SOUTH FLORIDA REGIONAL TRANSPORTATION AUTHORITY

SEGMENT 5

Before & After Study

submitted to:

Federal Transit Administration

submitted by:

South Florida Regional Transportation Authority

submittal date:

November 2009

Revised May 2010

SOUTH FLORIDA REGIONAL TRANSPORTATION AUTHORITY

TRI-RAIL DOUBLE-TRACK CORRIDOR IMPROVEMENT PROGRAM SEGMENT 5 BEFORE-AND-AFTER STUDY

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S. EXECUTIVE SUMMARY

In January 1989, Tri-County Commuter Rail Authority (Tri-Rail) was established to provide interim commuter rail service along a 67 mile corridor between the West Palm Beach Station in Palm Beach County and the Hialeah Market Station in Miami-Dade County after the 1988 Florida Department of Transportation (FDOT) purchase of the South Florida Rail Corridor (SFRC) from CSX Transportation Inc. In 1997 and 1998, Tri-Rail service was extended to the Mangonia Park Station in Palm Beach County (the northern terminus) and to the Miami International Airport Station in Miami-Dade County (the southern terminus), respectively.

In 2003, the South Florida Regional Transportation Authority (SFRTA), a tri-county federal public transit authority, was created by the Florida Legislature and enacted by FDOT, replacing the existing Tri-County Commuter Rail Authority. The purpose for creating SFRTA was to expand cooperation between Tri-Rail commuter rail services and the county transit operators and planning agencies within Palm Beach, Broward, and Miami-Dade County.

The SFRTA provides Tri-Rail commuter rail service over a 72-mile corridor that spans Palm Beach County, Broward County, and Miami-Dade County with service to 18 stations. Tri-Rail primarily runs through the regional eastern urbanized areas and services passes by the major downtowns of the various cities of each county starting from the Mangonia Park station in Palm Beach County continuing traveling south to Miami International Airport (MIA) in Miami-Dade County.

SFRTA has undertaken the Double Track Corridor Improvement Program Segment 5 Project to significantly enhance the service reliability of commuter rail on SFRC. This project also serves to reduce rail congestion in the SFRC and scheduling conflicts with Amtrak, CSXT and Tri-Rail and improve peak period service by providing sufficient rail capacity to allow Tri-Rail service to operate at 20-minute headways during the morning and evening rush hour periods.

The Segment 5 improvements include construction of a second mainline track along the current 71.7 miles of rail right-of-way, rehabilitation upgrading the grade crossing and signal system, modifications and renovations of existing stations and construction of a new station and parking improvements, acquisition of new rolling stock, improvements to the Hialeah Maintenance Yard Maintenance facility and construction of a new upgrading of the existing , northern maintenance/layover facility.

Improvements to the four other previous segments, while part of the overall Double Track Corridor Improvement Program of the commuter line, are not included in the Segment 5 project. These previous improvements include new track installations along the first four segments, the upgrading of the existing Hialeah Maintenance Yard, and the replacement construction of the New River Bridge which is a high clearance two-track bridge at the west branch of the New River in Fort Lauderdale.

Since the FTA approved an amendment to the FFGA originally awarded to the SFRTA May 2000, new federal regulations required preparation of a Before and After

Study (B&AS). The B&AS has two primary purposes: (1) to document the costs and impacts of the major transit investments; and, (2) to identify lessons learned in the process of developing those investments to improve the technical methods and procedures used in the planning and development of future investments.

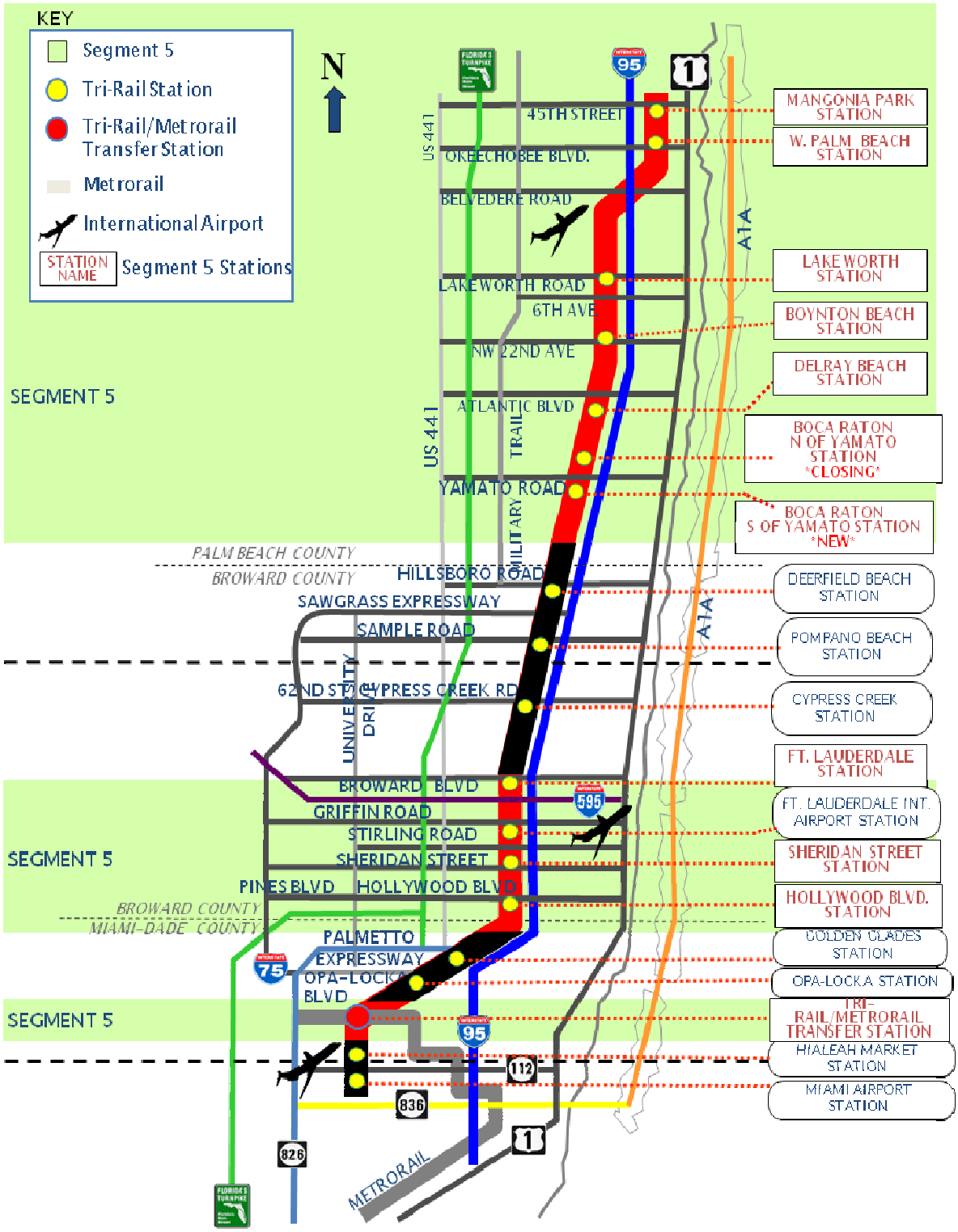
The successful development and completion of the Double Track Corridor Improvement Program Segment 5 project was evaluated throughout several project milestones. These milestones include the Environmental Assessment (EA) (October 1999), Full Funding Grant Agreement (FFGA) (May 2000) Amended Full Funding Grant Agreement (Amended FFGA) (approved by FTA April 2004) and the Actual Scope at completion of construction and start of revenue service operation (March 2006). These milestones represent the before period. The after period is defined as two years after project implementation as specified by FTA guidelines. On March 27, 2006, the SFRTA began operating revenue service along the 43.55 miles of additional double track mainline at the proposed 20-minute peak hour commuter rail schedule. Therefore, the after period is represented by the two-year anniversary of the opening service date or spring 2008.

An overview of the analysis for each of the four areas analyses to include project scope and capital cost, level of service, operations and maintenance, and ridership are presented as a summary for the B&AS.

S.1 Project Scope and Capital Cost

An analysis of the changes to the scope and capital cost estimates for the Double Track Corridor Improvement Segment 5 Project was performed. This analysis included a review of the scope for the before period and the Actual Scope at completion of construction or after period. The Amended FFGA was the last budget and scope approved by the FTA for the project prior to completion of construction. Figure S-1 highlights the location of the Segment 5 improvements along the SFRC.

Figure S-1:
Segment 5 Project Improvement Map



S.1.1 Project Scope at Completion

The following provides an overview of the project scope according to specific project infrastructure or classification for the after period. There were no fundamental changes made in scope of the project during the construction phase. However, change orders were issued as circumstances arose during the construction process.

***Guideway**:* 43.55 miles of second mainline track were installed. Eleven (11) new bridges were built, four (4) were replaced and nine (9) were rehabilitated.

***Stations**:* Nine (9) existing stations were rebuilt to accommodate the second mainline track. One (1) existing station was demolished (Boca Raton north of Yamato Road) and one (1) new was built (Boca Raton south of Yamato Road).

***Yard and Shop Facilities*:** Renovation and expansion of the existing West Palm Beach Maintenance and Layover Facility was completed to accommodate the additional locomotives and rolling stock required to operate the 20 minute peak period frequency service.

Special Conditions: Design and construction of ten (10) passenger overpasses with elevators and landscaping around the stations was completed as proposed in the amended FFGA. Additional parking was built at one (1) station.

Systems: The completed work included the procurement, installation and testing of the signal system and installation of new track circuits and control systems; signal bungalows and cases; and switch machines. Safety upgrades were completed at 70 grade crossings.

***Right-of-Way (ROW)*:** Thirty five (35) parcels were acquired as fee simple, easement or transit use permits, and five (5) parcels were modifications to FDOT/FHWA transit use parcels.

Vehicles: Five (5) refurbished locomotives and two (2) new cab coaches were purchased in September 2006 to operate the 20 minute peak period frequency service. The five (5) locomotives have already been delivered. The cab coaches are expected to be delivered in late 2009.

***Professional Services*:** The PMC role was provided by the firm DMJM-Harris. The PMC contract consisted of two phases: Phase I for developing the documents and assisting SFRTA/Tri-Rail in the procurement of a Design Build Contractor, and Phase II for the oversight of the design build contract.

A direct-pay purchase order process was utilized for the procurement of materials. Using this process resulted in a net savings of $3.8 million.

***Contingency*:** The contingency reserve was depleted by transferring monies to cover change orders in the Design Build contract, which were issued to account for events that resulted in added costs during the construction process.

S.1.2 Findings

The overall differences between the capital cost estimate presented in the amended FFGA and the actual cost were less than four percent (4%). The sharp differences between the estimate and the actual budget for each of the cost categories can be explained by the changes in scope that were made to maintain a relatively constant bottom line, such as upgrading the existing yard and shops instead of replacing them with a new facility. This small variance between estimated capital cost and actual cost demonstrates the SFRTA's effective management of the construction to ensure that project scope and additional costs were properly maintained in accordance with estimates. Table S-1 compares the estimates presented in the FFGA with the actual costs.

Table S-1:
Comparative Analysis of Capital Costs

FTA Standard Cost Category		FFGA (2002)	Amended FFGA (2004)	Actual (2007)	
		A	B	C	D
		Total	Total	Total	Percent Change w/Amended FFGA
10	Guideway	$83,478,334	$98,093,495	$105,155,870	7.2%
20	Stations	$37,384,871	$35,459,100	$38,080,780	7.4%
30	Yard and Shops	$22,681,248	$1,500,000	$3,159,400	110.6%
40	Sitework & Special Conditions	$14,617,222	$38,405,763	$41,528,346	8.1%
50	Systems	$64,298,410	$49,899,118	$63,585,126	27.4%
60	ROW	$8,363,525	$12,005,631	$8,050,000	-32.9%
70	Vehicles	$21,659,375	$13,650,000	$11,125,187	-18.5%
80	Professional Services				
	PMC	$11,100,652	$29,918,184	$35,900,381	20.0%
	Administration	$1,855,620	$2,055,620	$2,500,051	21.6%
	Flagging by CSX	$6,525,648	$3,498,495	$7,972,921	127.9%
	Testing Inspection by CSX	$1,350,076	$7,380,450	$4,380,450	-40.6%
	Before and After Study		$546,901	$546,901	0%
	Insurance, Permits, Misc.		$11,978,557	$23,646,486	97.4%
90	Contingency	$53,685,019	$29,496,246	0	-100%
	Total	$327,000,000	$333,887,560	$345,631,899	3.5%

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

S.2 Level of Service

The implementation of the Double Track Corridor Improvement Program Segment 5 Project resulted in changes in the level-of-service (LOS) related to the operation of Tri-Rail as well as to connecting local bus service. As a result, it is required by FTA to document changes in the frequency and quantity of service provided by the SFRTA through the development and implementation of the Segment 5 Project.

S.2.1 Tri-Rail Commuter Rail Service Improvements

The following table presents the improvements to Tri-Rail's service span, headway, and vehicle trips by direction experienced on a typical weekday for the before and after periods. After the Segment 5 Project was implemented, headways improved by 300 percent (300%) during the weekday peak period and 50 percent (50%) during the off-peak period. The total number of vehicle trips southbound and northbound increased by 79 percent (79%). Overall, Tri-Rail patrons are being provided more frequent service over a longer span of service, but especially during the peak travel periods, as a result of the Double Track Corridor Improvement Program Segment 5 Project.

Table S-2:
Tri-Rail Level of Weekday Service Summary

Direction	Route Start	Route Finish	Span (Hours: Minutes)	Headway (AM/PM Peak)	Headway (Midday)	Train Trips
Before Period (Prior to System Opening-2005)						
Northbound	4:19 AM	10:18 PM	18:00	60	90	15
Southbound	4:24 AM	10:39 PM	18:15	60	90	15
After Period (Two Years after System Opening-2008)						
Northbound	4:20 AM	11:05 PM	18:45	20	60	25
Southbound	4:00 AM	10:25 PM	18:25	20	60	25

Source: SFRTA 2005 and 2008 Timetable

S.2.2 Local Bus Service

A comparison between the before and after periods found that following the installation of the Segment 5 Project the average headways or frequency that buses serve Tri-Rail stations were increased or improved by as much as 67 percent (67%) to provide more frequent service and improve connections with local bus service. This demonstrates that local transit operators responded to higher Tri-Rail service frequency with more frequent headways to improve connectivity at stations.

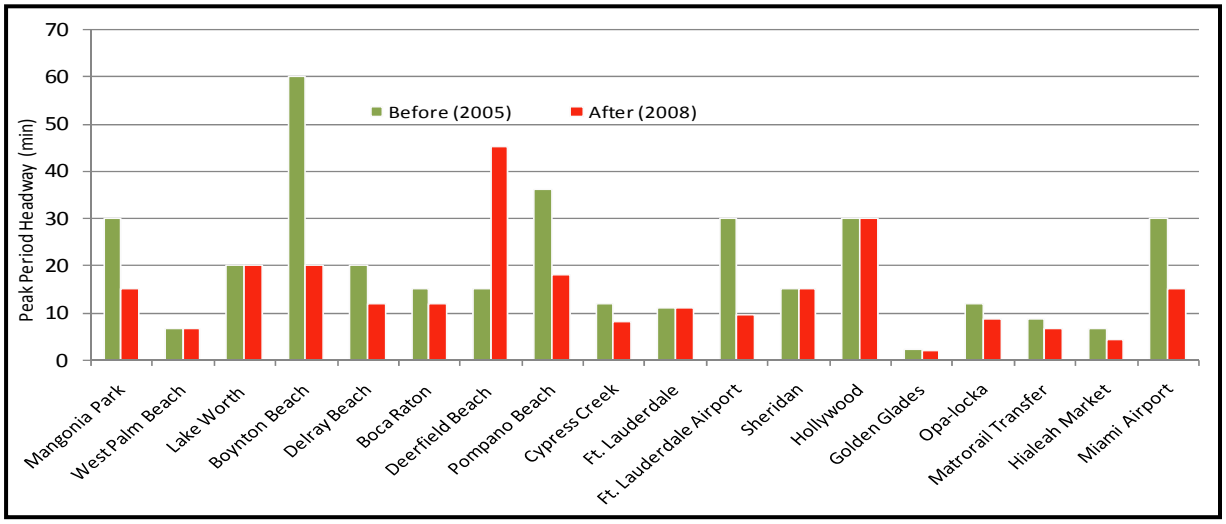
Table S-3:
Local Bus Peak Period Headway Before and After Periods

County	Level-of-Service	Average Local Bus Headway (min)		
	Station	Before (2005)	After (2008)	Change (%)
West Palm Beach	Mangonia Park	30	15	50%
	West Palm Beach	7	7	0%
	Lake Worth	20	20	0%
	Boynton Beach	60	20	67%
	Delray Beach	20	12	40%
	Boca Raton	15	12	20%
Broward County	Deerfield Beach	15	45	200%
	Pompano Beach	36	18	50%
	Cypress Creek	12	8	32%
	Fort Lauderdale	11	11	0%
	Fort Lauderdale Airport	30	10	67%
	Sheridan	15	15	0%
	Hollywood	30	30	0%
Miami-Dade County	Golden Glades	2	2	0%
	Opa-locka	12	7	28%
	Metrorail Transfer	9	7	22%
	Hialeah Market	7	4	34%
	Miami Airport	30	15	50%

Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

Eight (8) new bus routes that serve Tri-Rail stations were added between the before and after periods. Palm Beach and Broward Counties had the highest number of new bus routes, which included three (3) new routes to serve the growing demand for connections to Tri-Rail. Overall, local bus service to Tri-Rail stations increased by 31 percent (31%), and average headway was reduced by 28 percent (28%).

Figure S-2:
Comparison of Local Bus Peak Period Headway for the Before and After Periods



Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

S.2.3 Shuttle Bus Service

Fifteen new shuttle routes were provided throughout the regional system between the before and after periods. Specifically, five (5) new routes were provided that connect Tri-Rail service to downtown Fort Lauderdale, the Fort Lauderdale-Hollywood Airport, the Broward County Convention Center, and Port Everglades.

S.2.4 Findings

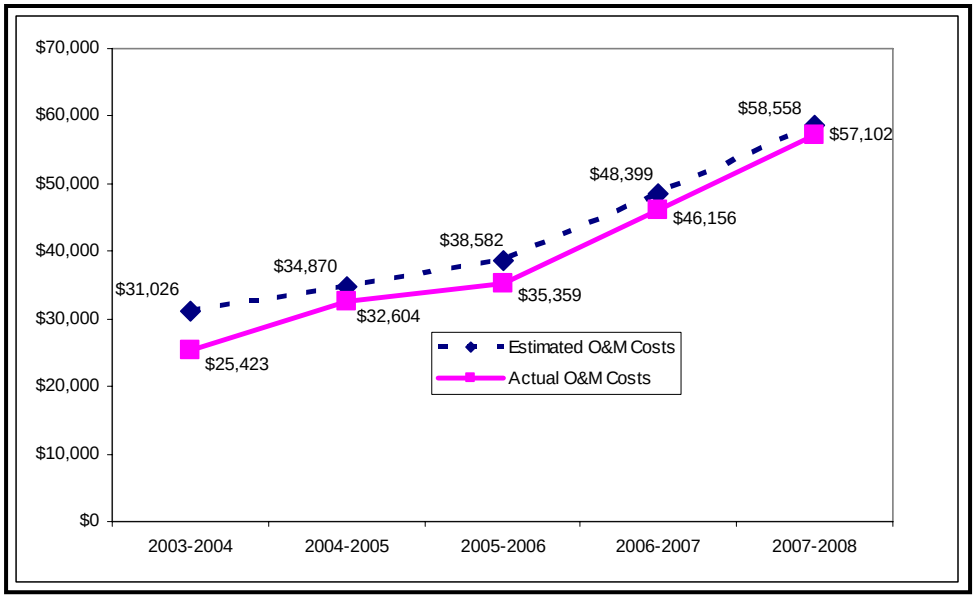
Upon evaluation of the LOS data presented for the before and after periods of the project, SFRTA has improved its LOS with respect to frequency, service span and on-time performance. Running times and hours of operation also have expanded since the implementation of the Double Track Corridor Improvement Program Segment 5 Project. The increase in the number of trains has provided SFRTA with the opportunity to improve service to its customers, evidence of which is an increase in ridership since March 2006.

S.3 Operations and Maintenance Costs

Trends and associated changes to Operation and Maintenance (O&M) costs that resulted from the completion of the Double Track Corridor Improvement Program Segment 5 Project were analyzed. The development of O&M cost estimates for the Segment 5 project was based on historic operating expenses. An analysis of these cost comparisons for the before and after periods was performed to identify factors contributing to differences in costs.

Figure S-3 shows the comparison of several years of actual and budgeted total costs for SFRTA. The figure illustrates that actual total O&M costs are very close to the predicted costs -- this is a result of thorough planning efforts on behalf of SFRTA, and also the fact that many of its services are contracted and their prices are fixed, in some cases years in advance.

Figure S-3:
Estimated and Actual O&M Costs at Different Years in the Thousands of Year of Expenditure Dollars



Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, February 21, 2003 and FTA National Transit Database

Additional analysis on a per unit cost basis determined that train operations increased seven percent (7%) per revenue hour primarily resulting from the increase in commuter rail service frequency from 30 to 50 trains per day. However, all other associated operation costs declined on a unit cost basis.

S.3.1 Findings

The estimates of the O&M costs during the before period were in-line with that actually experienced by the SFRTA. Based on comparison of the before and after periods, unit costs have not changed appreciably and the SFRTA appears to be operating at the same efficiency as it was in the "before" period. Comparison of SFRTA actual costs with those of other peer agencies, illustrate that the operating costs of SFRTA are lower than other agencies. A calculated average per revenue hour O&M costs of Caltrans, ACE, TRE, Coaster, VRE, and Sounder determined that per train revenue hour cost of those agencies is $718.[1] SFRTA's per train revenue hour O&M cost in the after period was $691.

[1] Using 2006 NTD data.

S.4 Ridership

The development of ridership projections for the Segment 5 project serves to estimate travel demand, determine estimates of operational revenue, and facilitate operations planning related to projected passenger capacity. As part of the B&AS, an assessment of the quality of ridership projection estimates of a project prior to implementation is compared with actual ridership of a project that is in operation after construction is compete.

The travel demand forecasting model used to estimate ridership for the Segment 5 Project is the Florida Department of Transportation (FDOT) Southeast Regional Planning Model IV (SERPM-IV). The SERPM model forecasts highway and transit travel modes for all three counties (Palm Beach, Broward and Miami-Dade) served by Tri-Rail commuter rail service. The SERPM-IV produces daily, AM, and PM peak period travel forecasts. In addition, SERPM-IV estimates transit passenger activity on routes, at transit stops and at Tri-Rail stations. This information is often necessary for station sizing and estimation of park and ride lot sizes.

The demand forecast results produced for the Segment 5 project focused on total ridership as well as peak hour station and transit line ridership volumes, primarily for the 2020 forecast year.

S.4.1 Findings

S.4.1.1 Modeled Estimates

Tri-Rail ridership estimates from the FFGA-2015 forecast proved higher than observed boardings for both before and after periods. The FFGA-2015 Model estimates were based upon a transit network that included projects such as the MDT North Corridor Metrorail Extension, Miami Intermodal Center (MIC), and future Miami East-West Metrorail Extension each being in place. The model also made assumptions that a population growth of 30 percent (30%) would occur in the South Florida region. These projects had not been implemented which is a major factor as to why the estimated model results over predicted the actual numbers for both before and after periods as stated in the FFGA.

The FFGA 2015 forecast estimated total transit trips of 818,175 for year 2015, and the amended FFGA-2020 estimated 769,244 transit trips by 2020. Tri-Rail ridership estimated in FFGA-2015 forecasts is 42,132 passenger trips and Amended FFGA-2020 shows only 22,221 trips for year 2020. This large disparity between those model forecasts is consistently observed across all modes except Express Bus.

The amended FFGA-2020 model forecast estimated total transit trips of 769,244 for year 2020, and the Tri-Rail ridership of 22,221 trips for year 2020. Observed Tri-Rail boardings for 2005 and 2008 closely match those levels forecasted in the amended FFGA-2020 model. These amended FFGA forecasts resulted in a more accurate ridership estimate based upon the following:

- Application of 2000 census data which merged the south Florida Urbanized Areas (UZAs) of Miami-Hialeah, Fort Lauderdale-Hollywood-Pompano Beach; and West Palm Beach-Boca Raton-Delray Beach into one UZA.
- MPO adopted 2020 TAZ data for the three counties (Palm Beach, Broward and Miami-Dade);
- An updated 2020 LRTP to include a revised listing of a financially cost feasible projects that did not include the Miami-Dade North Corridor project (2007 projected opening) and the Miami-Dade East-West line (2010 projected opening) being in place.

In the year 2005, the amended FFGA-2020 model estimated average weekday ridership of 10,927 trips, in comparison to the actual observed average weekday boardings of 9,446 unlinked trips. The Tri-Rail annual ridership predicted with the amended FFGA-2020 model was an estimated 4.8 million passenger trips in 2008. The actual Tri-Rail ridership total was similar, with 4.3 million trips in 2008.

S.4.1.2 Ridership Patterns

Overall, transit ridership in the Tri-Rail service area (Miami-Dade, Broward and Palm Beach Counties) has seen an impressive increase (17%) between 2005 and 2008. In 2005, average daily ridership throughout the system totaled about 488,491 trips and in 2008, transit ridership grew to 572,349 trips per day. During the same period Tri-Rail boardings grew by 56 percent (56%). Similarly, local bus and Metrorail ridership also increased moderately by 18 percent (18%) between the before and after periods.

In 2008, the Tri-Rail system found its highest share of ridership in Broward County (37%), followed by Palm Beach County with 34 percent (34%). Miami-Dade County accounted for the lowest share of Tri-Rail ridership with 29 percent (29%) of total ridership. During the before and after periods about 13 percent (13%) of all Tri-Rail boardings were observed at the Metrorail Transfer Station, where connections between Metrorail and Tri-Rail are made.

As a result of this analysis, it was determined that the growth in Tri-Rail ridership began in the first half of 2008 (January-May 2008) with a moderate increase ranging from 35 to 53 percent (35-53%) during that time period. This trend increased significantly during the summer of 2008, when Tri-Rail experienced an unprecedented growth in ridership that approached an increase of 100 percent (100%).

Tri-Rail improved headways by 50 percent (50%) during the peak period and 33 percent (33%) during off-peak period between the before and after periods. During the after period, Tri-Rail span of service increased three percent (3%) and local bus headways improved by 28 percent (28%). These combined factors contributed heavily to the overall growth of Tri-Rail ridership between 2005 and 2008.

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PREFACE AND PLANNING HISTORY

The South Florida Regional Transportation Authority (SFRTA), the operator of Tri-Rail, has undertaken the Double Track Corridor Improvement Program Segment 5 Project to significantly enhance the service reliability of commuter rail on the South Florida Rail Corridor (SFRC). Since the FTA approved an amendment to the FFGA originally awarded to the SFRTA May 2000, new federal regulations required preparation of a Before and After Study. The B&AS has two primary purposes: (1) to document the costs and impacts of the major transit investments; and, (2) to identify lessons learned in the process of developing those investments to improve the technical methods and procedures used in the planning and development of future investments.

This B&AS document is organized into a preface and four chapters of analysis. This preface describes the planning and project development process according to the guidelines set by the FTA, as well as project history documentation of the SFRTA Double Track Corridor Improvement Program Segment 5 Project.

Overview of the FTA New Starts Planning and Project Development Process

At the initiation of this B&AS, the FTA's New Starts grant program for major capital investments in fixed guideway public transit – Section 5309 of Title 49 of the United States Code (49 USC, Section 5309) – was operating under the SAFETEA-LU guidance and the Final Rule of 2000. The Final Rule requires that New Starts projects undergo a B&AS. In order for a project to receive federal funding, it is required to complete a number of studies to meet the requirements of the Metropolitan Transportation Planning process and the National Environmental Policy Act (NEPA). These steps are overseen by the FTA through a Project Management Oversight Consultant (PMOC) that ensures that the sponsors of candidate projects are technically and financially capable of carrying out the planning and development of a major investment in fixed-guideway public transportation. Figure 1 illustrates the steps of the project development process through which a candidate project must proceed to qualify for Federal funds.

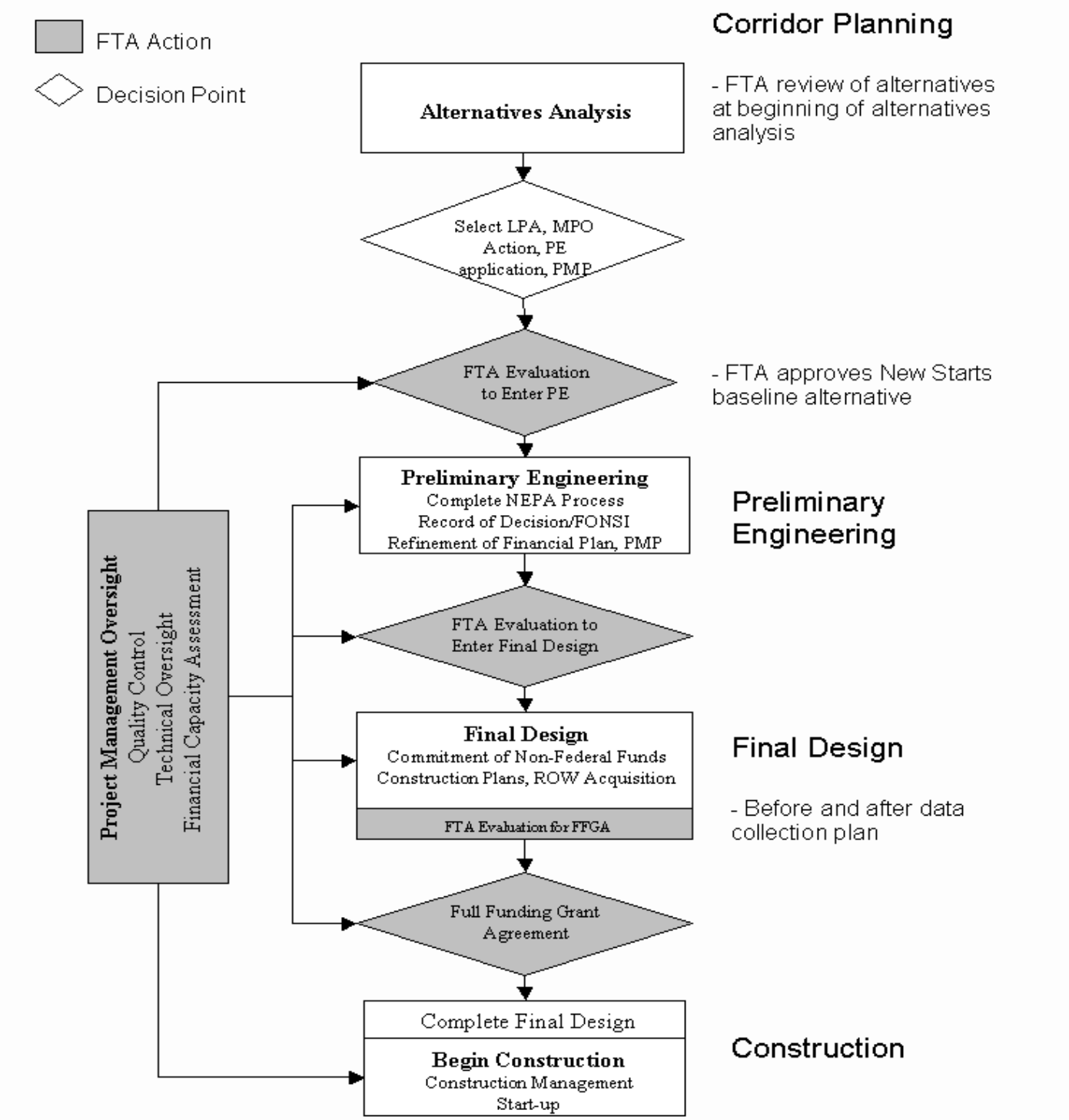
Alternatives Analysis

Candidate New Starts projects must be recommended by the Metropolitan Transportation Planning process to be considered for FTA funding. The Metropolitan Planning Organization (MPO) overseeing transportation for a given corridor must approve a Locally Preferred Alternative (LPA) that has been recommended in an Alternatives Analysis (AA) and has completed environmental documentation such as an Environmental Assessment (EA) or a Environmental Impact Statement (EIS). The FTA states that this LPA must then be incorporated into the MPO's financially-constrained long-range transportation plan before it can qualify for Preliminary Engineering (PE).

Preliminary Engineering

FTA grants permission to enter PE when the Alternatives Analysis is completed and the project sponsor has shown that it has the financial and technical capacity to successfully complete planning and development of the project.

Figure P-1:
FTA Project Development Process



Source: New Starts: An introduction to FTA's Capital Investment Program

At this point, the project sponsor begins refining the conceptual engineering to provide more precise cost and ridership projections for the project. Similarly, after receiving public input on the EA or DEIS, the project sponsor completes the environmental documentation to satisfy NEPA requirements. Once the sponsoring agency has compiled a refined financial plan, completed preliminary engineering and has received approval of the environmental documentation, an application is made to enter Final Design (FD).

Final Design

In the FD phase, the project sponsor receives commitments from local and state agencies for the local funding match, prepares construction plans, and begins acquiring any necessary right-of-way (ROW) for the project. FD is completed when final construction, operation, management and financial plans are completed and have received FTA review. At this point, a Full Funding Grant Agreement (FFGA) is issued and the agency can begin construction of the proposed project.

An FFGA is a contractual obligation that the FTA provides to local agencies when it is to invest a significant amount of New Starts funding into a locally-developed fixed guideway transit project. FTA provides a commitment to issue Federal funds over a series of years under the 49 USC 5309 New Starts program. In exchange for this commitment the project sponsor commits to completing the project on time, within budget, and in compliance with all applicable Federal requirements. Additionally, the FFGA "locks" the maximum Federal participation in the project, meaning that any cost increases that might occur subsequent to issuance of the agreement must be borne by the local project sponsor. The annual disbursement of Federal funds that is committed in the terms of the FFGA is subject to annual Congressional appropriations.

Planning History and Project Milestones

Environmental Assessment

In April 1999, the Tri-County Commuter Rail Authority (now known as SFRTA), which has provided commuter rail service to Palm Beach, Broward and Miami-Dade Counties on the SFRC corridor since 1989, began a Phase I EA for the Double Track Corridor Improvement Program Segment 5 Project. This project's purpose was to determine the potential environmental consequences of increased service frequency of commuter rail service within the SFRC. The primary objective of the Double Track Corridor Improvement Program Segment 5 Project was to provide 20-minute headways during peak period service. Furthermore, the project was intended to:

- Reduce rail congestion in the SFRC and scheduling conflicts with Amtrak, CSXT and Tri-Rail;
- Increase the effectiveness of commuter rail service to meet the travel demands of current and future transit users;
- Improve the safety and efficiency of commuter, freight and passenger train operations in the SFRC; and,
- Improve peak period service by providing sufficient rail capacity to allow Tri-Rail service to operate at 20-minute headways during the morning and evening rush hour periods.

The Double Track Corridor Improvement Program Segment 5 Project was a package of improvements to the SFRC rail line on which SFRTA's commuter rail system operates. The improvements analyzed in the environmental assessment were as follows:

- Installation of 44.31-miles of a second mainline track within the existing ROW;
- Upgrades to existing track, construction of 12 new bridges to accommodate the second mainline track:
- Reconstruction of four (4) existing bridges and minor repairs to two (2) existing bridges;
- Modification and renovation of nine (9) existing stations;
- Demolition of two (2) existing stations and construction of two (2) new stations;
- Upgrades to the existing signal system on the 44.31 mile segment;
- Installation of an automated grade crossing warning/protection system along the entire corridor;
- Procurement of two (2) locomotives, one (1) coach and two (2) cab cars; and,
- Development of a new maintenance and layover facility north of the Mangonia Park Station.

The Segment 5 project did not include an alternative analysis however an EA was prepared to include a No-Build and Build Alternative and no Baseline or Transportation System Management (TSM) Alternative. The Segment 5 project was unanimously endorsed by the Regional Transit Organization which included County and City Commissioners from Miami-Dade, Broward, and Palm Beach Counties.

After Federal review of the EA for the project, the FTA issued a Finding of No Significant Impact (FONSI) on November 5, 1999. The Segment 5 Project was the last of a series of capital improvement projects that completed the double tracking project for the Tri-Rail system.

Preliminary Engineering

The Double Track Corridor Improvement Program Segment 5 Project received Preliminary Engineering approval on September 18, 1999.

Final Design

The Double Track Corridor Improvement Program Segment 5 Project received Final Design approval on April 24, 2000.

Full Funding Grant Agreement

A FFGA is awarded by the FTA under the United States Department of Transportation (USDOT). An FFGA is granted to support construction and final design of the project, and sets forth the scope of the project that will be constructed using Federal and local funds. The capital cost and ridership predictions submitted to FTA for the November 1999 New Starts submittal remain unchanged through preliminary engineering, final design and the May 2000 FFGA approval.

The Double Track Corridor Improvement Program Segment 5 Project was awarded an FFGA on May 16, 2000. The Federal commitment of 49 USC Section 5309 funds was in the amount of $110,500,000, with a total net project cost of $327,000,000. Project administration and project management funds also were provided under the Section 5309 program. The anticipated revenue operations date (the date service was anticipated to start) was listed as March 31, 2005.

This FFGA agreement outlined the scope of the project which was to include the following elements:

- Installation of 44.31-miles of a second mainline track to be positioned within the existing ROW;
- Construction of 12 new bridges;
- Reconstruction of five (5) existing bridges;
- Construction of a new Palm Beach County maintenance and layover facility;
- Upgraded signal system along the 44.31-mile segment;
- Grade crossing improvements along the 71.70 mile corridor;
- Procurement of five (5) refurbished locomotives and two (2) cab coaches;
- Design and construction of nine (9) passenger overpasses with elevators, procurement and installation of all hardscape, ticket vending machines, furnishings and landscape;
- Design and construction of two (2) new stations and the demolition of one (1) existing station;
- The construction of the New River Bridge (FDOT responsibility); and,
- Property acquisitions of 13 areas adjacent to the existing railroad alignment.

Under the FFGA, it was CSXT's intent to design and construct the Segment 5 project as well as serve as the project manager based upon CSXT's experience in constructing similar types of railroad projects. Furthermore, CSXT also offered to make a contribution of $55 million to the project either through "construction efficiencies" or through an interest free loan. Relying on these representations, SFRTA budgeted a relatively limited amount of funds ($11 million) for project management consultant services. However, after the FFGA was executed, CSXT notified SFRTA that it would not perform the Design Build work and that it could not assist in the financing of the Project. These changes related to the design, construction and implementation of the project and significantly increased the project budget as developed and supported by the 1999 Segment 5 Project Financial Plan.

In addition to these changes, which caused delay on the Notice to Proceed, it was determined that the three south Florida Urbanized Areas (UZAs) of Miami-Hialeah; Fort Lauderdale-Hollywood-Pompano Beach; and West Palm Beach-Boca Raton-Delray Beach would be merged into one (1) UZA under the U.S. Census 2000. This merger impacted the amount of FTA formula funds that SFRTA would receive annually and over the life of the project which was not accounted for in the 1999 Segment 5 Financial Plan.

Both of these unforeseen changes made it necessary for SFRTA to revise the 1999 Segment 5 Project Financial Plan and corresponding budget to reflect the significant increase in project costs, as well as a decrease in the amount of federal funds. The fundamental changes in the plan for constructing and managing the Segment 5 project, coupled with the significant and unanticipated loss of FTA Section 5307 Urbanized Area Formula funds to SFRTA, warranted the necessity for SFRTA to develop an amendment to the FFGA to ensure that SFRTA could build a viable project. As part of the FFGA amendment application, Tri-Rail ridership forecasts were recalibrated with a revised transit network that no longer included two major capital improvement projects (Miami North Corridor Metrorail Extension and Miami East-West Metrorail Extension) to further estimate projected Tri-Rail ridership for the amended FFGA application.

Therefore, the project scope and capital cost, operating cost and ridership estimates prepared to support the amended FFGA application serve as the milestone for comparing the before period with the actual conditions of the after period for the Double Track Corridor Improvement Program Segment 5 Project in the chapters that proceed this section.

Amended Full Funding Grant Agreement

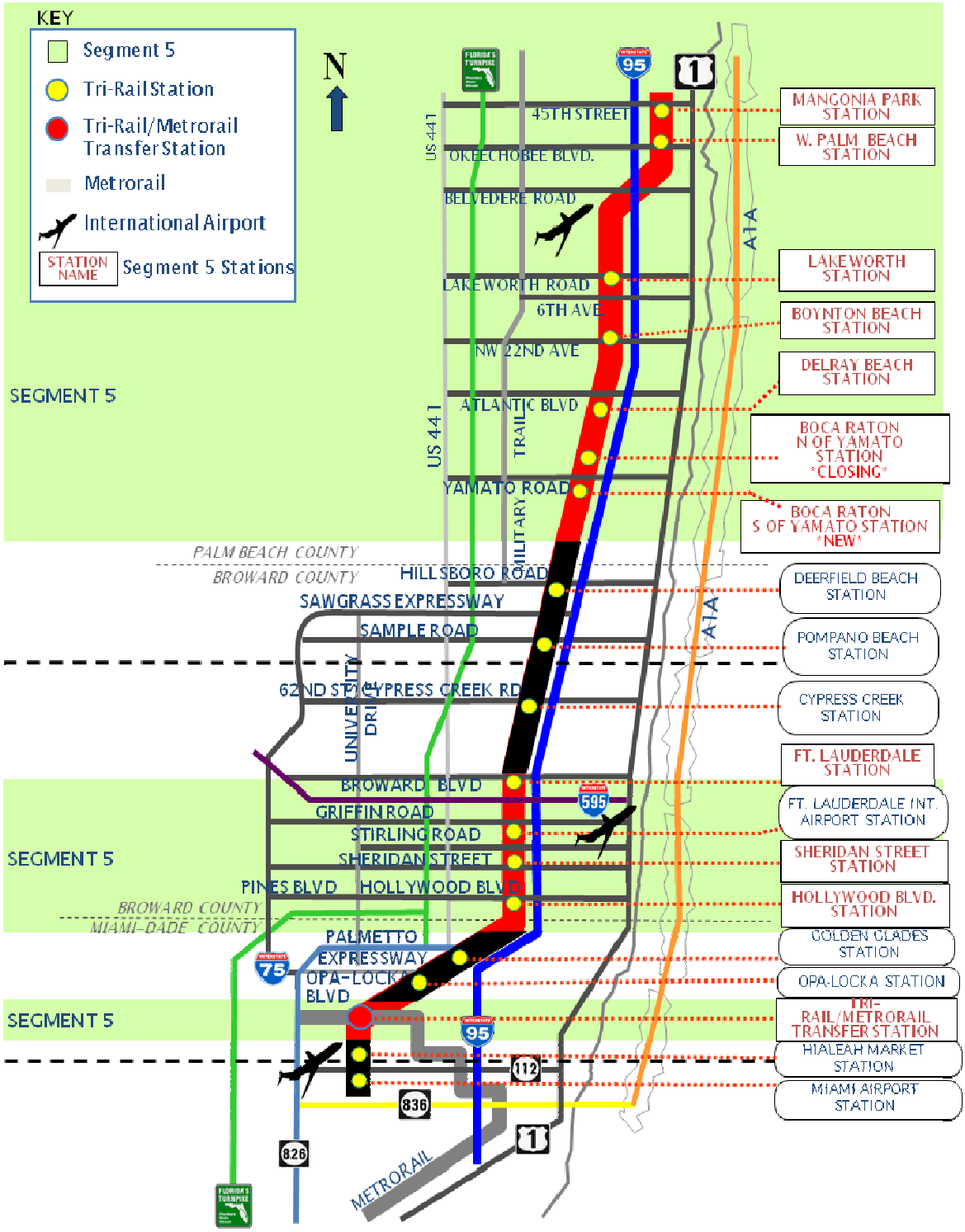
On April 12, 2004, FTA approved an application for an amended FFGA from SFRTA for the Double Track Corridor Improvement Program Segment 5 Project. Under the amended FFGA, the baseline estimated net project cost is $333,887,560 (up from $327 million in the original FFGA). The Revenue Operations (projected opening) date was postponed to March 31, 2006.

