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1.0 Purpose and Needs

1.1 Introduction

STV Incorporated and our associate partners are pleased to submit our preliminary report on the Cross-State Rail Feasibility Study to the Florida Department of Transportation (FDOT) for review and consideration. This preliminary report examines the prospect of connecting the metropolitan areas of St. Petersburg, Tampa and Orlando; the St. Petersburg, Clearwater, Tampa and Orlando airports; and the Port of Tampa and Port Canaveral with a passenger rail system. In addition, the report examines the potential for expanding existing and potential freight markets in the corridor in conjunction with the passenger rail service.

The Florida Department of Transportation has initiated this study, at the request of the Florida State Legislature, to consider metropolitan, tourist attraction, and port connections as an opportunity to expand transportation alternatives and solutions in Central Florida. The Study is to examine the needs of commuters, business travelers, and tourists that are currently flocking to the region. In addition the study is to assess the potential to provide a vital link connecting potential venues for the proposed 2012 Olympic Games. Toward that end the STV study team presented a Interim Report in September, 2000 designed to answer many of the question Olympic organizers and supporters have raised with regards to transportation options. Finally, the study will also address the possibility of enhancing freight opportunities in the corridor and perhaps utilizing freight opportunities as a mechanism for providing financial support to the project.

1.2 Transportation Goals and Objectives

This project was developed to address concern over increasing auto congestion on Interstate-4; lack of convenient alternatives for commuter, business and tourist markets; and pressure to develop increased capacity in a constrained transportation corridor. The corridor has also been subject to increasing growth and land use changes in the past twenty years that have exacerbated traffic congestion. Moreover, the metropolitan, tourist attraction, and port connections foreseen by the communities along the corridor suggests a strong opportunity for an alternative transportation solution based on the following needs:

- **Commuter Travel**. As the Plant City, Lakeland and Celebration portions of the I-4 Corridor become fully developed, the need for alternatives to I-4 will become even more critical.

- **Business Travel**. A fast, convenient rail connection between Tampa Bay and Orlando fulfills a significant business travel need that today is only effectively met by automobile.

- **Tourist Travel**. Studies consistently show that visitors to the Orlando area typically make a visit to either the Gulf or Atlantic Coast, if not both. Not only will the corridor meet several tourist travel needs; the airport and cruise ship port connections will greatly improve the convenience, speed and efficiency of tourist travel in the region.

- **Freight Movement**. There could be a significant demand for two types of freight movements. Low volume expedited freight, such as perishables, could be moved on the same trains as passengers. Also, general cargo could potentially use the port connections at night, provided connections to other rail lines are provided.

- **Olympic Games 2012.** Keeping in mind central Florida's bid for the 2012 Olympic Games, STV has committed to providing data to support the transportation element of the Olympic proposal. The STV team is exploring the effects of the increased travel demands associated with this international event, while recognizing that the ultimate recommendation for rail service must be based independent of Olympic potential.

In order to deal with this wide range of passenger and freight needs, STV has conducted comprehensive financial, technical and public policy analysis along the potential rail corridor. Study considerations examined included route alternatives (Proposed Alignments shown in Section 2.0), capital and operating costs, ridership potential, a cost-benefit analysis, and a preliminary recommendation for a phased implementation of the project. Based on this recommendation additional work is currently being undertaken to examine in detail the potential economic benefits of such a project and the potential structure of a financial plan that would allow for the phased implementation of the project.

1.3 Needs of Transportation Corridor

Florida's major transportation patterns and infrastructure are geographically configured in a north/south manner. These patterns follow the state's peninsular layout, on a north/south axis with major urbanized areas arrayed in a north-south configuration. Jacksonville to the north, Orlando/Tampa/Lakeland in the center of the state, and Ft. Lauderdale/Miami to the south. The state's inherent layout was the basis for designing and constructing the railroad access lines such as the Atlantic Coast Line in West Florida and the Florida East Coast Railway in the late1800s and early 20th century, respectively. Much later, in the 1960s and 70s, due largely to the geography and population growth patterns initiated by the railroads, the Federal Eisenhower Interstate Highway System, I-75 and I-95, was designed and constructed to provide direct access for personal travel and commerce into Central and South Florida population centers. East-west patterns of population growth and consumption were a much later phenomenon. In fact the Tampa/ Lakeland/Orlando/Spacecoast corridor is today Florida's first east-west megalopolis for the 21st century. Because this is a "new" phenomenon for this region, trade and commerce patterns in this east-west corridor are underdeveloped and contingent upon the effects of next generation global trade patterns and developing markets.

The following table shows projected population growth forecasts in areas along the cross-state rail corridor. Based on population growth in the region, it is possible to anticipate future demands along the east/ west corridor connecting Tampa and Orlando. BEBR forecasts show that the population in Florida is expected to grow at approximately 1.5 percent annually between 2000 and 2010, almost twice the national average. The Cross-Florida Study area is expected to grow a little slower, 1.4 percent annually, but still a substantial growth rate. Figure 1 shows the population forecasts for regions of the study area. As expected, the Central Florida/ Orlando area is projected to grow the fastest, followed by the Space Coast, both well above the overall state population growth rate.

Figure 1.1: Population Growth Forecasts for Cross-Florida Study Area

Region (County)	1997 Population	2000 Population	2005 Population	2010 Population	Annual Growth Rate*
Tampa Bay (Hillsborough, Pinellas, Pasco)	2,101,000	2,184,000	2,300,000	2,414,000	1.01%
Lakeland/Polk (Polk)	449,000	471,000	503,000	535,000	1.28%
Central Florida (Orange, Osceola, Seminole)	1,179,000	1,253,000	1,388,000	1,526,000	1.99%
Space Coast (Brevard)	461,000	481,000	521,000	561,000	1.57%
Study Area Total	4,190,000	4,388,000	4,713,000	5,036,000	1.39%
State Growth	14,654,000	15,424,000	16,665,000	17,894,000	1.50%

* The Annual Growth Rate is calculated between 2000 and 2010.

1.4 Project Overview

The STV team developed a comprehensive and inclusive process for evaluating the project corridor (Figure 1.2). The approach has included the following key tasks:

- Identify potential rail alignments within the corridor.
- Assess the viability of each alignment.
- Prepare an assessment of potential rail technologies that might be viable given current technology and the needs of the corridor
- Develop capital costs to construct a new, double-track railroad in the potential alignments, for each of the potential rail technologies.
- Develop ridership forecasts based on projected growth in the corridor including residential, tourist, business, cruise ship, and airport growth, for each of the proposed alignment alternatives and each of the technology options.
- Based on the ridership forecasts, prepare detailed service plans that satisfy the requirements identified in the forecasting process.
- Prepare detailed operating costs tied to each of the various service plans that are prepared.
- Develop a simple cost-benefit approach that recognizes the capital cost, operating cost, and ridership for each technology and each alignment alternative.
- Provide a preliminary recommendation for implementing the project.
- Identify the "next steps" including economic impact and creative financing opportunities that will help determine the ultimate viability of the project.

Figure 1.2

2.0 Route Alternatives

2.1 Route Alternatives

Through a process of evaluating the corridor from St. Petersburg to Port Canaveral the STV team arrived at six basic alignment alternatives. The process determined the extent to which it would be possible to use existing highway and railroad rights of way. The process began with an evaluation of existing highway and railroad rights-of-way, as well as alignments of previous studies in the corridors. In addition the alternatives were identified by finding the most concentrated activity centers along the corridor and recognizing the most effective alignments for linking these high activity centers. The STV team has narrowed down the alternatives to six (Figures 2.1-2.6), recognizing that within each alternative there are also sub-alignments (within metropolitan Orlando and the Tampa-St. Petersburg area for example). In addition, these alignments do not preclude the identification of other alternatives that might, at some later date, provide connections that are more advantageous based on local conditions (such as an alternative alignment from the Beeline along State Route 407 to the Titusville/Kennedy Space Center area for example).

Some of the route alternatives do not extend the length of the corridor. In order to best identify the most cost-effective and potentially most productive corridors "truncated", or shortened alignments were developed as well. By truncating the corridor, the STV team was able to assess the costs and Ridership potential for each of a number of logical segments along the entire corridor. The six primary corridors are identified in the following maps (Figures 2.1-2.6). Following the maps is a detailed description of each alignment alternative.

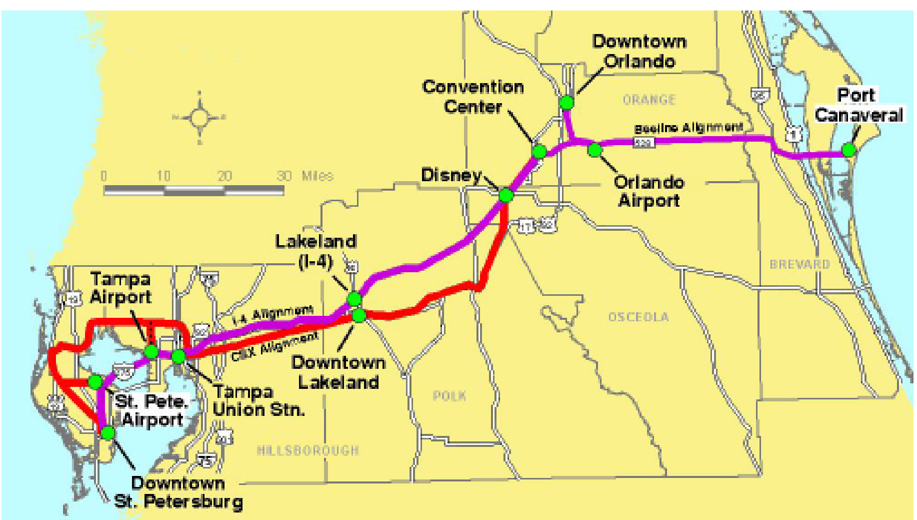


Figure 2.1 - Route 1 Alternative: Downtown St. Petersburg to Port Canaveral via Interstate 275, Interstate 4, Beeline Expressway and a connection to Downtown Orlando along the CSX Railroad, with a potential alternative of using CSX alignment from downtown St. Petersburg to Tampa Union Station and on to Celebration.

Figure 2.2- Route 2 Alternative: Same as Route 1, but truncated to include only service from Tampa Union Station to Orlando Airport.

Figure 2.3 - Route 3 Alternative: Downtown St. Petersburg to Port Canaveral via Interstate 275, Interstate 4 and Greeneway, Downtown Orlando via Beeline Expressway, with the potential for an alternative using the CSX alignment from downtown St. Petersburg and Tampa on to Celebration.

Figure 2.4 - Route 4 Alternative: Downtown St. Petersburg to Port Canaveral via Interstate 275, Interstate 4, Greeneway, and Beeline Expressway with connections to the Orange County Convention Center via the Beeline Expressway and Downtown Orlando, with the potential for an alternative using the CSX alignment from downtown St. Petersburg and Tampa on to Celebration.

