other studies.

Next Steps

In preparation for updating the MPO's Long-Range Transportation Plan (LRTP), opportunities exist for additional iterative testing that may result in higher boardings at select locations, particularly route end points. Specific origins and destinations could be evaluated to compare drive versus transit travel times using the regional model. District-to-district tabular or desire line summaries should also be conducted using the model to identify the magnitude of trips along major corridors and revise the *maximum potential* sketch ridership estimates for different mode split intervals.

It is also anticipated, in preparation for the LRTP Update, that these same routes will be tested in the coming months with the recently updated TBRPM Version 6.0. The TBRPM Version 6.0 mode choice model is more robust and addresses recent FTA ridership forecasting concerns more explicitly. It is understood that recent transit on-board surveys conducted by FDOT District 7 were also recently incorporated into the Version 6.0 model, resulting in a higher level of confidence for transit modeling. The only disadvantages of using TBRPM Version 6.0 are the requirements for recoding transit routes in the Cube-TP+ TRNBUILD format and the lack of networks and socioeconomic data outside the Florida DOT District 7 area.

Travel demand model refinements and sensitivity tests such as these will be important in addressing the latest FTA requirements for future consideration of New Starts funding.⁴

⁴Federal Transit Administration. "Travel Forecasting for New Starts Proposals – June 2006" and "Travel Forecasting for New Starts Proposals – September 2006." FTA web site: http://www.fta.dot.gov/planning/newstarts/planning_environment_7275.html.

APPENDIX A CONCEPT SCENARIOS RIDERSHIP

	Concept A - Urban Core					
	Daily Passenger Trips			Passenger Miles		
Corridor	Work	Nonwork	Total	Work	Nonwork	Total
Florida Corridor USF to CBD	1,028	1,671	2,699	6,607	10,594	17,201
Hillsborough Avenue Corridor (Town and Country to Seffner)	454	1,431	1,885	2,163	7,810	9,973
Dale Mabry Hwy Corridor	1,627	2,176	3,803	16,516	16,009	32,525
U.S. 301 North Corridor	376	491	867	3,619	3,116	6,735
Brandon to CBD	915	435	1,350	10,902	4,930	15,832
South Shore to CBD			0			0
Plant City to CBD			0			0
USF to Westshore to TIA Light Rail	4,481	5,018	9,499	27,623	23,780	51,403
New Tampa to USF to Westshore to TIA to Westchase						
St. Pete to South Shore						
MacDill AFB to Brandon						
St. Petersburg to Lakeland						
Sarasota to CBD						
Pasco to CBD						
North Pinellas to CBD						
Total	8,881	11,222	20,103	67,430	66,239	133,669

	Concept B - Urban Corridors					
	Daily Passenger Trips			Passenger Miles		
Corridor	Work	Nonwork	Total	Work	Nonwork	Total
Florida Corridor USF to CBD	1,119	1,743	2,862	7,601	10,751	18,352
Hillsborough Avenue Corridor (Town and Country to Seffner)	441	1,580	2,021	1,993	8,386	10,379
Dale Mabry Hwy Corridor	1,261	1,972	3,233	13,441	14,780	28,221
U.S. 301 North Corridor	278	406	684	2,603	2,277	4,880
Brandon to CBD			0			0
South Shore to CBD	565	579	1,144	6,179	5,606	11,785
Plant City to CBD	350	420	770	5,364	3,670	9,034
USF to Westshore to TIA Light Rail						
New Tampa to USF to Westshore to TIA to Westchase	3,384	3,089	6,473	26,603	14,782	41,385
St. Pete to South Shore	3,625	3,776	7,401	25,846	21,981	47,827
MacDill AFB to Brandon	3,593	4,207	7,800	17,057	14,835	31,892
St. Petersburg to Lakeland						
Sarasota to CBD						
Pasco to CBD						
North Pinellas to CBD						
	14,616	17,772	32,388	106,687	97,068	203,755

	Concept C - Urban Centers					
	Daily Passenger Trips			Passenger Miles		
Corridor	Work	Nonwork	Total	Work	Nonwork	Total
Florida Corridor USF to CBD	1,049	2,355	3,404	6,786	13,911	20,697
Hillsborough Avenue Corridor (Town and Country to Seffner)	400	1,143	1,543	1,835	5,975	7,810
Dale Mabry Hwy Corridor	852	1,692	2,544	6,214	11,518	17,732
U.S. 301 North Corridor	325	401	726	3,054	2,233	5,287
Brandon to CBD						
South Shore to CBD	942	952	1,894	10,345	9,535	19,880
Plant City to CBD	396	496	892	5,880	4,524	10,404
USF to Westshore to TIA Light Rail						
New Tampa to USF to Westshore to TIA to Westchase						
St. Pete to South Shore						
MacDill AFB to Brandon						
St. Petersburg to Lakeland	1,124	141	1,265	13,675	1,709	15,384
Sarasota to CBD	1,209	267	1,476	12,159	2,266	14,425
Pasco to CBD	1,222		1,222	17,670		17,670
North Pinellas to CBD	703		703	7,388		7,388
	8,222	7,447	15,669	85,006	51,671	136,677

	Concept ABC - Urban Cores, Corridors and Centers					
	Daily Passenger Trips			Passenger Miles		
Corridor	Work	Nonwork	Total	Work	Nonwork	Total
Florida Corridor USF to CBD	841	1,923	2,764	5,469	11,995	17,464
Hillsborough Avenue Corridor (Town and Country to Seffner)	421	1,513	1,934	1,862	7,977	9,839
Dale Mabry Hwy Corridor	673	2,062	2,735	5,214	16,075	21,289
U.S. 301 North Corridor	285	423	708	2,664	2,302	4,966
Brandon to CBD						
South Shore to CBD	431	510	941	4,231	4,587	8,818
Plant City to CBD	342	405	747	5,235	4,539	9,774
USF to Westshore to TIA Light rail			0			0
New Tampa to USF to Westshore to TIA to Westchase	2,923	2,258	5,181	24,410	9,520	33,930
St. Pete to South Shore	4,821	4,478	9,299	40,686	31,592	72,278
MacDill AFB to Brandon	3,671	3,634	7,305	17,862	13,149	31,011
St. Petersburg to Lakeland	497	253	750	5,322	1,659	6,981
Sarasota to CBD	426	200	626	4,336	1,679	6,015
Pasco to CBD	936		936	16,931		16,931
North Pinellas to CBD	475		475	7,012		7,012
	16,742	17,659	34,401	141,234	105,074	246,308