- The Amended FFGA included the following elements in the project scope:
- Installation of 44.31-miles of a second mainline track to be positioned within the existing ROW;
- Elimination of the Obstruction Detection System and Global Positioning Warning System;
- Bridge construction of 11 new bridges, down from 12 new bridges in the original FFGA;
- Reconstruction of five (5) existing bridges;
- Upgrading of the West Palm Beach facility, instead of the construction of a new maintenance facility;
- Upgraded signal system along the 44.31-mile segment;
- Grade crossing improvements along the 71.70 mile corridor;
- Purchase of five (5) remanufactured locomotives and two (2) cab coaches;
- Design and construction of ten passenger overpasses with elevators, procurement and installation of all hardscape, ticket vending machines, furnishings and landscape;
- Construction of one (1) new station (Boca Raton-south of Yamato Road), and demolition of one (1) existing station (Boca Raton-north of Yamato Road);
- Elimination of one mile of track work; and,
- Property acquisitions increased to 15 areas (28 parcels) adjacent to the existing railroad alignment, creating a higher impact.

Service Opening

On March 27, 2006, the SFRTA began operating revenue service along the 43.55 miles of additional double track mainline at the proposed 20-minute peak hour commuter rail schedule. Figure P-2 (area shaded in green) illustrates the implementation of the Segment 5 within the Tri-Rail system.

Figure P-2:
Segment 5 Project Improvement Map



1.0 PROJECT SCOPE AND CAPITAL COSTS

1.1 Projected and Actual Project Scope

This chapter presents a review of the changes to the scope and capital cost estimates for the three milestones of the Double Track Corridor Improvement Segment 5 Project: the Environmental Assessment (EA) (November 1999), Full Funding Grant Agreement (FFGA) (May 2000), Amended Full Funding Grant Agreement (Amended FFGA) (April 2004) and the Actual Scope at completion of construction and start of revenue service operation (March 2006). The Amended FFGA was the last budget and scope that was approved by the Federal Transit Administration (FTA) for the project prior to completion of construction and the initiation of revenue service.

This section consists of a presentation of the standard cost categories, scope of work descriptions for each milestone, and a comparative analysis of the three milestones.

1.1.1 Methodology and Rationale

Changes in the scope are described in this report following a breakdown of the major project elements, using the Standard Cost Categories (SCC) established by the FTA. The categories, and the elements contained within each category, are described below:

- Project Description: This category includes a written description of qualitative and quantitative information about the project that would otherwise be left out of the categories described below.
- 10. Guideway: This category includes all elements related to the rail line, such as structures and track-work. Bridges and structures, rails, ties, ballast, direct fixation components, rail fastening systems and special track-work, including crossovers and turnouts, are also included in this category.
- 20. Stations: Elements related to the function of stations are combined under this category. These elements include platform structure, station fixtures, ancillary buildings and urban design.
- 30. Yard and Shop Facilities: This category includes elements associated with yard and shop facilities, including buildings and storage yards.
- 40. Special Conditions: This category includes components of the project that are not directly related with the construction and operation, but are required to allow construction of the project in the environmental context in which it is proposed to be built. These include utility relocation expenses, roadway reconstruction, parking lots, environmental mitigation and landscaping costs.
- 50. Systems: This category includes elements associated with train control and signalization, communication and fare collection systems. This includes traffic signals and similar elements, and fare collection equipment.

- 60. Right-of-Way (ROW): This category includes elements associated with the purchase and management of additional property required for the construction of the Double Track Corridor Improvement Program Segment 5 Project. This category does *not* include property required for environmental mitigation, which is covered under the special conditions category.
- 70. Vehicles: This category includes all revenue and non-revenue vehicles required to operate the 20-minute headway service, together with the maintenance and inspection costs associated with procurement of these vehicles.
- 80. Professional Services (Soft Costs): This category includes engineering, design, project and construction management, project administration, insurance, financing, safety planning and administration, and other similar costs.
- 90. Contingency. Reserve to cover unforeseen costs.

This format has been adapted for use in the Double Track Corridor Improvement Program Segment 5 Project for several reasons. First, the format allows the analysis of project components at sufficient detail to identify how changes in project scope lead to significant changes in capital cost projections. Secondly, because this format has been established by FTA to analyze capital costs, it can be applied readily in the section of this report where the analysis of capital costs is discussed.

Following this format also makes the B&AS study of the Double Track Corridor Improvement Program Segment 5 Project consistent with nationwide practices. It also allows the study to foster the FTA's intention to make information from this New Starts B&AS's usable to transit planners from across the country performing other, similar studies.

1.1.2 Project Scope at Each Milestone

1.1.2.1 Project Scope at Environmental Assessment

Project Description: The EA was completed November 5, 1999, when FTA issued the FONSI. The Double Track Corridor Improvement Program Segment 5 Project included the installation of 44.31 miles of second mainline track within the existing SFRC railroad ROW. Existing sidings were proposed to be incorporated into the design of the additional track. The proposed work includes upgrading and adjusting existing track, relocation of utilities and construction of parallel bridges where required, and rehabilitation of existing bridges. No capital cost estimates were prepared as part of the EA.

Guideway: The project called for construction of 44.31 miles of new track and upgrades to the existing track, including necessary permitting and utility relocation. The construction of twelve new bridges and the replacement of four (4) existing bridges were planned. Also, a new bridge across the New River, a project that is the responsibility of the Florida Department of Transportation (FDOT), was included in the scope definition.

Stations: At the point of the EA milestone, plans for the closure of two (2) existing stations (Boca Raton-Yamato Station and West Palm Beach Airport Station) and the construction of two (2) new stations to replace the closed stations (Boca Raton-Congress Station and Glades Station) were included in the plan. Also included were renovations to nine (9) existing stations. These stations included:

- Mangonia Park;
- West Palm Beach;
- Lake Worth;
- Boynton Beach;
- Delray Beach;
- Fort Lauderdale;
- Sheridan Street
- Hollywood; and,
- Metrorail Transfer.

Yard and Shop Facilities: The EA included demolition, relocation and replacement of the existing Palm Beach County Northern Layover Facility to a new facility north of the Mangonia Park Station.

Special Conditions: No special conditions were identified.

Systems: The plan included a warning/protection system such as automated grade crossing systems and four quadrant gates that would be installed at grade crossings along the entire 71-mile corridor.

Right-of-Way (ROW): At the completion of the EA, it was anticipated that additional ROW and easements would be acquired.

Vehicles: The EA planned for the acquisition of two (2) diesel locomotives, one coach car and two cab cars that would be required to operate the more frequent 20 minute peak period service schedule.

Professional Services: No professional services were identified in the EA project.

1.1.2.2 Project Scope at FFGA

Project Description: In the initial FFGA (May 16, 2000), the Double Track Corridor Improvement Program Segment 5 Project included the installation of 44.31 miles of second mainline track system within the existing railroad ROW. Existing sidings would be incorporated into the track design. The work includes upgrading and adjusting existing track, utility relocation, construction of parallel bridges, and rehabilitation of existing bridges. The project was divided into twelve separate work areas for construction.

Guideway: The FFGA planned for upgrades and adjustments to the existing track, permitting, and utility relocation. The construction of 12 new bridges and the 44.31 miles of guideway replacement of five (5) existing bridges were included in scope. Also, the construction of New River Bridge (FDOT responsibility) was included.

Stations: At the FFGA milestone, design and construction of two (2) new stations (Boca Raton-Congress Station and the Glades Station) were planned and the closing and demolition of one (1) existing station (Boca Raton-Yamato). Modifications and renovation of nine existing stations (Mangonia Park, West Palm Beach, Lake Worth, Boynton Beach, Delray Beach, Fort Lauderdale, Sheridan Street, Hollywood and Metrorail transfer stations) were also planned. The work involved the design and construction of 400-feet long station platforms to allow access to five-car train sets, installation of new canopy structures, passenger overpasses and elevators, installation of hardscape furnishings and landscape.

Yard and Shop Facilities: Demolition and relocation of the existing Palm Beach County Northern Layover Facility was planned. Work included site development of 14-acres, track and signal work, and the design and construction of a new maintenance and layover facility. The proposed facility would include a storage yard to accommodate four car consists, dispensing and storage equipment for diesel fuel, a waste oil recovery facility, a car-washer, administrative/maintenance buildings, and internal roadway and parking areas.

Special Conditions: A total of nine (9) pedestrian bridges were included in the scope at this stage of the project.

Systems: Modifications to the Automatic Highway Crossing System to provide full closure along the 71.7 mile South Florida Rail Corridor (SFRC.) Also included, was the installation of an on-train global positioning warning system, grade crossing video alarms and transmission equipment. The modification included 72 highway grade crossings. The existing signal system along the 44.31 mile segment will be upgraded. Major activities include the procurement, installation, and testing of new track circuits and control systems; signal bungalows and cases; switch machines; automated grade crossing warning systems; four quadrant gates; cabling; and signal foundations.

Right-of-Way (ROW): SFRTA anticipated that the Double Track Corridor Improvement Program Segment 5 Project would impact thirteen (13) areas adjacent to the existing track alignment. Included in these areas is a vacant 14-acre site adjacent to the South Florida Rail Corridor (SFRC) ROW which needs to be purchased and would be used for the construction of a new maintenance and layover facility.

Vehicles: The acquisition of five (5) refurbished diesel locomotives (2 additional/3 replacement vehicles) and two (2) new cab control coaches were planned for purchase.

Professional Services: This contract unit provides for SFRTA's direct oversight, construction management, and administration of the Double Track Corridor Improvement Program Segment 5 Project from planning though engineering

development. This item also provides for staff support of the project (i.e. legal, contracts, finance, planning, etc.) and any miscellaneous administrative costs (i.e. personal computers, copiers, office equipment, furniture, etc.) incurred to support SFRTA staff. This also provides the agency with program management consultant technical services in managing the project through completion.

Contingency: A 16% contingency allowance was applied against the cost of the project to cover uncertainties.

1.1.2.3 Project Scope of the Amended FFGA

Project Description: The initial FFGA was amended on April 12, 2004, when plans were made for the installation of a second mainline track system, 44.31 miles long, to be positioned within the existing ROW. Existing sidings were to be incorporated into the track design. The date on which revenue operations were proposed to begin in the amended FFGA was March 31, 2006.

Guideway: The amended FFGA proposed 44.31 miles of new second track together with upgrades and adjustments to the existing track, permitting, and utility relocation. The amended FFGA also proposed construction of eleven (11) new bridges and the replacement of five (5) existing bridges at twelve (12) canal crossings. Also included were the rehabilitation of eight (8) existing bridges at twelve (12) canal crossings, which were required to accommodate the second mainline track.

The construction of the New River Bridge was not funded under the FFGA and for that reason its costs were not included in the cost analysis for the amended FFGA. However, the construction of this bridge remained a required part of the Double Track Corridor Improvement Segment 5 Project,

Stations: The amended FFGA included the renovation of nine (9) existing stations to accommodate the second mainline track; construction of one (1) new station (Boca Raton-south of Yamato Station); and demolition of one existing station (Boca Raton-north of Yamato Station). The nine (9) stations to be renovated under the amended FFGA include:

- Mangonia Park;
- West Palm Beach;
- Lake Worth;
- Boynton Beach;
- Delray Beach;
- Fort Lauderdale;
- Sheridan Street
- Hollywood; and,
- Metrorail Transfer.

Yard and Shop Facilities: The upgrade of the existing West Palm Beach Maintenance and Layover Facility was included in the amended FFGA. The proposed work included the preparation of design documents and final drawings for constructing storage tracks to accommodate the storage, maintenance and inspection of the additional locomotives and rolling stock required to operate the 20 minute peak period headway service.

Special Conditions: The amended FFGA included the design and construction of ten (10) passenger overpasses with elevators and landscaping around the stations.

Systems: The amended FFGA included the procurement, installation and testing of the signal system; installation of new track circuits and control systems; signal bungalows and cases; and switch machines as well as the installation of new ticket vending machines. The plan also included safety upgrades to 70 grade crossings along the 71.7-mile SFRC corridor.

Right-of-Way (ROW): At the signing of the amended FFGA, it was anticipated that 15 areas, comprising 28 parcels adjacent to the existing track alignment would be acquired to allow for the construction of the second track and other improvements.

Vehicles: The amended FFGA called for the acquisition of five (5) refurbished diesel locomotives and two (2) new cab control coaches.

Professional Services: This element provides for SFRTA's direct oversight, construction management, and administration of the Double Track Corridor Improvement Program Segment 5 Project, from the planning through engineering and development phases. This element also provides for staff support of the project (i.e. legal, contracts, finance, planning, engineering, etc.) and any miscellaneous administrative costs (i.e. personal computers, copiers, office equipment, furniture, etc.) incurred to support SFRTA staff.

The amended FFGA also provides for the agency to hire a Project Management Consultant (PMC) to provide technical services in managing the Double Track Corridor Improvement Program Segment 5 Project through completion. The costs associated with flagging protection and testing and inspection, both activities performed by CSX-T, are included in this category.

Contingency: A project contingency reserve of 8.8 percent (8.8%) of the estimated total budget has been applied against the cost of the project to cover costs or cost overruns.

1.1.2.4 Project Scope at Completion

Project Description: There were no fundamental changes made in the scope of the project during the construction phase. However, change orders were issued as circumstances arose during the construction process. The following describes the final project scope.

Guideway: 43.55 miles of second mainline track were installed. Eleven (11) new bridges were built, four (4) were replaced and nine (9) were rehabilitated.

Stations: Nine (9) existing stations were rebuilt to accommodate the second mainline track. One (1) existing station was demolished (Boca Raton north of Yamato Road) and one (1) new was built (Boca Raton south of Yamato Road).

Yard and Shop Facilities: Renovation and expansion of the existing West Palm Beach Maintenance and Layover Facility was completed to accommodate the additional locomotives and rolling stock required to operate the 20 minute peak period frequency service.

Special Conditions: Design and construction of ten (10) passenger overpasses with elevators and landscaping around the stations was completed as proposed in the amended FFGA. Additional parking was built at one (1) station.

Systems: The completed work included the procurement, installation and testing of the signal system and installation of new track circuits and control systems; signal bungalows and cases; and switch machines. Safety upgrades were completed at 70 grade crossings along the entire corridor.

Right-of-Way (ROW): Of the seventy five (75) parcels identified for the Segment 5 Project, 35 parcels were deleted or combined with other parcels, 35 were acquired as fee simple, easement or transit use permits, and five (5) parcels were modifications to FDOT/FHWA transit use parcels.

Vehicles: As proposed in the amended FFGA, five (5) refurbished locomotives and two (2) new cab coaches were purchased in September 2006 to operate the 20 minute peak period frequency service. The five (5) locomotives have already been delivered. The cab coaches are expected to be delivered in late 2009.

Professional Services: The PMC role was provided by the firm DMJM-Harris. The PMC contract consisted of two phases: Phase I for developing the documents and assisting SFRTA/Tri-Rail in the procurement of a Design Build Contractor, and Phase II for the oversight of the design build contract. Phase I was initiated in October 1999 and Phase II in May 2001. Phase II work was completed in June of 2007. Phase II of the contract is included under the Amended FFGA baseline budget.

A direct-pay purchase order process was utilized for the procurement of materials. Using this process resulted in a net savings of $3.8 million.

Contingency: The contingency reserve was depleted by transferring monies to cover change orders in the Design Build contract, which were issued to account for events that resulted in added costs during the construction process.

1.1.3 Project Scope Comparisons

Of the 166 change orders generated for the Design Build Contract, 106 caused the budget to increase, 26 reduced the budget, and 34 were administrative and had no cost implications. Phase II of the PMC Contract was amended 17 times and was extended to June of 2007.

The changes in scope generated during construction are reflected in the Change Order Log (Appendix 1-1). A comparison of scopes for each project milestone is presented in Table 1-1.

1.1 Projected and Actual Capital Costs

This section compares the budgets of the EA, FFGA, the amended FFGA, and the actual cost of the project at completion. The following sub-sections describe how that information was presented, and reviews the differences in capital cost that occurred between each of these project milestones.

1.1.1 Methodology and Rationale

1.1.1.1 Contract Units

The total budget of the project was made up of six contract units:

Contract Unit 1 – Design-Build Contract: This contract unit provided for the design-build procurement method. The design-build contractor was responsible for the final design and construction of the track, signal, bridge, station improvements, and modifications to the existing maintenance and layover facility in Palm Beach County. This contract unit includes the costs under the Category "A" and Category "B" Work Agreements with CSX Transportation (CSXT) to perform live track construction; signal installation and inspection and testing.

Contract Unit 2 – Project Management Consultant: This contract unit provided for the project management consultant technical services to manage the Double Track Corridor Improvement Program Segment 5 Project through project completion.

Contract Unit 3 – Project Administration: This contract unit provided for the continuation of SFRTA's project oversight, construction management, and administration of the Double Track Corridor Improvement Program Segment 5 Project from planning though engineering development. This item also provided for SFRTA's staff support of the project (i.e., legal, contracts, finance, planning, engineering, etc.) and any miscellaneous administrative costs (i.e., personal computers, copiers, office equipment, furniture, etc.) that were incurred to support SFRTA staff.

Contract Unit 4 – Right-of-Way and Easement Acquisitions: This contract unit provided for the property real estate acquisitions that were required to support the second track and other improvements.

Contract Unit 5 – Revenue Rolling Stock Acquisition: This contract unit provided for the procurement of five additional refurbished locomotives and two new cab coaches that were required to facilitate 20-minute headways during peak weekday periods.

Contract Unit 6 – Before and After Study (B&AS): This contract unit was added in the amended FFGA and provides for the development of the B&AS for the project.

Table 1-1:
Scope Comparison

SCC No.		EA Scope (1999)	FFGA (2000)	Amended FFGA (2004)	Scope at Completion (2007)
10	**Guideway**	• 44.31 miles of second track • Upgrading existing Track • 12 new bridges • Reconstruction of 4 bridges • Construction of New River Bridge	• 44.31 miles of second track • Upgrading existing track • Construction of 12 new bridges • Reconstruction of 5 existing bridges • Construction of the New River Bridge	• 43.31 miles of second track (reduction of one mile) • Upgrading existing track • Construction of 11 new bridges • Replacement of 5 existing bridges • Rehabilitation of 8 existing bridges at 12 canal crossings to accommodate the second track • Construction of New River Bridge (not funded by FFGA)	• 43.55 miles of second track • Upgrading existing track • Construction of 11 new bridges • Replacement of 5 existing bridges • Rehabilitation of 8 existing bridges at 12 canal crossings to accommodate the second track • Repair 2 bridges • Construction of New River Bridge (not funded by FFGA)
20	**Stations**	• Closure of 2 stations: Boca Raton-Yamato and West Palm Beach Airport • Construction of 2 new stations: Boca Raton-Congress and Glades • Renovation of 9 stations. Mangonia Park, West Palm Beach, Lake Worth, Boynton Beach, Delray Beach, Fort Lauderdale, Sheridan Street, Hollywood and Metrorail.	• Closure of one station (Boca Raton – Yamato) • Construction of 2 new stations: Boca Raton-Congress and Glades • Renovation of 9 stations: Mangonia Park, West Palm Beach, Lake Worth , Boynton Beach, Delray Beach, Fort Lauderdale, Sheridan Street, Hollywood and Metrorail	• Renovation of 9 stations. Mangonia Park, West Palm Beach, Lake Worth , Boynton Beach, Delray Beach, Fort Lauderdale, Sheridan St., Hollywood and Metrorail • Closure of 1 station: Boca Raton-Yamato • Construction of 1 new station: Boca Raton-Congress	• Nine stations were renovated, 5 involved the construction of a second platform and 4 involved the construction of both platforms • One station was demolished, Boca Raton, north of Yamato • Construction of new Station at Boca Raton, south of Yamato
30	**Yard and Shop Facilities**	• Demolition and relocation of the existing Palm Beach County Northern Layover Facility to a new 30-acre parcel	• New facility on a 14-acre site.	• Upgrade existing maintenance facility in West Palm Beach	• Upgrade existing maintenance facility in West Palm Beach (not funded by the FFGA)

Table 1—1:
Scope Comparison (Continued)

SCC No.		EA Scope (1999)	FFGA (2000)	Amended FFGA (2004)	Scope at Completion (2007)
40	**Special Conditions**		• 9 Pedestrian bridges	• 10 Pedestrian bridges	• 10 pedestrian bridges • Additional parking at Lake Worth and West Palm Beach Stations
50	**Systems**	• Automated grade crossing systems • Four quadrant gates	• On train GPS • Grade crossing video alarms and transmission equipment for 72 grade crossings • Upgrade of existing traffic control system along the 71.7 mile corridor	• Upgrade of existing signal system along the 71.7 mile corridor • Safety upgrades for 72 grade crossings	• Upgrade of existing traffic control system along the 71.7 mile corridor • Safety upgrade of 70 grade crossings
60	**Right-of-Way**		• Impact to 13 areas adjacent to the existing track alignment	• 28 parcels identified for acquisition	• A total of 75 parcels were identified. Of those, 35 were acquired, the rest were deleted, combined with others or modified to FDOT/FHWA transit use parcels
70	**Vehicles**	• Acquisition of 2 diesel locomotives • One coach • Two cab cars	• Acquisition of 5 refurbished diesel locomotives (2 additional, 3 replacement) • Two new cab control coaches	• Acquisition of 5 refurbished diesel locomotives (2 additional, 3 replacement) • Two new cab control coaches	• Acquisition of 5 refurbished diesel locomotives (2 additional, 3 replacements) • Two new cab control coaches
80	**Professional Services**		• SFRTA Administration costs • Project Management Consultant	• Expanded PMC Contract and Agency administration expenses • Flagging, Testing and Inspection	• PMC Contract and Agency administration expenses • Flagging, Testing and Inspection
90	**Contingency**		• 16 percent contingency	• 8.8 percent contingency	

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

Contract Unit 7 (Originally Contract Unit 6 prior to the amended FFGA) – Contingency: This contract unit provided an overall project contingency allowance of approximately nine percent (9%) of the estimated budget that has been applied against the cost of the project to cover unforeseen events and anticipated project impacts.

In Table 1-2, below, the dollar amounts of each of the contract unit budgets were assigned to the FTA Standard Cost Categories. This provides greater detail and helps in analyzing the differences in the budget between the various project phases.

Table 1-2:
FTA Standard Cost Categories vs. Contract Unit Scope.

SCC Category No.	Description	Contract Unit Used	Comments
10	Guideway	1	Trackwork, Bridges and Roadway or Trackbed
20	Stations	1	
30	Yard and Shops	1	Modifications/Expansion of the existing Yard
40	Sitework and Special Conditions	1	Drainage, Utility Relocations, Site Civil, Mobilizations and Contractor Overhead
50	Systems	1	Signal and Communications work under the D/B Contract. Passenger Information Systems for the stations. Grade Crossing systems
60	Right-of-Way Acquisition	4	
70	Vehicles	5	
80	Professional Services and other soft costs		
	Project Management Consultant	2	
	Agency Costs	3	
	Insurance and Permits	1	
	Inspection and Testing	1	
	Flagging	1	
	Before and After Study	6	
90	Contingency	7	

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

1.1.1.2 Change Order Logs

Change order logs kept by SFRTA to track project modifications also were used as a reference to develop the forecast estimates and actual cost at project completion. The change order logs provided enough detail to allocate the cost to a particular category, and then to identify the reason for the change. The complete Change Order Log has been included as Appendix 1-1.

1.1.2 Capital Cost Estimates

1.1.2.1 Cost Estimate at Contract Unit Level

Table 1-3 presents the projected budget for the FFGA, amended FFGA and the actual costs at completion. The actual costs on the table reflect the status of the budget as of April 2007.

Table 1-3:
Capital Costs as Estimated in the FFGA, Amended FFGA and Actual Costs at Completion

Contract Unit	FFGA (MAY 2000)	Amended FFGA (APRIL 2004)	Actual Costs SFRTA Budget Allocation (AT TIME OF EXPENDITURE UP TO APRIL 2007)
1. D/B Contract – Track, Stations and Systems	$230,335,809	$246,214,978	$287,505,878
2. Project Management Consultant	$11,100,652	$29,918,184	$35,900,382
3. Project Administration	$1,855,620	$2,055,620	$2,500,051
4. Right-of-Way	$8,363,525	$12,005,631	$8,050,000
5. Rolling Stock	$21,659,375	$13,650,000	$11,128,687
6. Before and After Study	$0	$546,901	$546,901
7. Contingency	$53,685,019	$29,496,246	$0
Total	$327,000,000	$333,887,560	**$345,631,899**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

The following sections present the budgets for both of the milestones in greater detail, specifically by assigning the Design-Build Contract costs of Unit No. 1 to the FTA's Standard Cost Categories, as described above.

The dollar amounts shown in Table 1-3 will be used throughout the report. The amounts presented for the actual construction costs are the actual amounts expended throughout the construction period and do not represent the present value of the amounts expended at any specific date. For that reason, an adjustment for inflation was not performed.

1.1.2.2 Capital Cost Estimate for the FFGA

The FFGA capital cost budget is shown in Table 1-4. The Design Build Contract Costs in column A correspond to the engineer's estimate at the time. Column B corresponds to the CSXT budget and column C shows the other contract units that are administered directly by SFRTA and the PMC.

Table 1-4:
FFGA Cost Estimate

FTA Standard Cost Category		FFGA (2002)			
		A	B	C	D
		D/B Contract	CSX	Tri-Rail (Other Contract Units)	Total
10	Guideway	$ 83,478,334			**$83,478,334**
20	Stations	$37,384,871			**$37,384,871**
30	Yard and Shops			$22,681,248	**$22,681,248**
40	Sitework & Special Conditions	$14,617,222			**$14,617,222**
50	Systems	$52,227,862	$12,070,548		**$64,298,410**
60	ROW			$ 8,363,525	**$8,363,525**
70	Vehicles			$21,659,375	**$21,659,375**
80	Professional Services				
	PMC			$11,100,652	**$11,100,652**
	Admin			$1,855,620	**$1,855,620**
	Flagging by CSX		$6,525,648		**$6,525,648**
	Testing Inspection by CSX		$1,350,076		**$1,350,076**
	Before and After Study				
	Insurance, Permits, Misc.				
90	Contingency			$53,685,019	**$ 53,685,019**
	Total	**$187,708,289**	**$19,946,272**	**$119,345,439**	**$327,000,000**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

The FFGA capital cost estimate was prepared under the assumption that under the agreement between FDOT and CSXT, CSXT would perform the full scope of the design and construction work for the Double Track Corridor Improvement Program Segment 5 Project on a "non-profit" basis. It was also CSXT's commitment to serve as Project Manager. CSXT also offered to make financial contributions to the project in the form of interest-free loans and construction efficiencies in light of the fact that they are on-site as the entity responsible for maintenance. These commitments by CSXT played an important role in the establishment of the budget. Column B shows the cost estimate for the CSXT work.

The FFGA budget included the construction of a new maintenance facility in West Palm Beach at a cost of $22.7 million.

1.1.2.3 Cost Estimate for the Amended FFGA

The amended FFGA capital cost budget is shown in Table 1-5. The design build contract amount shown in column A shows the amount of the winning bid for the Double Track Corridor Improvement Program Segment 5 Project awarded to Tri-County Rail Constructors (TCRC). Column B shows the change orders made to the contractor's bid and Column C is the cost estimate for CSXT. Column D shows the budget for the remaining Contract Units.

Table 1-5:
Cost Estimate for Amended FFGA

FTA Standard Cost Category		Amended FFGA (2004)				
		A	B	C	D	E
		D/B Contract	Change Orders	CSX	SFRTA (Other Contract Units)	Total
10	Guideway	$96,063,100	$2,030,395			**$98,093,495**
20	Stations	$35,459,100				**$35,459,100**
30	Yard and Shops		$1,500,000			**$1,500,000**
40	Sitework & Special Conditions	$39,528,500	($1,122,737)	($1,122,737)		**$38,405,763**
50	Systems	$60,587,100	($23,662,600)	$12,974,618		**$49,899,118**
60	ROW				$12,005,631	**$12,005,631**
70	Vehicles				$13,650,000	**$13,650,000**
80	Professional Services					
	PMC				$29,918,184	**$29,918,184**
	Administration				$2,055,620	**$2,055,620**
	Flagging by CSX			$3,498,495		**$3,498,495**
	Testing Inspection by CSX			$7,380,450		**$7,380,450**
	Before and After Study				$546,901	**$546,901**
	Insurance, Permits, Misc.		$11,978,557			**$11,978,557**
90	Contingency				$29,496,246	**$29,496,246**
	Total	**$231,637,800**	**($9,276,385)**	**$23,853,563**	**$87,672,582**	**$333,887,560**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

1.1.2.4 Costs at Project Completion

The costs at project completion, shown on Table 1-6, were developed by adding the change order costs generated during construction to the amended FFGA budget that was presented in Table 1-4. Column C in Table 1-6 is a summary of the change orders approved during construction, as taken from SFRTA's Change Order log dated September 30, 2008 (see Appendix 1-1.)

A cost category was assigned to each of the change orders in the log to fill column C, which shows the net total of the changes. The total costs incurred by CSXT during construction are shown in column D. Column E shows the updated costs for the other contract units in the budget.

Table 1-6:
Actual Project Costs (2007 $)

FTA Standard Cost Category		Actual (2007)					
		A	B	C	D	E	F
		D/B Contract	Change Orders Amended FFGA	Change Orders Construction	CSX	SFRTA (Other Contract Units)	Total
10	Guideway	$96,063,100	$2,030,395	$7,062,375			**$105,155,870**
20	Stations	$35,459,100		$2,621,680			**$38,080,780**
30	Yard and Shops	-	$1,500,000	$1,659,400			**$3,159,400**
40	Sitework & Special Conditions	$39,528,500	($1,122,737)	$3,122,583			**$41,528,346**
50	Systems	$60,587,100	($23,662,600)	$1,186,008	$25,474,618		**$63,585,126**
60	ROW			-		$8,050,000	**$8,050,000**
70	Vehicles			$(3,500)		$11,128,687	**$11,125,187**
80	Professional Services						
	PMC					$35,900,381	**$35,900,381**
	Administration					$2,500,051	**$2,500,051**
	Flagging by CSX				$7,972,921		**$7,972,921**
	Testing Inspection by CSX				$4,380,449		**$4,380,450**
	Before and After Study					$546,901	**$546,901**
	Insurance, Permits, Misc.		$11,978,557	($607,026)		$12,274,956	**$23,646,486**
90	Contingency						
	Total	**$231,637,800**	**($9,276,385)**	**$15,041,519**	**$37,827,989**	**$71,629,501**	**$345,631,899**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

1.1.3 Analysis of Capital Costs and Identification of Changes

The following sections will identify the categories in which the most significant capital cost changes occurred. Table 1-7 compares the estimates presented in the FFGA and amended FFGA with the actual costs.

Table 1-7:
Comparative Analysis of Capital Costs

FTA Standard Cost Category		FFGA (2002)	Amended FFGA (2004)	Actual (2007)	
		A	B	C	D
		Total	Total	Total	Percent Change w/Amended FFGA
10	Guideway	$83,478,334	$98,093,495	$105,155,870	7.2%
20	Stations	$37,384,871	$35,459,100	$38,080,780	7.4%
30	Yard and Shops	$22,681,248	$1,500,000	$3,159,400	110.6%
40	Sitework & Special Conditions	$14,617,222	$38,405,763	$41,528,346	8.1%
50	Systems	$64,298,410	$49,899,118	$63,585,126	27.4%
60	ROW	$8,363,525	$12,005,631	$8,050,000	-32.9%
70	Vehicles	$21,659,375	$13,650,000	$11,125,187	-18.5%
80	Professional Services				
	PMC	$11,100,652	$29,918,184	$35,900,381	20.0%
	Administration	$1,855,620	$2,055,620	$2,500,051	21.6%
	Flagging by CSX	$6,525,648	$3,498,495	$7,972,921	127.9%
	Testing Inspection by CSX	$1,350,076	$7,380,450	$4,380,450	-40.6%
	Before and After Study		$546,901	$546,901	0%
	Insurance, Permits, Misc.		$11,978,557	$23,646,486	97.4%
90	Contingency	$53,685,019	$29,496,246	0	-100%
	Total	$327,000,000	$333,887,560	$345,631,899	3.5%

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

The overall differences between the estimate presented in the amended FFGA and the actual cost are small, less than four percent (4%). The sharp differences between the estimate and the actual budget for each of the cost categories are explained by the changes in scope that were made to maintain a relatively constant bottom line, such as upgrading the existing yard and shops instead of replacing them with a new facility. The following sections highlight the scope changes that had the most impact on the costs.

1.1.3.1 Amended FFGA Budget Compared to the Initial FFGA Budget

The differences between the Amended FFGA and the original FFGA budget were the result of the following:

- The engineer's estimate for the Design Build Contract was replaced by the winning contractor's bid selected by SFRTA, which was higher in certain cost categories. The reasons for the differences between these two (2) estimates will be discussed later.
- Changes of scope in the original Design Build Contract, primarily in Systems and Guideway.

- Sharp reduction in the Systems cost due to elimination of the Obstruction Detection System.
- Revisions to the Professional Services costs by increasing the role of the Project Management Consultant and adding insurance costs.
- Change of scope in the vehicle procurement program and elimination of the proposed new maintenance facility.

1.1.3.2 Actual Costs Compared to the Amended FFGA Budget

The increases in actual costs were driven mostly by change orders that occurred during project construction. There were no major changes in scope after the amended FFGA budget was approved.

Table 1-8 compares cost per mile as estimated budget from the amended FFGA with the final actual cost. The most significant cost differences between the budget and actual cost are:

- Sharp increases in CSXT's task orders that affected guideway construction, systems and professional services;
- The cost associated with the expansion of the existing maintenance facility, which also increased markedly when compared to the original budget; and,
- The stations cost, which also increased due to modifications in the scope of work for several of the stations.

The percentages listed indicate the difference between the budget and the actual costs. By using cost per mile figures, the comparison between the budget and actual cost can be made without regard to the differences in the length of the Double Track Corridor Improvement Program Segment 5 Project between that proposed in the amended FFGA and the actual construction. The differences in scope that resulted in the differences between the budgeted and actual costs are explained in the following sections.

Table 1-8:
Cost per Mile at Each Stage and Comparison with Actual Costs

No.	Category	FFGA (44.3 mi)			Amended FFGA (43.3 mi)			Actual (43.6 mi)	
		Total Cost	Cost per mile	Percent Change compared to Actual	Total Cost	Cost per mile	Percent Change compared to Actual	Total Cost	Cost per mile
10	Guideway	$83,478,334	$1,884,397	-22%	$98,093,495	$2,265,439	-6%	$105,155,870	$2,411,832
20	Stations	$37,384,871	$843,902	-3%	$35,459,100	$818,917	-6%	$38,080,780	$873,412
30	Yard and Shops	$22,681,248	$511,992	N/A	$1,500,000	$34,642	-52%	$3,159,400	$72,463
40	Sitework & Special Conditions	$14,617,222	$329,960	-65%	$38,405,763	$886,969	-7%	$41,528,346	$952,485
50	Systems	$64,298,410	$1,451,431	0%	$49,899,118	$1,152,405	-21%	$63,585,126	$1,458,374
60	ROW	$8,363,525	$188,793	2%	$12,005,631	$277,266	50%	$8,050,000	$184,633
70	Vehicles	$21,659,375	$488,925	92%	$13,650,000	$315,242	24%	$11,125,187	$255,165
80	PMC	$11,100,652	$250,579	-70%	$29,918,184	$690,951	-16%	$35,900,381	$823,403
	Administration	$1,855,620	$41,888	-27%	$2,055,620	$47,474	-17%	$2,500,051	$57,341
	Flagging by CSX	$6,525,648	$147,306	-19%	$3,498,495	$80,797	-56%	$7,972,921	$182,865
	Testing Inspection by CSX	**$1,350,076**	**$30,476**	**-70%**	$7,380,450	$170,449	70%	$4,380,450	$100,469
	Before and After Study	-	-		$546,901	$12,631	0%	$546,901	$12,544
	Insurance, Permits, Misc.	-	-		$11,978,557	$276,641	-49%	423,646,486	$542,351
90	Contingency	**$53,685,019**	**$1,211,851**	**-43.8**	$29,496,246	$681,207	-100%	0	0
	Total	**$327,000,000**	**$7,381,490**	**-7%**	**$333,887,560**	**$7,711,030**	**-3%**	**$345,631,899**	**$7,927,337**

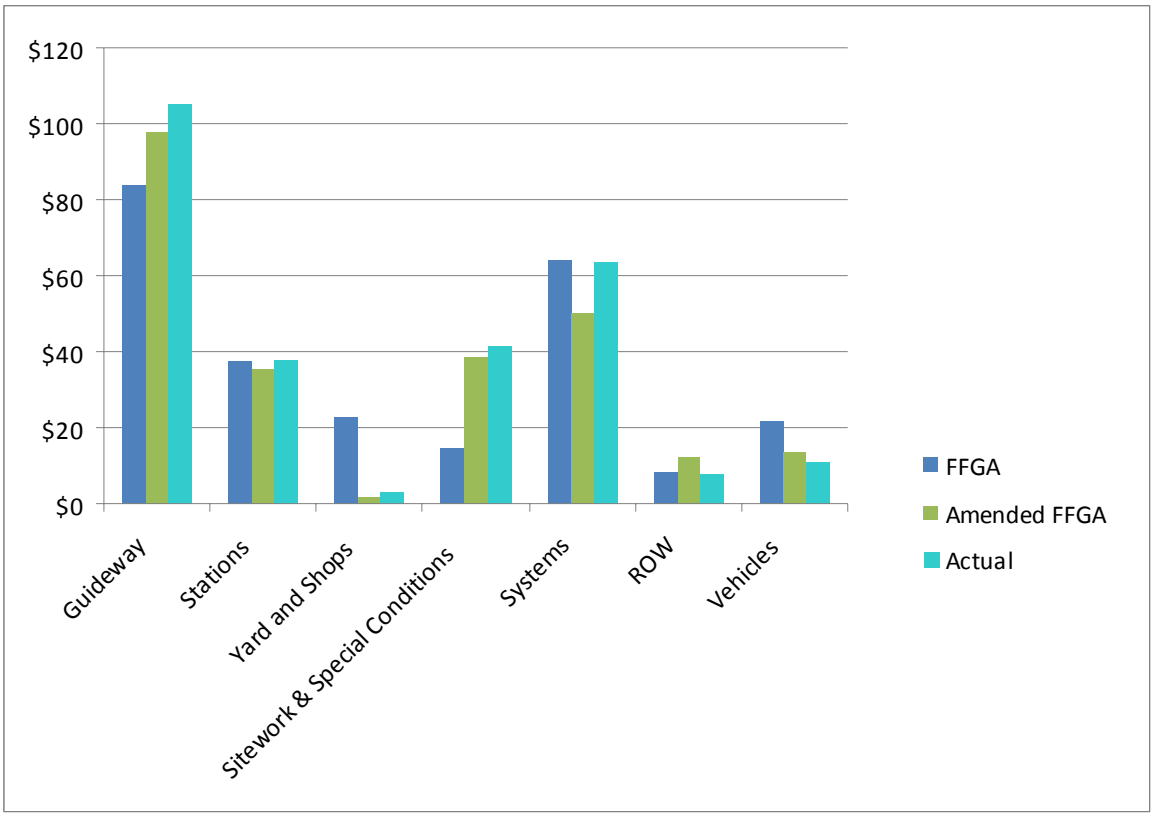
Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

1.1.4 Discussion of Reasons for Capital Cost Changes

1.1.4.1 Facilities Costs

The following section will describe the reasons for the differences between the budgeted and actual costs noted in the tables and sections above. Figure 1-1 compares the total costs for each of the construction categories in the Double Track Corridor Improvement Program Segment 5 Project.

Figure 1-1:
Facilities Cost Comparison
(Dollar figures in millions)



Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

Guideway

Actual Guideway costs were higher by seven percent (7%) when compared to the amended FFGA budget. The main reasons for that increase are the following:

- The estimate for live track work increased considerably at every stage, going from $1.9 million in the FFGA budget to $5.3 million in the amended FFGA budget to a total cost of $13.2 million when the project was completed.
- Modification of trackwork in the area between the West Palm Beach Station and the maintenance facility.

- Several scope deletions helped offset those cost increases, the most important being the reduction in the scope and budget of the Dania cut-off bridge.

Stations

The higher station costs were due to design changes in the West Palm Beach and Mangonia Stations that were required to accommodate unforeseen ROW acquisition issues.