Figure 2.5 - Route 5 Alternative: Same as Route 3, but truncated to include only Tampa to Orlando service.

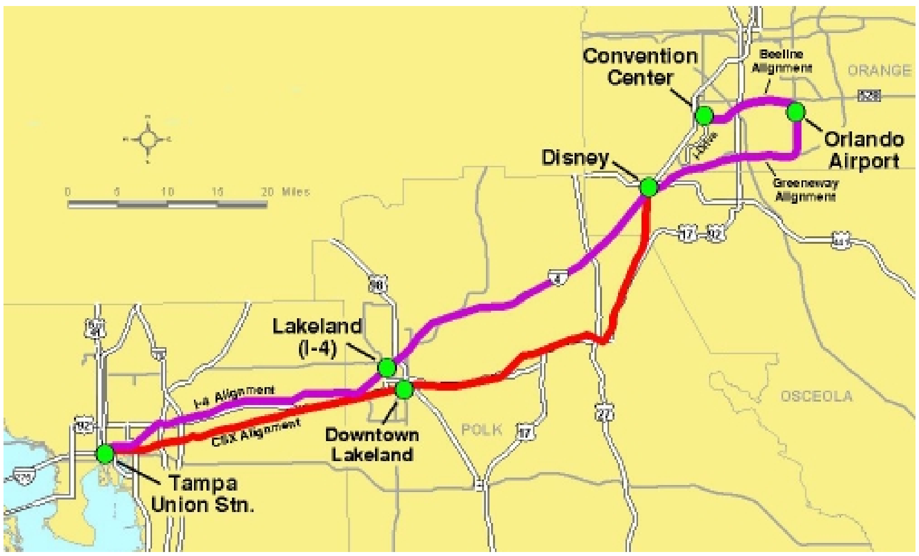


Figure 2.6 - Route 6 Alternative: Same as Route 4, but truncated to include Tampa, Orlando International Airport and Convention Center.

Each Route Alternative uses a combination of different alignments based on the availability of different rights-of-way. The following descriptions give a detailed analysis of each alignment alternative in each segment of the corridor

St. Petersburg to Tampa

In the western end of the corridor, Pinellas and Hillsborough Counties, two alignment options were considered. The most direct routing would use the median of Interstate 275 and a new bridge crossing of Tampa Bay, engineering Segment 1. The second alternative would provide a circuitous low-speed alternative circling around the north end of Tampa Bay utilizing CSX Clearwater Sub-Division right-of-way, engineering Segment 3.

Segment 1 would originate at a passenger station in Downtown St. Petersburg near the east end of I-375. The alignment would enter the median of I-375 passing through the interchange of I-375 and Interstate 275 on a structure concentric with the ramp from westbound I-375 to northbound Interstate 275. Interstate 275 would provide a rail transit envelope within the median that has been used for this study. There would be passenger stations in Downtown St. Petersburg, in the median of Interstate 275 near Roosevelt Boulevard to serve the St. Petersburg/Clearwater International Airport and another station located within I-275 corridor to serve the Westshore/Tampa Airport area. The alignment in the median of Interstate 275 would connect to the planned Tampa Intermodal Center. Interstate 275 will be reconstructed to provide an envelope for a rail corridor in the median beginning in 2006 for the eastbound lanes and 2009 for the westbound lanes. However, the Department of Transportation estimates that an additional $344 million in highway construction beyond what is currently programmed in the five year work program. All this would be required before the rail envelope in this segment can be made available.

Segment 3 would use the existing CSX Clearwater Sub-Division from Downtown St. Petersburg through Clearwater around the north side of Tampa Bay. The line extends east to a point in Tampa before turning south to a connection with the CSX Main Line tracks near Ybor City. The line is a lightly used single track railroad with 113 highway grade crossings and 20 bridges. The Clearwater Sub-Division would have to be double tracked with all highway grade crossing and most of the bridges replaced. There would be passenger stations at Downtown St. Petersburg, Downtown Clearwater and near Veterans Expressway to connect to a shuttle to Tampa International Airport. The line would use the CSX Main Line to reach Tampa Union Station.

Tampa to Disney (Celebration)

East from Tampa Intermodal Center (Downtown Tampa) the alignment could follow the median of Interstate 4; or from Tampa Union Station (Downtown Tampa) the alignment could follow the CSX Railroad right-of-way.

The median of Interstate 4 would be used from the Tampa Intermodal Center to Disney (Celebration), engineering Segments 2, 4 & 9. The ultimate layout along Interstate 4 would be a rail corridor within the median of the highway. The Downtown interchange of Interstate 275 and Interstate 4 from Hillsborough River to 21st Street is expected to be constructed after 2010, estimated to be $1.45 billion. The rail envelope in this section will not be available until all highway construction has been completed. The highway section from 21st street to 50th Street is expected to begin construction in 2003. The associated additional cost of highway construction to provide an envelop for an electrified inter-city rail corridor (44’ by 17.5’)would be $21 million. Interstate 4 from 50th Street to Interstate 75 is presently under re-construction. Once this construction is completed, it will provide for a rail corridor in the median. Interstate 4 has been reconstructed between Interstate 75 and the Polk County line and the rail envelope is already available throughout this segment. There are plans to widen Interstate 4 from two lanes to three lanes in each direction by constructing additional lanes in the median within Polk County. This would use the rail corridor envelope. The Department of Transportation (DOT) estimates that the additional lanes could be constructed to the outside at an additional cost of $165 million, thereby providing the required median envelope in this section. In summary, additional highway construction would need to be completed before the full I-4 median rail envelope is made availabe for this project. Figure 2.7 details the required expenditures which are not included in the current DOT five year work program. Also, these costs are above and beyond the infrastructure costs estimated and presented in Chapter 3.

The adopted master plans for the I-275 and the I-4 corridors from the Howard Frankland Bridge in Hillsborough county to state road 528 (Beeline) in Orange county call for the preservation of a 44' by 17.5' rail envelope in the median of the highway. In all of the alternatives utilizing the interstate highways, this envelope is assumed to be in place. The capital cost estimates developed by STV and which are provided in this chapter do not include any provisions for creating this envelope. It is simply assumed that this envelope will be in place before construction on the rail system, utilizing I-4/I-275 would begin.

Currently, the Department's five year work program provides funding for some improvements in the I-4/I275 corridor which will result in the envelope becoming available, for the most part, from 21st street (just east of I-275) in Hillsborough county to the Hillsborough/Polk county line and from Polk/ Osceola county line to state road 528 (Beeline). However, with respect to I-4 in Polk County, the Department is planning to construct two additional lanes in the median as an interim measure. This could possibly result in the loss of the opportunity for utilizing the median for implementation of a rail system in the foreseeable future. The cost of additional highway improvements that need to be made before the full envelope fully provided from the Howard Frankland Bridge in Hillsborough County to the Beeline in Orange County are tabulated below:

Figure 2.7

Segments of I-275/I-4	Non-Electrified Technologies (44' x 15' Envelope)	Electrified and Maglev Technologies (44' x 17.5' Envelope)
Howard Frankland Bridge to Hillsborough River	$344*	$344*
I-275/I-4 Interchange (Hillsborough River to 21st Street)	$1,450	$1,450
21st Street to just east of I-75	$0	$21
I-75 to Hillsborough/Polk County Line	$0	$0
Hillsborough/Polk County Line to Polk/Osceola County Line	$165**	$165**
Polk/Osceola County Line to SR528 (Beeline)	$0	$18

* Fully funded under the mobility 2000 program in years 2006 to 2010.

** Additional costs for providing the rail envelope with two new lanes added to the outside in accordance with the ultimate master plan. If the two additional lanes are built in the median as an interim project and later removed and rebuilt to the outside to accommodate the rail envelop, the total cost would be increased by approximately $49 million.

CSX Railroad's "A" Line from Tampa, through Lakeland to Orlando is a single track line with a second main track through Lakeland. Engineering Segment 5 provides a second main track from the end of double track in Tampa (Mile Post 877.3) to the beginning of the second main track at Lakeland (Mile Post 856). Engineering segment 6 provides a second main track from the end of double track in Lakeland (Mile Post 851.7) and the location of a connection to Interstate 4 (Mile Post 818). This work would provide a double track railroad on the existing CSX for a low-speed, 79 miles per hour, rail corridor.

Engineering segment 8 is a double track railroad from the CSX Railroad at the Polk / Osceola County Line (Mile Post 818) to Interstate 4 at the Osceola / Orange county Line near Disney (Celebration). The line would be grade separated crossing over State Route 532, a local road and the eastbound lanes of Interstate 4 to the median of Interstate 4. This alignment would serve the existing passenger station in Lakeland.

Disney (Celebration) to Orlando International Airport

There are two route alignment alternatives from a Disney Station at Celebration to Orlando International Airport.

A Railroad Line could be located in the median of Interstate 4 from Celebration to the interchange with the Beeline Expressway (State Route 528), engineering segment 10. There is an envelope in the median that would allow for the construction of a double track railroad.

At the interchange with the Beeline Expressway (State Route 528) the alignment would ascend crossing the eastbound lanes of Interstate 4 and concentric to the interchange ramp between the eastbound lanes of Interstate 4 and the eastbound lanes of the Beeline Expressway. The alignment would cross to the north side of the Beeline Expressway passing over the Westwood connector, which will be let for construction in January 2001. The alignment would remain on the north side of the Beeline Expressway to the vicinity of John Young Parkway avoiding the Williamsberg residential area.

From the interchange of the Beeline Expressway and John Young Parkway there are several possible alignments.

One alignment, engineering segment 11, would follow the Beeline Expressway as it turns slightly northeast crossing the westbound lanes of the Beeline to the median of the Beeline before the interchange with Orange Blossom Trail. The alignment would follow the alignment of the Beeline Expressway to Conway Road/ Tradeport Drive. Runways 1 and 2 (18 Right and Left) begin very close to the Beeline Expressway and the glide paths to the Airport would not allow a Rail Line to be located on the south side of the Beeline Expressway. The rail line would turn north crossing over the westbound lanes of the Beeline. It would descend to grade and east through the clear area on the approach to the Airport runways. The alignment would ascend to cross the interchange of the Beeline

Expressway and Semoran Boulevard (State Route 436) turning south into the Airport Terminal area.

The second alignment, engineering segment 13, from John Young Parkway would continue due east from the alignment parallel to the Beeline Expressway and south of the Taft–Vineland Road. This alignment would turn north parallel the CSX Railroad Main Line to north of Landstreet Road and east of the alignment suggested around the north end of the Orlando International Airport.

The third alignment, engineering segment 14, from John Young Parkway would continue due east from the alignment parallel to the Beeline Expressway and south of the Taft–Vineland Road. This alignment would turn south parallel the CSX Railroad Main Line to the Orlando Utilities Commission railroad and after passing around the south end of Runways 1 and 2 (36 Left and Right) turn north to the Orlando International Airport Terminal Building.