Yard and Shops

The original plan for constructing a new maintenance facility was postponed as a location for a permanent site had not been obtained. For that reason the FFGA budget of $23 million was reduced to $1.5 million in the Amended FFGA budget, which was an allowance for improvements at the existing West Palm Beach Layover Facility to accommodate 20 minute headways. After construction, the total costs of the improvements amounted to $3.2 million and included modifications to the West Palm Beach Station.

Sitework and Special Conditions

During construction the budget for this category increased $3.1 million (8%). This increase was due to various changes in the scope of the utility modifications, environmental mitigation, parking lot construction and additional pedestrian gates at grade crossings.

Systems

There was a drastic reduction in system costs at the adoption of the amended FFGA budget, over 25 percent (25%) less. This was due to a reduction in scope that resulted from eliminating a costly obstruction detection system. SFRTA made this decision because the technology was not yet proven and because there was no agreement with CSXT to accept the data generated by the system. CSXT's task order for signaling did not change significantly at this stage of the Double Track Corridor Improvement Program Segment 5 Project.

Systems costs, however, increased considerably during construction, increasing by 26 percent (26%). This offset the cost savings generated by the scope reductions accomplished in the amended FFGA stage. Systems costs increased from $50 million to $64 million. Almost all of the difference could be attributed to an increase in CSXT's signaling costs which increased from $12 million budgeted in the amended FFGA to $26 million at the completion of construction. This increase was attributed to unforeseen conditions related to the CSXT work rules, and was approved in a series of change orders.

Right-of-Way

A revision of the ROW estimate resulted in a $4 million increase for the Amended FFGA budget, a 43 percent (43%) increase from the FFGA budget. This increase was attributed to a more detailed plan of acquisitions that increased the number of parcels affected, more accurate and up-to-date property values, and administrative and legal costs.

ROW costs were not a driving force in the increase of the budget since they did not represent a large portion of the project cost. After construction, the ROW costs were roughly $4 million less (-33%) than originally budgeted in the amended FFGA. This lower cost was due to alignment modifications that resulted in less impact on adjacent properties. Several properties that were originally thought to be required and were slated for purchase ultimately were not acquired.

Vehicles

The scope of the vehicle procurement for all three budgets at the three stages of development under analysis did not change. However, the scope experienced a considerable revision at the amended FFGA stage (the change from new to used equipment) that resulted in a cost reduction of 40 percent (40%). The actual vehicles cost was just over $11 million, compared to an estimate of $13.65 million in the estimate in the amended FFGA. One factor contributing to the lower costs was that SFRTA was able to obtain a better price than expected for the refurbishment of five (5) locomotives that have already been received and are in operation. The cost of the two (2) cab coaches that were ordered in September 2006 was expected to be $3.7 million, significantly lower than the $4.6 million as budgeted in the amended FFGA. The two (2) new cab coaches are expected to be delivered in late 2009.

1.1.4.2 Professional Services

Figure 1-2 illustrates a comparison of the various soft costs between the FFGA, amended FFGA and actual project costs.

Project Management Consultant

The PMC costs represented the largest portion of the professional services budget. This cost was 20 percent (20%) higher than budgeted, mostly due to delays experienced during construction.

Administration

SFRTA administrative costs were 22 percent (22%) higher than budgeted, an increase that also was driven by delays in construction.

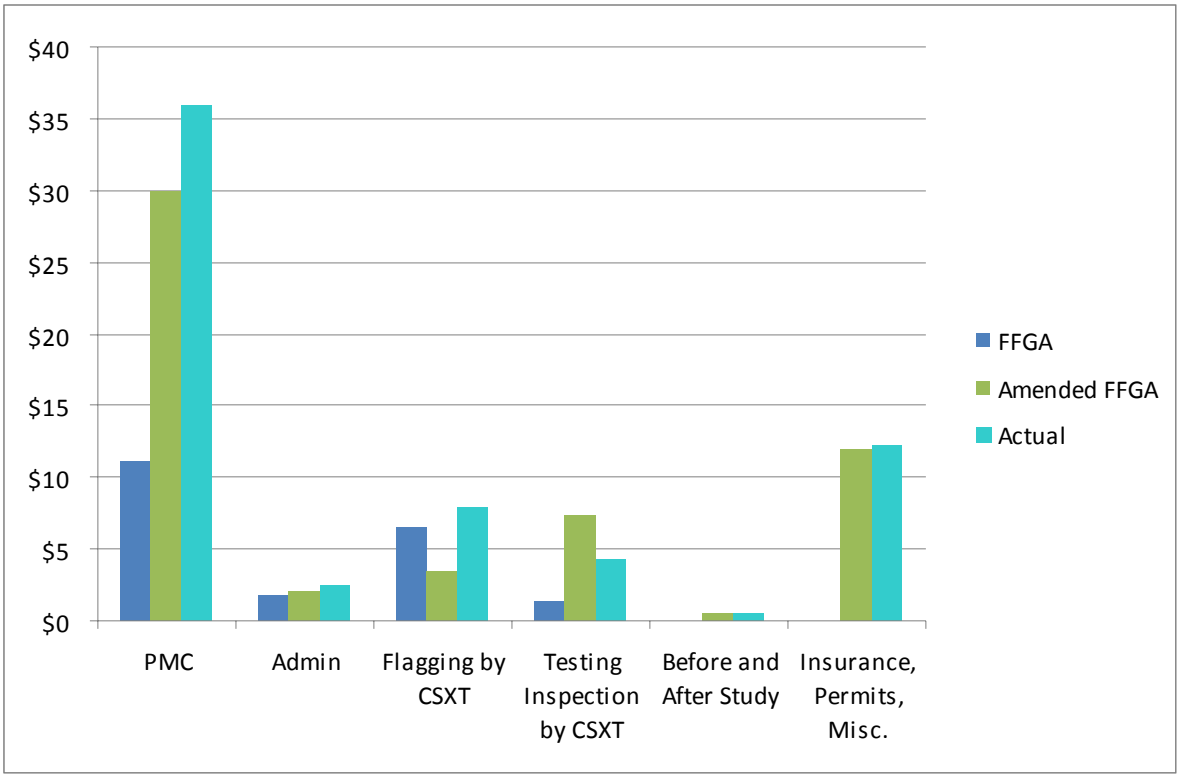
Flagging Protection

Flagging costs doubled and five (5) change orders were issued during construction. These additional costs were due to unforeseen CSXT work rules which increased the costs of flagging during the construction period. Two (2) of the change orders were funded from the reimbursement and cost sharing for flagging costs, as per the agreement with CSXT.

Inspection and Testing

Similar to flagging, the inspection and testing costs experienced great variations over the course of construction. They were due, in part, to transfers of funds between this item and signaling work. As a result, the total cost incurred after the completion of the project was lower than the amended FFGA amount.

Figure 1-2:
Professional Services Comparison
(Dollar figures in millions)



Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

Insurance, Permits and Miscellaneous Costs

The FFGA budget did not specify a budget for insurance and permits.

The amended FFGA budget for this category only included the cost of a Contractor Controlled Insurance Program. During construction, several change orders added other expenses to this category. Among the charges incurred during construction were extension of insurance policies, passenger bus services during track closures, additional insurance, overhead cost and additional permit costs.

SFRTA put in place a Direct Pay Purchase Order program whereby purchases for the Double Track Corridor Improvement Program Segment 5 Project would be made by SFRTA and thereby be exempt from sales tax. A total of $63.6 million dollars of equipment and materials were purchased under this program, saving the agency $3.8 million in sales taxes.

Included in the miscellaneous costs is a portion of a substantial settlement paid to the contractor to cover claims for delays.

1.2 Findings and Recommendations

The previous sections identified and explained the specific reasons for the differences between the cost estimates and actual costs through the various stages of the Double Track Corridor Improvement Program Segment 5 Project. This section will describe more general causes for those differences and identify any trends that could be similarly applied for other projects across the country.

This report will recommend ways in which the process of predicting the capital cost of the Double Track Corridor Improvement Program Segment 5 Project might have been improved. These recommendations will be presented in the context of a risk management perspective, analyzing the differences in capital cost and their general causes.

1.2.1 Risk

Risk will be defined here as the probability that a proposed estimate of cost will deviate from the actual cost incurred. This risk should decrease as the design process progresses, and as more information about existing conditions is available, project elements are better defined, and agreements with stakeholders are put in place. Typically, risk is higher in the planning stages of a project and decreases to its lowest levels in the final design stage.

In the case of the Double Track Corridor Improvement Program Segment 5 Project, the capital cost estimate from the FFGA, amended FFGA and the actual cost– do not follow the typical stages of planning, preliminary engineering, final design, and construction. However, they do represent a comparison of design to actual costs, and as such, they can be analyzed to draw general conclusions and recommendations.

As a measure of risk or deviation to actual cost, Table 1-9 lists the percentage differences between the amended FFGA and the actual cost using the average cost per mile (See Table 1-8). The table helps demonstrate that, while the variations in each category where large, the overall difference was small. The total cost per mile estimated in the amended FFGA was only three percent (3%) less than the actual.

Table 1-9:
Comparison of Cost per Mile for Each Category

No.	Category	FFGA per mile costs compared with actual costs	Amended FFGA costs per mile compared with actual costs
10	Guideway	-22%	-6%
20	Stations	-3%	-6%
30	Yard and Shops	N/A	-52%
40	Sitework & Special Conditions	-65%	-7%
50	Systems	0%	-21%
60	ROW	2%	50%
70	Vehicles	92%	24%
80	PMC	-70%	-16%
	Administration	-27%	-17%
	Flagging by CSX	-19%	-56%
	Testing Inspection by CSX	-70%	70%
	Before and After Study	N/A	0%
	Insurance, Permits, Misc.	N/A	-49%
90	Contingency	-43.8%	-100%
	Total	**-7%**	**-3%**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

Table 1-9 does not show a clear trend of the cost estimates getting closer to the actual cost from one milestone to the other, indicating that certain scope changes were not expected. The high percentages seem to indicate that, in most cases, the changes in budget occurred as a result of changes of scope that occurred due to unforeseen conditions.

1.2.2 Review of Areas for Potential Risk Reduction

To identify general causes for a specific difference between the budgeted and actual costs, Table 1-10 tabulates the percent changes between the two for each cost category. Two primary causes are identified:

- Discrepancies in unit costs when comparing the engineer's estimate with the contractor bid.
- Changes in scope. Elimination of important elements of the project such as the maintenance facility or the obstruction detection system.
- Unforeseen conditions, which in general are associated with CSXT's initial withdrawal from the project.
- Unforeseen conditions, which in general are associated with CSXT's unforeseen higher costs for fulfilling flagging, signal work, and inspections requirements.

Table 1-10:
Overview of Primary Causes of Change by Cost Category
(Figures adjusted for inflation to 2007$)

Category		FFGA (44.3 mi) Cost per mile	% Change between Amended. FFGA and FFGA	Reason	Amended FFGA (43.3 mi) Cost per mile	% Change between Actual and Amended FFGA	Reason	Actual (43.6 mi) Cost per mile
10	Guideway	$1,884,387	20%	Unit costs	$2,265,439	6%	Change in Scope	$2,411,832
20	Stations	$843,902	-3%	Not significant	$818,917	7%	Change in Scope	$873,412
30	Yard and Shops	$511,992	-93%	Change in Scope	$34,642	109%	Change in Scope	$72,463
40	Sitework & Special Conditions	$329,960	169%	Unit costs	$886,969	7%	Change in Scope	$952,485
50	Systems	$1,451,431	-21%	Change in Scope	$1,152,405	27%	Unforeseen conditions/Change in Scope	$1,458,374
60	ROW	$188,793	47%	Change in Scope	$277,266	-33%	Change in Scope	$184,633
70	Vehicles	$488,925	-36%	Unit costs	$315,242	-19%	Unit Costs	$255,165
80	PMC	$250,579	176%	Unforeseen conditions/Change in Scope	$690,951	19%	Unforeseen conditions	$823,403
	Administration	$41,888	13%	Change in Scope	$47,474	21%	Unforeseen conditions	$57,341
	Flagging by CSXT	$147,306	-45%	Change in Scope	$80,797	126%	Unforeseen conditions	$182,865
	Testing Inspection by CSXT	$30,476	459%	Change in Scope	$170,449	-41%	Unforeseen conditions	$100,469
	Before and After Study	-		N/A	$12,631	-1%	Not significant	$12,544
	Insurance, Permits, Misc.	-		N/A	$276,641	96%	Unforeseen conditions	$542,351
90	Contingency	$1,211,851	-44%	Change in scope	$681,207	-93%	Change in scope	$45,193
	Total	**$7,381,490**	**4%**		**$7,711,029**	**3%**		**$7,927,337**

Source: SFRTA Segment 5 Budget Summary (June 2009) and the Segment 5 Change Order Log

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1.2.3 Recommendation Based on Changes Resulting from Differences in Project Scope

The most significant changes of scope that affected the project were:

- Increase in the Systems (Signaling) work by CSXT;
- Modifications to the existing maintenance facility, and,
- Increases in PMC costs related to time extensions.

Changes in scope often are a result of unforeseen circumstances, but they can be minimized with a better definition of the project. A more advanced design of certain elements of the Double Track Corridor Improvement Program Segment 5 Project before obtaining a design build proposal could have resulted in lower costs. This particularly could have been the case for the modifications of the West Palm Beach Maintenance Facility.

1.2.4 Recommendation Based on Changes Resulting from Unforeseen Conditions.

The original FFGA budget was prepared based on the assumption of CSXT taking that role and performing the work more efficiently since it has control of the operation and maintenance of the corridor. CSXT's withdrawal from the project required SFRTA to apply for an amendment of the FFGA and to re-study the scope of the work. CSXT, however, remained responsible for key activities in the construction of the guideway, which experienced considerable increases in cost.

Much of the higher costs in the guideway and systems costs were related to the uncertainties of doing construction on an active track. Live track work, signaling and flagging costs increased considerably as a result of unexpected and unforeseen changes in the requirements of doing such work. Time delays and schedule extensions were necessary for the same reasons, generating claims by the contractor.

CSXT has the responsibility for train dispatch along the SFRC, and thus establishes most of the requirements for doing construction while trains are operating on adjacent tracks. These cost overruns could have been prevented, or the costs more accurately estimated, by having specific agreements in place with CSXT that covered flagging and signaling in construction areas. A better understanding of flagging and signaling work rules also could have helped prevent these overruns.

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2.0 LEVEL-OF-SERVICE

2.1 Introduction

The addition of mainline track to the existing Tri-Rail system resulted in changes in the level-of-service (LOS) provided. The purpose of this section is to document changes in the frequency and quantity of service provided by the SFRTA through the development of the Double Track Corridor Improvement Program Segment 5 Project.

This analysis is comprised of two distinct sections:

1) Methodology; and,
2) Presentation of before and after period data.

The methodology further describes the ways in which the LOS data was obtained and applied to the analysis. The B&AS guidance material identifies the analysis of LOS data in terms of five main factors. The analytic factors are as follows:

1) The types of services offered;
2) The amount of service;
3) The service span;
4) The frequency; and,
5) The capacity of the service provided

These individual factors are analyzed throughout the stages of development for the B&AS. The “before” (existing) stages of the project include the Environmental Assessment (EA) (October 26, 1999), the Full Funding Grant agreement (FFGA) (May 16, 2000), and the amended FFGA (April 12, 2004). The “after” period includes conditions present at the two year anniversary of the system opening for revenue service (March 27, 2006).

The B&AS guidance considers the final two stages as being immediately before project implementation and two years after project opening. Therefore, the appropriate before and after year periods are 2005 (one year before system opening) and 2008 (two years following system opening). This section reports LOS data for the before and after periods.

2.2 Methodology

This section of the study describes the sources of the data used in the analysis, as well as the presentation of information collected for the before and after time periods. Specific topics discussed include data sources and the methodologies used for analyzing Tri-Rail commuter rail and connecting local bus route services.

2.2.1 Data Sources

The data sources used to acquire bus and shuttle route service frequency for the before and after periods were obtained from current transit route characteristics information available from each of the three local county transit agencies, (Palm Tran, Broward County Transit (BCT), and Miami-Dade Transit (MDT)). SFRTA was the source of Tri-Rail commuter rail LOS information.

2.2.2 Commuter Rail Methodology

Operations for the Tri-Rail commuter rail system service is carried out in accordance with SFRTA operating agreements with both CSXT and the Florida Department of Transportation (FDOT). Operating schedules for the Tri-Rail Commuter Rail service were compared for the before and after periods.

2.2.3 Local Bus and Shuttle Routes Methodology

This study examined local bus route and shuttle routes that connect with each of the 18 Tri-Rail stations and are provided by the local public transit agencies in Miami-Dade (MDT), Broward (BCT), and Palm Beach Counties. Shuttle bus service provided by Tri-Rail under contract at designated stations was included in this analysis. Individual headways for each bus and shuttle route were obtained from the corresponding transit agency for both the before and after time period. Service routes are presented by transit provider and the county in which they provide local bus and shuttle service.

2.3 Analysis of Level-of-Service Data

2.3.1 Introduction

The implementation of the 50 train schedule, which provides a 20-minute headway during the peak periods of Tri-Rail service, represents a significant improvement in levels of service for train frequency and span of service for Tri-Rail commuter rail service. On-time performance (OTP) also has improved since the completion of construction on the rail corridor's double tracking project in early 2006. As of June 2008, on-time performance has risen three percentage points since the inception of the new schedule. These increases in LOS performance ratings have in turn led to corresponding increases in the LOS of the shuttle and county bus connections.

2.3.2 Types of Services Offered

Each of the three counties in the Tri-Rail service area provide connecting bus service from Tri-Rail stations to surrounding employment centers and other points of interest. Palm Tran, the transit agency for Palm Beach County, provides 22 bus and shuttle connections from six (6) stations. BCT, the transit agency for Broward County, provides 29 bus and shuttle connections from seven (7) stations. MDT, the transit agency for Miami-Dade County, offers 24 bus and shuttle connections from five (5) stations.

Commuter rail, local bus and shuttle bus services were available throughout the project phases of the Double Track Corridor Improvement Program Segment 5 Project. While the frequency of rail service and the characteristics of individual bus routes changed over the course of the project, the modes of transportation available were constant throughout the development of the project.

2.3.3 Volume of Service

Data for the B&AS periods reflects a substantial increase in the volume of service provided by the different transit agencies to accommodate Tri-Rail's operational system improvement. This section provides a brief overview of the service available by public and private transportation service providers in Miami-Dade, Broward, and Palm Beach Counties.

2.3.3.1 Commuter Rail Service

SFRTA's Tri-Rail commuter rail service predominantly operates diesel locomotives, bi-level coaches and bi-level cab cars in a push-pull configuration over a 72-mile commuter rail route between the Miami International Airport Station in Miami-Dade County and the Mangonia Park Station in Palm Beach County. The average spacing of the 18 Tri-Rail stations is about one station every four miles. Headways and hours of service for the before and after period are presented in a subsequent section in Table 2-5 and Table 2-7.

Through a service agreement between FDOT and CSXT, Tri-Rail has established operating windows for its service on the SFRC. Passenger train service, including Tri-Rail and Amtrak, has priority rights of operation between 5:20 AM and 9:30 AM and between 3:00 PM and 8:00 PM. Tri-Rail, Amtrak and CSXT share the rail line between the hours of 4:19 AM and 5:20 AM, 9:30 AM and 3:00 PM, and 8:00 PM and 10:39 PM. CSXT has exclusive operating rights between 10:39 PM and 4:19 AM. Amtrak's long haul passenger service shares the route with Tri-Rail and CSXT. Amtrak operates two northbound and two southbound trains in a common operating time period with Tri-Rail service.

Tri-Rail's existing vehicle fleet includes 12 locomotives, 11 cab cars and 15 coaches as well as two (2) Diesel Multiple Unit (DMU) train sets from Colorado Rail Car Manufacturing Company, owned by the Federal Railroad Administration (FRA) and FDOT, and are used for demonstration purposes. Ten (10) Tri-Rail trains operate during weekday peak periods. The passenger capacity varies slightly between the cab cars, which seat 157 passengers, and the bi-level coaches, which seat 162. Each of the DMU train sets is double decked and provides a seating capacity of 188 passengers per car.

2.3.3.2 Highway Level of Service

Over the last two decades, along with population and economic growth, traffic congestion also has increased on South Florida highways resulting in average highway LOS levels of E and F in the three (3) Counties served by Tri-Rail (Table 2-1). For the before and after period, the average annual daily traffic (AADT) data revealed consistent traffic congestion along the I-95 Highway corridor that parallels the Tri-Rail commuter rail system.

Table 2-1:
I-95 Level of Service Before and After

County	Before		After			
	2005 AADT	LOS	2006 AADT	2007 AADT	2008 AADT	LOS
Palm Beach County	163,789	E	164,858	168,161	199,895	E
Broward County	244,353	F	243,008	245,306	244,713	F
Miami-Dade County	214,900	F	225,611	223,611	206,313	F

Source: FDOT Average Annual Daily Traffic Data, 2005-2008

LOS in Palm Beach, Broward, and Miami-Dade counties has remained at LOS E and F throughout each year both before and after the implementation of the Segment 5 Project.

2.3.3.3 Local Bus Service

While Tri-Rail commuter rail service follows a linear 72-mile long corridor through the eastern regions of Miami-Dade, Broward and Palm Beach Counties, local bus service distributes passengers to points distant from the SFRC. Transit connections to and from Tri-Rail stations form an important component of the Tri-Rail system since relatively little development is located within close walking distance of Tri-Rail stations. Every Tri-Rail station is served by at least two (2) fixed-route bus routes.

Through inter-local agreements with each of the three counties, connecting bus service is also provided at Tri-Rail stations. As a part of that agreement, passengers transferring from Palm Tran, BCT or MDT receive a discounted Tri-Rail fare while Tri-Rail passengers are entitled to a free transfer when boarding Palm Tran, BCT, or MDT connecting service with a valid Tri-Rail ticket.

In Palm Beach and Miami-Dade counties, SFRTA reimburses the counties for their transit services to provide shuttle services to connect with Tri-Rail stations, as well as for direct connections with fixed route service that operates near Tri-Rail stations. However, in Broward County, SFRTA provides shuttle bus services through contractual agreements with private operators and is reimbursed for this service by the County. FDOT also provides operating funding assistance to SFRTA for Broward County feeder service costs through a Joint Participation Agreement (JPA).

Following the installation of the Segment 5 Project, the number and service frequency of bus routes available was reduced significantly due to reasons related to funding and ridership trends, and not related to Tri-Rail service or the Segment 5 Project (Table 2-2). Six (6) routes that existed in the before period were discontinued and no longer serve Tri-Rail stations. These routes served stations in Palm Beach and Broward counties.

Data analyzed in this study shows that local bus service at Tri-Rail stations was significantly improved following the opening of revenue service for the Segment 5 Project, except at the Deerfield Beach Station.

Table 2-2:
Change in Headway for Local Bus Routes Serving Tri-Rail

			Headway (AM/PM Peak Minutes)			
Station	Route	Carrier	Before	After	Change	% Change
Palm Beach County						
Mangonia Park	20	PalmTran	-	60	60	New Service
	31	PalmTran	30	30	-	0.00%
	33	PalmTran	-	60	60	New Service
West Palm Beach	2	PalmTran	30	30	-	0.00%
	31	PalmTran	30	30	-	0.00%
	40	PalmTran	-	30	30	New Service
	43	PalmTran	60	30	-30	50.00%
	44	PalmTran	30	60	30	100.00%
	46	PalmTran	30	0	30	Service Eliminated
Lake Worth	60	PalmTran	60	-	60	Service Eliminated
	61	PalmTran	-	60	60	New Service
	62	PalmTran	30	30	-	0.00%
Boynton Beach	70	PalmTran	-	30	30	New Service
	71	PalmTran	60	60	-	0.00%
Delray Beach	2	PalmTran	30	30	-	0.00%
	70	PalmTran	-	30	30	New Service
	81	PalmTran	60	60	-	0.00%
Boca Raton	2	PalmTran	30	30	-	0.00%
	94	PalmTran	30	20	-10	33.33%
Broward County						
Deerfield Beach	23	BCT	30	-	-30	Service Eliminated
	24	BCT	30	-	-30	Service Eliminated
	92	BCT	-	45	45	New Service
Pompano Beach	33	BCT	60	-	-60	Service Eliminated
	34	BCT	-	30	30	New Service
	93	BCT	-	90	90	New Service
	95	BCT	90	90	-	0.00%
Cypress Creek	14	BCT	30	20	-10	33.33%
	60	BCT	30	20	-10	33.33%
	62	BCT	60	45	-15	25.00%
Fort Lauderdale	9	BCT	40	40	-	0.00%
	22	BCT	30	30	-	0.00%
	81	BCT	30	30	-	0.00%

Table 2-2:
Change in Headway for Local Bus Routes Serving Tri-Rail (Continued)

			Headway (AM/PM Peak Minutes)			
Station	Route	Carrier	Before	After	Change	% Change
Hollywood/ Fort Lauderdale International Airport	3	BCT	60	60	-	0.00%
	6	BCT	30	30	-	0.00%
	15	BCT	45	45	-	0.00%
	18	BCT	-	30	30	New Service
Sheridan Street	74	BCT	40	-	-40	Service Eliminated
	3	BCT	60	60	-	0.00%
	12	BCT	40	40	-	0.00%
	17	BCT	40	40	-	0.00%
Hollywood	7	BCT	30	30	-	0.00%
Miami Dade County						
Golden Glades	18	MDT	15	30	15	100.00%
	E	MDT	15	30	15	100.00%
	V	MDT	15	60	45	300.00%
	22	MDT	15	15	-	0.00%
	42	MDT	15	30	15	100.00%
	77	MDT	7.5	10	2.5	33.33%
	95 Express	MDT	5	5	-	0.00%
	241	MDT	15	30	15	100.00%
	246	MDT	-	30	30	New Service
Opa Locka	E	MDT	15	30	15	100.00%
	32	MDT	15	20	5	33.33%
	42	MDT	15	30	15	100.00%
Metrorail Transfer	L	MDT	7.5	10	2.5	33.33%
	42	MDT	15	30	15	100.00%
	500	MDT	-	60	60	New Service
Hialeah Market	J	MDT	15	15	-	0.00%
	1	MDT	15	24	9	60.00%
	36	MDT	15	20	5	33.33%
	42	MDT	15	30	15	100.00%
	46	MDT	-	30	30	New Service
Miami Airport	238 East-West	MDT	15	30	15	100.00%
	37	MDT	30	30	-	0.00%

Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

Eight (8) new bus routes that serve Tri-Rail stations were added between the before and after periods. Palm Beach and Broward Counties had the highest number of new bus routes, which included three (3) new routes to meet the commuter rail service and serve the growing demand in the community for connections to Tri-Rail.

The Deerfield Beach Station did not experience a decrease in average headways between the before and after periods. This is directly attributed to the elimination of two of the three local bus connections serving this station. However, on many of the remaining routes, the average headways were reduced by as much as 67 percent (67%) (Table 2-3). Local bus routes serving the Delray Beach Station and the Boynton Beach Station as shown in Table 2-3 had headways reduced by 50 percent (50%) on some routes. The Delray Beach Station had the greatest reduction in headways between the before and after periods of any Tri-Rail station.

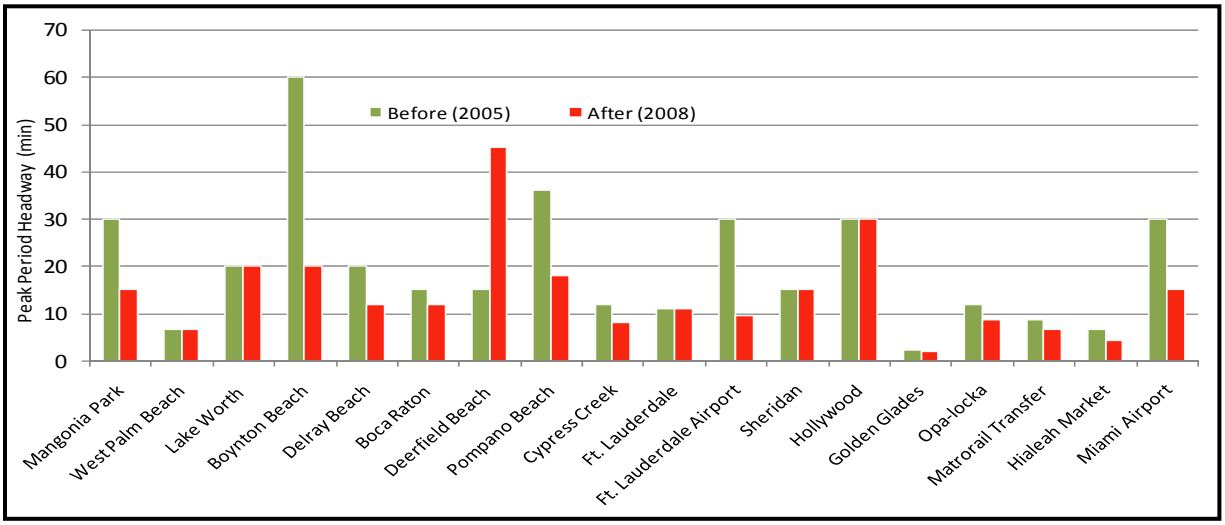
The average peak period headways were compared before and after construction for services at each station. Table 2-3 and Figure 2-1 present peak period local bus service offered at each Tri-Rail station by County.

Table 2-3:
Local Bus Peak Period Headway Before and After

County	Level-of-Service	Average Local Bus Headway (min)		
	Station	Before (2005)	After (2008)	Change (%)
West Palm Beach	Mangonia Park	30	15	50%
	West Palm Beach	7	7	0%
	Lake Worth	20	20	0%
	Boynton Beach	60	20	67%
	Delray Beach	20	12	40%
	Boca Raton	15	12	20%
Broward County	Deerfield Beach	15	45	200%
	Pompano Beach	36	18	50%
	Cypress Creek	12	8	32%
	Fort Lauderdale	11	11	0%
	Fort Lauderdale Airport	30	10	67%
	Sheridan	15	15	0%
	Hollywood	30	30	0%
Miami-Dade County	Golden Glades	2	2	0%
	Opa-locka	12	7	28%
	Metrorail Transfer	9	7	22%
	Hialeah Market	7	4	34%
	Miami Airport	30	15	50%

Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

Figure 2-1:
Local Bus Peak Period Headway Before and After



Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

During the "after" period, Tri-Rail patrons were offered increased LOS on some connecting services that were newly available in 2008. Local transit operators responded to higher Tri-Rail service frequency with more frequent headways to improve connectivity at stations.

For example, in 2008, local bus service significantly increased at five (5) stations: Mangonia Park, Boynton Beach, Pompano Beach, Fort Lauderdale Airport, and Miami Airport offering more frequent service. Headways were also decreased more than 25 percent (25%) to provide more frequent service at six (6) stations: Delray Beach, Boca Raton, Cypress Creek, Opa-locka, Metrorail Transfer, and Hialeah Market (Figure 2-1).

2.3.3.4 Shuttle Bus Service

SFRTA contracts with public and private operators to provide shuttle bus service at a number of stations, including the stations at the Miami, Fort Lauderdale-Hollywood, and West Palm Beach International Airports. Shuttle bus service is also provided from the Fort Lauderdale and West Palm Beach Stations to the adjacent downtown areas. Inter-local agreements are in place with each of the three counties to provide shuttle service to Tri-Rail stations, to transport passengers along major thoroughfares in close proximity to stations or to and from local activity centers.

Table 2-4 presents before-and-after changes in LOS for local bus routes and shuttle services that serve each station along the Tri-Rail system. Shuttle bus service from Fort Lauderdale-Hollywood Airport Station to Port Everglades and the South Florida Education Center (SFEC) in Davie is also provided. Shuttle bus service has improved greatly between the before and after periods.

Table 2-4:
Change in Headway for Shuttle Routes Serving Tri-Rail

Station	Route	Carrier	Before (min)	After (min)	Change (min)	% Change
Palm Beach County						
West Palm Beach	50 Downtown Shuttle	Palm Tran	20	20	-	0.00%
Boynton Beach	79 Boynton Beach Trolley	Boynton Beach	45	45	-	0.00%
Delray Beach	Downtown Shuttle Route 1	Palm Tran	-	60	60	New Service
Boca Raton	Boca Center Shuttle	Palm Tran	-	30	30	New Service
Broward County						
Deerfield Beach	DB1	BCT	-	60	60	New Service
	DB2	BCT	-	60	60	New Service
Pompano Beach	PB1 Blue	BCT	-	30	30	New Service
	PB1 Green	BCT	-	45	45	New Service
Cypress Creek	CC1	BCT	45	20	-25	56.00%
	CC2	BCT	45	20	-25	56.00%
	CC3	BCT	45	15	-30	67.00%
	Coconut Creek Shuttle	BCT	-	20	20	New Service
Fort Lauderdale	FL1	Tri-Rail	30	30	-	0.00%
	City Cruiser	BCT	-	120	120	New Service
Fort Lauderdale/ Hollywood Airport at Dania Beach	FLA1	Tri-Rail	-	20	20	New Service
	FLA2	Tri-Rail	-	20	20	New Service
	Convention Connection	BCT	-	15	15	New Service
	SFEC*	BCT	-	30	30	New Service
Sheridan Street	SS1	Tri-Rail	-	20	20	New Service
	Dania Beach East (Blue)	BCT	-	60	60	New Service
Miami Dade County						
Hialeah Market	132 (Koger)	MDT	Irregular	60	60	-
Miami International Airport	133 Airport	MDT	Irregular	10	10	-
	238 East/West	MDT	-	30	30	New Service

*South Florida Educational Center

Source: Palm Tran, Broward County Transit, Miami-Dade Transit service schedules and service improvement plans. (2005-2008)

An impressive 15 new shuttle routes were provided throughout the regional system between the two time periods (Table 2-4). The following table presents the change in LOS for shuttle bus routes serving Tri-Rail stations.

Connecting service to downtown Fort Lauderdale and the Fort Lauderdale-Hollywood Airport Station was greatly enhanced by offering five (5) new routes for distributing passengers primarily between Tri-Rail and downtown, the Broward County Convention Center, airport terminals, and Port Everglades.

Recent on-board passenger surveys show that 11 percent (11%) of passengers arrive at Tri-Rail stations on a locally operated bus, demonstrating that connecting bus service is an important mode of access and egress to Tri-Rail stations.

2.3.4 Service Span of Tri-Rail Commuter Rail Service

In 2005, Tri-Rail weekday service started at 4:19 a.m. and ended at 10:39 p.m. Trains departed on average every 60 to 90 minutes throughout the operation period. The average speed of trains was approximately 36 miles per hour (mph). The standard train operates in a push-pull configuration with a diesel locomotive, two coaches and a cab car. Service included 30 one-way trips each weekday, 14 one-way trips on Saturday and 12 one-way trips on Sunday.

Following the opening of the Double Track Corridor Improvement Program Segment 5 Project in March 2006, the weekday schedule began at 4:00 a.m. and ended at 11:05 p.m. Trains depart, on average, every 60 minutes throughout the period of operation, with the exception that Tri-Rail operates 20 minute headways in each direction during both the morning and evening peak periods, including 30 minute headway transition periods between the 20 minute peak headway service and the hourly off-peak service (Table 2-5). Weekend and holiday operating comparisons between the before and after periods are presented in Table 2-6.

Table 2-5:
Before and After Period Weekday Operating Condition Comparison

Weekday	Before - 2005	After - 2008
Route Start	4:19 AM	4:00 AM
Route Finish	10:39 PM	11:05 PM
Span (Hours: Minutes)	18:20	19:05
Headway (AM/PM Peak)	60	20
Headway (Midday)	90	60
Northbound trips	15	25
Southbound trips	15	25
Total Train trips	30	50

Source: SFRTA Rail Fleet Management Plan (2006) and SFRTA

Table 2-6:
Tri-Rail Before and After Period Weekend/Holiday Operating Condition Comparison

Weekend/Holiday	Before - 2005	After - 2008
Route Start	6:47 AM	6:00 AM
Route Finish	10:37 PM	10:15 PM
Span (Hours: Minutes)	15:10	16:15
Headway (AM/PM Peak)	120	120
Headway (Midday)	120	120
Saturday one-way trips	14	16
Sunday one-way trips	12	16
Total Train trips	26	32

Source: SFRTA Rail Fleet Management Plan (2006) and SFRTA

Table 2-7 and Table 2-8 present the improvements to Tri-Rail's service span, headway, and vehicle trips by direction experienced on a typical weekday. According to the data, following the two-year anniversary of the Segment 5 Project, headways improved by 300 percent (300%) during the weekday peak period and 50 percent (50%) during the off-peak period. The total number of vehicle trips southbound and northbound increased by 79 percent (79%). This suggests that, overall, Tri-Rail patrons are being provided more frequent service over a longer span of service, especially during the peak travel periods, as a result of the Double Track Corridor Improvement Program Segment 5 Project.

Table 2-7:
Tri-Rail Level of Weekday Service Summary

Direction	Route Start	Route Finish	Span (Hours: Minutes)	Headway (AM/PM Peak)	Headway (Midday)	Train Trips
Prior to System Opening (2005)						
Northbound	4:19 AM	10:18 PM	18:00	60	90	15
Southbound	4:24 AM	10:39 PM	18:15	60	90	15
Two Years after System Opening (2008)						
Northbound	4:20 AM	11:05 PM	18:45	20	60	25
Southbound	4:00 AM	10:25 PM	18:25	20	60	25

Source: SFRTA 2005 and 2008 Timetable

Table 2-8:
Change in Tri-Rail Weekday Level-of-Service

Direction	Span (Mins)	% Change	Headway (Peak)	% Change	Headway (Off-Peak)	% Change	Train Trips	% Change
Northbound	0:45	4%	20	300%	60	50%	10	79%
Southbound	0:10	2%	20	300%	60	50%	10	79%

Source: SFRTA 2005 and 2008 Timetable

The following tables (Table 2-9 and Table 2-10) illustrate the various improvements to Tri-Rail hours of operation, service span, headway, and vehicle trips by direction as operated on a typical weekend. In 2008, Tri-Rail hours of operation were extended by five percent (5%) for northbound trips and ten percent (10%) for southbound. Following the Double Track Corridor Improvement Program Segment 5 Project, vehicle trips were increased by a total of 47 percent (47%) systemwide. Following the two-year anniversary of the double track project, Tri-Rail service on holidays and weekends has also greatly increased since 2005. Weekend travelers and those traveling on major holidays now experience a longer span of service in comparison to the before period.

Table 2-9:
Tri-Rail Level of Weekend Service Summary

Direction	Route Start	Route Finish	Span (Hours: Minutes)	Headway (AM/PM Peak)	Headway (Midday)	Train Trips
Prior to System Opening (2005)						
Northbound	6:47 AM	10:18 PM	15:25	120	120	7
Southbound	7:28 AM	11:18 PM	14:50	120	120	7
Two Years after System Opening (2008)						
Northbound	6:00 AM	10:15 PM	16:15	120	120	8
Southbound	6:00 AM	10:15 PM	16:15	120	120	8

Source: SFRTA 2005 and 2008 Timetable

Table 2-10:
Change in Tri-Rail Weekend Level-of-Service

Direction	Span	% Change	Headway (Peak)	% Change	Headway (Off-Peak)	% Change	Train Trips	% Change
Northbound	0:50	5%	0	0%	0	0%	1	14%
Southbound	1:25	10%	0	0%	0	0%	1	33%

Source: SFRTA 2005 and 2008 Timetable

2.3.5 Service Frequency

According to travel demand models conducted for the EA phase and the amended FFGA phase it was estimated that operation would consist of 48 trains daily, operating 20 minute peak period headways and one-hour headways during the off-peak period in both directions for 2015 and 2020. These proposed headways for the Double Track Corridor Improvement Program Segment 5 Project after the opening of the system exceeded model predictions. As shown in the previous tables, Tri-Rail currently operates 50 trains daily, with 20-minute peak period headways and one-hour headways for the off-peak in either direction.

2.3.5.1 On-Time Performance

On-Time Performance (OTP) is a measure of an agency's schedule adherence and the level of success at which the system operates the schedule as published. SFRTA has consistently made every effort to operate Tri-Rail trains efficiently and to operate on-time, to provide reliable transportation for its customers.

There are many factors that can potentially have an impact on OTP, causing scheduling delays such as severe weather, technical equipment malfunctions, and emergencies. However, SFRTA has remained committed to overcoming these obstacles as they arise and providing Tri-Rail service that is reliable. OTP in the before period was significantly impacted by construction activities in 2004 and 2005 experiencing a reduction in reliability by 26 percent (26%) with a 62 percent (62%) weekday OTP. Service reliability began to improve in 2007, with the system operating at an 80 percent (80%) level of OTP. Service continued to operate at a 78 percent (78%) level of OTP in 2008 (Table 2-11). Table 2-11 presents weekday OTP for the before and after period.

Table 2-11:
Before and After Weekday On-Time Performance Comparison

Measure	Before			After		
	2003	2004	2005	2006	2007	2008
On-time performance (end to end)	84%	70%	62%	61%	80%	78%

Source: SFRTA Performance Measurement Evaluation

2.4 Findings

Upon evaluation of the LOS data presented for the before and after periods of the project, SFRTA has improved its LOS with respect to frequency, service span and on-time performance. The most important aspect is the increase of service frequency. Running times and hours of operation also have expanded since the implementation of the Double Track Corridor Improvement Program Segment 5 Project. The increase in the number of trains has provided SFRTA with the opportunity to improve service to its customers, evidence of which is an increase in ridership since March 2006. A summary of the LOS data to include revenue miles, revenue hours, unlinked trips and passenger miles are presented for the before and after periods in Table 2-12. A weekday and weekend total is provided for both commuter rail and bus.

2.5 Recommendations

Further improvements to the Tri-Rail system should include increased connecting shuttle and bus service to certain Tri-Rail stations, including the West Palm Beach and Golden Glades stations. While bus service at some stations has been reduced or eliminated, adequate and timely bus service that connects Tri-Rail passengers to centers of employment continues to be crucial for supporting continued ridership gains. Increases in OTP for both the Tri-Rail system and local bus/shuttle service may be improved with greater vehicle availability and improved operations and network planning.

Table 2-12:
Level of Service Summary Comparison

	2005-2006	2007-2008
Revenue Miles		
Bus - Weekdays	255,953	418,840
Bus - Weekends	9,048	14,806
Bus - Annual total	**265,001**	**433,646**
Rail - Weekdays	1,687,685	2,401,736
Rail - Weekends	319,539	454,734
Rail - Annual total	**2,007,224**	**2,856,470**
Vehicle Revenue Hours		
Bus - Weekdays	27,078	45,715
Bus - Weekends	1,379	2,327
Bus - Annual total	**28,457**	**48,042**
Rail - Weekdays	49,844	63,640
Rail - Weekends	10,166	12,980
Rail - Annual total	**60,010**	**76,620**
Unlinked Trips		
Bus - Weekdays	220,013	376,053
Bus - Weekends	13,855	23,681
Bus - Annual total	**233,868**	**399,734**
Rail - Weekdays	2,306,250	3,094,780
Rail - Weekends	368,302	494,228
Rail - Annual total	**2,674,552**	**3,589,008**
Passenger Miles		
Bus - Weekdays	622,434	1,055,900
Bus - Weekends	27,599	46,818
Bus - Annual total	**650,033**	**1,102,718**
Rail - Weekdays	73,100,613	105,481,271
Rail - Weekends	11,626,523	16,776,609
Rail - Annual total	**84,727,136**	**122,257,880**

Source: SFRTA NTD Submissions

3.0 OPERATIONS AND MAINTENANCE COSTS

3.1 Introduction

The purpose of this chapter is to track the changes in operations and maintenance (O&M) costs due to the completion of the Double Track Corridor Improvement Program Segment 5 Project. As noted in the FTA's guidance, "The Before and After Study has two distinct and important purposes: (1) to expand insights into the costs and impacts of major transit investments; and (2) to improve the technical methods and procedures used in the planning and development of those investments." This analysis is organized into four main sections:

1.) Methodology

2.) Presentation of tabulated data

3.) Analysis of data

4.) Findings and recommendations

The methodology section describes how the O&M cost data was developed. This section is followed by a presentation of tabulated data sourced for both the before and after periods. Trends and associated changes to O&M costs that result from the completion of the Double Track Corridor Improvement Program Segment 5 Project are described in the analysis of data section. Finally, a summary of findings and recommendations for future projects are presented at the end of this chapter.

3.2 Methodology

This section discusses the data sources and describes the methodology used to estimate O&M costs for the Double Track Corridor Improvement Program Segment 5 Project. The methodology uses available data from the agency and follows procedures and methodologies specified by FTA for analysis of O&M cost data.

3.2.1 Data Sources

In September 1999, the SFRTA prepared a Financial Plan in support of an application to FTA for a FFGA for the Double Track Corridor Improvement Program Segment 5 Project. The system wide O&M cost estimates included in this Financial Plan represent the O&M cost estimates for the project for years FY 2000 to FY 2015.

In February 2003, SFRTA prepared a Financial Plan in support of an application to the FTA for an amended FFGA for the Double Track Corridor Improvement Program Segment 5 Project. This Financial Plan projected the cost to operate and maintain the Segment 5 Project over 20 years for FY 2002 to FY 2022.

The O&M cost information, both budget data and data for the actual operation of the Tri-Rail commuter rail system as reported to the National Transit Database (NTD) was obtained from SFRTA for FY 2005 to FY 2006, and for FY 2007 to FY 2008 to

support the comparison of O&M costs before and after the construction of the Double Track Corridor Improvement Program Segment 5 Project

3.2.2 Environmental Assessment Operations and Maintenance Costs

No O&M cost estimates were prepared as part of the completion of the EA.

3.2.3 Full Funding Grant Agreement Operation and Maintenance Costs Methodology

Prior to the submittal of the FFGA Application to FTA, system wide O&M cost estimates were obtained from the September 1999 Financial Plan. These estimates were projected based upon actual expenditures and applied to a prescribed escalation rate over time that ranged from three percent (3%) to five percent (5%).

3.2.4 Amended Full Funding Grant Agreement Operations and Maintenance Costs Methodology

In advance of the amended FFGA application to FTA, system wide O&M cost estimates were obtained from the February 2003 Segment 5 Financial Plan. The O&M costs were projected to increase based upon the incremental cost of service expansion. An average inflation rate of approximately four percent (4%) was applied through FY 2021-2022.

3.2.5 Before-After Operations and Maintenance Cost Methodology

The before and after O&M costs for Tri-Rail commuter rail services were obtained from SFRTA budget data and information submitted annually to the NTD. These O&M costs represent expenditures required for the operation of the commuter rail trains and also include security for the system, marketing expenses, and station utilities, as well as other expenditures required for system operation. These costs for both the before and after period are representative of the various types of costs that were considered during the development of O&M estimates during the planning phase of project development.

3.2.6 Methodology and Procedure for Obtaining Comparable Data

The development of O&M cost estimates is based on Tri-Rail's historic operating expenses. This approach was applied at each project phase, and has the benefit of using actual expenditure data for existing Tri-Rail commuter rail operations. The same methodology was applied consistently throughout the project development process. This allows for comparison of the cost estimates developed for each project phase. In this analysis, for each phase, the estimate was escalated from the current dollar year of the estimate to the 2008 dollar year using inflation factors from the US Department of Commerce Consumer Price Index (CPI). It was necessary to bring all estimates to a common dollar year to allow for comparisons that illustrate any increases or decreases in O&M costs at project milestones over time.

An analysis of these cost comparisons was then used to develop conclusions to identify factors contributing to differences in costs between phases.

3.2.7 Allocation Method for Obtaining Operations and Maintenance Costs

The Double Track Corridor Improvement Program Segment 5 Project represents the operation of one specific mode operated by the SFRTA, commuter rail service. SFRTA also operates feeder bus service, but bus cost data was not analyzed to the level of detail as rail data, since SFRTA's costs of operating bus service is governed by the subsidized inter-county agreements with each of the county bus operators. This project did not include an extension of the new existing commuter rail line, but, rather, included additional railroad capacity which was added to allow for more frequent operations. As such, the collection of O&M data from the SFRTA operating budget and the NTD annual reports were deemed adequate for summarizing O&M costs for the project as operated in revenue service.

FTA guidance suggests performing an evaluation of O&M cost forecasts based on the changes in the number of units of service provided, as well as changes in costs per unit. At each of the project's milestones, the O&M cost estimate for the full operation was developed based on previous Tri-Rail operating experience. Therefore, the actual operating cost for the additional service attributable to Double Track Corridor Improvement Program Segment 5 Project is not easily distinguishable from the systemwide total.

3.3 Presentation of Tabulated Data

3.3.1 Methodology

The data presented in the following sections show O&M cost estimates for a year of full operation and the actual costs for the full "after" service operation in 2008. Since limited information was available, O&M costs were analyzed on a per-service-variable basis which is consistent with the FTA methodology.

3.3.2 Operations and Maintenance Cost Data

The amended FFGA shows O&M cost for the Tri-Rail system in full operation (2006-2007 LOS operations) at $45.1 million (Table 3-1).

Table 3-1:
Amended Full Funding Grant Agreement O&M Costs (FY 2002 - 2022)[2]

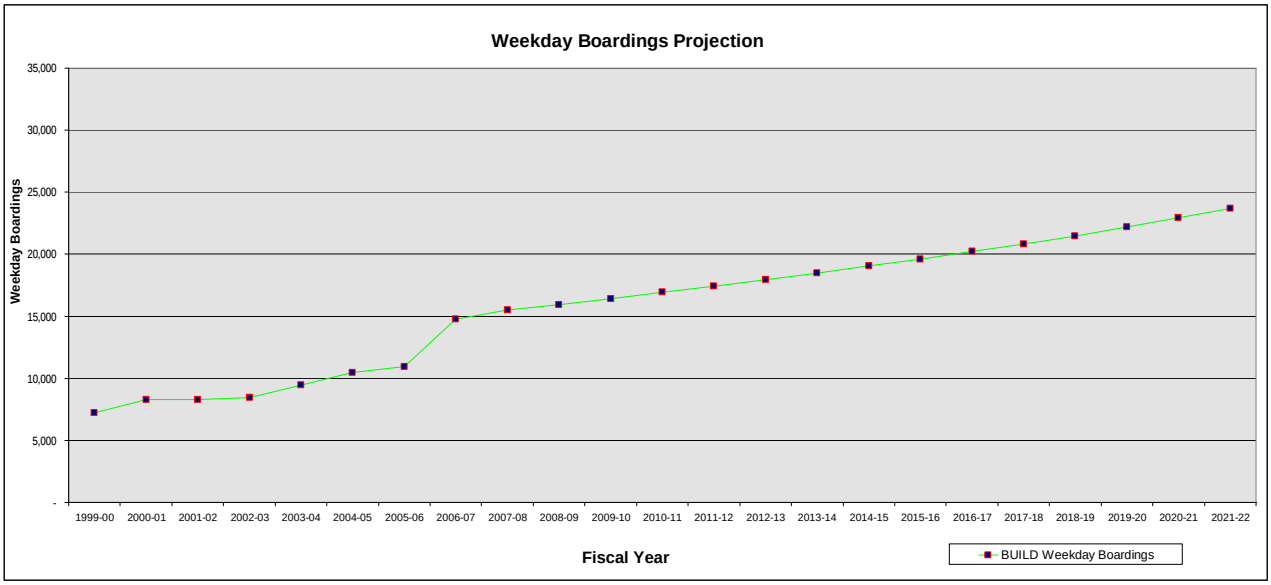
Operating Projections	Actual 1999-00	Actual 2000-01	Actual 2001-02	Budget 2002-03	Fiscal Year Projections 2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Passenger Fare & Other Revenue																								
Passenger Revenue	$5,143	$5,915	$6,030	$5,970	$6,687	$7,355	$8,495	$11,469	$12,042	$12,403	$14,053	$14,475	$14,909	$15,356	$15,817	$17,920	$18,458	$19,012	$19,582	$20,170	$20,876	$23,767	$24,599	$320,502
Advertising & Other Revenue	1,006	143	507	337	155	160	165	170	175	180	185	190	200	210	220	225	230	235	240	250	250	300	300	$6,033
Total Passenger Fare & Other Revenue (1)	**$6,149**	**$6,058**	**$6,537**	**$6,307**	**$6,842**	**$7,515**	**$8,660**	**$11,639**	**$12,217**	**$12,583**	**$14,238**	**$14,665**	**$15,109**	**$15,566**	**$16,037**	**$18,145**	**$18,688**	**$19,247**	**$19,822**	**$20,420**	**$21,126**	**$24,067**	**$24,899**	**$326,535**
State & County Revenue																								
FDOT - County Funding Match (50%)	$ 4,297	$ 4,426	$ 4,558	$ 4,695	$ 5,942	$ 6,619	$ 6,818	$ 12,478	$ 12,852	$ 13,238	$ 13,635	$ 14,044	$ 14,465	$ 14,899	$ 15,346	$ 15,807	$ 16,360	$ 16,933	$ 17,525	$ 18,139	$ 18,864	$ 19,619	$ 20,403	$291,962
Federal Highway Administration	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	$92,000
Federal Transit Administration	2,070	2,860	4,221	5,223	4,325	4,483	4,008	4,500	4,552	4,939	4,157	5,078	5,821	6,404	7,048	6,114	6,902	7,793	8,435	9,128	9,607	8,420	8,916	$135,004
Miami-Dade County	1,432	1,475	1,519	1,565	1,981	2,206	2,273	4,159	4,284	4,413	4,545	4,681	4,822	4,966	5,115	5,269	5,453	5,644	5,842	6,046	6,288	6,540	6,801	$97,320
Broward County	1,432	1,475	1,519	1,565	1,981	2,206	2,273	4,159	4,284	4,413	4,545	4,681	4,822	4,966	5,115	5,269	5,453	5,644	5,842	6,046	6,288	6,540	6,801	$97,320
Palm Beach County	1,432	1,475	1,519	1,565	1,981	2,206	2,273	4,159	4,284	4,413	4,545	4,681	4,822	4,966	5,115	5,269	5,453	5,644	5,842	6,046	6,288	6,540	6,801	$97,320
Total State & County Revenue	**$ 14,663**	**$15,711**	**$17,336**	**$18,613**	**$20,209**	**$21,721**	**$21,643**	**$33,456**	**$34,257**	**$35,415**	**$35,427**	**$37,166**	**$38,752**	**$ 40,203**	**$41,741**	**$41,728**	**$43,622**	**$45,658**	**$47,485**	**$49,405**	**$51,335**	**$ 51,657**	**$53,723**	**$810,926**
Total Operating Revenue	**$20,812**	**$21,769**	**$23,873**	**$24,920**	**$27,051**	**$29,236**	**$30,303**	**$45,095**	**$46,474**	**$47,998**	**$49,665**	**$51,831**	**$53,861**	**$55,769**	**$57,778**	**$59,873**	**$62,310**	**$64,905**	**$67,308**	**$69,825**	**$72,461**	**$75,724**	**$78,622**	**$1,137,460**
Operating & Maintenance Costs																								
Base Line Operating & Maintenance Costs	$20,812	$21,769	$23,873	$24,920	$25,733	$26,579	$27,460	$28,379	$29,337	$30,335	$31,376	$32,462	$33,594	$34,777	$36,011	$37,300	$38,647	$40,054	$41,524	$43,061	$44,668	$46,349	$48,108	$767,129
Costs of Additional Service	-	-	-	-	1,318	2,657	2,844	16,715	17,137	17,663	18,289	19,369	20,266	20,992	21,766	22,572	23,664	24,852	25,784	26,764	27,793	29,375	30,513	$370,332
Total Operating & Maintenance Costs (2)	**$20,812**	**$21,769**	**$23,873**	**$24,920**	**$27,051**	**$29,236**	**$30,304**	**$45,094**	**$46,473**	**$47,998**	**$49,665**	**$51,831**	**$53,860**	**$55,769**	**$57,777**	**$59,873**	**$62,310**	**$64,905**	**$67,308**	**$69,825**	**$72,461**	**$75,724**	**$78,621**	**$1,137,460**
Service Assumption																								
Weekdays Service	28	28	28	28	30	32	32	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Saturday Service	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Sunday Service	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Performance Information																								
Weekday Boardings	7,200	8,290	8,269	8,447	9,460	10,406	10,927	14,751	15,489	15,953	16,432	16,925	17,433	17,956	18,494	19,049	19,621	20,209	20,815	21,440	22,222	22,967	23,694	N/A
Annual Boardings (thousand)	2,232	2,544	2,530	2,619	2,933	3,226	3,387	4,573	4,801	4,946	5,094	5,247	5,404	5,566	5,733	5,905	6,082	6,265	6,453	6,646	6,879	7,120	7,369	N/A
% Increase/Decrease	0.0%	14.0%	-0.6%	3.5%	12.0%	10.0%	5.0%	35.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.5%	3.5%	3.5%	N/A
Fare Box Recovery Ratio	29.5%	27.8%	27.4%	25.3%	25.3%	25.7%	28.6%	25.8%	26.3%	26.2%	28.7%	28.3%	28.1%	27.9%	27.8%	30.3%	30.0%	29.7%	29.4%	29.2%	29.2%	31.8%	31.7%	N/A
Average Fare	$ 2.30	$ 2.33	$ 2.38	$ 2.28	$ 2.28	$ 2.28	$ 2.51	$ 2.51	$ 2.51	$ 2.51	$ 2.76	$ 2.76	$ 2.76	$ 2.76	$ 2.76	$ 3.03	$ 3.03	$ 3.03	$ 3.03	$ 3.03	$ 3.03	$ 3.34	$ 3.34	N/A

Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, February 21, 2003.

[2] Costs and Revenues are in YOE Dollars; only rail cost and revenues are shown

The ridership forecasts used in the February 2003 Financial Plan for projected passenger fare revenues through 2022 were based on SERPM-IV regional planning model results. The projected weekday boardings for Tri-Rail service for the Build Alternative are presented in Figure 3-1.

Figure 3-1:
Estimated Tri-Rail Weekday Boardings (2003 – 2022)



Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, February 21, 2003.

For FY 2005-2006 -- the "before" period -- SFRTA's Operating Budget predicted total annual O&M expenses at $38.6 million in 2006 dollars. Actual expenses based on the NTD submissions were $35.4 million in 2006 dollars. These expenses include the contractual operation of the feeder bus service. Without feeder bus operations, total O&M expenses for FY 2005-2006 were $33.5 million as reported to NTD.

For the FY 2007-2008 -- the "after" period -- SFRTA's Operating Budget predicted total annual O&M expenses at $58.6 million in 2008 dollars. Actual expenses based on the NTD submissions, were $57.1 million in 2008 dollars. These expenses include the contractual operation of the feeder bus service. Without feeder bus operations, total O&M expenses for 2007-2008 were $52.9 million, as reported to NTD. Estimates from amended FFGA predict total costs (without bus operations) to be $46.5 million (Table 3-2). Table 3-2 presents estimated and actual costs at different stages of the project in the specific year of expenditure. Estimates are for full operations scenario. Table 3-3 shows estimated and actual costs at the various stages of the project, in 2008 dollars.[3]

[3] All inflation adjusted is done using Bureau of Labor Statistics Southern Urban Florida CPI

Table 3-2:
Estimated and Actual O&M Costs at Different Stages (in millions of dollars)

		O&M Cost	Estimates/Actuals For	Dollars
FFGA	Estimate	$41,10	2005-2006	1999
Amended FFGA	Estimate	$45.10	2006-2007	2002
2005-2006	Actual	$33.53	2005-2006	2006
2007-2008	Actual	$52.93	2007-2008	2008

Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, September 20, 1999, February 21, 2003 and FTA National Transit Database.

Table 3-3:
Estimated and Actual O&M Costs at Different Stages in 2008 Dollars (in millions of dollars)

		O&M Cost in 2008$	Estimates/Actuals For
FFGA	Estimate	$50.42	2005-2006
Amended FFGA	Estimate	$51.95	2006-2007
2005-2006	Actual	$36.37	2005-2006
2007-2008	Actual	$52.93	2007-2008

Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, September 20, 1999, February 21, 2003 and FTA National Transit Database.

3.4 Analysis of Operation and Maintenance Data

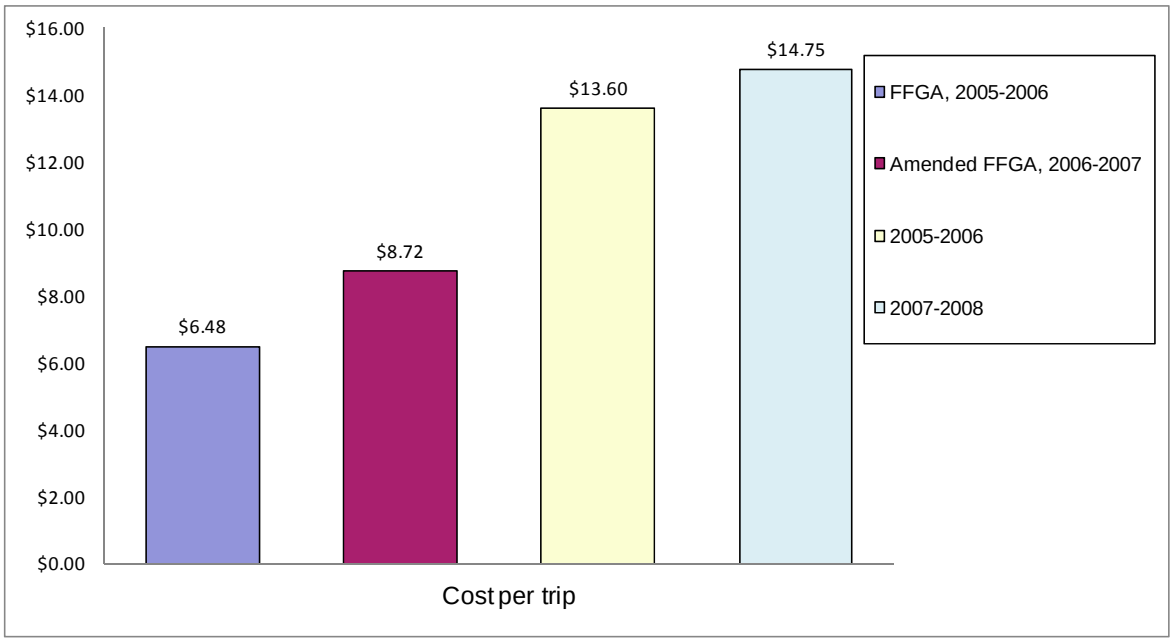
The initial analysis of the O&M data is scaled according to the estimated and actual annual number of boardings. Since boardings only indirectly affect the demand for service, estimates prepared for various stages of project planning as well as the before and after period are also presented on a per-revenue-hour basis. While actual revenue hours are available for the before and after periods, the estimates of revenue hours are not available for the planning phases of project development. Therefore, 2007-2008 (after) actual train revenue hours are used.

The comparison of 2005-2006 (before) to 2007-2008 (after) estimates is shown in greater detail given the variety of other information available through SFRTA and the NTD.

3.4.1 Comparison of Before and After Milestones

Figure 3-2 provides comparison of annual unit costs for the FFGA, amended FFGA and the actual results in the before and after periods. The unit of reference is the number of unlinked passenger trips in the various years. All costs are presented in 2008 dollars or two (2) years after the Segment 5 project opened for services, as recommended by FTA guidance.

Figure 3-2:
Estimated and Actual O&M Costs at Different Stages in 2008 Dollars per Annual Trips



Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, September 20, 1999, February 21, 2003 and FTA National Transit Database

Per trip cost is highest in the after period, at $14.75, and lowest in the amended FFGA, at $8.72 per trip. Differences in these costs are attributed to a number of factors such as:

- Projected ridership estimates higher than originally expected;
- Increases in fuel costs in 2007-2008;
- Increases in costs of various support contracts at SFRTA (this is described in greater detail in the following sections); and,
- Operation of 50 trains per weekday service while O&M estimates were based upon a 48 train per weekday service.

During the development of the O&M costs for various phases, it was assumed that the opening year of full operation the volume of operations would be the same, as shown in Table 3-4.

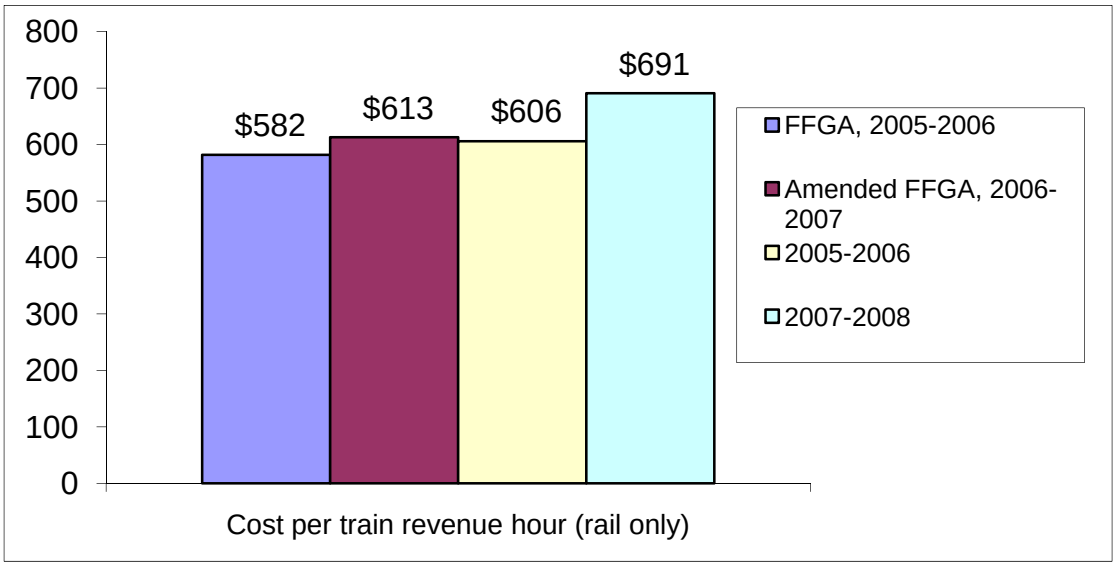
Analyzing costs for the before and after periods on a per revenue hour basis, the estimates appear to be similar to the actual costs, as seen in Figure 3-3.

Table 3-4:
Level-of-Service

	FFFGA, Amended FFGA	Before 2005-2006	After 2007-2008
Number of Stations	18	18	18
Number of One-Way Weekday Trips	48	30	50
Number of One-Way Sat Trips	16	14	16
Number of One-Way Sunday Trips	14	12	16
Weekday Peak Headway (min)	20	60	20
One way trip time (min)	105	119	105
One way trip distance (miles)	71.7	71.7	71.7
Number of peak train sets required	10	6	10

Source: Double Track Corridor Improvement Program Segment 5 Project FFGA, Amended FFGA and SFRTA.

Figure 3-3:
Estimated and Actual O&M Costs at Different Stages in 2008 Dollars per Revenue Hour[4]



Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, September 20, 1999, February 21, 2003 and FTA National Transit Database

In this analysis, the lowest costs per train revenue hour are found in the estimates prepared during the FFGA estimates, at $582. The highest are the actual costs in the after period, at $691 per train revenue hour. This suggests that, while estimated costs per revenue hour are very similar, actual costs in full operations are slightly higher than expected. The before costs are very close (within 2%) to the estimated costs. The analysis of the before and after O&M costs, presented in the following section, reveals reasons for the cost increases between these stages.

[4] 2005-2006 (Before) and 2007-2008 (After) periods use actual costs as reported through NTD

3.4.2 Annual O&M Costs and Driving Factors

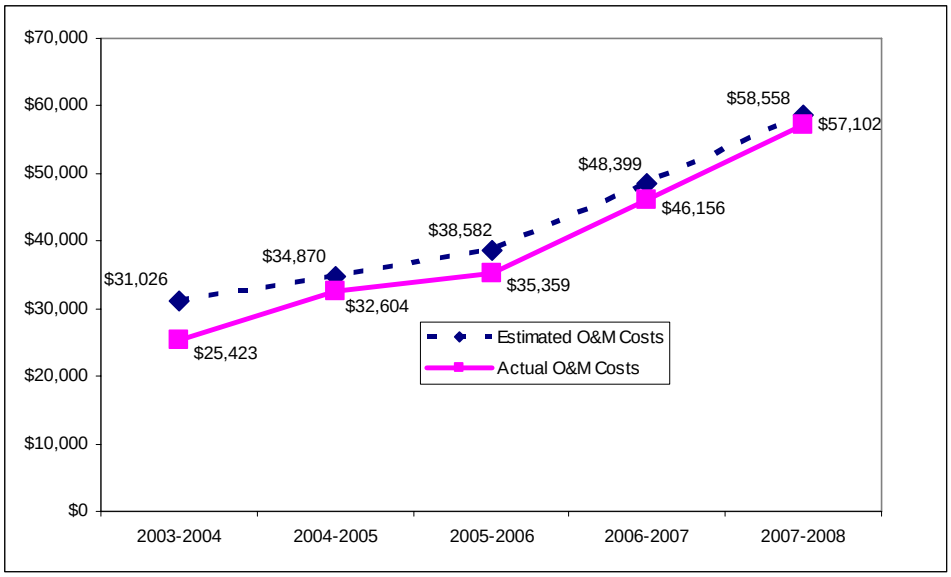
Detailed analysis of the before-and-after costs, categorized by cost driver, was compiled in this section. Given that the predicted number of boardings were available for the FFGA and amended FFGA phase of the analysis, no additional study was completed to evaluate estimated and actual costs other than the analysis that is shown in section 3.3.

SFRTA contracts out many of its services, and given the timing of this report, it was deemed appropriate to compare the categorized costs for budgeted amounts of the before and after periods of operation. However, actual costs were not included since these costs are not categorized. In estimating per unit or, per cost driver costs, actual service characteristics for the before and after period were used. Actual total O&M costs are very close to the predicted costs -- this is a result of thorough planning efforts on behalf of SFRTA, and also the fact that many of its services are contracted and their prices are fixed, in some cases years in advance.

In the following section, total operating costs are used for both for rail and feeder bus services. Feeder bus service is recovered by the agency through the intercounty contracts, but some costs can still be partially assigned to the feeder bus operation. For instance, personnel costs of the agency cannot be allocated to feeder bus, so merging both costs together is a more appropriate method of accounting for costs.

Figure 3-4 shows the comparison of several years of actual and budgeted total costs. Since 2003, actual O&M costs have been seven percent (7%) lower than budgeted. This difference shrank to only two percent (2%) during the 2007-2008 ("after") operating year.

Figure 3-4:
Estimated and Actual O&M Costs at Different Years in the Thousands of Year of Expenditure Dollars



Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, February 21, 2003 and FTA National Transit Database

A majority of SFRTA operating and maintenance cost functions are contracted to outside providers and are directly dependent on negotiated contracts. These are harder to scrutinize than services provided directly by SFRTA. The following services are contracted to outside vendors:

- Train maintenance: Bombardier Mass Transit.
- Train operation: Veolia Transportation
- Station maintenance: Meridian Management Corporation
- Security: The Wackenhut Corporation
- Train fuel: Macmillan Oil Company

Table 3-5 presents the cost driver variables used in the before (2005-06) and after period (2007-08) analysis for operations. The key differences in the before and after periods are: the increase in number of one-way weekday and weekend trips (from 30 to 50 for weekday; from 14 to 16 for Saturday trips; and from 12 to 16 for Sunday trips). As a result, the number of peak trains required rose from six to ten. Operating efficiencies has allowed travel time to be reduced by 14 minutes, from 119 minutes to 105 minutes in the after period. These combined changes result in an increase of nearly 850,000 miles for commuter rail and nearly 170,000 additional revenue miles for connecting buses.

Table 3-5:
Driving Variables

	2005-2006	2007-2008
Rail Service Characteristics		
Number of Stations	18	18
Number of One-Way Weekday Trips	30	50
Number of One-Way Sat Trips	14	16
Number of One-Way Sunday Trips	12	16
Weekday Peak Headway (min)	60	20
One way trip length (min)	119	105
One way trip distance (miles)	71.7	71.7
Average speed (mph)	36.2	41.0
Number of peak train sets required	6	10
Annual Revenue Miles		
Bus	265,001	433,646
Rail	2,007,224	2,856,470
Annual Vehicle Revenue Hours		
Bus	28,457	48,042
Rail	60,010	76,620
Annual Unlinked Trips		
Bus	233,868	399,734
Rail	2,674,552	3,589,008
Annual Passenger Miles		
Bus	650,033	1,102,718
Rail	84,727,136	122,257,880

Source: SFRTA NTD submissions

Table 3-6 compares 2005-2006 and 2007-2008 estimated and actual O&M costs for SFRTA services. Both columns are presented in 2008 dollars for ease of comparison. Cost driver variables for each O&M line item are presented based on the submissions to NTD. The unit cost and difference between the before–and-after period is presented in the last column of the table. The following analysis discusses where significant changes in the cost driver variables have occurred (reductions in costs are shown in green and increases in costs are shown in red).

Table 3-6:
Estimated and Actual O&M Costs in 2008 Dollars by Driving Variable

	Total O&M		Driving Variable			Unit Cost		Change in Per Unit Cost
	Before 2005-2006	After 2007-2008	Before 2005-2006	After 2007-2008		Before 2005-2006	After 2007-2008	
Train operations	$17,004,600	$23,301,395	60,010	76,620	Train revenue hours	$283.36	$304.12	7.3%
Feeder service	$3,523,702	$3,834,392	28,457	48,042	Bus revenue hours	$123.83	$79.81	-35.5%
Security contract	$3,403,924	$5,428,673	88,467	124,662	Total revenue hours	$38.48	$43.55	13.2%
Insurance	$1,756,782	$2,210,000	2,908,420	3,988,742	UPT[5]	$0.60	$0.55	-8.3%
Train fuel	$3,595,403	$5,559,047	2,272,225	3,290,116	Train revenue miles	$1.58	$1.69	6.8%
Bridge tender	$269,519	$3,062,977*	88,467	124,662	Total revenue hours	$3.05	$24.57	706.5%
Station utilities	$466,475	$617,456	2,908,420	3,988,742	UPT	$0.16	$0.15	-3.5%
Revenue collection	$347,210	$352,500	2,908,420	3,988,742	UPT	$0.12	$0.09	-26.0%
800 Phone service	$47,466	$43,500	2,908,420	3,988,742	UPT	$0.02	$0.01	-33.2%
Marketing expenses	$1,144,877	$1,022,072	2,908,420	3,988,742	UPT	$0.39	$0.26	-34.9%
Personnel services	$8,101,058	$9,365,019	2,908,420	3,988,742	UPT	$2.79	$2.35	-15.7%
Business Travel	$117,421	$177,004	2,908,420	3,988,742	UPT	$0.040	$0.044	9.9%
Dues and Subscriptions	$117,082	$172,970	2,908,420	3,988,742	UPT	$0.040	$0.043	7.7%
Seminars	$131,595	$143,619	2,908,420	3,988,742	UPT	$0.045	$0.036	-20.4%
Professional fees	$963,502	$1,382,000	2,908,420	3,988,742	UPT	$0.33	$0.35	4.6%
Office Business expense	$809,364	$1,115,147	2,908,420	3,988,742	UPT	$0.28	$0.28	0.5%
Office rent	$553,506	$670,399	2,908,420	3,988,742	UPT	$0.19	$0.17	-11.7%
Reserve	$545,585	$500,000	2,908,420	3,988,742	UPT	$0.19	$0.13	-33.2%
Transfer to capital program	-$799,584	-$400,000	2,908,420	3,988,742	UPT	-$0.27	-$0.10	-63.5%
Total budget	**$42,099,487**	**$58,558,170**						
Total actual	**$38,582,503**	**$57,102,418**						

Source: SFRTA Operating Budgets and NTD submissions

* Includes track/signal maintenance and dispatching over the New River Bridge.

[5] UPT=unlinked passenger trip

Train Operations, Number of Stations, and Station Hours of Operation[6]

SFRTA includes train operations, train maintenance, station maintenance and operations in the "Train Operation" budget line item. In 2008 dollars, costs of train operations increased from $17 million to $23.3 million, or 37%. Some of this increase is attributed to an increase in the number of one way trips due to the increase in service frequency (30 trips in 2005-2006 to 50 trips in 2007-2008). The increase is also attributed to newly instituted contracts with Bombardier Mass Transit for train maintenance and Veolia Transportation for train operations. These new 10-year maintenance and operating contracts reflect higher market costs (specifically fuel-related) for these services.

The increases in the base contract expenditures are mainly attributed to the significant increase in operating costs that result from the increase in commuter rail service frequency from 30 to 50 trains per day. Table 3-7 shows the breakdown of train operations further into base contracts (train operations and maintenance) and other costs. Although total train operations costs increased, the only sub-component of train operations that actually increased is the "base contracts" as shown in Table 3-7. All other costs actually declined on a per cost driver variable basis. In summary, unit costs for train operations increased seven percent (7%) per revenue hour according to Table 3-6. The base contracts category increased nearly 12 percent (12%). All other associated costs declined on a unit cost basis. This may be attributed to the fact that most of the other costs are based on the number of stations, which did not change between the before and after periods.

Table 3-7:
Train Operations O&M Costs in 2008 Dollars by Driving Variable

	Total O&M		Driving Variable			Unit Cost		Change in Per Unit Cost
	Before 2005-2006	After 2007-2008	Before 2005-2006	After 2007-2008		Before 2005-2006	After 2007-2008	
Base contracts	$15,210,718	$21,664,679	60,010	76,620	revenue hours	$253.47	$282.75	11.6%
Station and facility maintenance	$1,309,403	$1,304,276	18	18	stations	$72,744.61	$72,459.78	-0.4%
Station and facility repairs	$327,351	$175,000	18	18	stations	$18,186.15	$9,722.22	-46.5%
Emergency Bus service	$54,558	$50,000	233,868	399,734	Bus UPT	$0.23	$0.13	-46.4%
Dues - APTA	$20,732	$19,000	6	10	peak trains	$3,455.37	$1,900.00	-45.0%
Electronic message boards	$54,558	$50,000	18	18	Stations	$3,031.03	$2,777.78	-8.4%
Special trains	$27,279	$25,000	2,674,552	3,589,008	Rail UPT	$0.01	$0.01	-31.7%
Uniforms	$0	$3,200	2,674,552	3,589,008	Rail UPT	$0.00	$0.00	
Alarm systems	$0	$10,240	2,674,552	3,589,008	Rail UPT	$0.00	$0.00	
Total budget	**$17,004,600**	**$23,301,395**						

Source: Double Track Corridor Improvement Program Segment 5 Project Financial Plan, February 21, 2003 and FTA National Transit Database

[6] Only individual line items over $200K are reviewed.

Service span has increased slightly between the before and the after periods. On weekdays, stations were open from 4:16 a.m. to 10:08 p.m. in the before period. They are now open from 4:00 a.m. to 11:05 p.m. in the after period. This is nearly a 70 minute per day increase.

Feeder Service

SFRTA contracts out a feeder bus service to the local transit agencies and various private providers. Average costs declined from $123.83 to $79.81 per revenue bus hour between the before and after periods. This decline can be partially attributed to increased County funding and the efficiencies associated with nearly doubling the volume of service (from 265,001 to 433,646 revenue miles). As more bus service is operated, efficiencies associated with higher peak hour loads will result in still lower operating costs.

Security

Security services are currently contracted out by SFRTA to the Wackenhut Corporation. On a per revenue hour basis, costs of security rose from $38.48 in the before period to $43.55 in 2007-2008, the after period. The increase in cost is directly related to providing sufficient security coverage from a 30 train per day service to a 50 train per day service. In addition, a new security contract was signed and is reflective of higher market costs. The increase in hours that the stations are open further explains this difference.

Insurance

Insurance costs for the agency rose from $1.76 million to $2.21 million. However, on a per passenger trip basis, the costs have actually declined from $0.60 a trip to $0.55 a trip, a reduction in cost of eight percent (8.3%). This reduction is understandable given the increase in ridership that has come with the higher frequency of service.

Train Fuel

Train fuel is currently obtained through a contract with Macmillan Oil Company. Costs of fuel increased from $3.6 million to $5.6 million. Some of this increase can be attributed to increased service, however, on a per revenue mile basis, costs still rose 6.8 percent (6.8%) from $1.58 to $1.69 per mile. Part of this increase can be attributed to a significant increase in the cost of fuel – the cost of gasoline per gallon was approximately $2.30 in January 2006 versus $3.00 in January 2008.[7] Therefore, the increase in fuel costs is actually greater than the increase in per mile costs to SFRTA.

Bridge Tender

The bridge tender line item is one of the most significant single-line increases in the agency's O&M costs. While bridge tender costs were $269,519 in the 2005-2006 period, they were anticipated to be $3.06 million in 2007-2008. This increase is strictly a result of the completion of the New River Bridge. Upon its completion, SFRTA assumed the responsibilities of track/signal maintenance and dispatching commuter trains over the bridge. SFRTA contracted with Amtrak to provide the

[7] http://www.gasbuddy.com/gb_retail_price_chart.aspx

dispatching service. Fortunately, the new dispatching services are fully funded through an agreement with FDOT. A similar dollar amount appears on the revenue side to cover this cost.

Station Utilities

Station utilities rose from $466,000 in the before period to $617,000 in 2007-2008 after period. While it represents a nearly $150,000 increase in constant year dollars, on a per-passenger trip basis, there is actually a reduction in the cost from $0.16 to $0.15 per trip. This is due to the economies of scale of carrying larger numbers of passengers as a result of the increased service frequency.

Revenue Collection & 800-Tri-Rail Charges

Revenue collection costs include expenses for both fare collection and ticket vending machine maintenance. 800-Tri-Rail phone charges cover the cost of phone service, which is a convenience for Tri-Rail customers. Overall, these expenses grew by approximately $2,000, but on a per passenger trip basis, there is a considerable reduction in cost between the before and after periods.

Marketing Expenses

Marketing expenses decreased from $1.14 million to $1.02 million. This reduction is attributed to the reduction in the volume of promotional materials, advertising and web site costs that occurred over that period. On a per passenger trip basis, the reduction is even more accentuated with a decline from $0.39 to $0.26 per passenger trip.

Personnel Expenses

Personnel Expenses are for those positions that not contracted out to other providers and those maintained within SFRTA. SFRTA had 110 employees in the after period compared to 101 employees in the before period. Direct employment costs increased from $8.1 to $9.4 million. However, given the increase in operations and, hence, ridership, costs declined from $2.79 to $2.35 per passenger trip. It is difficult to estimate which new positions can be attributed to the additional service.

Business Travel, Dues and Subscriptions, Seminars

Business travel, dues and subscriptions, and seminars expenses increased from $366,000 in the before period to $493,000 in the after period. This represents a $130,000 increase in constant year dollars, but on a per-passenger trip basis, this represents a reduction in cost of $0.02 per trip. SFRTA was a co-host of the 2007 Rail-Volution Annual Conference, and a large portion of the increase was in conference and membership fees as well as other conference related costs.

Professional Fees

Professional fees are expenses for consultants, auditing services, and legal fees. There is an increase of $418,000 from the before to the after period. Most of this increase is attributed to Phase B negotiations for the rail corridor ($225,000). On a per-passenger trip basis, the increase was a small one, from $0.33 to $0.35 resulting in an approximately five percent (5%) increase.

Office Business Expense

Office business expenses rose from $809,000 in the before period to $1.112 million in the after period. Most of this increase ($141,000) is due to telephone expenses and the Consumer Information Network, which installed additional phone lines and upgrades that were necessary because of the completion of the Double Track Corridor Improvement Program Segment 5 Project.[8] On a passenger trip basis, this works out to a less than one percent (1%) increase in costs.

Office Rent

Office rent for the SFRTA personnel increased from $554,000 to $670,000. Most of this increase is related to acquisition of additional office space. On a per-passenger trip basis, there was a reduction from $0.19 to $0.17 per passenger trip.

Reserve and transfer to capital program

Transfers are related to salaries and related fringe benefits that can be directly attributable to a capital project. On a combined basis, the costs fell from $254,000 in the before period to $100,000 in the after period.

3.5 Impacts of the Project on Operation and Maintenance Costs: Findings and Recommendations

Overall, the estimates of the O&M costs from the FFGA and amended FFGA were in-line with what was actually experienced by the SFRTA.

A specific methodology for estimating O&M costs was not applied during the before period. Costs were extrapolated based on historic Tri-Rail commuter rail operating experience of SFRTA without direct consideration to cost drivers and factors based on the related unit costs. While this may often produce reasonable results, this methodology may not be flexible enough to account for and test changes in other operating conditions, such as utility costs, wage rates, changes to contracts, and others. Over the 2000 to 2008 period, both fuel costs and fringe benefit costs have risen at rates that exceed inflation at most transit agencies. A greatly simplified cost estimating methodology would not allow for sensitivity testing of these and other items that could be expected to increase at greater-than-inflationary rates in the future.