Engineering segment 12, from Interstate 4 would follow the Greeneway Expressway (State Route 417) from Interstate 4 to south of Orlando International Airport. At the interchange with the Greeneway Expressway (State Route 417) the alignment would ascend crossing the eastbound lanes of Interstate 4, concentric to the interchange ramp between the eastbound lanes of Interstate 4 and the northbound lanes of the Greeneway Expressway. This route would follow the alignment of the Greeneway Expressway in the median between the northbound and southbound lanes to the vicinity of the Boggy Creek Road (State Route 527) interchange. West of the Boggy Creek Road interchange the alignment would ascend crossing the westbound lanes of the Greeneway Expressway and turn north. The Rail Line would cross over Boggy Creek Road (State Route 527) and the Orlando Utilities Railroad, descending to the Orlando International Airport property. The Rail Line would connect to one of the alternative alignments through the Airport.

Orlando International Airport has planned for a route through the Airport. The improvements within the Airport that are planned or are under construction limit the alignment to a fixed envelope.

An alignment through the Orlando International Airport from the south and west would approach the Airport on an alignment parallel to the Orlando Utilities Commission railroad. The Rail Line would turn north crossing the South Airport Boulevard and the future internal access roads. The alignment would be designed to pass under the future south cross taxiway and continue north on an alignment in the area between Runway 2 (18 Left – 36 Right) and Runway 3 (17-35). It would pass under the existing cross taxiway between Runway 2 (18 Left – 36 Right) and Runway 3 (17-35) to a reverse curve between the air side complex for gates 60 to 99 and Airport Boulevard East. There would be a straight alignment through the area adjacent to the Terminal Building, which would be the station location. This alignment would pass under the cross taxiway under construction with a reverse curve to pass between the air side complex for under construction and Airport Boulevard East. The Rail Line would swing east on a curve through the northwest side of the long term parking lot to an alignment parallel the Beeline

Expressway. The alignment parallel to the Beeline Expressway would have to pass under the future Goldenrod Road interchange with the Beeline Expressway and not interfere with the future frontage road on the south side of the Expressway.

Orlando International Airport to Port Canaveral

A north alignment, engineering segment17, to Port Canaveral would leave Orlando International Airport parallel and just south of the Beeline Expressway in a direction slightly to the southeast. It would cross Narcoosee Road and turn to an easterly alignment parallel and south of the Beeline Expressway. On the approach to the Tosohatchee State Reserve the alignment would turn northwest and then east to an alignment parallel to and just south of the Beeline Expressway (State Route 528).

A south alignment, engineering segment 18, to Port Canaveral would leave the Orlando International Airport on an alignment parallel the Orlando Utilities Commission railroad. The alignment would turn east along Weewahootie Road parallel and south of the Beeline Expressway. On the approach to the Tosohatchee State Reserve the alignment would turn northwest and then east to an alignment parallel to and just south of the Beeline Expressway (State Route 528).

The north and south alignments would cross the Tosohatchee State Reserve and the St. Johns River parallel and contiguous to the Beeline Expressway. This alignment would cross the Beeline Expressway where it turns southeast after the interchange with State Route 407. The alignment would continue east staying north of the Canaveral Groves Subdivision until crossing Interstate Highway 95 where it would turn southeast crossing the intersection of Canaveral Groves Boulevard and Grissom Road. This alignment would then turn east crossing the Florida East Coast Railroad and U. S, Route 1, and continue east about 300 feet north of City Point Road. The Rail Line would cross the Indian River Lagoon to Merritt Island and follow the north side of the Canaveral Barge Canal to a crossing of the Banana River.

If the Greeneway Expressway alignment is used from Disney (Celebration) to Orlando International Airport a segment of the Beeline Expressway alignment would be used to reach the Orange County Convection Center, engineering segment 11.

Downtown Orlando to Orlando International Airport

The existing CSX Railroad would be used from the downtown Orlando Intermodal Center south to the vicinity of Sand Lake Road. This alignment would leave the CSX corridor, swinging west and looping back east passing over Orange Avenue, Sand Lake Road and the westbound lanes of the Beeline. This alignment would follow the Beeline Expressway to Conway Road/ Tradeport Drive. Runways 1 and 2 (18 Right and Left) begin very close to the Beeline Expressway and the glide paths to the Airport will not allow a Rail Line to be located on the south side of the Beeline Expressway. The rail line would turn north crossing over the westbound lanes of the Beeline. It would descend to grade and east through the clear area on the approach to the Airport runways. The alignment would ascend to cross the interchange of the Beeline Expressway and Semoran Boulevard (State Route 436) turning south into the Airport Terminal area. This is engineering segment 16.

2.2 Technology Options

There is a direct relationship between the corridors under consideration and the type of rail technology that might be most appropriate to meet the needs of the corridor. For example, due to the low-speed, low technology nature of the existing infrastructure and operations on existing freight rail infrastructure, sophisticated high-speed technologies may not be appropriate in these rights-of-way. So for the existing CSX freight rail corridor, for instance, only low speed (maximum 79 mph operations) technologies have been considered.

The following list provides descriptions of the complete range of technology options being considered in this study:

- **Low Speed:** Conventional, diesel locomotive powered rail is capable of operating up to a maximum of 79 mph. It can be readily adapted to existing freight rail infrastructure, however, it does not provide any travel times savings to effectively compete with automobile traffic in the corridor. The circuitous routing that would be required if this technology were implemented in the existing CSX right-of-way for example (Figure 1.1), would further erode travel time competitiveness with auto travel.

- **Intermediate Speed:** A number of candidate technologies could provide intermediate speed rail service up to 110 mph. Traditional diesel locomotive technology could be utilized in this service as well as newer, European-designed, self-propelled rail cars, known as diesel multiple units (DMUs). The advantage of the DMU technology is that each car is self-propelled. The disadvantages include issues such as meeting Federal Railroad Administration safety standards, and the fact that there is not a DMU service presently in operation anywhere in the US.

- **High Speed Rail:** Amtrak recently introduced the high speed (operating at 150 mph) Acela train in operations in the US. These electrified trains are a potential option for the Tampa/St. Petersburg-Port Canaveral corridor. The advantage of this technology is that there is already an example of this relatively high speed train operating in the US. One disadvantage is the need to electrify the entire corridor in order to construct this system. However, Amtrak is currently working on the development of a gas-turbine 150 mph train and expects to begin field trials in the Spring of 2001. Hopefully, non-electrified versions of this technology will soon be available.

- **Super High Speed Rail:** The super high speed rail considered in this study is a steel-wheeled, electrified technology, capable of speeds up to 190 mph. Existing technologies being considered as candidates in this study include the French designed TGV technology and the German ICE technology, a service that has been used in Europe for many years. The advantage of this technology is clearly its speed. One disadvantage is, again, the need to electrify the corridor.

- **Magnetic Levitation:** The Federal Railroad Administration is currently considering seven Maglev deployment projects in the US, under the Federal Maglev deployment program. One or more projects will be selected to receive construction funding under this program. However, at this time no revenue service exists in operation in the US or anywhere else in the world. Potential advantages of Maglev include its dramatic speed, and associated trip time advantages. Disadvantages include the inability to develop a commercially viable application, due to high capital and operating costs.

2.3 Station Locations

The nature of the proposed service, combines some characteristics of long-distance inter-city service, Orlando-Tampa for example; with other characteristics common to urban rail systems, the service options in metropolitan Orlando for instance. As such station location must be optimized to meet both the intra-urban needs within the major metropolitan areas, while maintaining enough separation between stations in the inter—urban market to allow for high overall operating speeds and competitive trip times are of little practical benefit if stations are within a few miles of each other. So the challenge throughout this study has been to attempt this balancing act: maximize station locations without unduly compromising the ability for higher speed services to provide real travel time savings in the corridor.

The following table summarizes the possible system alternatives associated with the six route alternatives, corresponding technology applications and station locations (Figure 2.8):

Figure 2.8: Summary of Alignments and Technology Options

Route	Technology	Downtown St Petersburg	St Pete/Clearwater Airport	Tampa Airport/West Shore	Tampa Union Station	Lakeland	Disney	Orange County Convention Center	Orlando International Airport	Downtown Orlando	Port Canaveral	Alignment Details
1a	Maglev (300 mph)	○	○	○	○	○	○	○	○	○	○	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando
1b	Super HSR (190 mph)	○	○	○	○	○	○	○	○	○	○	same as 1a, with electrification
1c	HSR (150 mph)	○	○	○	○	○	○	○	○	○	○	same as 1a, without electrification
1d	Intermediate Speed Rail (110 mph)	○	○	○	○	○	○	○	○	○	○	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline
1e	Low Speed Rail (79 mph)	○	○	○	○	○	○	○	○	○	○	CSX to Disney, I-4 to Beeline
2a	Maglev (300 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4 with CSX potential
2b	Super HSR (190 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4 with CSX potential
2c	HSR (150 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4 with CSX potential
2d	Intermediate Speed Rail (110 mph)				○	○	○	○	○			Tampa Union Station to DT Orlando, I-4 with CSX potential
2e	Low Speed Rail (79 mph)				○	○	○	○	○			Tampa Union Station to DT Orlando, I-4 with CSX potential
3a	Maglev (300 mph)	○	○	○	○	○	○		○	○	○	I-4 to Greeneway, DT Orlando and Beeline
3b	Super HSR (190 mph)	○	○	○	○	○	○		○	○	○	I-4 to Greeneway, DT Orlando and Beeline
3c	HSR (150 mph)	○	○	○	○	○	○		○	○	○	I-4 to Greeneway, DT Orlando and Beeline
3d	Intermediate Speed Rail (110 mph)	○	○	○	○	○	○		○	○	○	I-4 to Greeneway, DT Orlando and Beeline
4a	Maglev (300 mph)	○	○	○	○	○	○	○	○	○	○	I-4, Greeneway, CC, DT Orlando, Beeline
4b	Super HSR (190 mph)	○	○	○	○	○	○	○	○	○	○	I-4, Greeneway, CC, DT Orlando, Beeline
4c	HSR (150 mph)	○	○	○	○	○	○	○	○	○	○	I-4, Greeneway, CC, DT Orlando, Beeline
4d	Intermediate Speed Rail (110 mph)	○	○	○	○	○	○	○	○	○	○	I-4, Greeneway, CC, DT Orlando, Beeline
5a	Maglev (300 mph)			○	○	○	○		○			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5b	Super HSR (190 mph)			○	○	○	○		○			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5c	HSR (150 mph)			○	○	○	○		○			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5d	Intermediate Speed Rail (110 mph)				○	○	○		○			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
6a	Maglev (300 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6b	Super HSR (190 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6c	HSR (150 mph)			○	○	○	○	○	○			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6d	Intermediate Speed Rail (110 mph)				○	○	○	○	○			Tampa Union Station to DT Orlando, I-4, Greeneway, CC

* Ridership and O&M data was calculated to include Tampa Airport/Westshore area on truncated routes 2, 5 and 6. Capital Costs for these routes, however, were calculated only to Tampa Union Station.