However, based on comparison of the before and after actual periods, it appears that unit costs have not changed appreciably and the SFRTA appears to be operating at the same efficiency as it was in the before period. Comparison of SFRTA actual costs with those of other peer agencies, illustrate that the operating costs of SFRTA are lower than other agencies. A calculated average per revenue hour O&M costs of Caltrans, ACE, TRE, Coaster, VRE, and Sounder determined that per train revenue hour cost of those agencies is $718.[9] SFRTA's per train revenue hour O&M cost in the after period was $691.

[8] SFRTA Operating Budget, FY 2006-2007
[9] Using 2006 NTD data

Overall, the following improvements are recommended for O&M estimates as part of this B&AS.

- For the O&M cost estimate, the SFRTA should have used an O&M cost build up approach, which is based on key cost driver variables, including, but not limited to revenue miles, hours, miles of guideway, station staffing, fuel costs, and other costs.
- SFRTA should calibrate the predicted O&M costs to actual values on an annual basis, with a detailed analysis identifying where the variability occurs. While the budgeted costs are not estimated using FTA-recommended cost estimating techniques, SFRTA compares its budgeted costs to actual on an annual basis. In the before-and-after periods, actual unit costs were within seven percent (7%) of the predicted values.
- Because SFRTA has multiple contractual agreements with outside service providers, comparison of O&M costs at different stages is difficult to predict.

In summary, while predicted costs appear in line with the actual costs, it would be beneficial to use a resource build-up approach for future cost estimation. Comparisons with other agencies are crucial in understanding areas of improvements.

4.0 RIDERSHIP

4.1 Introduction

The development of ridership projections for a major capital investment serves to estimate travel demand, determine estimates of operational revenue, and facilitates operations planning from the projected passenger capacity of a planned transportation service. B&AS guidance specifies that a main objective of the ridership chapter is to provide insights into the methods used for ridership forecasting and travel market analysis in order to improve travel forecasting procedures. This is accomplished through an assessment of the quality of projections and the estimates made during the planning and development phases of the project.

The quality of the data sources and methods used to analyze data for a transportation project of this type largely determines the quality of the results. The following subsections describe the methods used to collect and analyze the data presented in this chapter.

4.1.1 Time Period Selection

The B&AS guidance considers the final two project milestones as being immediately before project implementation and two years after project opening. Therefore, the appropriate before and after year periods are 2005 (one year before system opening) and 2008 (two years after system opening).

4.1.2 Population Growth Patterns

The Tri-Rail commuter rail service area includes Miami-Dade, Broward, and Palm Beach counties within the South Florida region. Prior to and during the development period of the second mainline track, the region had been one of the fastest growing in the United States, in terms of population, employment and development. For the before period the growth rates for each of the three counties ranged from two percent (2%) to four percent (4%) according to estimates from the U.S. Census. Palm Beach County -- the least developed of the three counties--experienced the highest rate of growth during the three year span. Contrastingly, for the after period (2006-2008), growth trends have reversed. Population growth in the after condition decreased significantly, with negative growth rates in each County. Broward County experienced the lowest population growth rate (-2%) within the region (Table 4-1).

Table 4-1:
Before and After Population Growth Patterns

County	Before			Percent Growth (2003-2005)	After			Percent Growth (2006-2008)
	2003	2004	2005		2006	2007	2008	
Broward	1,711,269	1,734,734	1,757,590	3%	1,787,636	1,759,591	1,751,234	-2%
Miami-Dade	2,294,651	2,316,708	2,329,187	2%	2,402,208	2,387,170	2,398,245	-0.2%
Palm Beach	1,196,071	1,223,206	1,247,908	4%	1,274,013	1,266,451	1,265,293	-0.7%

Source: 2003-2008 American Community Survey

4.1.2.1 Population and Employment Density

An assessment of population and employment density before and after the Double Track Corridor Improvement Program Segment 5 Project was evaluated. Population and employment densities within a half (1/2) mile radius from Tri-Rail stations were evaluated for the amount of increase or decrease in population within the entire Tri-Rail commuter rail corridor. It was determined from estimates that areas within close proximity to each Tri-Rail station experienced an overall population increase of four percent (4%) and an employment density increase of three percent (3%) between the before and after periods.

4.1.3 Travel Demand Projections

The travel demand forecasting model used for the Segment 5 Project is the Southeast Regional Planning Model IV (SERPM-IV). The SERPM model was developed for the Florida Department of Transportation (FDOT) to forecast highway and transit travel modes in South Florida (Palm Beach, Broward and Miami-Dade Counties). The SERPM-IV travel demand model is primarily used for major urban areas in Southeast Florida to analyze compliance with Florida Intrastate Highway System (FIHS) policies. To date, SERPM-IV is the only planning model available that includes all of the three counties served by Tri-Rail commuter rail service.

The SERPM-IV model has been found to be more comprehensive than the Florida Standard Urban Transportation Modeling Structure (FSUTMS), and was designed to improve multimodal aspects of the FSUTMS which has been developed and maintained by FDOT. SERPM-IV produces daily, AM, and PM peak period travel forecasts. This model also contains routines for analyzing High Occupancy Vehicle (HOV) facilities and can model mode split for the transit systems in Miami-Dade, Broward, and Palm Beach Counties. In addition, SERPM-IV estimates transit passenger activity on routes, at transit stops and at Tri-Rail stations. This information is often necessary for station sizing and estimation of park and ride lot sizes.

The SERPM–IV model has a validated year of 1996 which is used for both the FFGA and amended FFGA forecasts. Later in 2001, the SERPM-IV Model was updated for the preparation of the 2020 Long Range Transportation Plan (LRTP). The updated travel demand modeling performed in 2001, with updated financial and assumptions as prepared for the FFGA amendment application, is used to estimate ridership for the Double Track Corridor Improvement Program Segment 5 Project. The demand forecast results produced for this phase focused on total ridership as well as peak hour station and transit line ridership volumes, primarily for the 2020 forecast year. Travel demand forecast ridership results for the opening year were limited. The results of the 2020 model run are detailed in the Tri-Rail Long Range Modeling report.

4.1.4 Model Data

Based upon the B&AS guidance which references the type of information required for the necessary project comparison, FFGA and the amended FFGA Model results are described. Both of these forecasts have limited data and did not present an

opening year forecast nor detailed ridership by market segments, thus limiting this Before and After study to only compare between 2008 onboard survey and modeled 2020 amended FFGA forecast. The amended FFGA was submitted to the Federal Transit Administration (FTA) by SFRTA in and approved by FTA 2004. The socioeconomic data from the LRTP was used in conjunction with certain assumptions and the anticipation of future transit projects to be completed by 2020.

4.1.5 Modeled Assumptions for FFGA - 2015 Model Year

For the EA phase of project development the FDOT SERPM-IV was used to create model runs in May 1999. The SERPM-IV model was calibrated using historical Tri-Rail commuter rail ridership. The 2015 network was reviewed and modified to develop two distinct Tri-Rail networks: the No-Build Alternative and the Build Alternative. The most notable difference between these networks is that the Build Alternative includes the Double Track Corridor Improvement Program Segment 5 project. Socioeconomic data developed and used in the 2015 model was incorporated into both Tri-Rail model runs. Each of the three Metropolitan Planning Organizations (MPO) and FDOT supplied data as part of the 2015 cost feasible model development process. The estimated ridership is interpolated annually at a growth rate of three percent (3%).

The FFGA estimated Tri-Rail ridership for Fiscal Year (FY) 2015 includes the following data points:

- MPO adopted 2015 TAZ data for the three counties (Palm Beach, Broward and Miami-Dade);
- Priority 1 LRTP for both street and highway projects within the three counties;
- Operations of 48 trains with 20-minute peak period headways and one-hour peak period headways for the off-peak in both directions;
- Future Miami North Corridor Metrorail Extension project in place;
- Miami Intermodal Center (MIC) in place;
- Future MIC/Miami International Airport (MIA) connector in place;
- Future Miami East-West Metrorail Extension to include SR 826 in place;
- High rate of population growth predicted for South Florida (more than 30%);
- Severe congestion projected on the two parallel transportation facilities, I-95 and Florida Turnpike; and,
- The synergy of other programmed transit developments within the region.

4.1.6 Model Results for FFGA-2015 Model Year

Due to the assumptions previously listed, the estimated model results over predicted the actual numbers for both before and after periods. In 1999, using SERPM IV Model, it was assumed that in 2005 SFRTA would operate 48 weekday trips in the northbound and southbound directions, and 30 trips on average during the weekend

to include eight (8) northbound and seven (7) southbound trips while the actual number of weekday trips operated was 28 and 26 vehicle trips for the weekend.

The Before and After Conditions revealed that actual ridership numbers reported for 2005 proved to be lower than the expected modeled estimates. The FFGA-2015 model runs estimated that in 2005 Tri-Rail ridership would be 14,540 riders, whereas actual 2005 Tri-Rail ridership was found to be 9,446. The model estimated annual passenger trips at 4.5 million for year 2005; the actual passenger trips were 2.8 million in that year (Table 4-2).

Table 4-2:
Modeled Assumptions and Results for Before Opening Year (2005)

Assumptions and Estimates	FFGA Modeled Estimate for year 2005 (Before)	Actual (2005)	Difference
Average Weekday Boardings	14,540	9,446	(5,094)
Annual Passenger Trips (000's)	4,507	2,800	(1,707)
Headway (AM/PM Peak)	60*	60	-
Headway (Midday)	90*	90	-
Northbound trips	24	14	(10)
Southbound trips	24	14	(10)
Total Train trips	**48**	**28**	(20)
Saturday	8	7	(1)
Sunday	7	6	(1)
Weekend Train trips	**30**	**26**	(4)

Note: Headways for year 2005 is not available as there is no forecast for opening year and all projections are estimated for 2015 and then apportioned annually. *Hence it is assumed before opening, the headways are the same as the base year (1999).

The FFGA-2015 modeled estimates projected the Tri-Rail annual ridership for 2008 at 8.1 million passenger trips. The actual ridership for the after period in 2008 experienced slightly more than half of estimated boardings at 4.3 million trips.

The model assumed Tri-Rail would operate 48 trips in 2008 on an average weekday. Tri-Rail exceeded this assumption and operates 50 trips on an average weekday. The model details of the FFGA-2015 estimate are presented in Table 4-3 showing the modeled assumptions and results for the two years after system opening.

Table 4-3:
Modeled Assumptions and Results for After Opening Year (2008)

Assumptions and Estimates	After FFGA Modeled Estimate for year 2008	Actual (2008)	Difference
Average Weekday Boardings	26,371	13,882	(12,489)
Annual Passenger Trips (000's)	8,175	4,304	(3,871)
Headway (AM/PM Peak)	30*	20	(10)
Headway (Midday)	60*	60	-
Northbound trips	24	25	1
Southbound trips	24	25	1
Total Train trips	**48**	**50**	2
Saturday	9	8	(1)
Sunday	7	8	1
Weekend Train trips	**32**	**32**	-

Note: Headways for year 2008 are not available as there is no forecast data available for two years after opening and all projections are estimated for 2015 and then apportioned annually. *Hence it is assumed after opening, the headways are the same as the base year (2015).

4.1.7 Modeled Assumptions for the Amended FFGA – 2020 Model Year

The amended FFGA-2020 forecasted ridership used the FDOT SERPM-IV regional planning model. This model is calibrated using historical Tri-Rail commuter rail ridership. The amended FFGA-2020 network for model input included the following data and other anticipated future transit projects:

- MPO adopted 2020 TAZ data for the three counties (Palm Beach, Broward and Miami-Dade);
- Financially feasible projects in the 2020 LRTP's of each of the three counties;
- Local Transit Development Plan bus networks for each of the three counties;
- Operation of 48 Tri-Rail trains, with 20 minute peak period headways and 60-minute peak period headways for off-peak in both directions;
- Miami Intermodal Center in place; and
- Future MIC/MIA Mover in place.

The amended FFGA-2020 forecasted ridership was more accurate than the FFGA 2015 forecast based upon the following modeling data assumptions:

1.) The benefit of the 2000 census data which merged the south Florida Urbanized Areas (UZAS) of Miami-Hialeah, Fort Lauderdale-Hollywood-Pompano Beach; and West Palm Beach-Boca Raton-Delray Beach into one UZA.

2.) An updated 2020 LRTP to include a revised listing of a financially cost feasible projects.

3.) A revised transit network that did not include the Miami-Dade North Corridor project (2007 projected opening) and the Miami-Dade East-West line (2010 projected opening) being in place.

4.1.8 Model Results for Amended FFGA-2020 Model Year

In 2002, the SERPM IV model was recalibrated with a revised transit network and used to further estimate Tri-Rail ridership for the amended FFGA-2020 model runs. Table 4-4 presents the details of the modeled assumptions and modeled results for one year before system opening (2005) and actual ridership counts for 2005.

Table 4-4:
Modeled Assumptions and Results for Before Opening Year (2005)

Assumptions and Estimates	Before Amended FFGA Modeled Estimate for year 2005	Actual (2005)	Difference
Average Weekday Boardings	10,927	9,446	(1,481)
Annual Passenger Trips (000's)	3,387	2,800	(587)
Headway (AM/PM Peak)	60*	60	-
Headway (Midday)	60*	90	30
Northbound trips	16	14	(2)
Southbound trips	16	14	(2)
Total Train trips	**32**	**28**	(4)
Saturday	7	7	-
Sunday	6	6	-
Weekend Train trips	**26**	**26**	-

Source: Amended FFGA Report-2020. Note* Headways for year 2005 and 2008 are not available as there is no forecast for opening year, and all projections are extrapolated between base year 2001 and project year 2020 and are apportioned annually at a 3% growth factor. For these reasons, the 2005 headways are assumed to be same as base year (1999) headway.

The amended FFGA-2020 model runs estimated Tri-Rail ridership to be 3.3 million annual passenger trips in 2005, with 32 trains on a typical weekday. Actual annual ridership was observed at 2.8 million trips, with 28 daily train trips for 2005. The difference between the amended FFGA-2020 estimates and actual average weekday trips for opening year were 1,481 trips, or 13.5 percent (13.5%) less than the estimated values.

The model assumptions for 2008 would include Tri-Rail operating 48 daily trips with average weekday boardings of 15,489. Actual reports indicated Tri-Rail operating 50 trips with average weekday boardings of 13,882. The gap between the amended FFGA-2020 estimate and actual Tri-Rail ridership experienced is 1,607 trips per day. The amended FFGA-2020 model estimated Tri-Rail annual ridership for 2008 at 4.8 million passenger trips. The actual ridership in 2008 was 4.3 million trips, which is slightly lower than model estimates.

Table 4-5 presents details of the amended FFGA-2020 model assumptions and results compared to the actual observed trips for the after period.

Table 4-5:
Modeled Assumptions and Results for After Opening Year (2008)

Assumptions and Estimates	After Amended FFGA Modeled Estimate for year 2008	Actual (2008)	Difference
Average Weekday Boardings	15,489	14,732	(1,607)
Annual Passenger Trips (000's)	4,801	4,304	(497)
Headway (AM/PM Peak)	20	20	
Headway (Midday)	60	60	
Northbound trips	24	25	1
Southbound trips	24	25	1
Total Vehicle trips	48	50	2
Saturday	8	8	
Sunday	6	8	2
Weekend Vehicle trips	28	32	4

Source: Tri-Rail Long Range Plan Modeling Report, 2001 and SFRTA 2008

4.2 Systemwide Ridership Analysis

The south Florida region is served by three local transit agencies, Palm Tran in Palm Beach County, BCT in Broward County, and MDT in Miami-Dade County. These agencies operate transit systems providing local bus service, shuttle services, and, in the case of MDT, fixed guideway heavy rail and people-mover systems. These agencies provide direct connections to the Tri-Rail commuter rail system. As a result, changes in service on any of these individual systems may affect Tri-Rail ridership. This section explores ridership before and after the implementation of the Double Track Corridor Improvement Program Segment 5 Project.

The 2005 average daily ridership throughout the system was about 488,491 trips (Table 4-6), and in 2008 transit ridership increased by 17 percent (17%) to 572,349 daily trips. During this time period, local bus accounted for about 79 percent (79%) of all transit trips, and Tri-Rail served about two percent (2%) of all unlinked trips. In Miami-Dade County, Metrorail train service carried about 12 percent (12%) of total systemwide ridership, and the Metromover supported another six percent (6%) of total transit ridership.

Figure 4-1 outlines the growth in transit ridership in South Florida by transit agency and transit mode for the before and after periods.

Between 2005 and 2008, transit ridership increased both systemwide by agency and by individual transit modes (except for MDT's Metromover). Tri-Rail boardings grew by 56 percent (56%), while local bus and MDT's Metrorail both grew by 18 percent (18%) between 2005 and 2008. Between 2005 and 2008, Tri-Rail headways were improved by 50 percent (50%) during peak periods and 33 percent (33%) during off-peak periods. Overall, vehicle trips increased by 79 percent (79%) on a typical weekday.

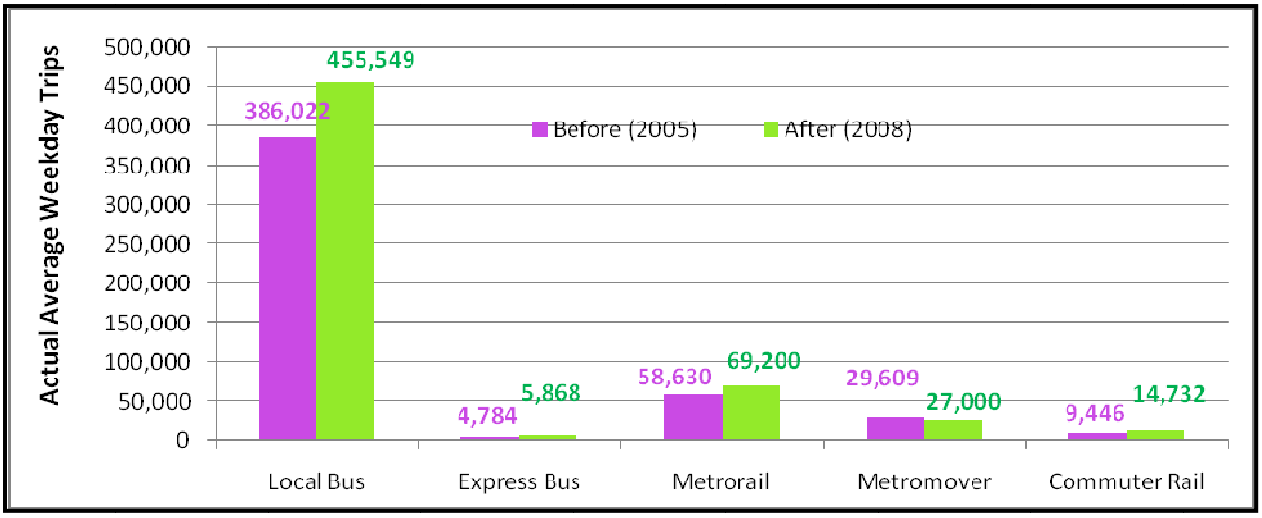
Table 4-6:
Actual Systemwide Average Weekday Ridership

	MODE	MDT	BCT	Palm Tran	SFRTA	Total
NTD Data for 2005 (Before)	Local Bus	234,427	122,501	29,094		386,022
	Express Bus	4,784				4,784
	Metrorail	58,630				58,630
	Metromover	29,609				29,609
	Commuter Rail				9,446	9,446
	Total	**327,450**	**122,501**	**29,094**	**9,446**	**488,491**
2008 Data from Annual Reports (After)	**MODE**	**MDT**	**BCT**	**Palm Tran**		**Total**
	Local Bus	293,400	125,543	36,606		455,549
	Express Bus	5,868				5,868
	Metrorail	69,200				69,200
	Metromover	27,000				27,000
	Commuter Rail				14,732	14,732
	Total	**395,468**	**125,543**	**36,606**	**14,732**	**572,349**

Note: NTD data presents local bus ridership as a total of express bus service and regular bus service combined. For this effort, express bus ridership counts were extracted from total amount and presented separately.

Source: 2005, NTD; MDT Ridership technical report Sep 2008; Tri-Rail Monthly Operations Report; BCT annual report shows annual ridership for fixed routes for 2008 and this is factored by 306 days (factor is derived from 2005 = annual ridership/ avg. weekday ridership).

Figure 4-1:
Actual Before and After Systemwide Unlinked Trips by Mode



Note: Since there is no readily available data for express bus service, it is assumed as 2% of local bus trips based on Miami-Dade fare revenue reported in monthly operation reports.

4.2.1 Tri-Rail Trips by County Before and After

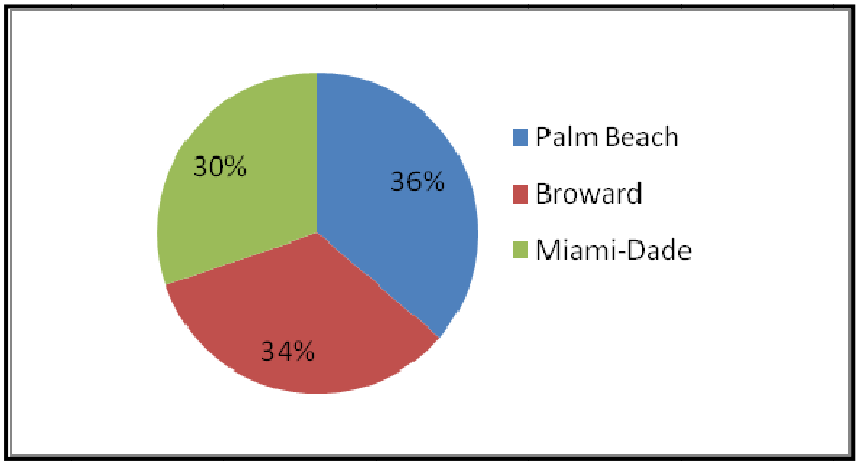
Between 2005 and 2008, Tri-Rail ridership grew by 81 percent (81%) in Broward County, 58 percent (58%) in Miami-Dade and 54 percent (54%) in Palm Beach County as shown in Table 4-7, Figure 4-2 and Figure 4-3. In 2005, Palm Beach County showed the highest share of Tri-Rail commuters (36%), followed by Broward County at 33 percent (33%) and Miami-Dade at 30 percent (30%) as presented in Table 4-7. Figure 4-3 depicts Tri-Rail's market share of trips in 2008. During this time period, ridership by County remained at levels similar to 2005. The only exception was an increase in the number of Tri-Rail commuters observed in Broward County.

Table 4-7:
Actual Annual Tri-Rail Trips by County

County	Before 2005	After 2008	Percent Change
Palm Beach	998,459	1,533,603	54%
Broward	921,490	1,670,083	81%
Miami-Dade	833,940	1,320,268	58%
Total	2,753,889	4,523,954	64%

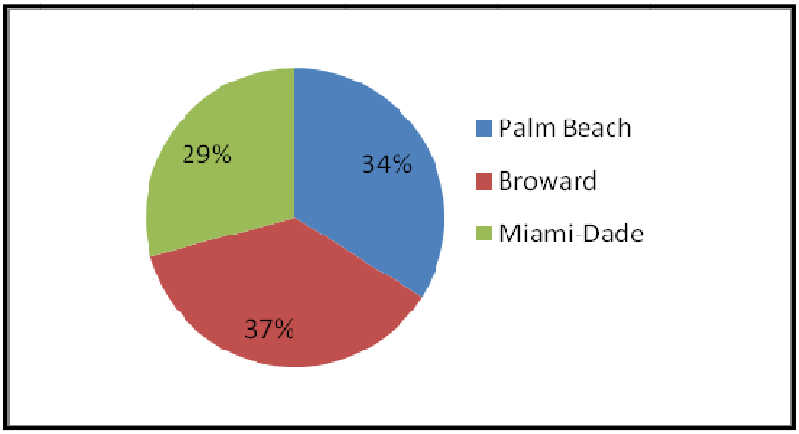
Source: SFRTA Operations Report (2005 and 2008)

Figure 4-2:
Before (2005) - Tri-Rail Trips by County



Source: SFRTA Operations Report (2005 and 2008)

Figure 4-3:
After (2008) - Tri-Rail Trips by County



Source: SFRTA Operations Report (2005 and 2008)

4.2.2 Tri-Rail Monthly Ridership Before and After

In 2008, two years after opening of the Segment 5 project for revenue service, Tri-Rail served about 4.3 million passenger trips, an increase of 56 percent (56%) from 2005. Figure 4-4 presents Tri-Rail monthly ridership comparisons between the before period (one year prior to opening in 2005) and the after period (two years after opening in 2008).

The respective monthly ridership for 2005 and 2008 showed consistent ridership growth throughout the year, with the exception of two summer months. Comparing respective months in 2005 and 2008, the growth in Tri-Rail ridership starting from January to May, was moderate, ranging from 35-53 percent (35-53%), record increases of 98-100 hundred percent (98-100%) were observed during the months of June and July. This may be partly attributed to increases in oil prices which increased to $146 per barrel during the summer of 2008 and saw gasoline retail prices topping $4 per gallon (http://www.gasbuddy.com). However, from August to December, the steady growth in ridership ranged from 60-80 percent (60-80%) even though gasoline prices had declined. Part of this growth is coupled with systemwide increases in transit ridership, an overall increase of 17 percent (17%) between the before and after periods.

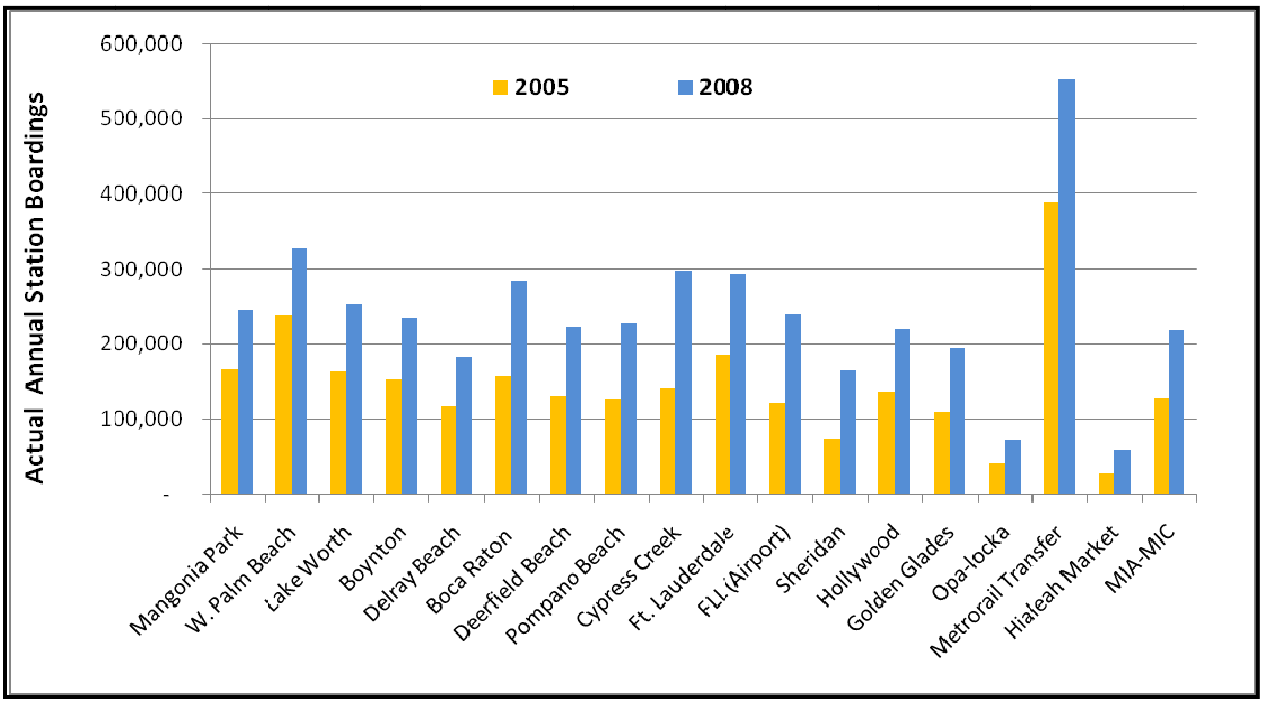
Figure 4-4:
Actual Average Weekday Boardings Before and After

Source: SFRTA Operations Report (2005 and 2008)

4.2.3 Station Boardings

Between 2005 and 2008, Tri-Rail's annual boardings increased by 56 percent (56%) to 4.3 million trips. During the same period Tri-Rail stations such as Cypress Creek, Sheridan, and Hialeah Market saw ridership grow by more than 100 percent (100%). At another 12 stations, ridership grew between 50-80 percent (50-80%). Three (3) stations, Mangonia Park, West Palm Beach, and Metrorail Transfer Stations grew at a moderate rate of 37-48 percent (37-48%). Figure 4-5 presents the annual Tri-Rail boardings for 2005 and 2008 by station.

Figure 4-5:
Actual Annual Station Boardings (Before and After)



Source: SFRTA Operations Report (2005 and 2008)

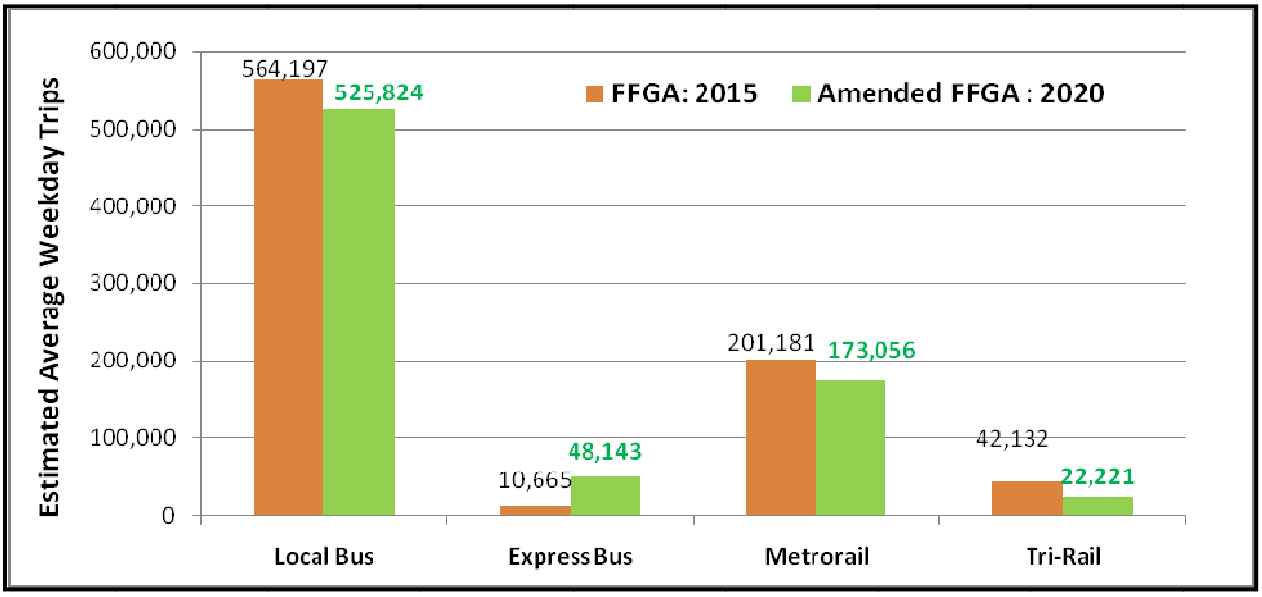
During both the before (2005) and after periods (2008), the highest number of boardings to the Tri-Rail system were at the Metrorail Transfer Station, where Metrorail and Tri-Rail riders transfer between systems. The growth in ridership that occurred over this period is related to the improved level of transit service to Tri-Rail stations, as well as to the increase in service frequency that was made possible by the double tracking project.

4.2.4 Estimated Ridership

This section provides detail into the two (2) model forecasts prepared for FFGA-2015 and the Amended FFGA-2020. These forecasts are compared in an effort to determine the differences in estimated trips both systemwide as well as individual Tri-Rail trips. The FFGA-2015 forecast estimated total transit trips of 818,175 in 2015, whereas the Amended FFGA-2020 estimated total transit trips of 769,244 in

2020. This difference in total trips was observed across all modes except for Express Bus. Tri-Rail ridership estimates in FFGA-2015 forecasted 42,132 passenger trips and the Amended FFGA-2020 estimated 22,221 trips for 2020. Figure 4-6 presents the comparison of estimated unlinked trips from both forecasts.

Figure 4-6:
Comparison of estimated ridership between FFGA-2015 (Forecast) and Amended FFGA 2020 (Forecast)



Source: Tri-Rail Long Range Plan Modeling Report, 2001

With the FFGA-2015 forecasts, the underlying transit network was coded with future transportation projects such as North Corridor, East-West Metrorail Extension Projects, Miami-MIC Metrorail Connector in Miami-Dade, other population and employment growth rates as per the available LRTP and other potential future transit projects.

The amended FFGA-2020 forecast included a revised set of population and employment growth rates based on the available LRTPs and other potential future transit projects. The original model included two major future transit projects, the MDT North Corridor and East-West Metrorail Extension projects. These were excluded as the LRTP data was updated for 2020. Table 4-8 presents the estimated total transit person trips and boardings by mode.

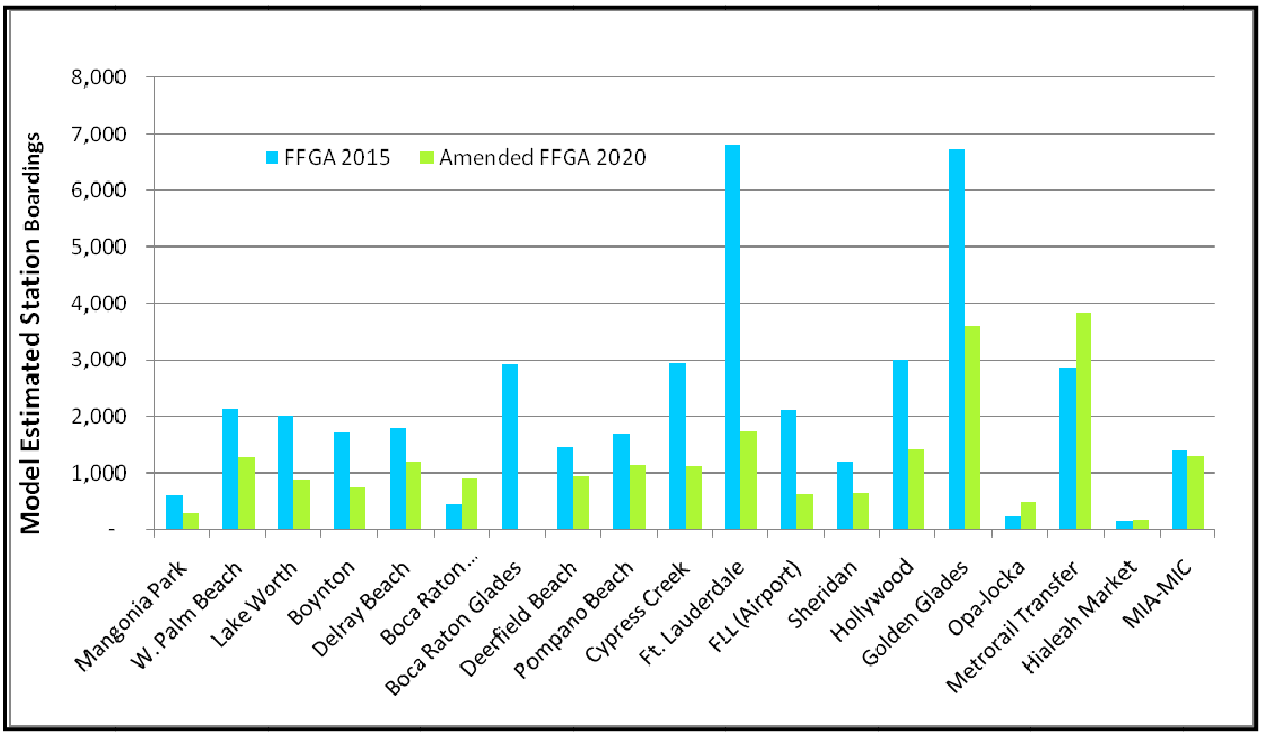
Table 4-8:
Estimated Average Weekday Ridership by Mode

Mode	FFGA: 2015	Amended FFGA : 2020	Difference
Local Bus	564,197	525,824	-38,373
Express Bus	10,665	48,143	37,478
Metrorail	201,181	173,056	-28,125
Tri-Rail	42,132	22,221	-19,911
Total Trips	**818,175**	**769,244**	**-48,931**

4.2.5 Estimated Station Boardings

The FFGA 2015 model forecasted that 32 percent (32%) of all Tri-Rail commuters would board at the Fort Lauderdale and Golden Glades Stations and another seven percent (7%) at the Tri-Rail Metrorail Transfer Station. Exact reasons for the spike at Golden Glades and Fort Lauderdale Stations are not known due to data limitations; however, at Metrorail Transfer Station, a significant number of commuters transfer to Metrorail, which serves downtown Miami. The amended FFGA-2020 model predicted that 34 percent (34%) of all Tri-Rail commuters would board at the Golden Glades and Metrorail Transfer Stations and that an additional seven percent (7%) would board at the Fort Lauderdale Station. Figure 4-7 presents comparison of estimated daily Tri-Rail station boardings between FFGA 2015 and amended FFGA 2020 forecasts.

Figure 4-7:
Estimated Daily Station Boardings for FFGA 2015 and Amended FFGA 2020



Source: Tri-Rail Long Range Plan Modeling Report, 2001

4.2.6 Tri-Rail Ridership Estimated to Actual Comparative Analysis

The following figure compares model estimated ridership from FFGA-2015 and the amended FFGA-2020 to actual observed ridership for one year Before (2005) and two years after (2008) opening of Double Track Corridor Program Segment 5 project. In 2005, the FFGA-2015 forecast estimated 14,013 Tri-Rail passenger trips, and the amended FFGA-2020 estimated 10,406 passenger trips.

The actual observed boardings in 2005 for the Before Condition were 9,446 trips. Shortly after opening of the Segment 5 project the FFGA-2015 estimated 26,371 trips by year 2008, almost 88 percent (88%) more than observed boardings in 2008.

The amended FFGA-2020 forecasts were based on the 1996 recalibrated SERPM IV model and revised fare model accounting for proper transfers to and from Metrorail as well as accurate representation of Tri-Rail fares zones. The amended FFGA-2020 model also exhibits similar ridership patterns compared to actual annual Tri-Rail boardings.

As the amended FFGA-2020 forecasts found, the Metrorail Transfer Station shows the highest number of boardings per station, with about 17 percent (17%) of all Tri-Rail trips. Actual observed trips at this station were 13 percent (13%) of all Tri-Rail trips. The amended FFGA-2020 estimated 15,489 trips for 2008, but the actual average weekday boardings observed were 14,732 trips. In comparison, the amended FFGA-2020 model assumptions and forecasts provided estimates closer to actual observed numbers from NTD.

4.3 Travel Market Pattern Analysis

4.3.1 Methodology for Obtaining Boarding Data

Boarding data for Tri-Rail commuter rail service is required to understand the impact that the Double Track Corridor Improvement Program Segment 5 Project has had on the Tri-Rail system. The following subsections describe the methodology for collecting boarding data at Tri-Rail stations.

As a result of Tri-Rail utilizing a proof-of-payment method of fare collection, boardings are not tracked through ticket purchases. Therefore, boardings at Tri-Rail stations must be counted manually. Tri-Rail records boardings and alightings at each station on the commuter line for each trip. This information is reported in a monthly ridership report, disaggregated by peak and off-peak periods, by direction (north-south), by county and for each station.

4.3.2 Limitations to Survey Data

Surveys conducted for the before period are in Origin-Destination format and sample records are not expanded to total Tri-Rail Boardings. An example of Origin-Destination is Home to Work trips where home is both an origin and production, work is both a destination and attraction end. For these two reasons, Before period market patterns such as trip purpose, trip access and egress are hard to study and evaluate. Survey data for 2008 (after period) is expanded and converted into Production- Attraction format to precisely study the Tri-Rail markets. An example of Production-Attraction is Work to Home trips where work is considered both Origin and Attraction trips. However, home is considered both Destination and Production ends. Model estimated trips by purpose are in Production-Attraction format, therefore for consistency B&AS survey analysis is conducted in the Production-Attraction format.

Figure 4-10 and Figure 4-11 presents Tri-Rail Markets for the after period from the 2008 expanded sample survey. The figures present a comparison of patron responses from the 2004 and 2008 Tri-Rail On-Board surveys for trip origin and destination, mode of access and income distribution.

4.3.3 Methodology for Obtaining Comparable Travel Market Pattern

The B&AS guidance recommends the use of on-board surveys at both the before and after milestones of the project. The evaluation of the effectiveness of the project, and of the ridership forecasting methods, is facilitated from the collection of actual travel market patterns. SFRTA performed an on-board survey in 2004 and 2008 on Tri-Rail commuter rail service operations. These surveys provided responses from riders for the before-and-after period milestones.

4.3.3.1 Before Period On-Board Survey Methodology

In December 2004, SFRTA performed an on-board survey on Tri-Rail commuter rail service operations. The purpose of the survey was to collect origin and destination information that would provide an understanding of travel market pattern behavior. This survey provided responses from riders to document the before period. On-board survey respondents answered questions regarding trip origin, trip purpose, mode of access to-and-from a Tri-Rail station, and their trip destination. This sample included 920 surveys.

4.3.3.2 After Period On-Board Survey Methodology

Actual travel market pattern data was obtained through the collection of ridership information from an on-board survey conducted in May 2008. The on-board survey was developed and administered in collaboration with SFRTA staff for the purposes of assessing the ridership market patterns prior to and after the implementation of the Segment 5 Project, and to capture a representative sample of commuter trips. A total of 1,277 valid surveys were collected from the passengers riding Tri-Rail commuter rail service during peak and non-peak weekday trains and on mid-day trains during the weekend.

4.3.4 Tri-Rail Parking and Circulation Study

The 2008 SFRTA Tri-Rail Parking and Circulation Study is also referenced since this study examines Tri-Rail patron usage of station parking lots to determine the existing parking capacity at Tri-Rail stations (Table 4-9). As a comparative data reference, parking lot facilities for each station as identified in the 1999 EA are also presented. Due to data limitations, this reference does not include utilization rates or capacity status during that time period (Table 4-10).