The following list provides descriptions of each of the passenger station locations:

- **St. Petersburg:** This station would be located at the Downtown Transit Center whose location will be defined by Locally Preferred Alternative Guideway of the Pinellas Mobility Major Investment Study. The location will be in the vicinity of Interstate 375 and 4th Street. The station will have access to the Guideway/Transit system to the Tyrone area of St. Petersburg and the St. Petersburg Beaches.

- **St. Petersburg/Clearwater International Airport:** This station would be located within the median of Interstate 275 in the vicinity of Roosevelt Boulevard (State Route 686). This location would be served by the Locally Preferred Alternative Guideway of the Pinellas Mobility Major Investment Study, which would provide service to the Airport and Downtown Clearwater.

- **Tampa International Airport:** This station would be in the median of Interstate 275 in the vicinity of Memorial Highway (State Route 589). The Airport would be served by a shuttle service.

- **Tampa Intermodal Center:** This station would be located on Interstate 275 at the north end of Downtown Tampa. Local plans for a rail guideway transit plan to connect a station at this location to the Tampa Central business District and Ybor City.

- **Tampa Union Station:** This station exists on Nebraska Street at the east end of the Tampa Central Business District. This location would be used for a passenger station for all route alternatives that use the CSX Railroad.

- **Lakeland:** There are two alternative locations for this station, depending on the type of technology used. A station in Lakeland would be selected for the high speed rail system. It would be somewhere in the median of Interstate 4, just east of the overpass of Kathleen Road (State Route 539). The existing railroad passenger station in Downtown Lakeland would be used for the route alternative using the CSX Railroad.

- **Disney/Celebration:** The passenger station serving the Disney Theme Parks would be located in the vicinity of Celebration near the interchange of Interstate 4 and the Greeneway Expressway (State Route 417). For the alignment along Interstate 4, the station might be located in the median of the Interstate 4 with landside access to Celebration Place. For the alignment along the Greeneway Expressway, a station site might be in the median of the Greeneway east of the interchange with Interstate 4. Landside access would be from Celebration Place.

- **International Drive/Orange County Convention Center:** This Passenger Station would be located north of the Beeline Expressway (State Route 528), near Canadian Court. Orange County is developing an intermodal station at this location.

- **Orlando International Airport:** The Orlando International Airport has prepared a master plan for the development of a second major terminal building south of the existing terminal building. This new facility is designed to have a rail passenger station integrated into the facility.

  If the rail project precedes the development of the new south Terminal A temporary station, the station location would be at the location defined for high speed rail passenger service in the earlier study. This location is on the east side of the existing terminal building, by the north bound airport access road under the people mover shuttles that go to gates air side complex (gates 60-99) and to the new air side gate complex northeast of the Terminal Building. The trackage serving this station has a north-south orientation.

- **Downtown Orlando:** This station would be at the Orlando Intermodal Center located along the CSX Railroad. The local LYNX transit system and the Amtrak intercity passenger service would serve the station.

- **Port Canaveral:** This station would be located at the east side of the Banana River serving a general public and the Cruse Ship Terminal. The station would have access to the public roadway system and the proposed local maglev system for access to the Kennedy Space Center and local communities.

- **Titusville Airport:** An alternate route to a termination on the Space Coast would be at Titusville Airport. This location would be served by the proposed local maglev system, providing access to the Kennedy Space Center and the Port Canaveral Cruse Ship Terminal. The location would also connect to the proposed Amtrak inter-city passenger service on the Florida East Coast railroad.

3.0 Capital & Operating Cost Estimates

3.1 Capital Cost for Each Alignment Alternative by Technology

The cost to build and operate any system linking the Central Florida metropolitan areas will be an expensive undertaking. The STV team developed a detailed matrix that identifies all of the critical costs associated with rail capital project implementation. This Capital Cost Model summarizes unit costs and was used as a basis for cost estimates on a variety of rail projects throughout the United States. The data compiled provides a detailed examination of all technical elements and potential costs as well as capital costs for all technologies and operating scenarios.

The Unit Costs for specific items comes from STV's database of current, similar projects from across the country **(Appendix A).** One of STV's on-going projects in California is particularly relevant to the work being done in Florida. The STV project team working on the California project is determining the costs and benefits of improvements on four inter-city rail passenger corridors operated by Amtrak West, the California Department of Transportation, the Surfliner Corridor, the Coast Corridor, the Capital Corridor and the San Joaquin Corridor. Capital Costs from this project have been extremely helpful in providing a basis of comparison for Capital Costs.

In addition to the STV database, having five other engineering firms working on capital cost information in support of this project has provided a wide, universal basis of comparison. At the onset of the project, the STV team developed Units Costs for all of the consultants to base their work **(Unit Cost Summary, Appendix A).**

Material costs in Florida sometimes varied from those in other states. Stone ballast, for example is more expensive in Florida than in California because it must be transported from out of state. When the consultants working on this project noticed significant differences in local costs, they adjusted the material costs accordingly. However, for the most part, the unit costs on the spreadsheet shown in **Appendix A** provide a reasonable comparison for alternate Route Segments in the study.

Capital Cost Categories

The capital cost estimates was calculated for six specific categories. These categories and their units of construction are defined as follows:

Track & Embankment

The length of each segment was determined by developing a geometric alignment, both horizontal and vertical. Where possible these alignments were based on rationalized aerial photographs with computer generated mathematical alignment using computer programs developed for such work. For alignments within existing highway rights of way, such as Interstate 275, Interstate 4, the Greeneway Expressway and the Beeline Expressway, alignments of the existing "as-built" plans or the proposed construction plans were used. The median centerline for horizontal and vertical alignments were determined and an end-to-end alignment was determined. For alignments on the CSX Railroad the Track Charts of the Railroad were used to establish the horizontal and vertical alignments.

The engineering stationing (linear distances) were used as input to the Capital Cost Model for the length of the track and roadbed required for each segment. The vertical profiles were evaluated to determine the amount of cut and fill required to construct each segment. This data was divided, by engineering station, into defined cost elements of the Capital Cost Model. As defined in the Bridge Category, the embankment was omitted where the track was on a structure.

For the Maglev system a separate Section/Composite Cost for the guideway was determined. This cost followed the route costs provided by the Transrapid Maglev System for the six applications for Maglev funding to the Federal Railroad Administration. The linear length was applied to this Section/Composite Cost to determine the Maglev cost for each segment.

Bridge

The location of bridge structures was determined using the vertical profiles on highway plans and the railroad Track Charts. Further locations of bridges were identified by looking at the places where the railroad line would cross into a highway or an obstruction. The engineering stations were determined, to the extent possible, for input into the Capital Cost Model. For locations on the existing CSX Railroad, bridge lengths were duplicated from the structures listed on the Track Charts.

For Maglev, the system is continuously on bridge structure and the structure cost is in the guideway cost. Therefore no bridge costs are shown for Maglev.

Electric Traction

Electric Traction is the catenary power distribution system for an electrified railroad, as would be the case for the 190 miles per hour options. The horizontal alignment engineering stationing was used to determine the catenary length to be electrified for each segment. In addition , the unit cost of protecting each overhead structure was calculated.

Electric power substations are required approximately every 20 miles along an electrified railroad. Each segment was analyzed to determine the number of substations required. The number of substations was found by considering the location of substations on the adjacent segments. The electric power substation costs were then applied to the 190 miles per hour system (TGV Technology) and the Maglev system.

Property Acquisition

Where the alignment of a segment was not on the right of way for a highway or the CSX Railroad, property acquisition was determined. If the vertical alignment was at or close to the existing ground, the right of way was assumed to be 100 feet wide. Where the vertical alignment was determined to be more than 10 feet above the existing ground the right of way was assumed to be 150 feet wide. Property acquisition locations were further divided into urbanized or rural areas. The engineering stations were determined for the locations of property acquisition and applied to the Capital Cost Model.

Property was assumed to be required for the construction of an electric traction power substation.

Stations

Depending on the type of technology, stations were attributed fixed costs. For service levels at or below 150 miles per hour, a typical Amtrak Intercity passenger station unit cost was used. For 190 miles per hour, TGV Technology, the station costs for the previously proposed high speed rail system in Florida was used. For Maglev the station costs from the Transrapid Maglev System six applications for Maglev funding to the Federal Railroad Administration were used.

Equipment Maintenance Facilities

The Equipment Maintenance Facilities were also attributed fixed costs based on the type of the type of technology associated with them.

Overview of Capital Costs

The net result of the STV team's effort was to derive capital costs for each technology option for every route alternative. The following table gives a summary of the costs of each alternative.

Figure 3.1 Capital Cost by Route Alternative by Technology

Route	Alignment	Technology	Segments, Stations and Maintenance Facility	Capital Cost
1a	I-4, Beeline	Maglev (300mph)	20,21,22,23,24,28,29,30	$9,168,386,099
1b	I-4, Beeline	Super HSR (190mph)	1,2,4,9,10,14,16,17	$3,866,549,911
1c	I-4, Beeline	HSR (150mph)	1,2,4,9,10,14,16,17	$3,112,674,786
1d	I-4, Beeline	Intermediate Speed Rail (110mph)	1,2,4,9,10,14,15,17	$3,046,044,008
1e	I-4, Beeline	Low Speed Rail (79 mph)	3,5,7,8,10,14,15,17	$2,349,539,062
2a	I-4	Maglev (300mph)	21,22,23,24,28	$5,141,836,293
2b	I-4	Super HSR (190mph)	2,4,9,10,14	$1,393,417,285
2c	I-4	HSR (150mph)	2,4,9,10,14	$1,185,247,547
2d	I-4	Intermediate Speed Rail (110mph)	2,4,9,10,14	$1,170,247,547
2e	I-4	Low Speed Rail (79 mph)	5,6,8,10,14	$1,091,864,415
3a	Greeneway	Maglev (300mph)	20,21,22,23,26,29,30	$8,998,453,146
3b	Greeneway	Super HSR (190mph)	1,2,4,9,12,16,17	$3,999,550,914
3c	Greeneway	HSR (150mph)	1,2,4,9,12,16,17	$3,259,337,337
3d	Greeneway	Intermediate Speed Rail (110mph)	1,2,4,9,12,16,17	$2,977,844,143
4a	Greeneway, Beeline	Maglev (300mph)	20,21,22,23,25,26,29,30 -1 Sta	$9,725,834,650
4b	Greeneway, Beeline	Super HSR (190mph)	1,2,4,9,11,12,16,17 -1 Sta	$4,371,893,764
4c	Greeneway, Beeline	HSR (150mph)	1,2,4,9,11,12,16,17 -1 Sta	$3,594,568,749
4d	Greeneway, Beeline	Intermediate Speed Rail (110mph)	1,2,4,9,11,12,16,17-1 Sta	$3,313,075,555
5a	Greeneway	Maglev (300mph)	21,22,23,26	$4,971,903,339
5b	Greeneway	Super HSR (190mph)	2,4,9,12	$1,526,418,288
5c	Greeneway	HSR (150mph)	2,4,9,12	$1,331,910,098
5d	Greeneway	Intermediate Speed Rail (110mph)	2,4,9,12	$1,316,910,098
6a	Greeneway	Maglev (300mph)	21,22,23,25,26 -1 Sta	$5,699,284,844
6b	Greeneway	Super HSR (190mph)	2,4,9,11,12 -1 Sta	$1,898,761,137
6c	Greeneway	HSR (150mph)	2,4,9,11,12 -1 Sta	$1,667,141,511
6d	Greeneway	Intermediate Speed Rail (110mph)	2,4,9,11,12 -1 Sta	$1,652,141,511

* Note: segment numbers correspond to segments in Appendix A.