Table 4-9:
Tri-Rail Parking Lot Counts (2008)

Station	Available Tri-Rail spaces	Vehicles Observed	Overflow/ Nearby street parking	Total	Utilization Rate	Status
Mangonia Park	272	272	5	277	102%	Over Capacity
West Palm Beach	114	111	55	166	146%	Over Capacity
Lake Worth	157	150	6	156	99%	Over Capacity
Lake Worth (temporary lot)	68	50	0	50	74%	Approaching Capacity
Boynton Beach	324	288	0	288	89%	Over Capacity
Delray Beach	129	127	2	129	100%	Over Capacity
Boca Raton	159	148	0	148	93%	Over Capacity
Deerfield Beach (E)	132	57	0	57	43%	Space Available
Deerfield Beach (W)	104	102	15	117	113%	Over Capacity
Pompano Beach	259	193	0	193	75%	Approaching Capacity
Cypress Creek	560	232	0	232	41%	Space Available
Fort Lauderdale	296	268	1	269	91%	Over Capacity
Fort Lauderdale Airport Station at Dania Beach	183	171	0	171	93%	Over Capacity
Sheridan Street	592	412	0	412	70%	Approaching Capacity
Hollywood	150	139	0	139	93%	Over Capacity
Golden Glades	1027	1025	16	1041	101%	Over Capacity
Opa-locka	72	69	7	76	106%	Over Capacity
MetroRail Transfer	44	43	13	56	127%	Over Capacity
Hialeah Market	123	78	0	78	63%	Space Available
Miami Airport	143	125	10	135	94%	Over Capacity

Source: SFRTA Tri-Rail Parking and Circulation Study, 2008.

Table 4-10:
Tri-Rail Parking Lot Inventory (1999)

Station	Parking Spaces	Station	Parking Spaces
Mangonia Park	265	Fort Lauderdale	283
West Palm Beach	116	Fort Lauderdale Airport	126
Lake Worth	84	Sheridan Street	794
Boynton Beach	310	Hollywood	126
Delray Beach	97	Golden Glades	221
Boca Raton	53	Opa-locka	72
Deerfield Beach	64	Metrorail Transfer	39
Pompano Beach	259	Hialeah Market	61
Cypress Creek	541	Miami Airport	242

Source: Tri-Rail's Double Track Corridor Improvement Program Segment 5 Project Environmental Assessment (1999).

Table 4-11:
Tri-Rail Parking Lot Inventory (2008)

Station	Parking Spaces	Station	Parking Spaces
Mangonia Park	272	Fort Lauderdale	296
West Palm Beach	114	Fort Lauderdale Airport	183
Lake Worth	225	Sheridan Street	592
Boynton Beach	324	Hollywood	150
Delray Beach	129	Golden Glades	1027
Boca Raton	159	Opa-locka	72
Deerfield Beach	236	Metrorail Transfer	44
Pompano Beach	259	Hialeah Market	123
Cypress Creek	560	Miami Airport	143

Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

Since the opening of revenue service for the Double Track Corridor Improvement Program Segment 5 Project, Tri-Rail service has experienced a high rate of ridership growth and a corresponding growth in parking demands at each Tri-Rail station. In July 2008, SFRTA conducted parking counts at each of the 18 Tri-Rail stations to assess parking capacity. The findings revealed that, based on Tri-Rail patron utilization rates, three (3) station parking lots provide adequate parking, three (3) station parking lots are approaching full capacity, and fourteen (14) station parking lots are at or over capacity.

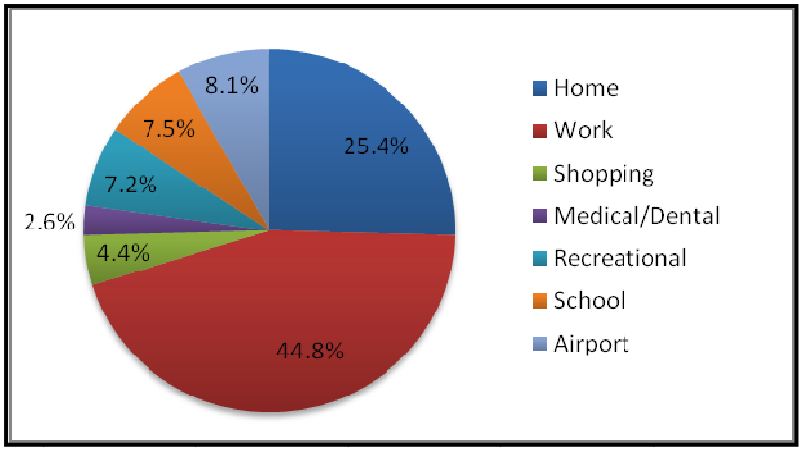
Furthermore, comparisons between the number of parking spaces in 1999 and those available in 2008 suggest that the number of parking spaces have increased at nearly all stations during the before and after periods to accommodate the growing number of Tri-Rail passengers parking their vehicles and boarding the trains (Table 4-10 and Table 4-11).

4.4 Originating Trips by Purpose

4.4.1 Before and After Period Trip Purpose

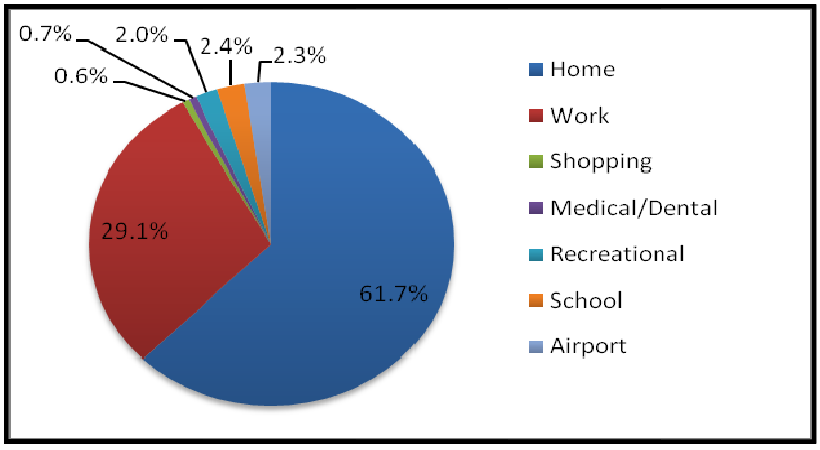
The originating trip purpose was compared to determine the travel behavior of passengers before and after project implementation. From the December 2004 Tri-Rail Survey, originating trip purpose is analyzed from unexpanded samples. Figure 4-8 and Figure 4-9 present the Tri-Rail trip originating purpose for before and after period years. In 2004, before the construction of Double Track Corridor Improvement Program Segment 5 Project, the vast majority of the respondents (70%) began their journey either from home or work, with 45 percent (45%) reporting to start their trip from their workplace. In 2008, 92 percent (92%) of all riders reported their trips origination is either work or home.

Figure 4-8:
Before Period (2004) - Originating Trips by Purpose



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

Figure 4-9:
After Period (2008) - Originating Trips by Purpose



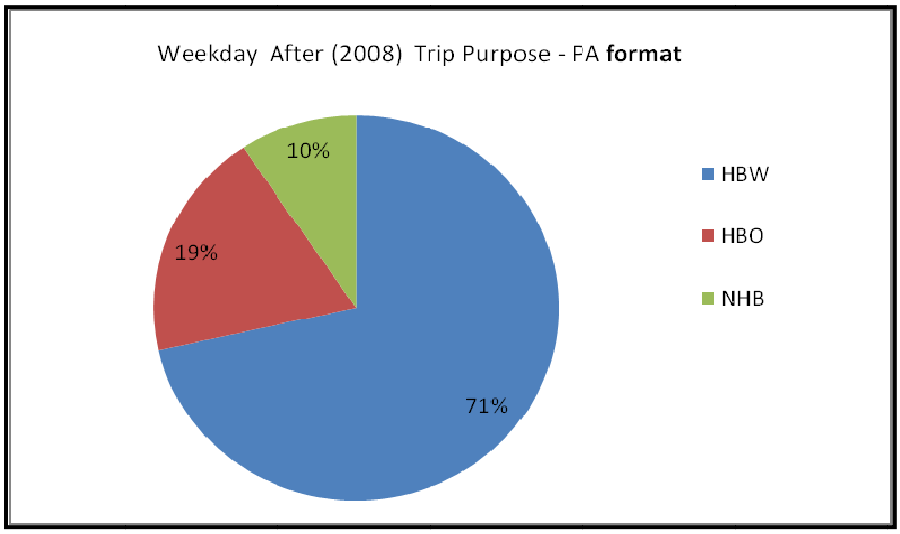
Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

4.5 After Period Travel Market Patterns

4.5.1 Trip Purpose

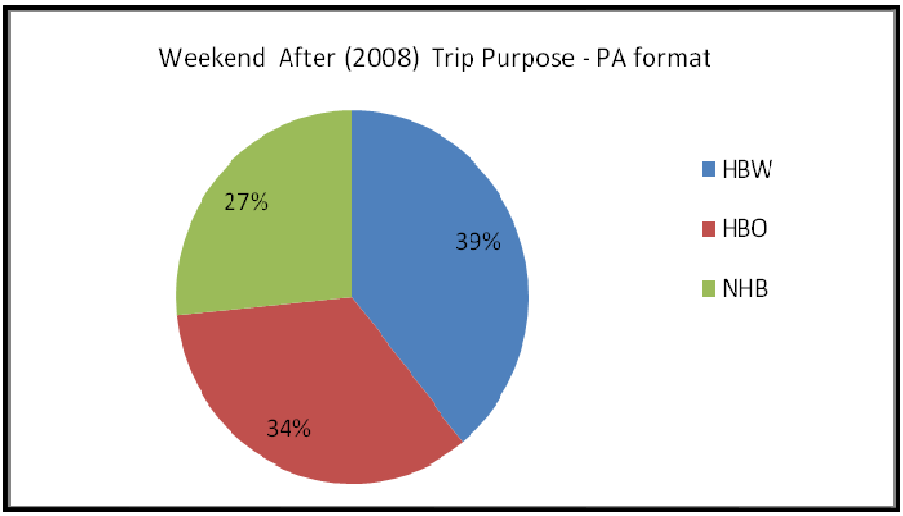
For the after period in 2008, about 71 percent (71%) of all Tri-Rail commuters used Tri-Rail primarily for home-based work (HBW) trips, followed by 19 percent (19%) of home-based other (HBO) trips, and ten percent (10%) of non-home based (NHB) trips. Figure 4-10 and Figure 4-11 show trip purpose on an average weekday and weekend respectively.

Figure 4-10:
Weekday After Period Trip Purpose



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

Figure 4-11:
Weekend After Period Trip Purpose



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

The results of the survey revealed that a majority of Tri-Rail passengers' trip purpose continues to be home based work trips during the weekday (71%). However, during weekends only 39 percent (39%) of Tri-Rail trips were home based work trips, 34 percent (34%) home based other trips and 27 percent (27%) of trips are non-home based trips (Figure 4-11).

4.5.2 Analysis of Modeled Trips and Actual Trips by Purpose

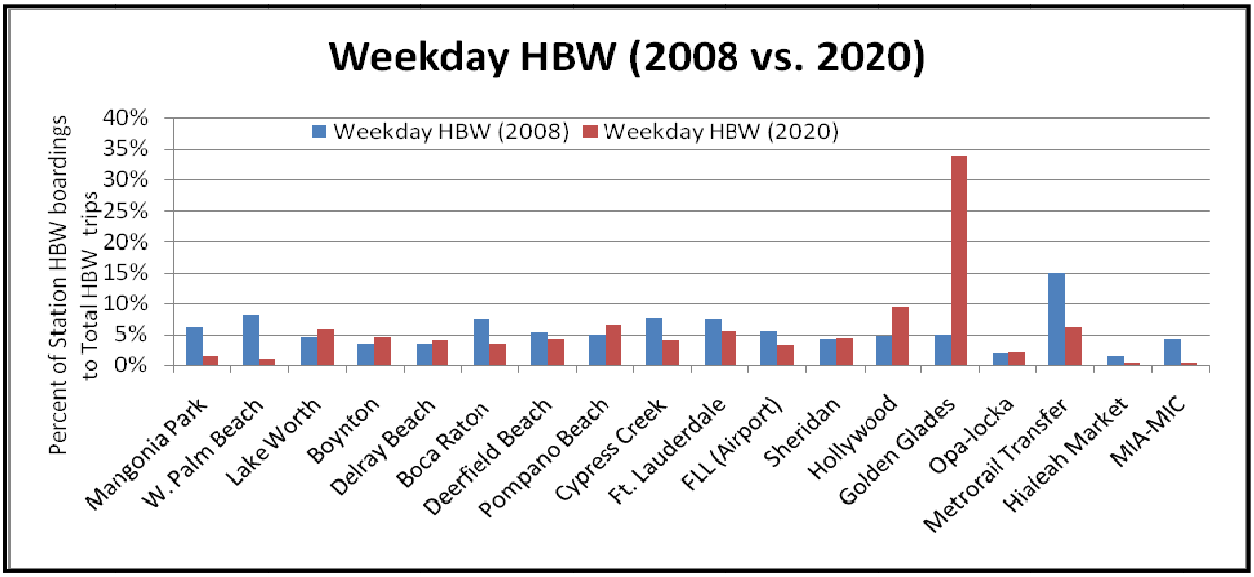
Both model forecasts, FFGA and the amended FFGA show limited estimates and no opening year forecast. The FFGA forecast has also limited information on ridership details such as trips by mode of access (Walk, PNR and KNR), trip purpose (HBW, HBO and NHB) and station level boarding by purpose. The amended FFGA forecasts developed in 2001, preserves some of these details allowing this study to focus on comparing actual 2008 to modeled 2020 amended FFGA forecasts.

The following illustrations present a comparison between the amended FFGA 2020 estimated forecast and actual observed trips in 2008. In the SERPM IV Model, transit trips by trip purposes are segregated by transit peak and off-peak skims. Transit peak skims are used in estimating home based work trips and off-peak skims in home based other and non-home based trips.

Trips from both the on-board survey and model data are grouped into home based other (HBO) and non-home based (NHB) trips. The comparisons between 2008 actual and amended FFGA-2020 model estimates are shown in Figure 4-12 and Figure 4-13 are limited to two trip purposes. Only totals were compared between the amended FFGA-2020 model forecasts and actual trips due to limitations in the modeling process. An analysis by trip purpose and access mode was not performed.

Figure 4-12 compares weekday home based work (HBW) trips at station level for 2008 and 2020. It was observed that actual trips by purpose from 2008 survey data closely matches the amended FFGA-2020 estimates, except at four (4) stations (Mangonia Park, West Palm Beach, Golden Glades and Metrorail Transfer).

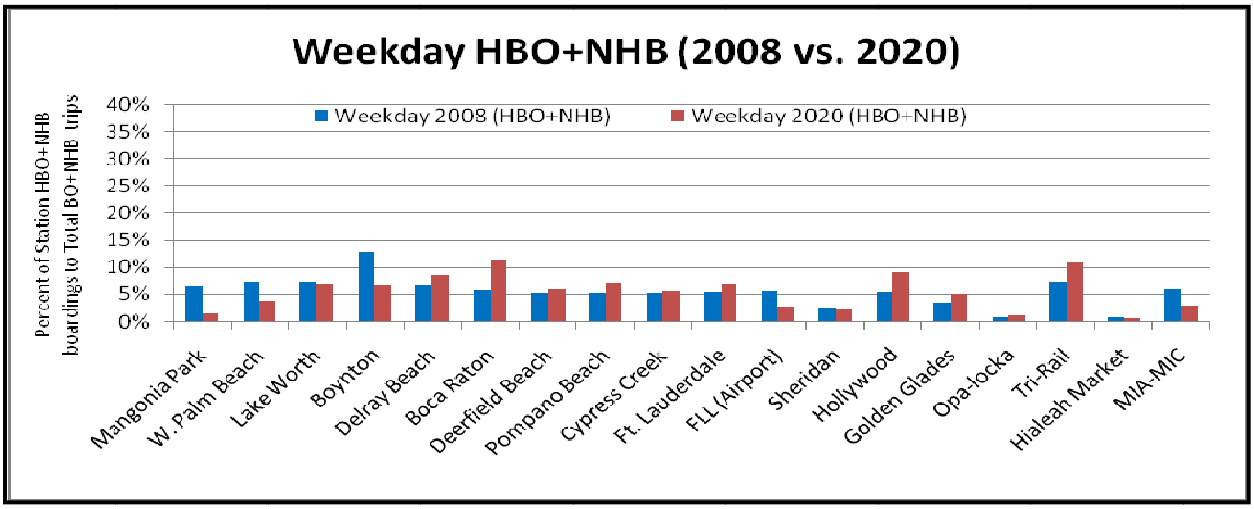
Figure 4-12:
Weekday HBW (2008 vs. amended FFGA-2020)



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data and Tri-Rail Long Range Plan Modeling Report, 2001

Figure 4-13 presents weekday home based other and non-home based trip comparison by station level. It was found that actual observed trips by purpose from 2008 survey data closely matched the amended FFGA-2020 estimates, except for five (5) stations. The Boynton Beach Station and MIA-MIC project had more home based other and non-home based trips in 2008 than estimated in the amended FFGA-2020 model. The Boca Raton, Hollywood, and Metrorail Transfer stations saw lower boardings for home based other and home based work in 2008 than estimated by the amended FFGA-2020 model.

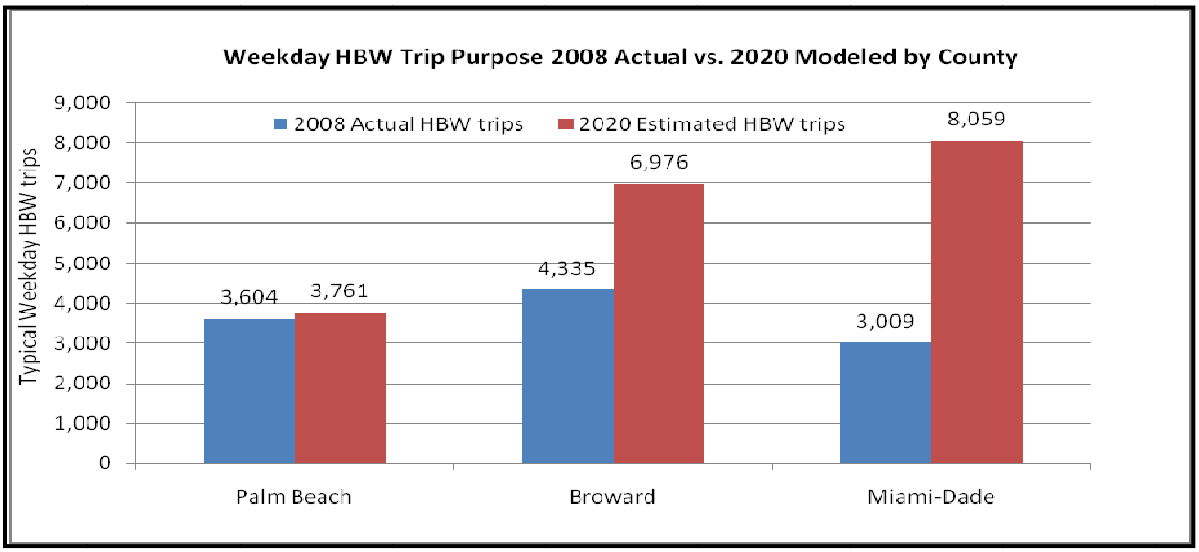
Figure 4-13:
Weekday HBO + NHB (2008 vs. amended FFGA-2020)



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data and Tri-Rail Long Range Plan Modeling Report, 2001

Figure 4-14 presents a comparison of home based work trips for actual observed trips in 2008 and the number of trips estimated in the amended FFGA-2020 model by county. In 2008, Palm Beach County observed numbers of home based work trips that were close to the number of estimated trips from the Amended FFGA-2020 model. Broward County also showed a positive trend towards the estimated 2020 home based work trips. In contrast, Miami-Dade County observed home based work trips in 2008 that were significantly lower than the amended FFGA-2020 estimated home based work trips.

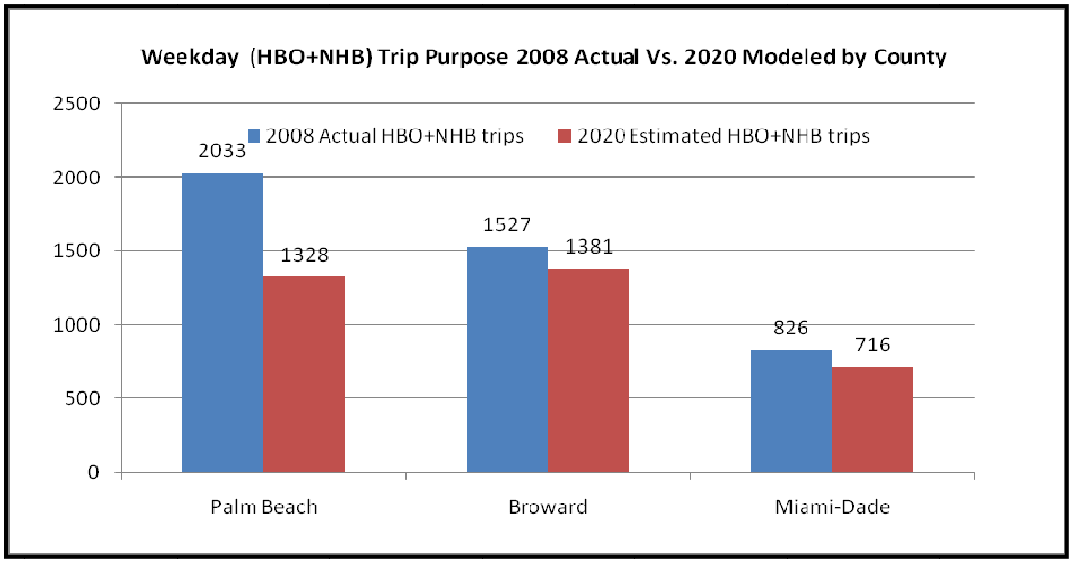
Figure 4-14:
Weekday HBW Trip Purpose 2008 Actual vs. amended FFGA-2020 Modeled by County



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data and Tri-Rail Long Range Plan Modeling Report, 2001

Figure 4-15 presents a county level comparison of home based other and non-home based trips between actual trips in 2008 and those forecasted in the amended FFGA-2020 model. In all three counties, the number of observed home based other and non-home based trips are higher than the amended FFGA-2020 estimated Off-Peak Tri-Rail trips (HBO and NHB).

Figure 4-15:
Weekday (HBO + NHB) Trip Purpose 2008 Actual vs. amended FFGA-2020 Modeled by County



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data and Tri-Rail Long Range Plan Modeling Report, 2001

4.5.3 Station Access and Egress

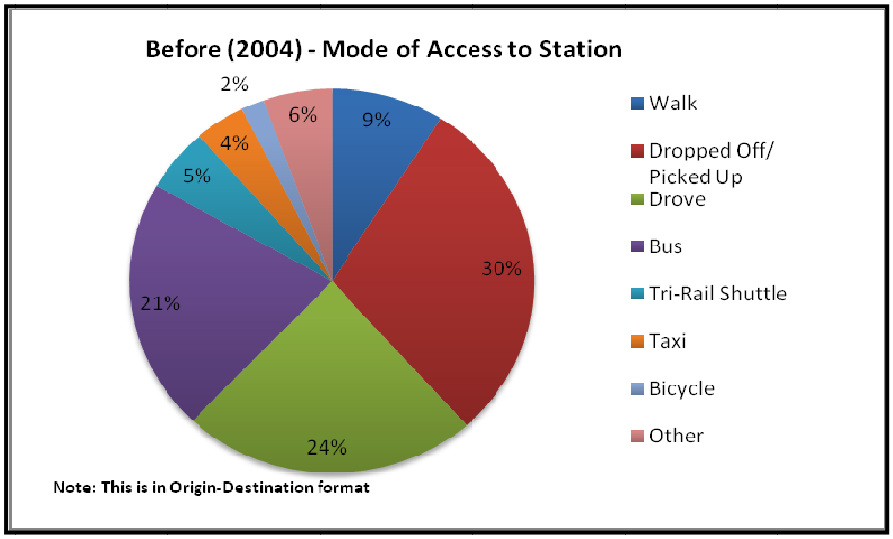
4.5.3.1 Station Access

Due to survey data limitations for the before period, station access is defined as the mode of transportation used to access the station or origin. Data for station access was obtained from the two on-board surveys which presented data in the origin-destination format making it difficult to determine the total number of persons dropped off (access) or picked up (egress). Figure 4-16 and Figure 4-17 present mode of access for the before and after periods.

In 2004, about 30 percent (30%) of survey respondents reported they were dropped off at a station, 24 percent (24%) reported that they drove to a station, 21 percent (21%) took a bus to a station, and about 9 percent (9%) walked to a station.

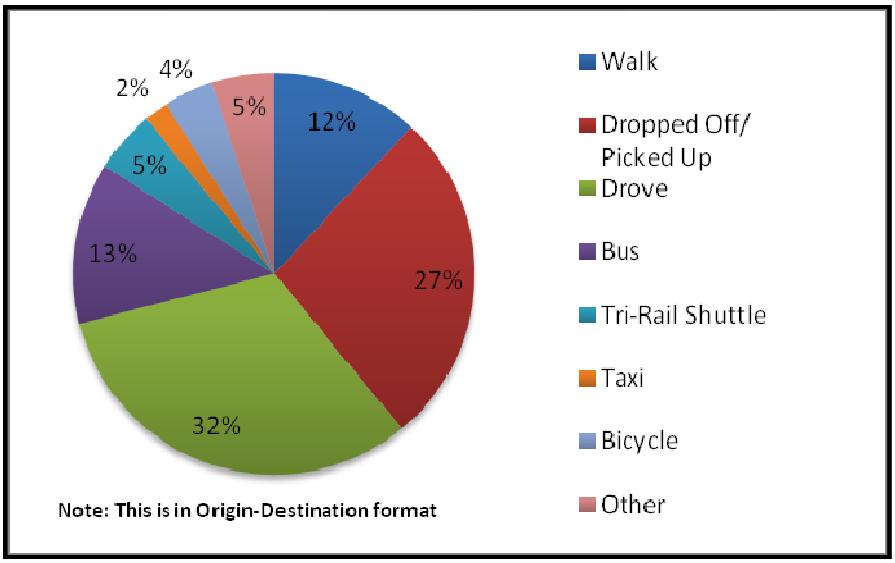
In 2008, 27 percent (27%) were dropped off at station, 32 percent (32%) drove to station, 13 percent (13%) took a bus to the station, and 12 percent (12%) walked to a station. On both on-board surveys, access by driving was the major mode of access to the extent that in 2008 drive access increased to 32 percent (32%) from 24 percent (24%) in 2004.

Figure 4-16:
Before Period (2004) - Mode of Access to Station



Source: SFRTA, 2004 Tri-Rail Onboard Survey Data.

Figure 4-17:
After Period (2008) - Mode of Access to Station

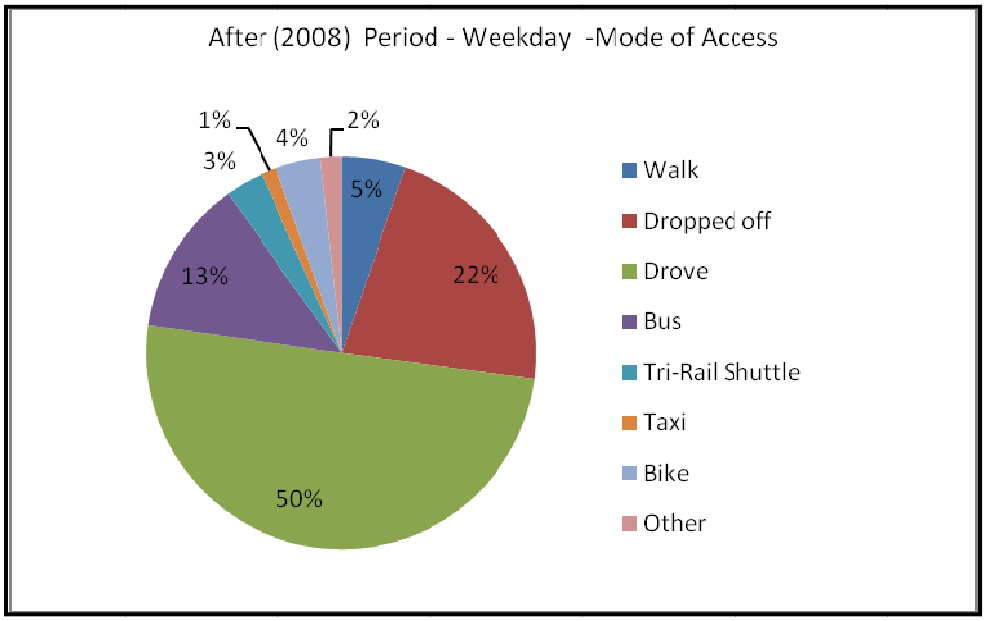


Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

4.5.3.2 Weekday Trip Access and Egress (2008)

Survey records collected for the after period were expanded to total Tri-Rail daily boardings and are converted from origin-destination format to production-attraction format to facilitate analysis of mode of access and egress for Tri-Rail users. In 2008, about 50 percent (50%) of Tri-Rail commuters drove to stations, 22 percent (22%) were dropped off, 13 percent (13%) used local bus service, five percent (5%) walked, and three percent (3%) took the Tri-Rail shuttle (Figure 4-18). One of the contributing factors for Tri-Rail ridership growth has been the creation of additional park-and-ride lots that accommodate additional weekday park-and-ride commuters.

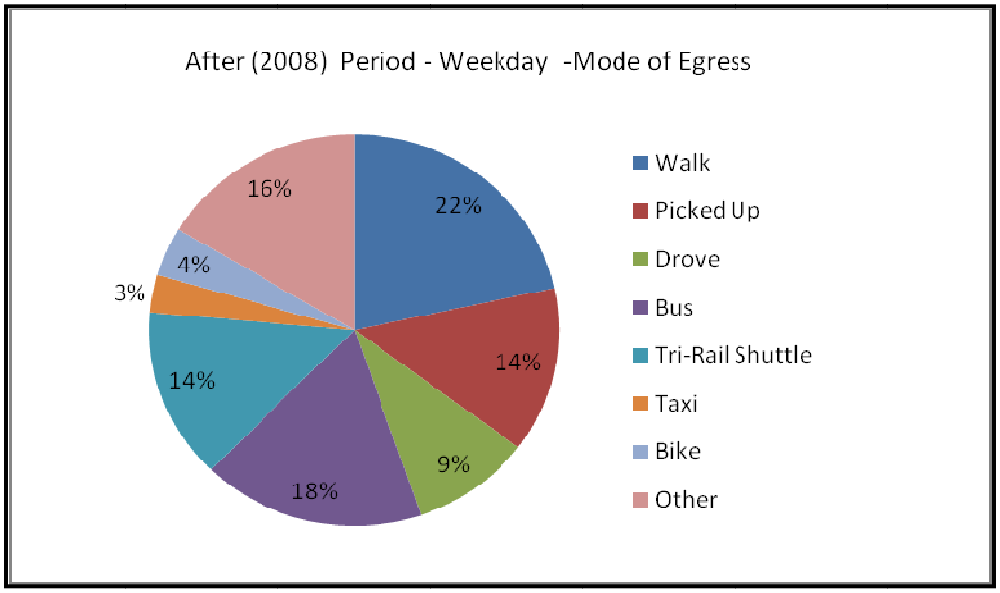
Figure 4-18:
After Period (2008) - Weekday Access



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

Figure 4-19 presents Tri-Rail users' mode of egress from the station to their destination. Twenty-two percent (22%) of all Tri-Rail commuters walk from a station to their destination; 14 percent (14%) are picked up, 18 percent (18%) travel by bus, and nine percent (9%) drive personal vehicles from the station to complete their trip.

Figure 4-19:
After Period (2008) - Weekday Egress

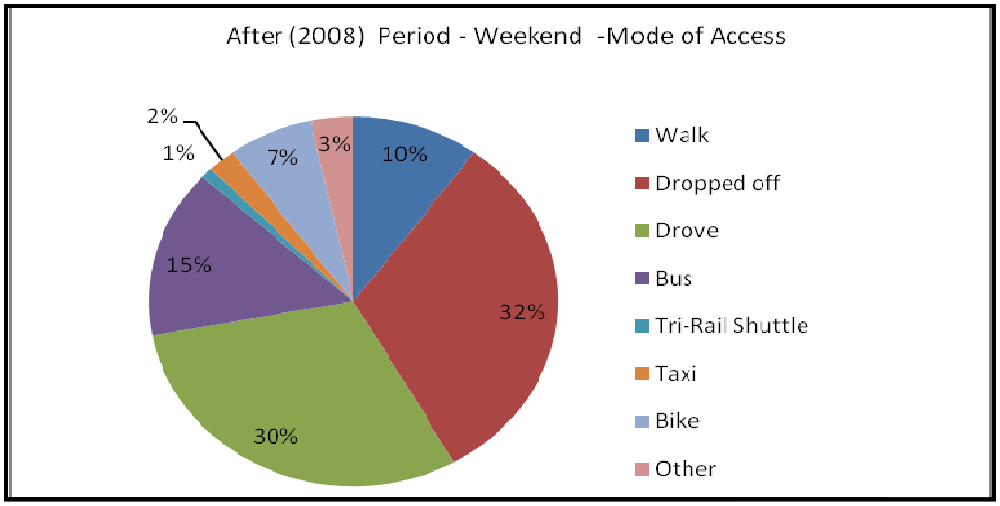


Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

4.5.3.3 Weekend Trip Access and Egress (2008):

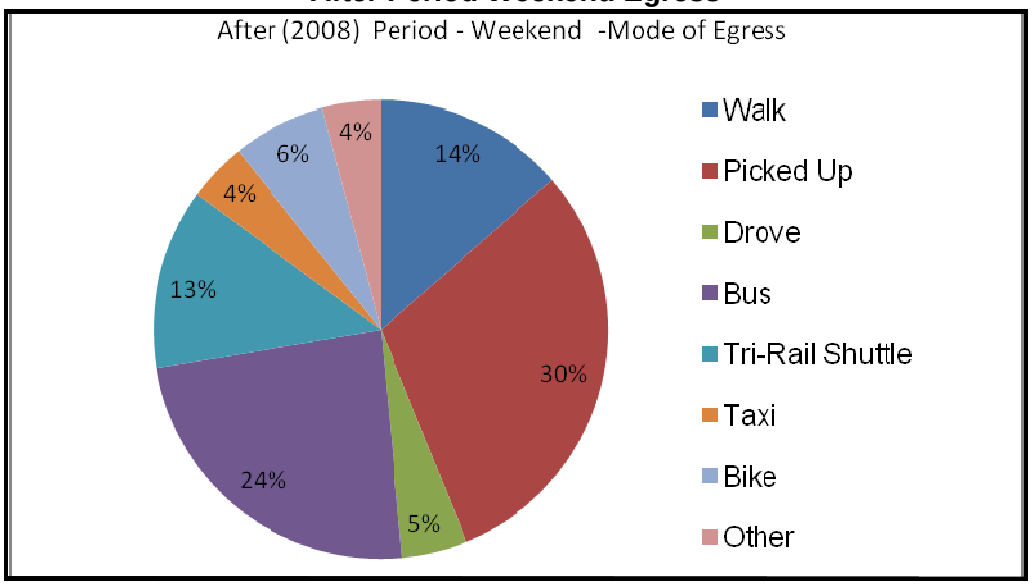
The following results present Tri-Rail commuters access and egress modes for travel made during the weekend. In terms of weekend access, 32 percent (32%) of all Tri-Rail patrons were dropped off at the station, 30 percent (30%) drove to the station, and 15 percent (15%) used local bus service to access the station (Figure 4-20). For egress, a majority of respondents (30%) said that they were picked up from the station, 24 percent (24%) traveled by local bus, 14 percent (14%) walked, and five percent (5%) drove private vehicles to their destination (Figure 4-21).

Figure 4-20:
After Period Weekend Access



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

Figure 4-21:
After Period Weekend Egress

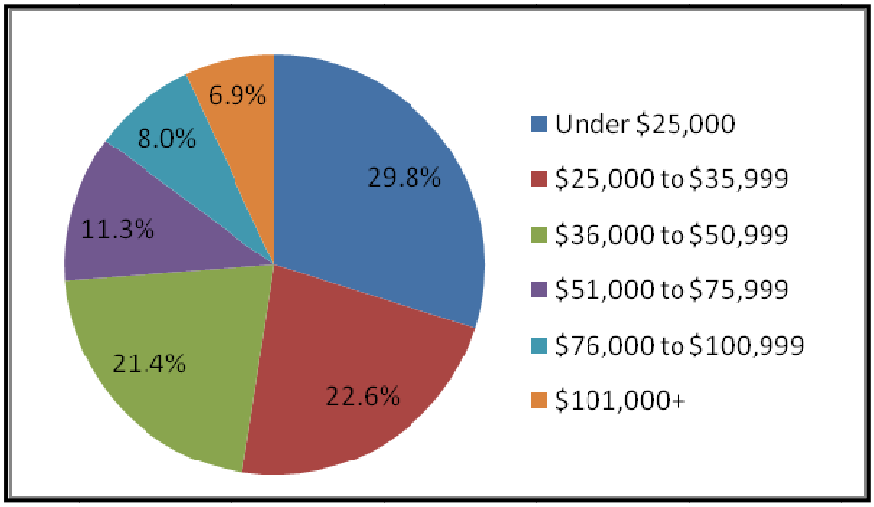


Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

4.5.4 Tri-Rail Commuter Income Profile

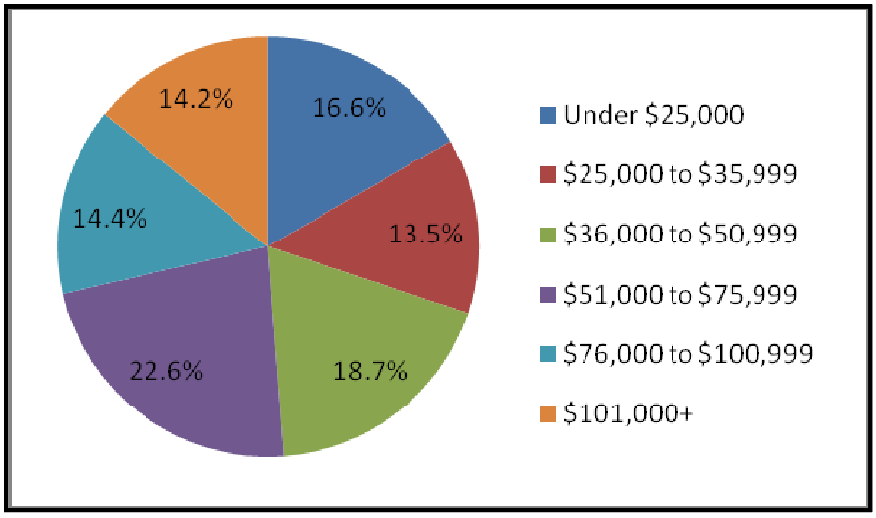
The following graphics present the income profile of Tri-Rail riders for before and after periods, respectively. In 2008, the Tri-Rail system served all income groups equally with 23 percent (23%) of riders reporting incomes between $51,000 and $76,000. In 2004, the share of riders in the same income bracket was reported as 11 percent (11%). The Tri-Rail ridership profile grew more diverse in 2008 as compared to 2005 in that it served a larger number of higher income riders. In 2004, more than half (about 52%) of Tri-Rail ridership reported income less than $36,000 annually. In 2008, only 30 percent (30%) of riders reported earning less than $36,000 per year (Figure 4-22 and Figure 4-23).

Figure 4-22:
Before Period (2004) Commuter Income Profile



Source: SFRTA, 2004 Tri-Rail Onboard Survey Data.

Figure 4-23:
After Period (2008) - Commuter Income Profile



Source: SFRTA, 2008 Tri-Rail Onboard Survey Data.

4.6 Revenue Data (Fares)

4.6.1 Fare Structure

The fare structure for the Tri-Rail system is based upon a zonal fare rate for weekday trips (Table 4-12). The Tri-Rail system is comprised of six fare zones, with weekday passenger fares determined by the number of zones through which a passenger travels. Ticket prices range from $2.50 for a one way fare (within one zone) to a $100.00 monthly pass that allows unlimited use of the system, regardless of distance.

Table 4-12:
Tri-Rail Fare Structure

Zoned Fares							
Number of Zones Traveled	One Way	Discount One Way	Round Trip	Discount Round Trip	12 Trip	Monthly	Discount Monthly
1	$2.50	$1.25	$4.40	$2.50	$21.25	$100.00	$50.00
2	$3.75	$1.90	$6.25	$3.75	$31.25	$100.00	$50.00
3	$5.00	$2.50	$8.45	$5.00	$41.90	$100.00	$50.00
4	$5.65	$2.80	$9.70	$5.65	$47.50	$100.00	$50.00
5	$6.25	$3.15	$10.65	$6.25	$52.50	$100.00	$50.00
6	$6.90	$3.45	$11.55	$6.90	$57.50	$100.00	$50.00

Source: SFRTA, 2008

On weekends and holidays, a flat fee of $5.00 is charged for all passengers. Senior citizens (65 years and older), persons with disabilities, Medicare card holders, and students receive discounted fare rates. Children under the age of five ride free, and children between the ages of five and twelve also receive discounted fares. Reduced fares are also available for employees of businesses enrolled in the Employer Discount Program (EDP), with Monthly and 12-Trip tickets discounted by 25 percent (25%).

No fare increases or changes in fare structure or fare policy had occurred and the overall structure remained intact throughout the before and after periods.

4.6.2 Farebox Recovery

Further analysis included the presentation of farebox recovery rate for both the before and after periods. A farebox recovery rate is the proportion of the total cost of operating and maintaining the system divided by the total amount collected in passenger fares. For the before condition, farebox recovery rates were obtained from the corresponding financial report prepared for the amended FFGA. These financial reports applied forecasted operating and maintenance costs and projected ridership from travel demand forecasts for each project milestone. The actual farebox recovery rates were obtained from the SFRTA Comprehensive Annual Financial Report for FY 2005-2006 and FY 2007-2008 (Table 4-13).