Capital cost development for each alternative required an extensive investigation of field conditions and engineering drawings for the entire corridor. Figures 3.2-3.7 show capital costs associated with each of the alignment and technology alternatives identified in Figure 3.1. Differences in capital costs reflect differences in alignment geometry, technology infrastructure requirements and the geography of the built environment through which each alignment travels. The following maps illustrate the variations between the six primary route alternatives considered in this study.

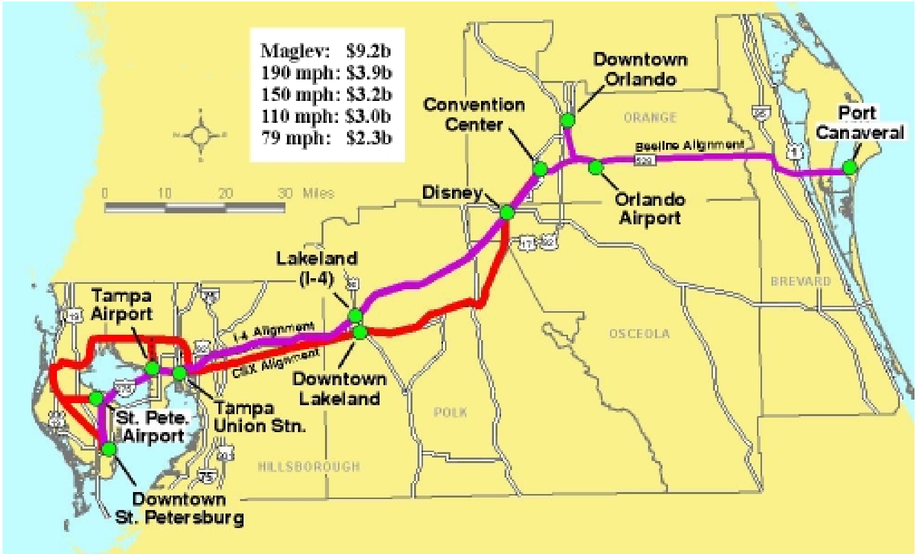


Figure 3.2: Route Alternative 1- Full corridor from St. Petersburg to Port Canaveral. Could use I-4 or CSX right-of-way to Beeline. Provides direct connection between Disney, Orange County Convention Center, Downtown Orlando, and Orlando International Airport.

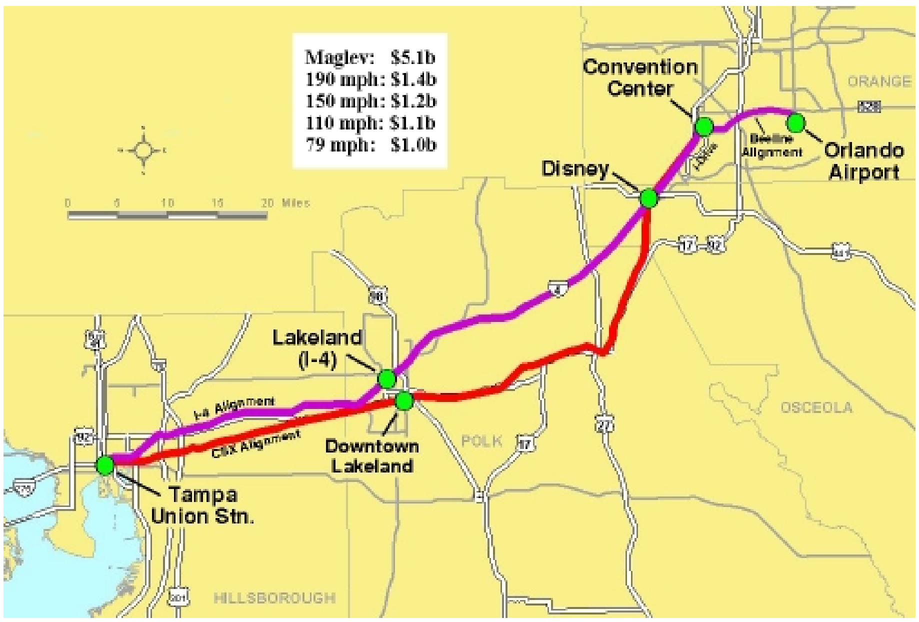


Figure 3.3: Route Alternative 2- Truncated system connecting Tampa to Orlando via I-4 and the Beeline, with possibility of CSX right-of-way. Provides direct connection between Disney, Orange County Convention Center and Orlando International Airport.

Figure 3.4: Route Alternative 3- Connection from Downtown St. Petersburg to Port Canaveral using Greeneway option through Orlando. Includes connection to downtown Orlando, however, there is no connection to Orange County Convention Center.

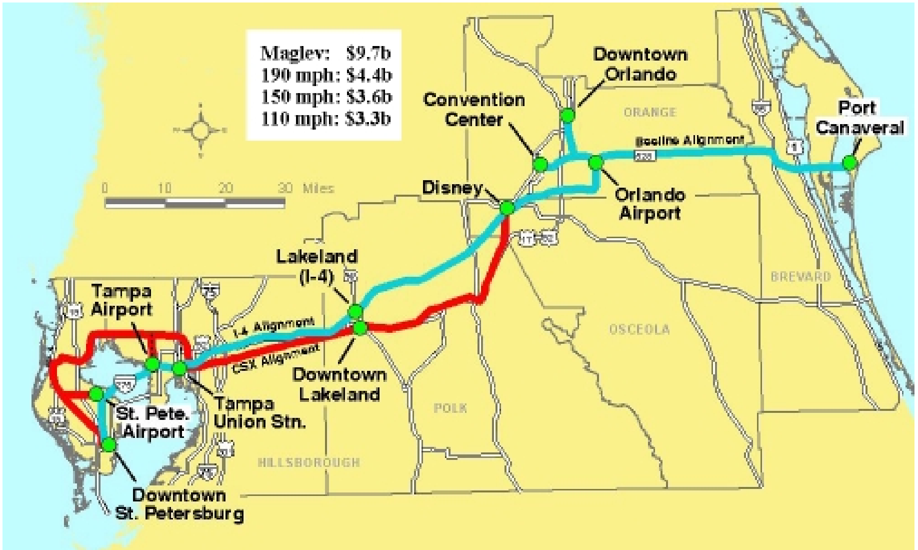


Figure 3.5: Route Alternative 4- Same as Alternative 3, however, an extension to Orange County Convention Center is provided.

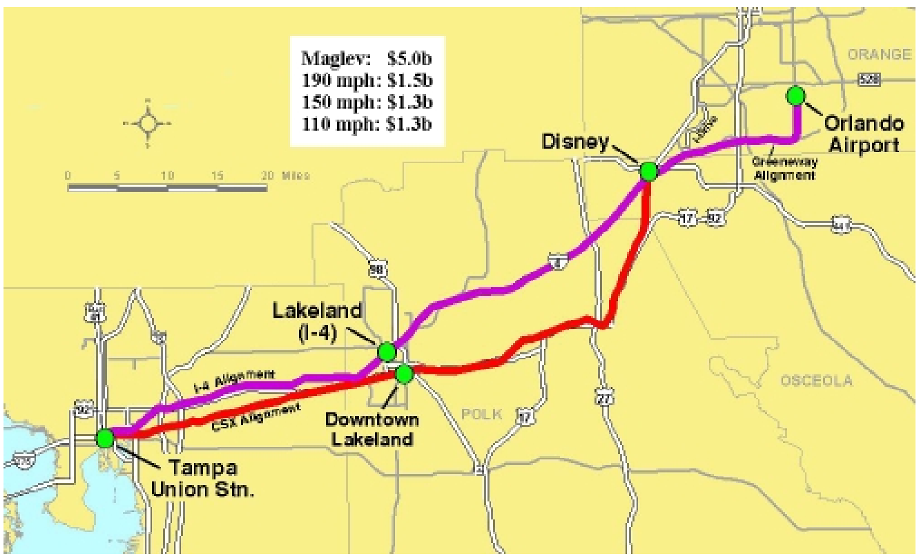


Figure 3.6: Route Alternative 5- Truncated Greeneway alignment connecting Tampa to Orlando. Connections to Disney and Orlando International Airport only.

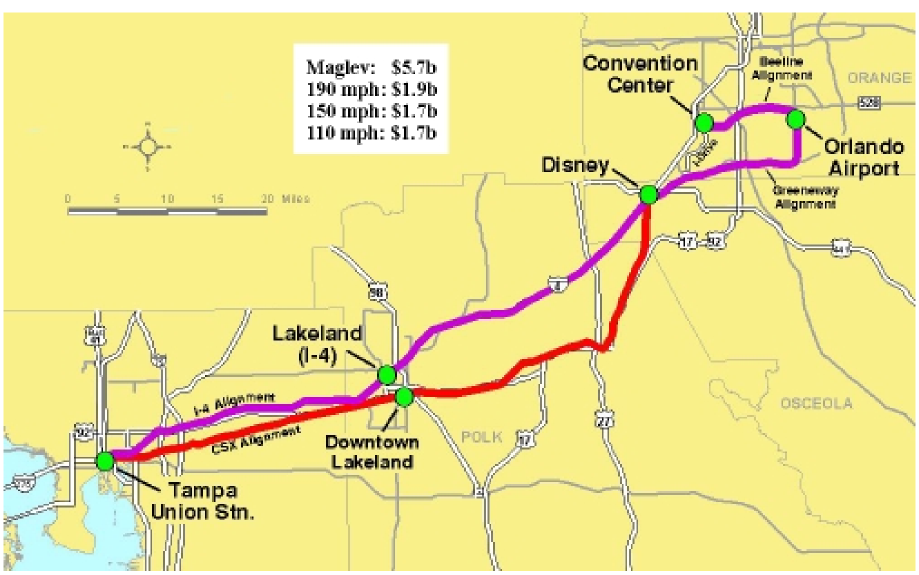


Figure 3.7: Route Alternative 6- Same as Alternative 5, but with the addition of an extension to Orange County Convention Center.