Table 4-13:
Comparison of Estimated and Actual Farebox Recovery Rates

			Farebox Recovery
Before	Amended FFGA	Estimate	25%
	2005-2006	Actual	21%
After	Amended FFGA	Estimate	26%
	2007-2008	Actual	19%

Source: SFRTA Comprehensive Annual Financial Report for FY 2005-2006 and FY 2007-2008

For FY 2005-2006, the Tri-Rail farebox recovery rate was approximately 21 percent (21%) and for FY 2007-2008, the Tri-Rail farebox recovery ratio was approximately 19 percent (19%). Both of these were both comparatively lower than farebox recovery estimated for Amended FFGA. Increased operation and maintenance costs can be the cause of a lower actual farebox recovery ratio. SFRTA operating costs increased by 28 percent (28%) and 25 percent (25%) in FY 2005-2006 and FY 2006-2007, respectively. This mainly results from the increase to a 50-weekday train service and the renewal of contracts for the operation and maintenance of the Tri-Rail commuter rail system. Projected operation and maintenance cost estimates were escalated at four percent (4%) on average in the amended FFGA estimates.

4.7 Other Project Factors

4.7.1 Station Area Proposed Development

The construction of a new station in Boca Raton as well as the renovations of the Fort Lauderdale and Sheridan Tri-Rail stations as part of the Double Track Corridor Improvement Program Segment 5 Project has resulted in the initiation of proposals and plans for new station area development. Table 4-14 presents the proposed land use development being planned for construction at four Tri-Rail stations. This further exemplifies the type of development opportunities that SFRTA continues to encourage at other Tri-Rail stations along the commuter rail line. Additional reference information is presented in Attachment 1-6.

Table 4-14:
Proposed Tri-Rail Station Area Development

	Yamato Road Joint Venture	Deerfield Station	Fort Lauderdale Riverbend DRI	Sheridan Stationside Village
Status	Proposed	City Site Plan Approved	DRI Approval in Process	City Site Plan Approval in Process
Acres	6	8.07	60 +	41.88
Office	99,000 sq. ft.	36,000 sq. ft.	3,381,000 sq. ft.	115,000 sq. ft.
Residential	198 units	549 units	427 units	639 units
Commercial/Retail	55,000 sq. ft.	15,072 sq. ft.	1,146,000 sq. ft.	300,000 sq. ft.
Hotel	150 rooms	148 rooms	550 rooms	150 rooms
Industrial	N/A	N/A	N/A	N/A

Source: SFRTA, 2009

4.7.2 Property Values

Changes in the valuation of property surrounding the Tri-Rail system was evaluated for the before and after periods. The median values (dollars) of owner-occupied homes were obtained from the U.S. Census American Community Survey (ACS) database based on the city location of the Tri-Rail station. A limitation to ACS data is that not all cities are represented in the data, and at the time this evaluation was performed 2008 data was not yet available. However, distinct changes in property values between 2005 and 2007 were identified within the region (Table 4-15). Areas such as Deerfield Beach, Hialeah, Miami, and West Palm Beach reported percent increases over 20 percent (20%) during that period. Property values in Miami and West Palm Beach increased by 33 percent (33%) and 32 percent (32%) respectively between the before and after periods.

A reason for these dramatic increases may be due to increased home sales and inflation during this time period, and may have little correlation to the implementation of the Double Track Corridor Improvement Program Segment 5 Project or other improvements to the Tri-Rail system.

Table 4-15:
Before and After Property Values

Station	2005	2007	Percent Change
Boca Raton	$433,900	$460,800	6%
Boynton Beach	$215,300	$230,400	7%
Fort Lauderdale	$344,800	$370,300	7%
Pompano Beach	$214,500	$244,100	13%
Hollywood	$239,900	$286,300	19%
Hialeah	$202,300	$245,900	22%
Deerfield Beach	$168,500	$207,500	23%
West Palm Beach	$226,600	$298,800	32%
Miami	$248,500	$330,800	33%

Source: US Census, 2008

4.7.3 Rent Amounts

In addition to changes in property values within jurisdictions in close proximity to Tri-Rail stations, the residential rent amounts were also evaluated. ACS city data was used to compare median gross rent (dollars) for 2005 and 2007 (Table 4-16). ACS data is not available for all geographies and could not be evaluated for areas within a short distance of Tri-Rail stations. The data presented in Table 4-16 indicates that Boca Raton experienced the highest level of rent increase between 2005 and 2007 (38%). Following Boca Raton with considerably high rent increases include Miami (22%), Pompano Beach (19%), and Hialeah (17%). These increases may be attributable to the inflation of housing prices and costs during that time period, and may not be directly correlated to the implementation of the Double Track Corridor Improvement Program Segment 5 Project or other changes to the Tri-Rail system.

Table 4-16:
Before and After Median Gross Rent (Dollars)

Geography	2005	2007	Percent Change
Hollywood	$874	$947	8%
West Palm Beach	$864	$964	12%
Boynton Beach	$1,008	$1,138	13%
Deerfield Beach	$980	$1,115	14%
Fort Lauderdale	$815	$927	14%
Hialeah	$776	$911	17%
Pompano Beach	$878	$1,048	19%
Miami	$686	$837	22%
Boca Raton	$1,075	$1,487	38%

Source: 2005-2007 American Community Survey Estimates

4.8 Summary of Findings

4.8.1 Modeled Estimates

Tri-Rail ridership estimates from the FFGA-2015 forecast proved higher than observed boardings for both before and after periods by 35 percent (35%) and 47 percent (47%) respectively. The FFGA-2015 Model estimates were based upon a transit network that included projects such as the MDT North Corridor Metrorail Extension, Miami Intermodal Center (MIC), and future Miami East-West Metrorail Extension each being in place. The model also made assumptions that a population growth of 30 percent (30%) would occur in the South Florida region. These projects had not been implemented which is a major factor as to why the estimated model results over predicted the actual numbers for both before and after periods as stated in the FFGA.

The FFGA 2015 forecast estimated total transit trips of 818,175 for year 2015, and the amended FFGA-2020 estimated 769,244 transit trips by 2020. Tri-Rail ridership estimated in FFGA-2015 forecasts is 42,132 passenger trips and Amended FFGA-2020 shows only 22,221 trips for year 2020. This large disparity between those model forecasts is consistently observed across all modes except Express Bus.

The amended FFGA-2020 model forecast estimated total transit trips of 769,244 for year 2020, and the Tri-Rail ridership of 22,221 trips for year 2020. Observed Tri-Rail boardings for 2005 and 2008 closely match those levels forecasted in the amended FFGA-2020 model. These amended FFGA forecasts resulted in a more accurate ridership estimate based upon the following:

- Application of 2000 census data which merged the south Florida Urbanized Areas (UZAS) of Miami-Hialeah, Fort Lauderdale-Hollywood-Pompano Beach; and West Palm Beach-Boca Raton-Delray Beach into one UZA.
- MPO adopted 2020 TAZ data for the three counties (Palm Beach, Broward and Miami-Dade);

- An updated 2020 LRTP to include a revised listing of a financially cost feasible projects that did not include the Miami-Dade North Corridor project (2007 projected opening) and the Miami-Dade East-West line (2010 projected opening) being in place.

In the year 2005, the amended FFGA-2020 model estimated average weekday ridership of 10,927 trips, in comparison to the actual observed average weekday boardings of 9,446 unlinked trips. The Tri-Rail annual ridership predicted with the amended FFGA-2020 model was an estimated 4.8 million passenger trips in 2008. The actual Tri-Rail ridership total was similar, with 4.3 million trips in 2008.

4.8.2 Ridership Patterns

Overall, transit ridership in the Tri-Rail service area (Miami-Dade, Broward and Palm Beach Counties) has seen an impressive increase (17%) between 2005 and 2008. In 2005, average daily ridership throughout the system totaled about 488,491 trips and in 2008, transit ridership grew to 572,349 trips per day. During the same period Tri-Rail boardings grew by 56 percent (56%). Similarly, local bus and Metrorail ridership also increased moderately by 18 percent (18%) between the before and after periods.

In 2008, the Tri-Rail system found its highest share of ridership in Broward County (37%), followed by Palm Beach County with 34 percent (34%). Miami-Dade County accounted for the lowest share of Tri-Rail ridership with 29 percent (29%) of total ridership. During the before and after periods about 13 percent (13%) of all Tri-Rail boardings were observed at the Metrorail Transfer Station, where connections between Metrorail and Tri-Rail are made.

As a result of this analysis it was determined that the growth in Tri-Rail ridership began in the first half of 2008 (January-May 2008) with a moderate increase ranging from 35 to 53 percent (35-53%) during that time period. This trend increased significantly during the summer of 2008, when Tri-Rail experienced an unprecedented growth in ridership that approached an increase of 100 percent (100%).

This increase may be partly attributed to the spike in fuel prices during summer 2008, when oil reached $146 per barrel and gasoline prices topped $4 per gallon. Interestingly, it was found that from August to December, the growth in ridership maintained a range of 60 to 80 percent (60-80%) despite the reduction in fuel costs during that period.

Tri-Rail improved headways by 50 percent (50%) during the peak period and 33 percent (33%) during off-peak period between the before and after periods. Tri-Rail also increased the number of vehicle trips, which grew by 79 percent (79%) on a typical weekday. During the after period, Tri-Rail's span of service increased three percent (3%), local bus headways improved by 28 percent (28%). These combined factors contributed heavily to the overall growth of Tri-Rail ridership between 2005 and 2008.

4.8.3 Travel Market Patterns

An assessment of Tri-Rail market trends for the before period is limited to origin-destination purposes, access, and income profiles due to survey data limitations.

For the after period in 2008, according to on-board survey results, about 71 percent (71%) of Tri-Rail commuters completed home based work trips. This amount is followed by home based other trips (19%), and non-home based trips (10%). However, during weekends, only 39 percent (39%) of Tri-Rail trips were home based work trips, 34 percent (34%) were home based other trips, and 27 percent (27%) were non-home based trips.

In 2008, about 50 percent (50%) of Tri-Rail commuters drove personal vehicles to Tri-Rail stations, 22 percent (22%) were dropped off, 13 percent (13%) used local bus to arrive at station, five percent (5%) walked, and three percent (3%) used the Tri-Rail shuttle.

The profile of a typical Tri-Rail rider grew more diverse as ridership increased in 2008. In 2005, more than half (about 52%) of Tri-Rail riders' income was less than $36,000 per year and 15 percent (15%) of riders indicated household income ranges greater than $76,000 annually. In 2008, Tri-Rail served income groups with the following distribution ranges: 15 percent (15%) earning less than $25,000, 12 percent (12%) earning between $25,000 – $34,999, 17 percent (17%) earning $35,000 – $49,999, 21 percent (21%) earning $50,000 – $74,999, 26 percent (26%) earning $76,000 and over per annum. A remaining nine percent (9%) of those surveyed did not respond to this question.

4.9 Recommendations

4.9.1 Travel Patterns

As previously discussed in the Travel Market Patterns section, before period data is very limited. The market patterns were instead derived from survey work that mainly focused on service, fare type, and customer satisfaction instead of rider profile information.

In order to present a fair comparison of Tri-Rail market patterns for the before and after periods, it is recommended that, in the future, data should be geo-coded with zones that are readily available in the Regional Planning Model. With this information, origins to destinations should also be converted into the productions-attractions format. This conversion would aid in clearly presenting trips by purpose, trip access and egress modes, income profiles, and origins and destinations. Identifying trips by purpose, location, and time of day would also be beneficial in identifying potential markets and future service improvements in the region and within the system.

4.9.2 Model Estimates

Both the FFGA-2015 and the Amended FFGA-2020 model estimates were only available for model years 2015 and 2020 respectively. Ridership forecasts for one

year prior to opening and two years after opening of Double Track Corridor Improvement Program Segment 5 Project, in 2005 and 2008 respectively, are apportioned at an annual rate of three percent (3%). These two extrapolated estimates, for 2005 and 2008, are independent of socio-demographics, land use patterns and traffic conditions of the region during that period.

The amended FFGA 2020 model estimates included ridership results for the forecast year or 2020. Ridership forecasts for one year prior to opening and two years after opening of Double Track Corridor Improvement Program Segment 5 Project, in 2005 and 2008 respectively, are apportioned at an annual rate of three percent (3%). These two extrapolated estimates, for 2005 and 2008, are independent of socio-demographics, land use patterns and traffic conditions of the region during that period.

To accurately compare actual to estimated ridership, it is recommended that forecasts for the Double Track Corridor Improvement Program Segment 5 Project should be modeled for the opening year. Modeled estimates of opening and forecast years would make a fair comparison of Tri-Rail ridership and market conditions, thus leading for better analyses of Tri-Rail project benefits.

ATTACHMENTS

Attachment 1-1: Change Order Log

Attachment 1-2: Segment 5 Budgets.
(Not adjusted for inflation)

		FFGA (2002)				Amended FFGA (2004)						Actual (2007)						
		A	B		C	D	E	F		G	H	I	J	K	L		M	N
	FTA Standard Cost Category	D/B Contract	CSX	SFRTA (Other Contract Units)	Total	D/B Contract	Change Orders	CSX	SFRTA (Other Contract Units)	Total	Percent Change w/FFGA	D/B Contract	Change Orders Amended FFGA	Change Orders Construction	CSX	SFRTA (Other Contract Units)	Total	Percent Change w/Amended FFGA
10	Guideway	83,478,334			**83,478,334**	96,063,100	2,030,395			**98,093,495**	17.5%	96,063,100	2,030,395	7,062,375.0			**105,155,870**	7.2%
20	Stations	37,384,871			**37,384,871**	35,459,100	-			**35,459,100**	-5.2%	35,459,100		2,621,680.0			**38,080,780**	7.4%
30	Yard and Shops			22,681,248	**22,681,248**	-	1,500,000			**1,500,000**	-93.4%	-	1,500,000	1,659,400.0			**3,159,400**	110.6%
40	Sitework & Special Conditions	14,617,222			**14,617,222**	39,528,500	(1,122,737)			**38,405,763**	162.7%	39,528,500	(1,122,737)	3,122,583.0			**41,528,346**	8.1%
50	Systems	52,227,862	12,070,548		**64,298,410**	60,587,100	(23,662,600)	12,974,618		**49,899,118**	-22.4%	60,587,100	(23,662,600)	1,186,008.0	25,474,618.0		**63,585,126**	27.4%
60	ROW			8,363,525	**8,363,525**				12,005,631	**12,005,631**	43.5%			-		8,050,000	**8,050,000**	-32.9%
70	Vehicles			21,659,375	**21,659,375**				13,650,000	**13,650,000**	-37.0%			(3,500.0)		11,128,687	**11,125,187**	-18.5%
80	Professional Services																	
	PMC			11,100,652	**11,100,652**				29,918,184	**29,918,184**	169.5%					35,900,381	**35,900,381**	20.0%
	Admin			1,855,620	**1,855,620**				2,055,620	**2,055,620**	10.8%					2,500,051	**2,500,051**	21.6%
	Flagging by CSXT		6,525,648		**6,525,648**			3,498,495		**3,498,495**	-46.4%				7,972,921.0		**7,972,921**	127.9%
	Testing Inspection by CSXT		1,350,076		**1,350,076**			7,380,450		**7,380,450**	446.7%				4,380,449.6		**4,380,450**	-40.6%
	Before and After Study								546,901	**546,901**						546,901	**546,901**	0.0%
	Insurance, Permits, Misc.						11,978,557			**11,978,557**			11,978,557	(607,026.7)		12,274,956.0	**23,646,486**	97.4%
90	Contingency			53,685,019	**53,685,019**				29,496,246	**29,496,246**						-	**-**	-100.0%
	Total	**187,708,289**	**19,946,272**	**119,345,439**	**327,000,000**	**231,637,800**	**(9,276,385)**	**23,853,563**	**87,672,582**	**333,887,560**	**2.1%**	**231,637,800**	**(9,276,385)**	**15,041,519**	**37,827,989**	**70,400,976**	**345,631,899**	**3.5%**
			207,654,561					246,214,978							275,230,923			

Attachment 1-3: Financial Plan (February 2003)

TRI RAIL™

DOUBLE TRACK CORRIDOR

IMPROVEMENT PROGAM

SEGMENT 5 PROJECT

FINANCIAL PLAN

February 21, 2003

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1. INTRODUCTION

The Tri-County Commuter Rail Authority (Tri-Rail) is submitting this Financial Plan for the Tri-Rail Double Track Corridor Improvement Program Segment 5 Project, in support of a Full Funding Grant Agreement (FFGA) Amendment between Tri-Rail and the Federal Transit Administration (FTA). This Financial Plan has been developed in accordance with the provisions of FTA Circular 5200.1 and Section 5309 of Title 49, U.S.C., and includes, as specified in that circular, a Financial Plan for Capital Costs (FPCC) and a Financial Plan for Operating and Maintenance Costs (FPOM).

The FTA Circular requires the FPCC to describe the funding sources and amounts to be provided by each source for the Project, including the anticipated Federal financial contribution. The FPCC should also provide information to support the reliability and availability of the proposed funding sources. The discussion and documentation by Tri-Rail set forth below is intended to satisfy the requirements of the FTA Circular. In addition, Tri-Rail's FPCC and FPOM are designed to provide the information required under Section 5309(e) of Title 49, U.S.C., as amended by the Transportation Equity Act for the 21st Century (TEA-21). Under Section 5309(e), the Secretary of Transportation, in evaluating a New Starts project, must require that:

- The Project funding plan provides contingency amounts that are reasonable to cover unanticipated cost increases;
- The local sources of capital and operating funds are stable, reliable, and available with the Project timetable; and
- Local resources are available to operate the overall transit system, without requiring a reduction in existing services, in order to operate the proposed Project.

The circular further provides that, in assessing the stability, reliability, and availability of local funding, the Secretary shall consider (among other things) the degree to which financing sources are dedicated to the proposed Project and the extent to which the Project has a local funding "overmatch." Tri-Rail believes that the financial information provided below will address each of these statutory requirements.

1.1 Background

In 1981, the Florida Department of Transportation (FDOT) commissioned a study of future transportation needs for the tri-county, South Florida region. A plan was derived from the study to reconstruct and widen I-95, as well as operate a commuter rail service as a temporary traffic mitigation measure during peak hours. As a result, in 1986, the Tri-County Commuter Rail Organization (TCRO) was formed to begin the task of building a new commuter rail system along the CSXT Rail Corridor.

In 1988, FDOT purchased the South Florida Rail Corridor from CSXT freight railroad. On January 9, 1989, Tri-Rail began commuter rail service and was the first new North American commuter rail star-up in more prominent; hence, the state Legislature in 1988 made Tri-Rail a permanent fixture in South Florida's mass-transit network. As a result, TCRO was changed to Tri-County Commuter Rail Authority (TCRA), or as more commonly known – Tri-Rail.

The Tri-County Commuter Rail Authority (Tri-Rail) is responsible for the operation of commuter rail service along the 71.7-mile South Florida Rail Corridor. The rail corridor extends northward from the Miami Airport Station in Miami-Dade County through Broward County to the northern terminus at the Mangonia Park Station in Palm Beach County.

This rail corridor is currently operating at capacity, with not only Tri-Rail commuter traffic, but also daily CSXT freight trains and Amtrak passenger trains. To address this problem, Tri-Rail has undertaken an aggressive Program of Projects to improve the corridor system as a whole. The Program, known as the Double Track Corridor Improvement Program, entails the laying of a second mainline track along the current 71.7-miles of rail right-of-way; upgrading the grade crossing and signal systems; modifying and renovating existing stations and constructing a new station; acquiring rolling stock; and upgrading the existing northern maintenance/layover facility **(see Attachment I)**.

The Tri-Rail Double Track Corridor Improvement Program was originally programmed to be constructed in 11 segments in order to minimize service interruptions. The construction of:

- Segment 1 of the Program from Pompano Beach Milepost (MP) 1003.43, to Broward Boulevard MP 1011.57 in Broward County was completed in April 1997.

- Segment 2 from MP 1034.29 to MP 1037.50, the southern extension of the line terminating at the new Miami International Airport (MIA) Station, was completed in June 1998.

- Segment 3 from south of Glades Road in the City of Boca Raton MP 996.46 to south of the Pompano Beach Station MP 1003.43, was completed in June 2000.

- Segment 4 north of the Golden Glades Station to north of the Tri-Rail/Metrorail Transfer Station (MP 1024.7 to MP 1033.77) with improvements to two stations is scheduled to be completed in June 2003.

- Segments 5 through 11 have been combined into a single project and are now referred to as the Segment 5 Project. The Segment 5 Project is approximately 43.3-miles long, running from West Palm Beach Milepost (MP) 966.02, to south of Camino Real MP 996.64 in Palm Beach County; then from MP 1011.48 to MP 1024.81 in Broward County (excluding MP 1012.74 to MP 1014.33 since it is included in the New River Bridge Project, which is discussed below); and MP 1033.47 to MP 1034.41 in Miami-Dade County. Segment 5 is the portion of the Program covered by the Full Funding Grant Agreement (FFGA). Construction began in July 2002, and is scheduled to be completed in January 2006. The Revenue Operations Date (ROD) in the FFGA, as amended, is March, 2006.

1.2 Segment 5 Project Goals

Segment 5 of the Double Track Corridor Improvement Program will address the following three specific transportation needs:

1. Improve regional intermodal connections to airports, seaports, highways, and leisure destinations in the South Florida area;

2. Increase the effectiveness of public transit in meeting the travel demands of existing and prospective transit users, especially the provision of efficient access for reverse-commuting trips to employment centers along the South Florida Rail Corridor; and

3. Improve the safe and efficient movement of commuter freight and passenger trains in the South Florida Rail Corridor.

1.3 FFGA Amendment

When the FFGA was being developed and negotiated, Tri-Rail was proceeding under the good faith belief that CSXT would perform all of the design and construction of the FFGA Project scope, which is also referred to as Segment 5 of the Double Track Corridor Improvement Program. Evidence of this original understanding is reflected in a June 4, 1999 letter from CSXT to the Florida Department of Transportation (FDOT), in which CSXT provided notice that it was exercising its rights under an agreement between FDOT and CSXT[1] to perform the Segment 5 Project work, and stated that it could perform the work at a "lower cost than any other entity" and would do the work on a "non-profit" basis. CSXT confirmed its intent to design and construct the Project in a letter to Tri-Rail dated August 19, 1999, where it also offered to make a contribution of $55,000,000[2] to the Project cost, either through "construction efficiencies" or through an interest-free loan. In meetings with Tri-Rail, CSXT also proposed to serve as the project manager for the Project, and indicated that even if it did not serve in that role, Tri-Rail would need only limited project management consultant services due to CSXT's experience in constructing similar projects. Relying on these presentations, Tri-Rail budgeted a relatively limited amount of funds ($11,000,000) for project management consultant services.

For the reasons described above, both the budget and the schedule for the Segment 5 Project, as set forth in the original FFGA, were based on the assumption that CSXT would perform the full scope of design and construction work for the Project. However, after the FFGA was executed, CSXT notified Tri-Rail that it was no longer interested in performing the Design/Build work[3], and also that it would not assist in project financing. Faced with this significant post-FFGA change, Tri-Rail recognized it was essential to move forward with a full Design/Build procurement, and after conducting that procurement selected a private contractor to build the Project. However, even with this

[1] Operating and Maintenance Agreement, Phase 1 (OMAPA). CSXT claimed that under OMAPA it had the right of first refusal to perform South Florida Rail Corridor work.

[2] At the time, $55,000,000 was the amount needed to fund the difference between the estimated net project cost and the Federal, State, and Local grant funds then available.

[3] CSXT's change of position was apparently due to its then pending ConRail merger and other business priorities.

change in design-build responsibility, it remains necessary for CSXT to perform certain Project work, such as signaling, live track work, and flagging.

These fundamental changes in the plan for constructing and implementing the Project have had a significant impact on the overall Project budget and schedule. The major impacts include the following: (1) the CSXT signaling, track work, and flag work, which were included in the FFGA scope within the original budget for the design-build contractor, are now priced as a change order to the design build scope in the amount of approximately $29.2 million; (2) the price proposals of the design-build proposers were higher than the engineer's estimate for the specific scope of work included in that procurement, due at least in part to the uncertainties and risks associated with the role of CSXT and the performance of the CSXT work; and (3) the scope of work of Tri-Rail's Project Management Consultant (PMC), which was budgeted in the FFGA at approximately $11 million because CSXT indicated only limited project management services would be needed, has significantly increased to a revised cost of approximately $29.9 million.

In addition to these significant change in circumstances, the financial plan for the Project has been substantially impacted by the Census 2000 merger of three South Florida Urbanized Areas (UZAs) -- Miami-Hialeah; Ft. Lauderdale-Hollywood-Pompano Beach; and West Palm Beach-Boca Raton-Delray Beach. These three UZAs have been combined into one UZA under Census 2000. This merger impacts FTA Formula Program funds which are apportioned annually by statutory formula to UZAs. Previously, Tri Rail received the commuter rail formula "floor" from each of the three UZAs. Under the new single UZA designation, Tri Rail will lose approximately $10 million in Formula Program funds annually, totaling about $40 million in lost funds over the life of the Project. This change has obviously made it essential for Tri-Rail to revise its Project financial plan to reflect the decreases in the amount of funds from this Federal funding resource.

In short, the fundamental changes in the plan for constructing the Project and the significant and unanticipated loss of FTA Section 5307 Urbanized Area Formula funds to Tri-Rail have made it necessary to develop an amendment to the FFGA in order to assure that Tri Rail can build a viable and successful project.

1.4 Project Scope

The scope of the Segment 5 Project covered by the FFGA Amendment consists of the following five activities:

1. Design/Build: The Segment 5 Project will be designed and constructed in its entirety using a Design/Build procurement method. Tri-Rail selected this construction approach in order to realize a schedule and cost reduction. Specifically, the overlap of final design and initial construction allows compression in the Project schedule, a smaller number of contracts to manage, and faster Project implementation. A shorter construction schedule reduces inflationary costs and ongoing project management costs.

   The Design/Build Contractor will be responsible for the final design and construction of the track, signal, bridge, station improvements, and modification to the existing maintenance and layover facility in Palm Beach County. The Design/Build Contractor will be responsible for:

- The purchase and installation of 43.3-miles of a second mainline track system to be positioned within the existing right-of-way (existing sidings will be incorporated into the track design). The work also includes upgrading and adjusting the existing track, permitting, utility relocation, and construction of eleven (11) new bridges, replacement of five (5) existing bridges, and rehabilitation of eight (8) existing bridges to accommodate the second mainline track.

- Modifications to the Automatic Highway Crossing System to provide full closure along the 71.7-mile South Florida Rail Corridor.

- Renovations of eight (8) existing stations to accommodate the second mainline track, construction of one (1) new station and reconstruction of one (1) existing station, demolition of one (1) existing station, design and construction of ten (10) passenger overpasses with elevators, procurement and installation of all hardscape, ticket vending machines, furnishings and landscape.

- Upgrading the existing West Palm Beach Maintenance and Layover Facility by preparing design documents and final drawings; designing and constructing storage tracks which will accommodate service and inspection; and procuring, installing and testing of the signal system, installation of new track circuits and control systems; signal bungalows and cases; and switch machines.

2. Project Management: A Project Management Consultant team will assist Tri-Rail with the overall management of the Segment 5 Project.

3. ROW and Easement Acquisitions: The Segment 5 Project will result in partial property acquisitions in 15 areas (which includes 28 parcels) adjacent to the existing alignment.

4. Project Administration: This activity provides for Tri-Rail's direct oversight, management and administration of the Segment 5 Project planning and engineering development.

5. Revenue Rolling Stock Acquisition: Included in the Segment 5 Project is the acquisition of five (5) refurbished diesel locomotives and two (2) new cab control coaches to provide limited 20-minute headways during peak periods once construction is completed.

1.5 Project Costs

Under the FFGA as amended, the Baseline Cost Estimate for the Segment 5 Project is $333,887,560. This represents an increase of $6,887,560 or 2 percent over the original FFGA budget of $327,000,000.

The new cost estimate of $333,887,560 is predicated on: (1) The Design/Build contract has been executed, with a fixed contract price, subject to change order; (2) Preliminary level of engineering has been completed for the new Boca Raton Station and the

modifications to the existing maintenance and layover facility; (3) 25 of the 28 parcels of real estate have been acquired at a final price, so the real estate cost is substantially established; and (4) Tri-Rail has acquired previously owned locomotives at a firm fixed price and will issue a request for proposal (RFP) for the rehabilitation of the five locomotive cores.

The cost estimate includes a contingency factor of 9% of the overall project cost. The contingency level takes into consideration that contracts have been negotiated with the Project design/builder of the track, signal, bridges, grade crossings and station improvements, CSXT, and Tri-Rail's Project Management Consultant team. Sufficient contingency funds are programmed for real estate and revenue equipment acquisition.

Federal capital new starts (Section 5309) participation totals $110,500,000. This amount has not been changed as a result of the FFGA Amendment. Table 1 delineates the change in funds allocated to the Segment 5 Project.

TABLE 1
SEGMENT 5 REVENUE SOURCES

SOURCE	APPROVED FFGA	AMENDED FFGA	CHANGE
FTA Section 5309 – New Starts Funds	$110.500	$110.500	$-0-
FTA Section 5307 – Formula Funds	14.932	12.474	-2.458
FTA Section 5309(m)(1)(A) – Rail Mod. Funds	19.315	21.958	2.643
FHWA – STP Funds	57.167	112.667	55.500
State – Gas Tax	69.912	71.289	1.377
Private Sector	-0-	5.000	5.000
Revenue Bond	55.174	-0-	-55.174
TOTAL	**$327.000**	**$333.888**	**$6.888**

2. CAPITAL PLAN

2.1 Project Funding Source

The Segment 5 Project revised baseline cost estimate is $333.888 million. For purpose of the FPCC, the Project is funded with 77% federal and 23% local funds. To date, Tri-Rail has received $182.646 million in federal and state funds. This leaves a balance of $151.242 million to be allocated to the Project between Fiscal Years 2003-06. Table 2 below summarizes the Project funding sources by year, as specified in Attachment 6 of the FFGA Amendment (dollars in millions).

TABLE 2 SEGMENT 5 REVENUE SCHEDULE BY YEAR (Fiscal Year Ends June 30)									
REVENUE SOURCE	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
Section 5309 – New Starts	$1.000	$ 9.811	$14.860	$26.730	$29.250	$28.849	$-0-	$-0-	$110.500
Section 5307 – Formula	-0-	4.611	1.924	5.939	-0-	-0-	-0-	-0-	12.474
Section 5309(m)(1)(A) Rail Mod.	-0-	3.168	3.296	5.578	6.496	-0-	3.420	-0-	21.958
Federal STP	-0-	7.167	5.000	45.000	8.125	20.625	11.625	15.125	112.667
Total Federal Funds	**$1.000**	**$24.757**	**$25.080**	**$83.247**	**$43.871**	**$49.474**	**$15.045**	**$15.125**	**$257.599**
State – FDOT	0.960	2.207	12.174	14.494	17.727	12.727	11.000	-0-	71.289
Private Sector	-0-	-0-	-0-	1.000	1.000	1.000	1.000	1.000	5.000
Total Local Funds	**$0.960**	**$2.207**	**$12.174**	**$15.494**	**$18.727**	**$13.727**	**$12.000**	**$1.000**	**$76.289**
TOTAL	**$1.960**	**$26.964**	**$37.254**	**$98.741**	**$62.598**	**$63.201**	**$27.045**	**$16.125**	**$333.888**

Capital funds for the Project are to be provided to Tri-Rail from federal and local sources. The Federal funds being utilized are from four different sources: (1) Section 5309(m)(1)(B) New Starts Funds; (2) Section 5307 Urbanized Area Formula funds; (3) Section 5309(m)(1)(A) Rail Modernization Fixed Guideway Funds; (3); and (4) Surface Transportation Program Funds. Local funds are from private sector and the Florida Department of Transportation (FDOT).

2.2 Description of Funding Source

Section 5309 (m)(1)(B), New Starts Funds: These funds are programmed by the FTA for use on capital projects for new fixed guideway systems and extensions to existing fixed guideway systems. The extensive application process includes planning, environmental, engineering, and construction documentation. The final commitment of these funds culminates in a FFGA. The Project's FFGA includes $110.500 million in New Starts Funds. Through fiscal year 2002, $52.401 million has been allocated to the Project in FTA grant FL-03-0195-03 **(see Attachment II)**.

Section 5307, Urbanized Area Formula Funds: The Segment 5 Project capital budget includes $12.474 million in Section 5307 Urbanized Area Formula Funds. The Segment 5 Project is Tri-Rail's highest capital funding priority project, and Tri-Rail is demonstrating that priority by committing a significant portion of its formula funds towards the Project. Through fiscal year 2002, $12.474 million has been approved in FTA grant FL-90-X394-02 for the Project **(see Attachment III).**

Section 5309 (m)(1)(A), Rail Modernization Fixed Guideway Funds: The Segment 5 Project capital budget includes $21.958 million in Section 5309 Rail Modernization Fixed Guideway Funds. The funds are allocated by statutory formula to grantees with existing rail programs, and have historically been a very dependable source of federal capital funding. The formula was revised in TEA-21 and should result in a stable

allocation of funds to Tri-Rail over the TEA-21 period and subsequent reauthorization. Through fiscal year 2002, $12.042 million have been approved in FTA grant FL-03-0200-02 for the Project **(see Attachment IV).**

Surface Transportation Program (STP) Funds: The Segment 5 Project capital budget includes $112.667 million in Surface Transportation Program Funds. Under the Surface Transportation Program, as enacted in the Intermodal Surface Transportation Efficiency Act of 1991 and continued in TEA-21, Federal recipients may elect to "flex" STP funds for any eligible transit capital activity, including the design and construction of a new starts project. Of the amount programmed, $77.667 million consists of the local county (MPO) shares for Palm Beach, Broward, and Miami-Dade Counties. An additional $35.000 million in funds has been programmed by the State. Through fiscal year 2002, $57.167 million in STP funds has been approved in FTA grant FL-90-X394-02 for the Project **(see Attachment III).**

Florida Department of Transportation: FDOT's primary source of funding is the Florida State Fuel Tax. Initiated with a one cent per gallon tax in 1921, the State highway and off-highway fuel taxes have increased in both numbers of categories and overall size. The current State imposed tax for fuel is 17.6 cents per gallon, of which approximately 12 cents per gallon is provided to FDOT for transportation projects. FDOT distributes these funds directly through District offices. FDOT District IV has committed $71.289 million in funds for the Project. Through fiscal year 2003, Tri-Rail has received $47.562 million from FDOT **(see Attachment V).**

Private Sector: CSXT will provide $5.000 for the Segment 5 Project in accordance with agreement between Tri-Rail and CSXT **(see Attachment VI).**

2.3 Project Baseline Cost Estimate

The Double Track Corridor Improvement Program Segment 5 Project Baseline Cost Estimate is highlighted in Table 3 below (dollars in millions). Table 4 indicates the Project's annual cash flow requirements. The cost estimate is based on escalated dollars.

TABLE 3
SEGMENT 5 BASELINE COST ESTIMATE

PROJECT ELEMENTS	AMOUNT
Design/Build - Track, Signal & Stations	$246.215
Project Management Consultant	29.918
Project Administration	2.056
Right-of-Way Acquisition	12.006
Rolling Stock Acquisition	13.650
Project Contingency	30.043
TOTAL PROJECT COST	**$333.888**

TABLE 4 SEGMENT 5 CASHFLOW REQUIREMENTS BY YEAR									
PROJECT ELEMENTS	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**TOTAL**
Design/Build - Track, Signal & Stations	$-0-	$-0-	$31	$79.567	$104.451	$49.106	$13.059	$-0-	$246.215
Project Management Consultant	-0-	-0-	3.600	6.339	7.096	7.602	5.281	-0-	29.918
Project Administration	-0-	0.112	0.362	0.429	0.473	0.473	0.208	-0-	2.056
R-O-W Acquisition	-0-	-0-	0.248	2.518	9.239	-0-	-0-	-0-	12.006
Rolling Stock Acquisition	-0-	-0-	-0-	-0-	3.688	7.375	2.588	-0-	13.650
Contingency	-0-	-0-	-0-	-0-	-0-	5.236	8.667	16.140	30.043
TOTAL	**$-0-**	**$0.112**	**$4.241**	**$88.853**	**$124.947**	**$69.792**	**$29.803**	**$16.140**	**$333.888**

2.4 Project Funding Contingency Plan

The Capital Cash Flow Plan for Fiscal Years 2000-2022 indicates a cumulative surplus of $40.366 million. If required, these funds may be utilized for short term financing should the Segment 5 Project costs exceed the Project's revenue schedule. Tri-Rail, in coordination with the State of Florida Division of Bond Finance, will develop a contingency plan for short term borrowing (i.e., a bank line or letter of credit) to utilize these funds, if necessary, for the Project.

2.5 Reliability of Capital Cost Estimate

The Segment 5 Project cost estimate is based on actual contractual agreements, with the design/builder of the track, signal and stations, CSXT, and the Project Management Consultant.

Design/Builders: The Segment 5 Project will be designed and constructed in its entirety using a design/build procurement method. The revised cost estimate and cash flow projections for the track, signal and stations element of the Project is based on an actual contractual agreement.

Project Management: A Project Management Consultant (PMC) team will assist Tri-Rail in the overall management of the Segment 5 Project. The revised cost estimate and cash flow projections for the PMC contract is based on actual contractual agreement.

Project Administration: This activity includes Tri-Rail's direct oversight, management, and administration of the Segment 5 Project planning and engineering development. The revised cost estimate and cash flow projections for Project Administration are based on an actual contractual agreement.

ROW & Easement Acquisitions: The Segment 5 Project will impact fifteen (15) areas (28 parcels) adjacent to the existing track alignment. The revised cost estimate and cash flow projections for ROW reflects the fact that the twenty-eight (28) parcels required for the Project have either been appraised, negotiated and/or acquired. All 15 areas (28 parcels) will be acquired by June 2003.

Revenue Rolling Stock Acquisition: Included in the Segment 5 Project is the acquisition of five (5) diesel locomotives (two additional/three replacement vehicles) and two (2) cab control coaches (additional vehicles) to provide 20-minute headways during peak periods once construction is completed. The revised cost estimate reflects the actual acquisition of five (5) previously owned diesel locomotives at a firm fixed price and Tri-Rail will issue a request for proposal (RFP) for the rehabilitation of the five locomotive cores. In addition the cost estimate for the two (2) control coaches cab based on cost estimate received from Bombardier.

Contingencies: The cost estimate includes a contingency factor of 9% of the overall Project cost. The contingency level takes into consideration that contracts has been negotiated with the selected design/builder of the track, signal, bridge and station improvements, CSXT, and Tri-Rail's Project Management Consultant team.

2.6 Capital Cost and Revenue Assumptions

The Capital Cash Flow Plan for Fiscal Years 2000-2022 indicates that it has the financial capacity to construct, operate and maintain the existing and expanded system. The cash flow plan is projecting capital expenditures totaling $566.741 million. This includes the Segment 5 Baseline Cost Estimate as delineated in Table 4 above and all other planned capital projects over the next 20-years. The cash flow plan assumes the following expenditures:

1) Program funds to ensure preventive maintenance costs are fully funded as required by the Operating and Maintenance Cost Estimate for Fiscal Years 2000-2022;
2) Program expenditures for on-going station maintenance and renovation; and
3) Program expenditures for rolling stock rehabilitation and renovation to ensure maximum efficiency in accordance with Tri-Rail's Revenue Fleet Management Plan.

Tri-Rail's Capital Revenue Plan for Fiscal Years 2000 – 2022 totals $607.105 million **(see Attachment VII)**. The revenue plan incorporates the Segment 5 Project revenues as delineated in Table 2. The revenue projections assume a modest increase of 3% in Federal Section 5307 Urbanized Area Formula and Section 5309(m)(1)(A) Rail Modernization Fixed Guideway Funds between Fiscal Years 2003-08; thereafter revenues remain flat through Fiscal Year 2021-22.

Between Fiscal Years 2000-2022, Tri-Rail is projecting a cumulative surplus of approximately $40.366 million. The revenue plan demonstrates Tri-Rail's ability to successfully construct the Segment 5 Project while adequately maintaining and recapitalizing the existing and planned improvements.

3. OPERATING AND MAINTENANCE PLAN

3.1. Operating and Maintenance Plan

The FTA Circular requires that the Grantee calculate a realistic estimate of its increased operating deficit, and develop a plan for financing that additional cost without compromising its existing mass transit system, and without greater dependence upon

federal financing. Tri-Rail's Operating and Maintenance Cost Estimate for Fiscal Years 2000 to 2022 **(see Attachment VIII)** incorporates the projected cost to operate and maintain the Segment 5 Project over the next 20-years.

The annual operating and maintenance cost of the Tri-Rail system is $24.920 million for Fiscal Year 2002-03. The Operating and Maintenance Plan assumes modest growth in the baseline operating and maintenance cost over the construction period of the Project. Tri-Rail is projecting an increase in total operating and maintenance cost in Fiscal Year 2003-04 of $27.051 million as a result of operating two (2) additional train trips and $29.236 million in FY 2004-05 as a result of adding another two (2) additional train trips. Thereafter, with full implementation of the Project, Tri-Rail is estimating the annual system operating and maintenance cost will be $45.095 million in Fiscal Year 2006-07 and $78.622 million by Fiscal Year 2021-22.

Operating and maintenance costs are projected to increase annually based on projected increases in the incremental costs associated with expanded services and on estimated average inflation rate of 3.6% through Fiscal Year 2015, and average inflation rate of 4.0% thereafter through Fiscal Year 2021-22.

3.2 Operating and Maintenance Plan Funding Source

Train Revenue: Train revenue projections are based on ridership, which are based on the current schedule of 28 weekday trains. In Fiscal Year 2006-07, with completion of the Double Track Corridor Improvement Program, Tri-Rail will have the ability to support up to 20 additional trains to its daily schedule. This increase in service will result in an increase in the number of passengers from 2.619 million in Fiscal Year 2002-03 to 7.369 million annual riders in Fiscal Year 2021-22. With the completion of the Project, Tri-Rail, CSXT and Amtrak will be able to operate with greater corridor efficiency. Tri-Rail's farebox recovery is projected to increase from 25.3% in Fiscal Year 2002-03 to 31.7% in Fiscal Year 2021-22.

Florida Department of Transportation (FDOT): FDOT is required under Florida State Statute (F.S. 341.303) to fund up to 50 % of Tri-Rail's net deficit, with the stipulation that its total contributions cannot exceed the local contribution of the three counties. Per the Florida Statute, the net deficit is the operating expenditures less the farebox recovery and any Federal assistance. FDOT and Tri-Rail annually enter a Joint Participation Agreement (JPA) to match the three counties contribution. FDOT's share of operating subsidy will increase from $4.695 million in Fiscal Year 2002-03 to $20.403 million in Fiscal Year 2021-22.

Palm Beach, Broward, and Miami-Dade Counties: Tri-Rail will be introducing statutory changes that will incorporate language that will negate the need for Interlocal Agreements between Tri-Rail and Miami-Dade, Broward and Palm Beach Counties. All three counties have given approval to the statue change to incorporate the Interlocal Agreement language in Tri-Rail's status. If approved, these changes would only require Tri-Rail to submit annual operating and maintenance budget to the three counties for approval. In previous years, Tri-Rail would enter into 5-year Interlocal Agreement with the three counties to fund Tri-Rail's net operating budget deficit pursuant to Florida State Statue (F.S. 341.303). Each County's share of operating subsidy will increase from $1.565 million in Fiscal Year 2002-03 to $6.801 million in Fiscal Year 2021-22.

Federal Highway Administration (FHWA): Since its inception in 1989, Tri-Rail has received an annual allocation in FHWA funds, due to the fact that Tri-Rail was the result of a traffic mitigation project. Per the fiscal year 1995 Senate Appropriations Committee Report, FHWA Section, Section 339(a) of Public Law 103-122 made permanent the permission of the State of Florida to obligate up to the $4.000 million appropriated under Title 29, USC Section 104(b)(5)(B), for operating expenses for Tri-Rail in the area of Miami-Dade, Broward and Palm Beach Counties, Florida **(See Attachment IX)**. Since this language is now permanent, its inclusion in bill language in this act or future acts is no longer necessary in order for the Secretary and the State of Florida to carry out legislative intent of this provision. This funding is passed through from FDOT to Tri-Rail.

Federal Transit Administration (FTA): Under the provisions of the Transportation Equity Act for the 21st Century (TEA-21), urbanized areas of 200,000+ population no longer receive federal financing for operating expenses. "Preventative Maintenance," which is defined as all maintenance costs, is an allowable capital expenditure under the formula program. There is no cap on the amount of formula funds that can be used for preventative maintenance. As Tri-Rail adds trains, FTA's allocation to the operating and maintenance budget will increase from $5.223 million in Fiscal Year 2002-03 to $8.916 million in Fiscal Year 2021-22.

3.3 Passenger Demand - Regional Planning Model

The ridership forecasts used in projecting the operating and maintenance costs from Fiscal Year 2000 through 2022 is based on the latest model run used in the development of Tri-Rail's Long Range Master Plan. The model analysis was prepared by Carr-Smith Corradino (CSC), using the SERPM-4 model. SERPM-4 is the regional planning model used by FDOT District IV Office. The model includes Palm Beach, Broward, and Miami-Dade Counties within its boundaries. It is the only planning model available that includes all of the counties served by Tri-Rail. SERPM-4 is more comprehensive than the Florida Standard Urban Transportation Modeling Structure (FSUTMS) and was designed to improve the multi-modal aspects of the FSUTMS. Table 5 shows the interpolated growth in ridership based on changes in Tri-Rail service, completion of regional improvements, and regional growth.

TABLE 5 FORECAST RIDERSHIP GROWTH			
YEAR	NUMBER OF TRAINS	EVENT	DAILY PROJECTED RIDERSHIP
2000	28		7,427 (actual)
2001	28		8,934 (actual)
2002	28		8,663 (actual)
2003	28		8,447
2004	32	Add. Peak Hour Service	9,460
2005	32	Add. Peak Hour Service	10,406
2006	48	Double Track Completed	10,927
2007	48	MIC/MIA Opens	14,751
2008	48		15,489
2009	48		15,953
2010	48		16,432
2011	48		16,925
2012	48		17,433
2013	48		17,956
2014	48		18,494
2015	48		19,049
2016	48		19,621
2017	48		20,209
2018	48		20,815
2019	48		21,440
2020	48		22,222
2021	48		22,967
2022	48		23,694

4. CASH FLOW ANALYSIS

4.1 Project Cash Flow

The Double Track Corridor Improvement Program Segment 5 Project Cash Flow is delineated in Table 6 (dollars in millions). The revised Project Cash Flow is incorporated in the agency's Capital Cash Flow Plan **(see Attachment X).**

TABLE 6 SEGMENT 5 REVISED CASH FLOW									
Description	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
Annual Project Expenditures	**$-0-**	**$0.112**	**$4.241**	**$88.853**	**$124.947**	**$69.792**	**$29.803**	**$16.140**	**$333.888**
Annual Project Revenues									
Section 5309 – New Starts	$-0-	$.090	$2.088	$50.223	$29.250	$28.849	$-0-	$-0-	$110.500
Section 5307 – Formula	-0-	-0-	0.722	9.510	2.242	-0-	-0-	-0-	12.474
Section 5309(m)(1)(A) Rail Mod.	-0-	-0-	0.583	11.349	6.606	-0-	3.420	-0-	21.958
Federal STP/CMAQ	-0-	-0-	-0-	-0-	57.928	27.989	11.625	15.125	112.667
Total Federal	**$-0-**	**$0.090**	**$3.393**	**$71.082**	**$96.026**	**$56.838**	**$15.045**	**$15.125**	**$257.599**
State – FDOT	-0-	0.022	0.848	17.771	28.921	12.727	11.000	-0-	71.289
Private Sector	-0-	-0-	-0-	-0-	-0-	0.227	3.758	1.015	5.000
Total Local Funds	**$-0-**	**$0.022**	**$0.848**	**$17.771**	**$28.921**	**$12.954**	**$14.758**	**$1.015**	**$76.289**
TOTAL	**$-0-**	**$0.112**	**$4.241**	**$88.853**	**$124.947**	**$69.792**	**$29.803**	**$16.140**	**$333.888**

4.2 Capital Cash Flow Projections

Tri-Rail is projecting in excess of $1.744 billion in revenues (see Table 7) over the next 20-years and a cumulative surplus in excess of $40.000 million over the same period. The 22-year cash flow is a summary of Tri-Rail's capital, operating and maintenance plans combined over the 22-year period. The 22-year cash flow projection demonstrates Tri-Rail's ability to successfully construct the Segment 5 Project while adequately operating, maintaining and re-capitalizing the existing and planned improvements.

The 22-year cash flow incorporates the Segment 5 Project revenues and costs, on-going capital maintenance/upgrades of facilities and rolling stock and the cost to operate and maintain the Segment 5 Project over the next twenty-four years. The projected revenues and expenditures assume an average inflation rate ranging from 3.5% to 4% annually over the 22-year period. Tables 8 and 9 delineate the projected sources of revenues and expenditures for both capital and operating funds (dollars in millions).

TABLE 7 FISCAL YEARS 2000-2022 PROJECTED REVENUES		
REVENUES	**TOTAL**	**PERCENT**
Operating Revenues/Other Income	$326.535	18.7%
Palm Beach, Broward, and Miami-Dade Counties:		
Operating Subsidy	291.960	16.7%
STP Funds (FFGA)	77.667	4.5%
Other Capital Projects	.875	.1%
Federal Highway Administration (FWHA):		
Operating Subsidy	92.000	5.3%
STP Funds (FFGA)	35.000	2.0%
Florida Department of Transportation (FDOT) Funds:		
Operating Subsidy	291.963	16.7%
FFGA Matching Funds	71.289	4.1%
Other Capital Projects	71.651	4.1%
Formula Federal Funds:		
Section 5307 Formula Funds - Operating Subsidy	135.004	7.7%
Section 5307 Formula Funds – FFGA	12.474	.7%
Section 5307 Formula Funds – Other Capital Projects	38.259	2.2%
Section 5309 Rail Mod. Funds – FFGA	21.958	1.3%
Section 5309 Rail Mod. Funds – Other Capital Projects	156.200	9.0%
Discretionary Federal Funds:		
Section 5309 New Starts Funds – FFGA	110.500	6.3%
Other Capital Projects	2.232	.1%
Private Sector	9.000	.5%
TOTAL	**$1,744.567**	**100.0%**

TABLE 8 FISCAL YEARS 2000–2022 PROJECTED EXPENDITURES		
USES OF FUNDS	**TOTAL**	**PERCENT**
Operating and Maintenance Costs	$ 1,137.462	66.7%
Capital Costs	566.741	33.3%
TOTAL	**$1,704.203**	**100.0%**

4.3 Financial Evaluation

Tri-Rail believes our funding sources for the Segment 5 Project and our 22-year capital and operating plans are stable, reliable, and will be realized as conservatively projected.

Stability and Reliability of Operating & Maintenance Funds: Our 22-year operating plan revenues and costs were projected after careful analysis of Tri-Rail's historical data. In addition, other primary factors considered when projecting operating and maintenance costs were as follow:

1. Impact of Escalation; and
2. Impact of the addition of train movements following the completion of the Segment 5 Project

The 22-year operating and maintenance plan, following implementation of the Project, will be funded by the same combination of revenues currently supporting Tri-Rail's operations, although the precise "mix" of sources may vary. These operating revenues, in combination, provide a stable and reliable resource for funding the operating and maintenance costs of the Tri-Rail system. The increased headways that result from the Project, together with the increased reliability of service, are expected to increase ridership. Therefore, it is reasonable to expect that this farebox recovery ratio will increase to reflect the growth in ridership.

Stability and Reliability of Capital Funds: As outlined in Table 9, approximately 54.7 percent of the Segment 5 Project revenues have been allocated to the Project, which is consistent with the revised Segment 5 Project revenue plan. With the exception of the Federal New Starts Funds, the allocation of funds to the Segment 5 Project is controlled by Tri-Rail i.e. Federal Rail Modernization Fixed Guideway Funds and Federal Surface Transportation Program Funds committed by the Miami-Dade, Broward and Palm Beach Metropolitan Planning Organizations to be "flexed" within the programmed fiscal year. The local funds for the Project have been committed and programmed by the State. Tri-Rail and FDOT have entered into a Joint Participation Agreement (JPA), which provides the necessary funding for the Project.

Through the commitment of a FFGA between Tri-Rail and the FTA, Tri-Rail has secured $81.651 million of the $110.500 million in Federal New Starts Funds including a Fiscal Year 2002-03 earmark of $29.250 million. Per Attachment 6 of the FFGA, Tri-Rail was schedule to receive $39.689 million in Fiscal Year 2003; however $29.250 million, which was earmarked for the Project. This leaves a balance of $28.849 million to be secured in Fiscal Year 2004.

TABLE 9 SEGMENT 5 REVENUE COMMITMENTS				
Funding Source	**FFGA Amended Budget**	**Received Thru FY 2003**	**Outstanding FY 2003-06**	**Evidence of Commitment**
FTA Section 5309 – New Starts	$110.500	$52.401	$58.099	Full Funding Grant Agreement
FTA Section 5307 – Formula	12.474	12.474	-0-	100% received
FTA Section 5309(m)(1)(A) – Rail Mod.	21.958	12.042	9.916	Tri-Rail programmed Rail Mod. funds – 20-year Capital Plan
FHWA – STP/CMAQ	112.667	57.167	55.500	Funds committed by the Miami-Dade, Broward & Palm Beach MPO's – FDOT work program
State – Gas Tax	71.289	47.562	23.727	Approved Joint Participation Agreement (JPA)
Private Sector	5.000	1.000	4.000	Per Agreement with CSXT
TOTAL	**$333.888**	**$182.646**	**$151.242**	

Tri-Rail's 22-year capital and operating and maintenance cash flow projections demonstrate that Tri-Rail has adequate resources to not only complete the Segment 5 Project as planned, and also to operate the existing and expanded commuter rail service.

ATTACHMENTS

Attachment I – Segment 5 System Map
Attachment II – FTA Grant FL-03-0195
Attachment III – FTA Grant FL-90-X394
Attachment IV – FTA Grant FL-03-0200
Attachment V – JPA 42
Attachment VI – CSXT Agreement
Attachment VII – Capital Revenue Plan for Fiscal Years 2000-2022
Attachment VIII – Operating & Maintenance Cost Estimate for Fiscal Years 2000-2022
Attachment IX – FHWA Operating Funds
Attachment X - Capital Cash Flow Plan Fiscal Years 2000-2022

OTHER SUPPORT DOCUMENTS

Organizational Chart
Board Approval – Amended Segment 5 Project Scope and Budget
2002 Comprehensive Annual Financial Report
FDOT Work Program
Proposed Statue Changes for Local Funds
Fare Structure
Rail Fleet Management Plan, dated 3-8-02

Attachment 1-4: Inflation Adjustment

The inflation adjustment was done using the rates suggested by FDOT every year. The following table uses those rates to calculate the escalation factor needed to adjust the 2002 and 2004 budgets to 2007 dollars.

Year	Inflation Rate(*)	Escalation Factor 2002 - 2007	Escalation Factor 2004 - 2007
2002		1.000	
2003	3.6%	1.036	
2004	3.5%	1.072	1.000
2005	3.3%	1.108	1.033
2006	3.5%	1.146	1.069
2007	10.0%	1.261	1.176

* Source FDOT Office of Policy Planning.

Attachment 1-5: On-Board Survey Questionnaires

South Florida Regional Transportation Authority Survey

SFRTA is planning for the future. To do this we need to learn more about your trip. Please complete this survey and return it to the surveyor as you leave the train. Complete as many questions as your time allows. WE DON'T NEED YOUR NAME AND ALL INFORMATION IS CONFIDENTIAL.

1. Where were you when you started this trip?

____ home ____ recreational
____ work ____ school
____ shopping ____ airport
____ medical/dental

Name or address of the place you checked, or nearest intersection.

_____

2. At what station did you board the train?

_____

3. How did you arrive at the station where you boarded the train?

____ walked ____ Tri-Rail shuttle
____ dropped off ____ taxi
____ drove ____ bicycle
____ bus ____ other

4. What is the final destination for this trip?

____ home ____ recreational
____ work ____ school
____ shopping ____ airport
____ medical/dental

Name or address of the place you checked, or nearest intersection.

_____

5. At what station will (or did) you get off the train?

_____

6. How will you get from Tri-Rail to the place you are going?

____ walked ____ Tri-Rail shuttle
____ picked-up ____ taxi
____ drive ____ bicycle
____ bus ____ other

7. How many times today will you ride Tri-Rail ?

____ 1 ____ 2 ____ 3 or more

8. How frequently do you ride Tri-Rail? (Circle one)

Daily Occasionally

Weekdays Weekends

9. How long have you been riding Tri-Rail?

____ First time ____ less than one year

____ One year + ____ 3 years +

10. How many people are you traveling with (counting yourself)?

_____ 1 _____ 2 _____ 3

11. How do you rate your overall satisfaction with Tri-Rail? (Circle one)

Excellent
Very good
Good
Fair
Poor

OVER

12. Please rate Tri-Rail on each of the categories below. Check one answer for each category:

Category	Excellent	Very good	Good	Fair	Poor
On-time performance	_____	_____	_____	_____	_____
Customer Service	_____	_____	_____	_____	_____
Train Cleanliness	_____	_____	_____	_____	_____
Station Cleanliness	_____	_____	_____	_____	_____
Bus Connections	_____	_____	_____	_____	_____
Station Parking	_____	_____	_____	_____	_____
Price/value	_____	_____	_____	_____	_____
Ticket machines	_____	_____	_____	_____	_____

13. What is your major transit need?_____

_____

14. What can Tri-Rail do to improve your transit trip? _____

_____

15. How did you first hear about Tri-Rail? (Circle one)

Television Newspaper Co-worker Friend/relative Radio Website

16. What County do you live in: Miami Dade Broward Palm Beach Other _____

17. Your zip code? _____

18. What is your age? UNDER 18 18-24 25-34 35-44 45-54 55-64 65+

19. What is the last year of school you completed?

Some High School High school Grad. Some College College Grad Post Grad

20. IF CURRENTLY EMPLOYED, which best describes your primary occupation? (Circle one)

Professional Management Other _____
Sales Office support

21. What is your household's annual income? (Circle one)

Under $25,000 $25-35,000 $36-50,000 $51-75,000 $76-100,000 $101,000+

22. Are you: ANGLO BLACK HISPANIC ASIAN other _____

23. Are you: MALE FEMALE

THANK YOU FOR RIDING TRI-RAIL!

SOUTH FLORIDA REGIONAL TRANSPORTATION AUTHORITY SURVEY (SFRTA) – MAY 2008

SFRTA is planning for the future. To do this we need to learn more about **the trip you are on now**. Please complete this survey and return it to the surveyor as you leave the train. Complete as many questions as your time allows. **WE DON'T NEED YOUR NAME AND ALL INFORMATION IS CONFIDENTIAL.**

2.1.1 1. Where were you when you started this trip?

____ (h) home ___ (r) recreational
____ (w) work ___ (s) school
____ (s) shopping ___ (a) airport
____ (m) medical/dental ___ (h) hotel
____ (o) Other: **SPECIFY**_____

1b. What is the address/location of the place you checked above, (where you started this trip or nearest intersection)
_____ **OR**
_____and _____

2.1.2 2. At what Tri-rail Station did you board the train?
2.1.3
2.1.4 _____

2.1.5 3. How did you get to the station where you get on the train?

____(a) walked more than 3 blocks
____ (b) walked 0-3 blocks ___ (f) dropped off
____ (c) bicycle (see 3 B please) ___ (g) Tri-Rail shuttle
____ (d) drove alone & parked ___ (h) taxi
____ (e) carpooled with another person & parked at station
____ (t) Transferred from Bus (circle one below)
MDT **BCT** **Palm Tran**

What bus route: (#)_____

____ **(o) Other: SPECIFY**_____
2.1.6
2.1.7 3b. I took my BIKE on the Train: ____ (y) Yes____ (n) No
2.1.8
2.1.9 4. What is the final destination for this trip?

____ (h) home ___ (r) recreational
____ (w) work ___ (s) school
____ (s) shopping ___ (a) airport
____ (m) medical/dental ___ (h) hotel
____ (o) Other: **SPECIFY**_____

4b. What is the address/location of the place you checked above, (where you started this trip or nearest intersection.
_____ **OR**
_____and _____

2.1.10 5. At what Tri-rail station will you get off the train?
2.1.11 _____

6. How will you get from Tri-Rail to the place you are going?

____ (a) walked more than 3 blocks ____ (c) Picked up
____ (b) walked 0-3 blocks ____ (f) taxi
____ (c) Tri-Rail shuttle ____ (g) bicycle
(d) will drive to destination

____ (a)First time ___ (c) more than one year
____ (b) less than one year ___ (d) more than 3 years

9. How do you rate your overall satisfaction with Tri-Rail? (Check one)

_____ (a) Excellent _____ (d) Fair
_____ (b) Very good _____ (e) Poor
_____ (c) Good

10. How did you pay for your ride on this Tri-Rail Trip?
____ (a) Monthly fare ____ (d) Round Trip fare
____ (b) One-way fare ____ (e) Weekend fare/all-day
____ (c) 12 trip fare

10b. Did you use a fare Discount- ____ ?
____ (a) Employer Discount Program (EDP)
____ (b) Senior Citizen Discount Program
____ (c) Disabled Citizen Discount Program
____ (d) Medicare Card Holder Discount Program
____ (e) Students/Children with ID
(Discounts are for Senior Citizens, persons with disabilities, Medicare card holders, students and children with ID)

11. How many autos, trucks or motorcycles are owned or leased by people in your household?
_____ #

12. Please rate Tri-Rail on each of the categories below. Check one answer for each category:
(a) On-time performance

Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(b) Customer Service
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(c) Train Cleanliness
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(d) Station Cleanliness
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(e) Bus Connections
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(f) Station Parking
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(g) Price/value
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(h) Ticket machines
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(t) Announcements on the train that announce the next stop
Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

(s) Announcements at the station that announce the next train

Excellent Very good Good Fair Poor
_____ _____ ____ ____ ____

Attachment 1-6: Tri-Rail Station Area Development

South Florida Regional Transportation Authority
Proposed and Approved Station Area Development

	Yamato Road Joint Venture (9/17/07)	**Deerfield Station**	**Riverbend DRI**	**Sheridan Stationside Village**
Status	Proposed	City Site Plan Approved	DRI Approval in Process	City Site Plan Approval in Process
Acres	6	8.07	60 +	41.88
Office	99,000 sq. ft.	36,000 sq. ft.	3,381,000 sq. ft.	115,000 sq. ft.
Residential	198 units	549 units	427 units	639 units
Commercial/Retail	55,000 sq. ft.	15,072 sq. ft.	1,146,000 sq. ft.	300,000 sq. ft.
Hotel	150 rooms	148 rooms	550 rooms	150 rooms
Industrial	N/A	N/A	N/A	N/A

SITE PLAN

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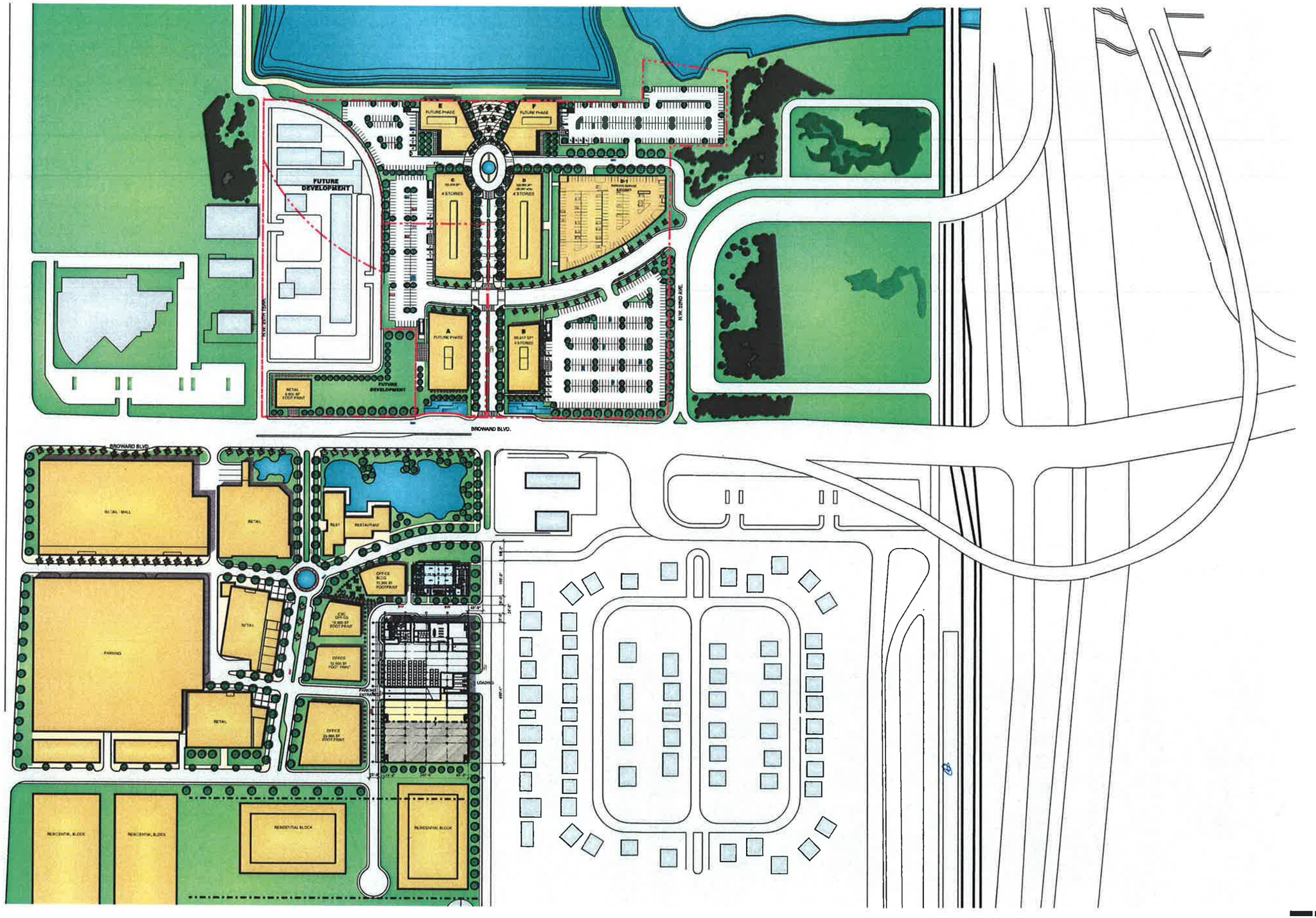

SCB

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OVERALL SITE PLAN 11-07-07 N. T. S.

BROWARD COUNTY SUPERVISOR OF ELECTIONS FACILITY

Riverbend Ft. Lauderdale - Barron Commercial Development

SCB

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VIEW FROM EAST
RIVERBEND - AERIAL VIEWS
Barron Commercial Development

12.20.2007

5156.013

NO.	DATE	APPROV.	REVISIONS

WAKEFIELD BEASLEY & ASSOCIATES

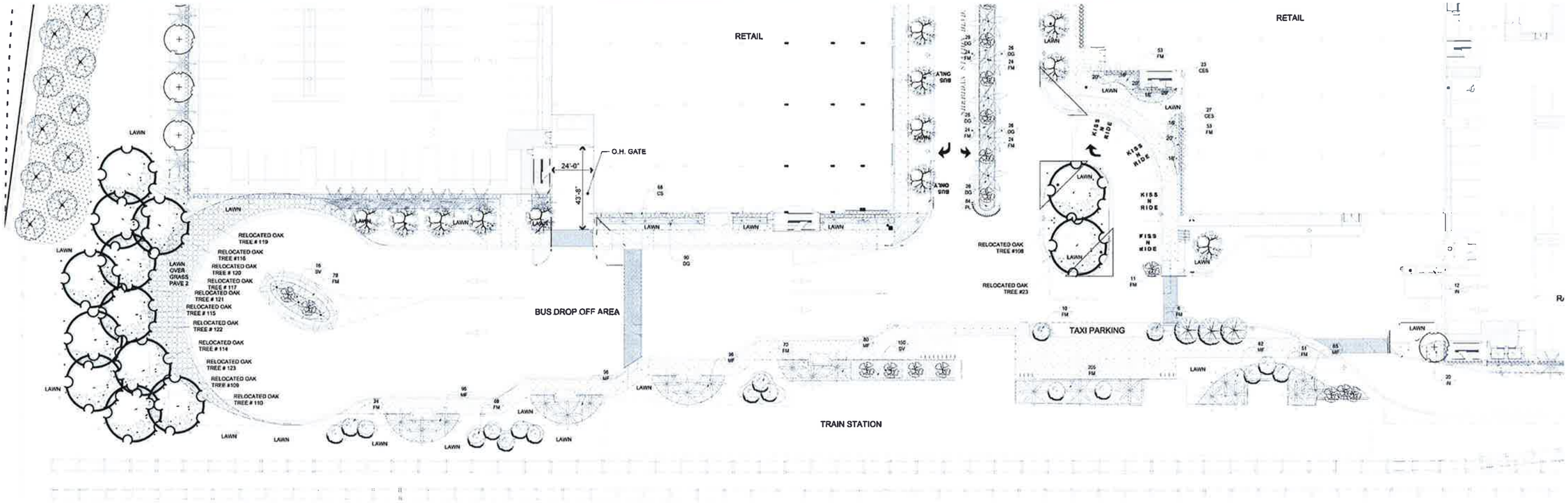
JACOBS Carter Burgess

ROGER FRY & ASSOCIATES ARCHITECTS, P.A.

SHERIDAN STATION
A TRANSIT ORIENTED DEVELOPMENT, HOLLYWOOD, FLORIDA
RAM DEVELOPMENT and PINNACLE HOUSING GROUP

MASTER SITE PLAN

DESIGNED BY:
DATE: 03-31-08
DRAWN BY: TEM
DATE: 03-31-08
CHKD BY: CAT
DWG FILE: 470425
SCALE: 1"=100'
PROJECT NO.: 470425
ISSUED FOR: SDP
ISSUED FOR CONSTRUCTION:
SHEET NO.
SP2 - 7



PLAN

WEST ELEVATION - VIEW FROM TRAIN STATION

BUILDINGS 3A & 1B

Sheridan Station

A TRANSIT ORIENTED DEVELOPMENT
www.sheridan-station.com

RAM DEVELOPMENT COMPANY
AND PINNACLE HOUSING GROUP

July 7, 2008

Okomo Associates, LLC
9400 S. Dadeland Boulevard, Suite 100
Miami, FL 33156

Florida Department of Transportation
Office of Right of Way
605 Suwannee Street, MS22,
Tallahassee, FL, 32399-0450
Via fax: 850-414-4850

RE: 05-DPY-72d

SUBJECT: Okomo Associates, LLC and Florida Department of Transportation request Final Site Plan Review for a mixed use development (approximately 639 residential units, 300,000 sq ft retail, 115,000 sq ft office and 800 space FDOT parking garage) for property generally located north of Taft Street, south of Sheridan Street, east of CSX railway and west of I-95 (Sheridan Stationside Village Phase I).

THE APPLICANT MUST ADDRESS ALL COMMENTS AND FINDINGS AS IDENTIFIED BY MEMBERS OF THE TECHNICAL ADVISORY COMMITTEE BOTH IN WRITING (IDENTIFY PAGE NUMBER OF THE CORRECTION) AND ON THE SITE PLAN. (ALL CHANGES MUST BE IDENTIFIED, I.E. BUBBLED).

BACKGROUND:

Owner/Applicant:	Okomo Associates, LLC/Florida Department of Transportation /Debbie M. Orshefsky, Esq.
Address/Location:	Generally located north of Taft Street, south of Sheridan Street, east of CSX railway and west of I-95
Net/Gross Size of Property:	Approximately 39.75 acres/41.88 acres
Present Zoning:	Planned Development District (PD)
Future Land Use Designation:	Transient Oriented Development (TOD)
Existing Use of Land:	Mobile Home Park, Tri-Rail Station and Park and Ride Lot

---

ADJACENT ZONING

North: Low Intensity Industrial and Manufacturing (IM-1)/Government Use District (GU)
South: Low Intensity Industrial and Manufacturing (IM-1)/ Government Use District (GU)

East: Government Use District (GU)/Interstate 95
West: Transportation/Low Intensity Industrial and Manufacturing (IM-1)/High Intensity Commercial (C-5)

ADJACENT LAND USE

North: Industrial
South: Industrial/Transportation/General Business
East: Transportation
West: Industrial/General Business

A. APPLICATION SUBMITTALS
Julie Walls, Principal Planner 921-3471

1. Plat must be submitted for recordation with Broward County prior to project consideration by any city Boards. Additionally, right-of-way vacations must also be approved by the City Commission prior to project consideration by any Boards.

2. Submitted plans still do not appear to include the Site Plan laid over the tree survey. Staff has stressed the importance of preserving valuable tree clusters throughout the site; however we were unable to conduct a full review. Changes based on the submittal of the tree survey/site plan may result in additional review/comments.

3. Staff did not locate Floor Plans and Elevations for Buildings 1C-3C. Please be aware if these buildings are not included in the package currently under review, additional review/approvals may be required for these buildings.

4. Staff encourages all applicants meet with the civic associations their project is located within prior to submitting for the Development Review Board. Please provide an update on the status of this.

5. The O&E Report needs to be dated back to 1953. Additionally, there are some encumbrances listed on the O&E not plotted on the survey & some on the survey not listed in the O&E. Please clarify. (2nd request) Provide copies of all encumbrances.

Responses have been provided for the following comments; however a meeting with various staff members and the applicant needs to be held to discuss how these items affect the project.

6. Include plan as to what off-site right-of-way improvements will be included to support this phase and future phases. Additionally, work with Engineering to include timeframe for these improvements to be C/O'd &/or C/C'd in coordination with buildings receiving C/Os and the land use plan amendment. (2nd request) While an annual outline for these improvements was included as part of the land use amendment, their relationship with each Phase needs to be included.

PUBLIC HEARINGS 2ND READING - CONTINUED

Roll Call: YEAS: Commissioner Steve Gonot, Commissioner Sylvia Poitier, Vice Mayor Marty Popelsky, and Mayor Albert Capellini. NAYS: Commissioner Pam Militello.

QUASI-JUDICIAL PUBLIC HEARINGS

ITEM: 8 **TAPE 1, COUNT 1195**

P.H. 2008-058: APPLICATION 07-P-182 Applicant: DEERFIELD STATION, LLC, by Rhon Ernest-Jones Consulting Engineers Proposal: To plat a 8.07-acre parcel to be known as the DEERFIELD STATION TOD plat. Location: Land lying in the South ½ of Government Lot 1, Section 2, Township 48 South, Range 42 East, more particularly described in the file, located at 1250 W. Hillsboro Boulevard.

Item 8 was discussed as a part of Item 7.

Mr. Maurodis recommended that Item 7 include all of Staff's recommendations and department comments and conditions. Also the plat, the site plan would include the conditions set forth in Ordinance 2008/005.

MOTION was made by Commissioner Sylvia Poitier and seconded by Vice Mayor Marty Popelsky to approve item 8 to include all of Staff's recommendations and departmental comments and conditions and Ordinance 2008/005.

Roll Call: YEAS: Commissioner Steve Gonot, Commissioner Sylvia Poitier, Vice Mayor Marty Popelsky, and Mayor Albert Capellini. NAYS: Commissioner Pam Militello.

ITEM: 9

P.H. 2008-059: APPLICATION 07-TOD-A1 AND CASE NO. 2127 Applicant: DEERFIELD STATION, LLC, by Rhon Ernest-Jones Consulting Engineers Proposal: Site plan approval to construct a mixed-use transit oriented development, consisting of 549 residential dwelling units, 148 hotel rooms, 15,072 square feet of commercial use, 36,000 square feet of office use and 2 parking garages containing 1,140 spaces; AND seeking CONDITIONAL USE approval in accordance with the provisions of Section 98-63 (c) (2) of the Deerfield Beach Land Development Code in order to allow a hotel in the TOD zoning district.
Location: A 8.07-acre parcel described as land lying in the South ½ of Government Lot 1, Section 2, Township 48 South, Range 42 East, more particularly described in the file, located at 1250 West Hillsboro Boulevard.

10. GENERAL PROJECT DESCRIPTION

PART I: SPECIFIC PROJECT DESCRIPTION

A. Describe and discuss in general terms all major elements of the proposed development in its completed form. Include in this discussion the proposed phases (or stages) of development (not to exceed five YEARS), magnitude in the appropriate units from Chapter 28-24, F.A.C., where applicable, and expected beginning and completion dates for construction.

Riverbend DRI is a mixed-use development which will include transit-oriented development (TOD) design principles in a location that will become the regional transportation hub of Broward County. At buildout, Riverbend DRI will include 3,381,000 square feet of Class A office, 427 residential units, 1,146,000 square feet of retail uses and 550 hotel rooms. The Project will be developed in a single phase over a 10 year period with full buildout in 2018.

The Riverbend DRI is located in the City of Fort Lauderdale, Florida. The site which encompasses over 60 acres is directly west of I-95 and east of SW 27th Avenue, is bifurcated by Broward Boulevard and includes three sites owned by the Florida Department of Transportation (FDOT). The FDOT sites are located west of I-95 and adjacent to the privately owned property within the Riverbend DRI. Recognizing the regional transportation importance of the three sites, FDOT issued a request for proposals for the joint public/private development of the sites. The applicant was the selected responder and is negotiating the terms of a lease with FDOT. The redevelopment of the FDOT sites will result in a new intermodal facility which will serve as the hub between Tri-Rail and the future planned Central Broward East/West Transit which will connect to downtown Ft. Lauderdale.

The development will include a main street which will serve as the center of the office park. Transit oriented amenities such as retail and food service will be located on the transit platforms. When completed, the system will allow easy access by car, foot, or trolley to mass transit facilities along the tri-rail line as well as car access to Broward Boulevard, NW 27th Avenue, and the dedicated ramps to and from I-95 that serve the adjacent park and ride lots.

B. Provide a breakdown of the existing and proposed land uses on the site for each phase of development through completion of the project. The developed land uses should be those identified in Section 380.0651, F.S. and Chapter 28-24, F.A.C. Use Level III of <u>The Florida Land Use and Cover Classification System: A Technical Report</u> (September 1985), available from each regional planning council. Refer to Maps D (Existing Land Use) and H (Master Plan). Use the format below and treat each land use category as mutually exclusive unless otherwise agreed to at the pre-application conference. See Table below.

TABLE 10.1 EXISTING AND PROPOSED LAND USES									
Land Use	NON-RESIDENTIAL (Specify by CH.28-24 F.A.C. Land Use Type)		RESIDENTIAL				OTHER	TOTAL	
	Acres	GSF/Units	Acres	D.U.	Net Density	Gross Density	Acres	Acres	D.U./GSF
Existing									
Office	--	65,000 sf	--	--	--	--	--	--	--
Proposed									
Office:	--	3,381,000 sf	--	--	--	--	--	--	--
Retail:	--	1,146,000 sf	--	--	--	--	--	--	--
Hotel:	--	550 Rooms	--	--	--	--	--	--	--
Residential:	--	--	--	427 du	--	--	--	--	--

*Proposed office includes the existing office space.

C. Briefly describe previous and existing activities on site. Identify any constraints or special planning considerations that these previous activities have with respect to the proposed development.

The site is a redevelopment site which will include residential/retail/office/hotel uses. The proposed plan introduces those uses in an urban design compatible with the planning initiatives of the City of Fort Lauderdale and Broward County.

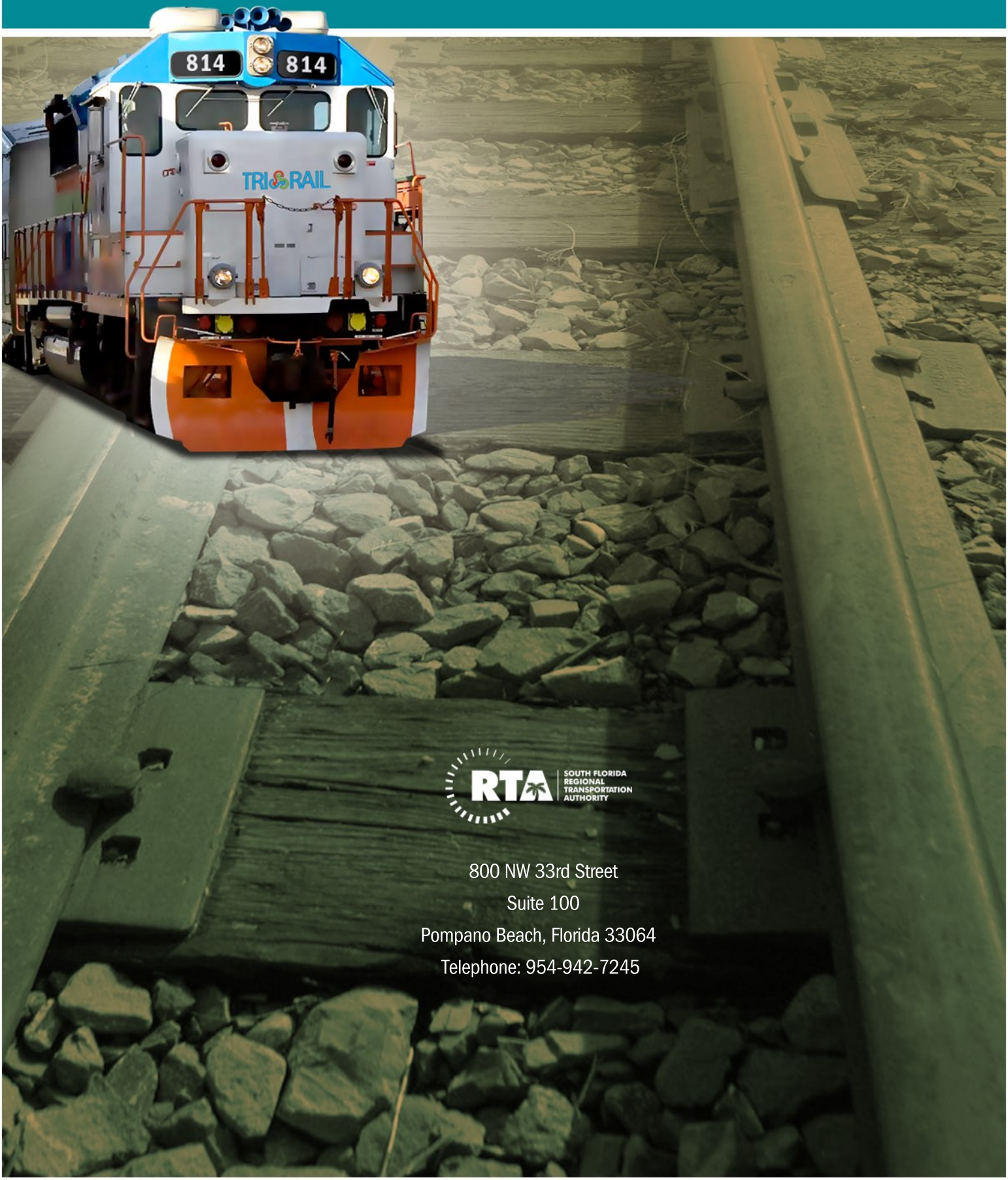
D. If the development is proposed to contain a shopping center, describe the primary and secondary trade areas which the proposed shopping center will serve.

The primary and secondary market areas for the proposed retail space within the Riverbend DRI will be defined by 1-mile and 3-mile radii, respectfully. Support for the proposed retail development within the project will also be derived from the nearly 13,492 people who will be employed on-site and thousands upon thousands of people that will pass by it each day on Interstate 95 and Broward Boulevard or that will pass through the proposed regional transit hub.

E. Describe, in general terms, how the demand for this project was determined.

The marketability of the proposed Riverbend DRI is predicated on four primary factors:

- Its superior location astride Broward County's existing roadway and proposed transit systems. With respect to roadways, the project is located at the intersection of Interstate 95 and Broward Boulevard, the "gateway" to Downtown Ft. Lauderdale, and within a mile of the intersection of Interstate 95 and Interstate 595, which is the major east-west connector in Broward County to Ft. Lauderdale-Hollywood International Airport and Port Everglades as well as to the growing residential communities in the southwestern and west central portions of Broward County. It will also be at the northern terminus of the express commuter lanes that are being installed on Interstate 95 between Downtown Ft. Lauderdale and Downtown Miami. At buildout, the project is expected to become the County's regional transit hub, which will provide connection between Tri-rail, the



RTA SOUTH FLORIDA REGIONAL TRANSPORTATION AUTHORITY

800 NW 33rd Street
Suite 100
Pompano Beach, Florida 33064
Telephone: 954-942-7245