Figures 3.8-3.11 represent breakdowns of the capital costs for the alignment alternatives within each of the metropolitan areas.

In Tampa/St. Petersburg, two capital cost alternatives were developed. The first of which was a direct connection between Tampa and St. Petersburg across Tampa Bay. The second option utilizes CSX right-of-way around the bay into St. Petersburg.

In Metropolitan Orlando, alternatives centered around two primary connections between the area's major activity centers. The I-4/Beeline connection provides the most direct connection between major area attractions. The Greeneway alternative provides direct access from Disney to Orlando International Airport, but no direct access from Disney to the Convention Center/I-Drive area.

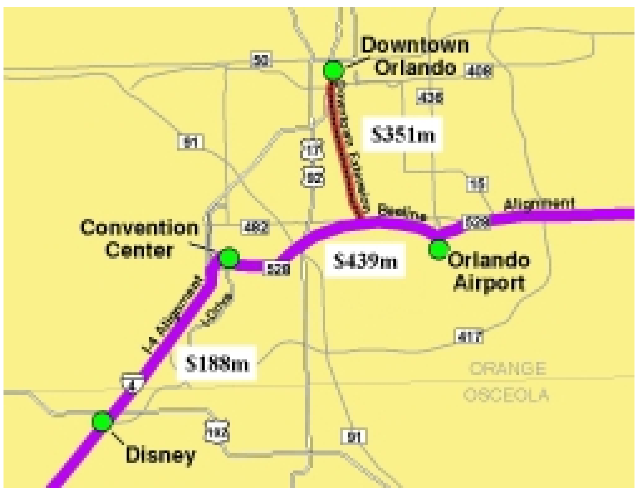


Figure 3.8

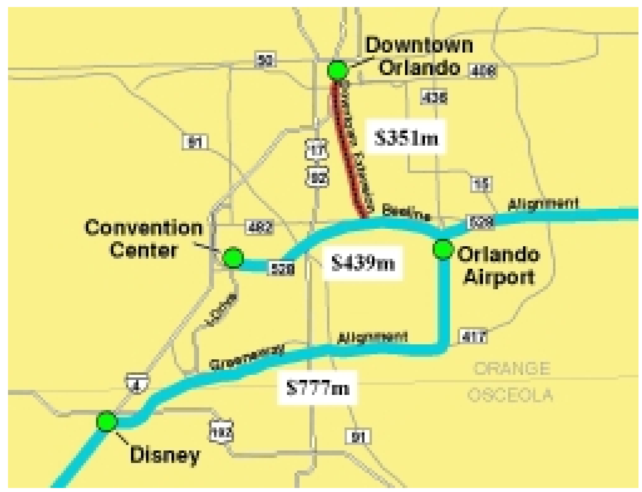


Figure 3.9

Figure 3.10

Figures 3.8-10: Metropolitan Orlando Segment Capital Costs. In metropolitan Orlando, there are three primary alternatives for serving the areas major trip generators/attractions. The costs include only infrastructure costs for building non-electrified 150mph technology.

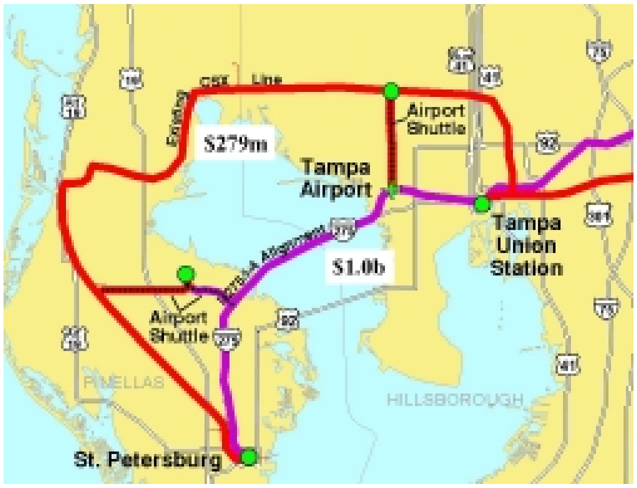


Figure 3.11: St. Petersburg-Tampa Segment Capital Costs. In the Tampa-St. Petersburg region, there are two alternate alignments that could serve the areas destinations. The costs include only infrastructure costs for building non-electrified 150mph technology.

3.2 Operating and Maintenance Cost Estimates

The operating and maintenance (O&M) cost model is intended to yield O&M cost estimates useful for comparing major transportation investments during planning level analyses. Estimates are developed at the unit service level to provide a consistent basis of cost comparison across each alternative. This basis also supports the re-application of these costs to specific investment alternatives as investment definitions and their operating plans are refined and improved.

The development of passenger rail alternatives for this study began with the identification of a variety of appropriate rail technologies. These selected technologies are Maglev (300 MPH), Super High Speed Rail (190 MPH) with electric locomotive propulsion, High Speed Rail (150 MPH) with diesel or gas turbine locomotive propulsion, Diesel Multiple Unit (110 MPH), and Low Speed Rail (79 MPH) with diesel locomotive propulsion. By combining the selected rail technologies with potential alignment options (Table 1.2 Alignment and Technology Options), a set of alternatives was established. A draft operating plan was developed for each alternative that, depending on the alignment and station stops, contained three to five concurrent service patterns. (See Section __ for a description of service plans.) The costs for operating all service patterns of a particular service plan are combined in order to calculate O&M costs for a given alternative.

O&M costs were developed for each of the alternatives by applying the required service units (e.g., trainset miles, crew hours) to unit costs (e.g., propulsion cost per mile, wage rates) from comparable systems. (Expressed mathematically, service units are multiplied by unit costs to achieve the total cost for a specific cost category or Cost = Amount of Service Units x Dollars/Unit.) This mathematical approach is utilized to calculate the costs of all of the following O&M cost categories.

Operating and Maintenance Cost Categories

O&M cost estimates were calculated according to five specific cost categories. These categories and their respective units of service are defined as follows:

- **Track and signal maintenance costs**
  This category includes the costs associated with maintaining the track and signal systems for a given alternative within required operational parameters. Also included in this category are costs for equipment and other material that must be replaced periodically due to normal wear. It is important to note that track and signal maintenance costs increase with the higher operating speeds of the particular rail technology. According to FRA regulations, more sophisticated (and thus more costly) train control systems are required as the maximum operating speed is increased. In addition, higher operating speeds induce greater wear on tracks and equipment while requiring tighter control of mechanical tolerances.

  The cost of trackage rights and liability insurance has not been included in the cost estimates. For the alternatives that utilize the CSX alignment, trackage rights and insurance costs will be subject to negotiation with CSX.

  The unit of service for calculating track and signal maintenance costs is track miles. Assuming a double-track configuration throughout the system, track miles is a function of twice the route miles plus track mileage for accessing maintenance facilities and storage yards.

- **Station operation and maintenance costs**
  This category includes the cost of cleaning and maintenance for all stations in the system and comprises station staffing costs for maintenance workers, ticket clerks, and other support personnel. It is assumed that a ticket center will be provided at each station and that concessions and retail will be furnished by the private sector.

  Unit cost for this category is the number of stations and varies by the routing of the particular alternative. The stations in the system are classified by size (i.e., small, medium, and large) with unit costs varying accordingly. The stations are classified as follows:

  Large stations: Orlando Airport, International Drive, and Disney
  Medium stations: Port Canaveral, Downtown Orlando, Tampa Union Station, Tampa Airport
  Small stations: Lakeland, Downtown St. Petersburg, St. Petersburg Airport

- **Trainset operating costs**
  This category comprises the costs to provide propulsion to the locomotive/power car and electrical power to operate systems and devices internal to the trainset. The unit of service for this category is locomotive or power car miles depending on the technology employed. For diesel locomotives/power cars and electric locomotives, unit costs are expressed in fuel costs per mile and electrical power costs per mile, respectively.

- **Trainset maintenance costs.**
  The costs to provide labor and equipment for the cleaning and servicing of the locomotives/power cars and railcars (and cab cars, if utilized) represents the total trainset maintenance costs. Included in this category are the costs of light maintenance (cleaning of car interior and exterior, replacement of lights, switches, and minor components, and replenishment of supplies.) and heavy repair, changeout and overhaul of major equipment and components.

  The unit of service for this category is miles and is calculated separately for both the locomotive/power car and railcar vehicles.

- **Trainset (on-board) crew operating costs.**
  Trainset crew operating costs are calculated for all on-board crews which are comprised of an engineer, conductor, and an assistant conductor, and a café/ first class car attendant. On-board crews are assumed to work on an hourly basis, with time plus one-half pay for overtime hours. Crew operating costs are based on a five-day, 44-week year. Spare crew factors are utilized to provide coverage for sick time, holidays, and vacation. The unit of service is crew hours.

  The calculation of crew hours is performed by multiplying the number of crews required to maintain a service plan by the time by the summation of the running, dwell, layover, and prep time required per service pattern. A reasonable layover, not less than 15 percent of the running time, is assumed. A 10 percent cushion is applied to running and dwell times to account for deviation from theoretical schedules.

The costs for each O&M costs category are calculated on an annual basis; the results of each category are summed to attain the total O&M costs per alternative.

Units of Service and Unit Cost per Category

In the O&M cost model, units of service are applied to the unit costs to calculate the total cost of providing the particular service. Unit costs have been obtained from cost reports or studies of comparable systems in order to generate estimates of O&M costs. For example, unit costs for track and signal maintenance were obtained from reports on the LA Metrolink system; trainset maintenance and operating unit costs were obtained from the New Jersey West Shore Rail Study. Station O&M costs and crew labor rates, obtained from the Florida Overland Express study, are assumed to be constant across all alternatives. (All unit costs have been adjusted for inflation to Year 2000 dollars.) Where comparable systems have not been developed or have no history of revenue service, the unit costs were developed from assumptions and contingency factors applied to existing rail systems or from ongoing research and development studies. In this study, Maglev technology and the High Speed 150 MPH Diesel technology with tilting apparatus are the two technologies that have no record of revenue service.

Maglev technology has not been employed in revenue service outside of the test track environment. Therefore, reliable O&M unit costs are not available for a system that provides point-to-point commercial service comparable to the Maglev alternatives investigated in this study. The unit costs utilized for Maglev in this study were obtained from FRA and follow from several studies conducted or currently underway by this agency. Thus, cost estimates for Maglev should be treated with the level of uncertainty appropriate to a technology that is currently under development. Unit costs for the individual cost categories of track and signal maintenance, trainset operating, and trainset maintenance were not available from FRA. Instead, FRA provided an aggregate unit cost for track and trainset operating and maintenance costs that was applied to total route miles of the Maglev alternatives.

The 150 MPH diesel trainset with tilt technology, intended for use with the High Speed alternatives, also has no commercial service history in the United States. Moreover, while a 125 MPH (non-tilting) diesel train is currently operating in Great Britain, it is has not been developed for compliance with stringent FRA high speed operating requirements that would require additional vehicle weight to improve crashworthiness. At the time of this writing, the authors are unaware of any development programs currently underway for producing a 150 MPH Diesel train that employs tilt technology. However, Amtrak and the FRA are developing a 150 MPH non-tilting gas turbine powered locomotive. Units costs are thus based on contingency factors applied to existing diesel train technology to account for the expected higher O&M costs associated with 150 MPH operation.

Summary of O&M Costs

The table below provides a summary of the O&M costs for each the 26 alternatives investigated for the Florida Cross State Rail Study. O&M costs are in current (Year 2000) dollars. (Figure 3.12)

Figure 3.12

Route	Trainset Miles	Track & Signal Maintenance Costs (in millions)	Trainset Operating Costs (in millions)	Trainset Maintenance Costs (in millions)	Crew Costs (in millions)	Station Cost (in millions)	Total (in millions)
1a*	2,093,000	$147.9			$8.3	$16.8	**$173.1**
1b	2,093,000	$16.5	$4.3	$28.0	$8.3	$16.8	**$73.9**
1c	2,093,000	$14.0	$5.9	$26.8	$8.3	$3.4	**$58.4**
1d	2,093,000	$13.3	$6.6	$16.0	$8.3	$3.4	**$47.7**
1e	2,541,000	$16.2	$5.4	$22.2	$12.9	$3.4	**$60.1**
2a*	1,289,000	$117.6			$4.1	$11.0	**$132.6**
2b	1,289,000	$13.1	$2.7	$15.0	$4.4	$11.0	**$46.2**
2c	1,289,000	$11.1	$3.6	$16.7	$4.4	$2.4	**$38.2**
2d	1,227,000	$10.2	$3.9	$9.4	$4.1	$2.1	**$29.7**
2e	1,265,000	$10.6	$2.7	$11.0	$5.5	$2.1	**$31.9**
3a*	2,088,000	$147.9			$9.2	$14.5	**$171.7**
3b	2,088,000	$16.5	$4.3	$26.0	$9.9	$14.5	**$71.2**
3c	2,088,000	$14.0	$5.8	$28.7	$9.1	$2.9	**$60.5**
3d	2,088,000	$13.3	$6.6	$16.0	$9.1	$2.9	**$47.9**
4a*	2,227,000	$157.1			$10.4	$16.8	**$184.3**
4b	2,227,000	$17.5	$4.6	$21.4	$11.0	$16.8	**$71.3**
4c	2,227,000	$14.9	$6.2	$23.9	$11.0	$3.4	**$59.5**
4d	2,227,000	$14.1	$7.0	$17.1	$11.3	$3.4	**$53.0**
5a*	1,284,000	$77.8			$4.4	$8.7	**$90.9**
5b	1,284,000	$8.6	$2.6	$12.0	$4.4	$8.7	**$36.4**
5c	1,284,000	$7.4	$3.6	$13.4	$4.4	$1.8	**$30.6**
5d	1,222,000	$7.0	$3.9	$9.4	$4.4	$1.6	**$26.2**
6a*	1,423,000	$86.9			$5.9	$8.7	**$101.5**
6b	1,423,000	$9.7	$3.0	$13.3	$5.9	$8.7	**$40.5**
6c	1,423,000	$8.2	$4.0	$14.9	$5.9	$1.8	**$34.8**
6d	1,361,000	$7.4	$4.3	$10.5	$5.9	$1.6	**$29.7**

* Unit costs for Track & Signal Maintenance, Trainset Operating, and Trainset Maintenance are based on an aggregate unit cost from FRA for track and trainset O&M costs.

4.0 Ridership and Revenue Forecasts

Ridership and revenue forecasts were prepared for each of the Cross-State system alternatives, representing different combinations of alignments, stations, and technologies. These forecasts are based on the demand forecasting methodology and related inputs described in the interim report. This includes forecasts of total market size and diversion to the proposed systems, based on the key service characteristics of the systems – travel time, frequency, and price.

This section of the report provides an overview of the travel demand forecasting methodology, a detailed description of the Cross-Florida service alternatives, and the ridership/revenue forecast results. The latter includes both a system wide summary level presentation of the forecasts as well as detailed results by type of market, type of service, and station.

4.1 Forecasting Methodology

This section provides an overview of the overall market size and growth and a review of the demand forecasting methodology used to prepare the ridership and revenue forecasts.

For more information on the methodology the reader is asked to reference the Florida High Speed and Intercity Rail Market and Ridership Study[1] and the Florida Overland Express High Speed Rail Study[2].

Existing Market Size

All forecasts are based on the same estimates of total market size. This includes the following types of markets:

- The **Intercity** travel market, which includes travel between regions in the Cross-Florida corridor (e.g., Tampa to Orlando, Lakeland to Orlando, Tampa to Port Canaveral) – these markets were the primary focus of the 1992 and 1997 studies

- The **Airport Access** market, which includes trips to/from the airport continuing as a longer trip outside of the study area (e.g., access to the airport from the Orlando attractions for a flight to Los Angeles, CA) – this is the principal market that the proposed system would serve within the Orlando/Central Florida region

- Other **Urban Travel** markets within the Tampa Bay and Orlando regions (e.g., St. Petersburg to Tampa, the Disney/Celebration area to Downtown Orlando)

For the **Intercity** travel market data from travel surveys preformed for previous studies completed in 1992 and 1997 were combined to create an estimate of existing travel in the Cross Florida Study area. Figure 4.1 provides a summary of the estimated existing intercity travel volumes in major geographic markets in the study area.

Figure 4.1 : Estimated Existing Intercity Travel Volumes

City Pair	Auto	Air	Total
Tampa - Lakeland/Polk	8,182,000	-	8,182,000
Tampa - Orlando	12,442,000	53,000	12,496,000
Tampa - Space Coast	807,000	2,000	810,000
Lakeland/Pok - Orlando	4,792,000	1,000	4,793,000
Lakeland/Polk - Space Coast	504,000	-	504,000
Orlando - Space Coast	12,576,000	2,000	12,579,000
Total	**39,304,000**	**59,000**	**39,363,000**

The Tampa – Orlando and Orlando – Space Coast markets are the largest markets in the study area comprising more than half of the total number of trips. Significant intercity travel is expected between the two largest regions in the study area, Tampa and Orlando and the shorter-haul Space Coast – Orlando and Lakeland/ Polk to Tampa and Orlando markets are also significant because they include commute and other “urban” trips between these regions. Although Tampa – Space Coast is the longest distance market, the air volumes are still very small because of the inaccessibility of the airports at both ends of the trip and lack of service in the market. Overall, the air market is inconsequential to the overall travel market in the Cross-Florida Corridor.

For the **Airport Access** market, number of annual enplanements (or boardings) and recent survey data were used to estimate market size. In Spring and Summer 2000, new surveys of departing air passengers were conducted for FDOT at the Orlando International Airport to support ongoing revisions to the Orlando urban travel demand models. Passengers were interviewed at the gates of departing flights and asked a variety of questions including origin of trip and mode of access to the airport. The data from these surveys were geocoded and tabulated by another consultant, and provided to the Cross-State study team in October 2000. The survey data were then expanded to represent total annual airport access travel using total airport enplanements and deplanements, less connecting passengers, which currently total about 20 million.

For other **Urban Travel** markets, total person travel from the Tampa Bay and Orlando regional models were used to quantify market size. These regional forecasting models, maintained by FDOT and the MPOs, reflect the regions' adopted land use and travel patterns used to evaluate proposed transportation improvements. Each of the regional models' Traffic Analysis Zones (TAZs) were assigned to the appropriate Cross-Florida Study Area zones. Similarly, the urban trip purposes were mapped to the primary trip purposes (e.g., commute, recreation) and residency (e.g., resident, visitor) market definitions used in the Cross-Florida study.

4.2 Market Growth

Key indicators of growth in the region, including population, employment, and income projections were used to increase the trips from a 1997 base to 2010. Different markets such as business/non-business and resident/non-resident use different growth indicators to factor the number of trips to the future year. Figure 4.2 summarizes the key indicators of market growth by market segment.

Figure 4.2: Key Indicators of Market Growth

Market	Growth Indicators
Intercity - Business - Resident	Population, Employment
Intercity - Business - NonResident	Employment
Intercity - NonBusiness - Resident	Population, Income
Intercity - NonBusiness - NonResident	Statewide Tourism, Hotel Rooms
Airport Access	Enplanements, Employment
Other Urban Travel	Households, Employment

Socio-Economic Measures

The primary source of population, income, and employment data and forecasts used in the Cross-Florida Study will be the Bureau of Economic and Business Research (BEBR), University of Florida. However, since the BEBR forecasts are available only at the county level, data from appropriate Metropolitan Planning Organizations (MPOs) along the corridor will be used to allocate to the sub-county zones used in the study. This procedure was also used in the 1992 and 1997 studies. As in the 1992 study, the number of hotel rooms, which is not included in the BEBR forecasts, will be obtained directly from the MPOs.

Based on recent BEBR forecasts, population in Florida is expected to grow at approximately 1.5 percent annually between 2000 and 2010, almost twice the national average. The Cross-Florida Study area is expected to grow a little slower, 1.4 percent annually, but still a substantial growth rate. Figure 4.3 shows the population forecasts for regions of the study area. As expected, the Central Florida/

Orlando area is projected to grow the fastest, followed by the Space Coast, both well above the overall state population growth rate.

Figure 4.3: Population Growth Forecasts for Cross-Florida Study Area

Region (County)	1997 Population	2000 Population	2005 Population	2010 Population	Annual Growth Rate
Tampa Bay (Hillsborough, Pinellas, Pasco)	2,101,000	2,184,000	2,300,000	2,414,000	1.01%
Lakeland/Polk (Polk)	449,000	471,000	503,000	535,000	1.28%
Central Florida (Orange, Osceola, Seminole)	1,179,000	1,253,000	1,388,000	1,526,000	1.99%
Space Coast (Brevard)	461,000	481,000	521,000	561,000	1.57%
Study Area Total	4,190,000	4,388,000	4,713,000	5,036,000	1.39%
State Growth	14,654,000	15,424,000	16,665,000	17,894,000	1.50%

* The Annual Growth rate is calculated between 2000 and 2010

Figure 4.4 shows employment growth by region. The growth in non-agricultural employment is greatest in the Orlando area as it was with population growth, however the Lakeland/Polk and Tampa Bay areas show larger growth in employment than the Space Coast.

Figure 4.4: Employment Growth Forecasts for Cross-Florida Study Area

Region (County)	1997 Employment	2000 Employment	2005 Employment	2010 Employment	Annual Growth Rate
Tampa Bay (Hillsborough, Pinellas, Pasco)	493,000	541,000	592,000	648,000	1.81%
Lakeland/Polk (Polk)	169,000	183,000	201,000	220,000	1.88%
Central Florida (Orange, Osceola, Seminole)	687,000	765,000	880,000	1,006,000	2.77%
Space Coast (Brevard)	177,000	188,000	203,000	219,000	1.51%
Study Area Total	1,526,000	1,678,000	1,876,000	2,093,000	2.23%
State Growth	6,415,000	7,057,000	7,813,000	8,663,000	2.07%

* The Annual Growth rate is calculated between 2000 and 2010

Tourism Forecasts

Tourism forecasts are available from the U.S. Economic Estimating Conference. These forecasts are provided by mode of arrival (air or auto) at the state level. Figure 4.5 summarizes these statewide tourism forecasts, which were used in the 1997 study. More recent long-range forecasts through 2010 or later are not available.

Figure 4.5: Tourism Forecasts

Mode of Arrival	Tourists (in thousands) 1995	2000	2005	2010	Annual Growth Rate 1995-00	2000-05	2005-10
Auto	19,785	21,614	24,083	26,924	1.8%	2.2%	2.3%
Air	21,082	27,041	31,975	37,574	5.1%	3.4%	3.3%
Total	**40,867**	**48,655**	**56,058**	**64,498**	**3.6%**	**2.9%**	**2.8%**

As shown by Figure 4.5, substantial growth in tourism is expected, especially in visitors arriving by air. The differentiation of visitor growth by mode of arrival results in higher growth rates for areas with airports and therefore accounts for the higher growth potential of areas like Tampa and Orlando.

Airport Enplanements

Figure 4.6 shows the number of annual enplanements at the Orlando Airport for 1997 and forecast for 2000, 2010, and 2020. While the raw number of enplanements from 2000 to 2010, is impressive, more than doubling the current estimate in twenty years, the average growth rate is over four percent annually. This growth rate is above the statewide average, reflecting Orlando's continuing growth. These figures provide the basis for estimating future growth in the airport access travel market

Figure 4.6: Existing and Forecast Enplanements at Orlando Airport and Statewide

Airport	Code	1997	2000*	2010*	2020*	Annual Growth Rate
Orlando International	MCO	13,162,700	14,704,200	24,176,100	34,648,200	4.38%
Statewide Total	FL	53,928,400	59,986,300	92,834,600	132,748,500	4.05%

4.3 Demand Forecasting Models

Ridership by mode is simply the product of (1) future estimated total travel volumes and (2) future estimated shares, by mode and market segment. These shares are estimated using mode share model(s), based on the characteristics of modes providing service in each market. Revenue is then simply the product of ridership and fare or price by market (e.g., station pair).

Mode share models estimate shares of travel using each of the available modes, such as:

- Car
- Air
- Intercity Rail

Such intercity mode share models were developed in both the 1992 and 1997 studies. The 1992 study focused on a range of future rail technologies, from conventional speed rail to high speed rail to magnetic levitation (Maglev) technologies. The 1997 study focused on a specific high speed rail technology. Given the scope of the Cross-Florida Study, the 1992 models will provide the primary basis for estimating intercity mode share. However, as described above, extensive travel survey data collected in the 1997 study will also be used. A similar combination of 1992 and 1997 study resources provided the basis for forecasts supporting the 2000 Florida Vision Plan.

The 1992 (and 1997) intercity mode share models were developed using two types of survey data:

- Revealed Preferences (RP), which are the actual observed choices that travelers currently make
- Stated Preferences (SP), which are the stated intentions of travelers to make certain choices under a variety of different situations reflecting different characteristics of the available choices

Key independent variables in the model include:

- Total door-to-door travel cost
- Total door-to-door travel time
- Access time (time spent getting to and from the rail or air mode)
- Departure frequency
- Income
- A number of mode-specific constants which capture remaining differences among modes (and between markets) not addressed by the above variables

4.4 Service Alternatives

This section describes the characteristics of alternatives in the cross state rail study. This discussion of characteristics includes a service plan summary, including stations and markets served and type of service provided, and fare structures for the various train technologies.

Complete service plans were developed for each of the route alternative in the Cross-State Study based on a consistent set of frequency targets by type of market. After an initial round of market analysis, these service levels were adjusted to better match the forecasted demand. The following text summarizes the resulting frequencies for the Intercity, Tampa Bay Urban, Orlando Urban/Airport Access markets.

All of the alternatives provide through intercity service from the Tampa Bay area to the Orlando area to the Space Coast. There are a total of twelve (12) daily round trips between Tampa and Orlando, providing hourly service during the morning and evening peak travel periods with departures every two hours at other times of the day. This base level of service (12 round trips) operates over the entire system and is therefore the minimum frequency between any two points, although a connection at the Orlando Airport may be required for Downtown Orlando or Port Canaveral.

Each of the alternatives provides additional local service within the Tampa Bay Urban area, from St. Petersburg to Lakeland. Six (6) additional daily round trips are provided resulting in a total of eighteen (18) daily round trips between the western terminus of the system (St. Petersburg, Tampa Airport, or Downtown Tampa depending upon the alternative) and Lakeland.

Local service within Orlando Urban/Airport Access service area is somewhat more complex and varies by alternative. All of the full system alternatives serve Downtown Orlando and Port Canaveral with a total of twelve (12) daily round trips, provided by a combination of through intercity trains and local trains, depending upon the alternative. Twenty-four (24) additional daily round trips are provided between Disney/Celebration and the Orlando Airport, serving the Convention Center in route in some of the alternatives. This results in a total of thirty-six (36) daily round trips in these important urban/airport access markets. Two of the alternatives provide separate services to Disney/Celebration and the Convention Center on different alignments. In these alternatives, a total of eighteen (18) daily round trips are provided between the Convention Center and the Airport.

4.5 Detailed Service Summary

This section describes in detail the service plans, alignments, and technologies adopted for the Cross State System. A condensed summary of the alignments, technologies and the stations served by each of these alignments is shown below in Figure 4.7.

Route	Technology	Downtown St Petersburg	St Pete/Clearwater Airport	Tampa Airport/West Shore	Tampa Union Station	Lakeland	Disney	Orange County Convention Center	Orlando International Airport	Downtown Orlando	Port Canaveral	Alignment Details
1a	Maglev (300 mph)	●	●	●	●	●	●	●	●	●	●	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando
1b	Super HSR (190 mph)	●	●	●	●	●	●	●	●	●	●	same as 1a, with electrification
1c	HSR (150 mph)	●	●	●	●	●	●	●	●	●	●	same as 1a, without electrification
1d	Intermediate Speed Rail (110 mph)	●	●	●	●	●	●	●	●	●	●	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline
1e	Low Speed Rail (79 mph)	●	●	●	●	●	●	●	●	●	●	CSX to Disney, I-4 to Beeline
2a	Maglev (300 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4 with CSX potential
2b	Super HSR (190 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4 with CSX potential
2c	HSR (150 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4 with CSX potential
2d	Intermediate Speed Rail (110 mph)				●	●	●	●	●			Tampa Union Station to DT Orlando, I-4 with CSX potential
2e	Low Speed Rail (79 mph)				●	●	●	●	●			Tampa Union Station to DT Orlando, I-4 with CSX potential
3a	Maglev (300 mph)	●	●	●	●	●	●		●	●	●	I-4 to Greeneway, DT Orlando and Beeline
3b	Super HSR (190 mph)	●	●	●	●	●	●		●	●	●	I-4 to Greeneway, DT Orlando and Beeline
3c	HSR (150 mph)	●	●	●	●	●	●		●	●	●	I-4 to Greeneway, DT Orlando and Beeline
3d	Intermediate Speed Rail (110 mph)	●	●	●	●	●	●		●	●	●	I-4 to Greeneway, DT Orlando and Beeline
4a	Maglev (300 mph)	●	●	●	●	●	●	●	●	●	●	I-4, Greeneway, CC, DT Orlando, Beeline
4b	Super HSR (190 mph)	●	●	●	●	●	●	●	●	●	●	I-4, Greeneway, CC, DT Orlando, Beeline
4c	HSR (150 mph)	●	●	●	●	●	●	●	●	●	●	I-4, Greeneway, CC, DT Orlando, Beeline
4d	Intermediate Speed Rail (110 mph)	●	●	●	●	●	●	●	●	●	●	I-4, Greeneway, CC, DT Orlando, Beeline
5a	Maglev (300 mph)			●	●	●	●		●			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5b	Super HSR (190 mph)			●	●	●	●		●			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5c	HSR (150 mph)			●	●	●	●		●			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5d	Intermediate Speed Rail (110 mph)				●	●	●		●			Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
6a	Maglev (300 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6b	Super HSR (190 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6c	HSR (150 mph)			●	●	●	●	●	●			Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6d	Intermediate Speed Rail (110 mph)				●	●	●	●	●			Tampa Union Station to DT Orlando, I-4, Greeneway, CC

Figure 4.7: Alignment Matrix for Cross Florida Rail Study

4.6 Schematics and Description of Alternatives

As shown in Exhibit 2.1, six different alignments are considered for analysis in the Tampa Bay – Orlando/Central Florida – Port Canaveral corridor. A detailed description of the alignments is as follows:

Alternative 1

This alignment runs across the bay along a new rail alignment between St. Petersburg and Tampa Union Station servicing St. Petersburg, St. Petersburg Airport, Tampa Airport and Tampa Union Station. The alignment continues along the I-4 Corridor between Tampa and the Disney Celebration Station servicing a Lakeland Station and the Disney Celebration Station. This alignment is used by the following four technologies:

- Maglev – Alternative 1A
- Super High Speed Rail (HSR) – Alternative 1B
- HSR – Alternative 1C
- Intermediate Speed Rail – Alternative 1D

The low speed alternative (Alternative 1E) uses the CSX alignment around the north end of Tampa Bay. The train would service Clearwater instead of St. Petersburg Airport. The stations serviced by this alignment are St. Petersburg, Clearwater, Tampa Airport and Tampa Union Station. The CSX alignment continues along the existing CSX track to Lakeland and Disney Celebration.

All five technology options alternatives then run along the I-4 Corridor between Disney Celebration and Orlando Airport servicing Disney, Convention Center and Orlando Airport. Airport access is provided by this alternative with service between Downtown Orlando and Orlando Airport. The alignment then runs along the Bee-Line between Orlando Airport and Port Canaveral. The daily round trip frequencies between important destinations along this alignment are shown below in Figure 4.8. The schematics of this alternative are shown in Figure 4.9 and 4.10.

Figure 4.8: Daily Round Trip Frequencies for Alternative 1

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	36 trains
Downtown Orlando - Orlando Airport	12 trains
Port Canaveral - Orlando Airport	12 trains
Disney - Port Canaveral	12 trains
St. Petersburg - Orlando Airport	12 trains
St. Petersburg - Tampa Union Station - Lakeland	18 trains

Figure 4.9: Alternative 1 A, B, C, D via I-4 and Bee-Line – Full System

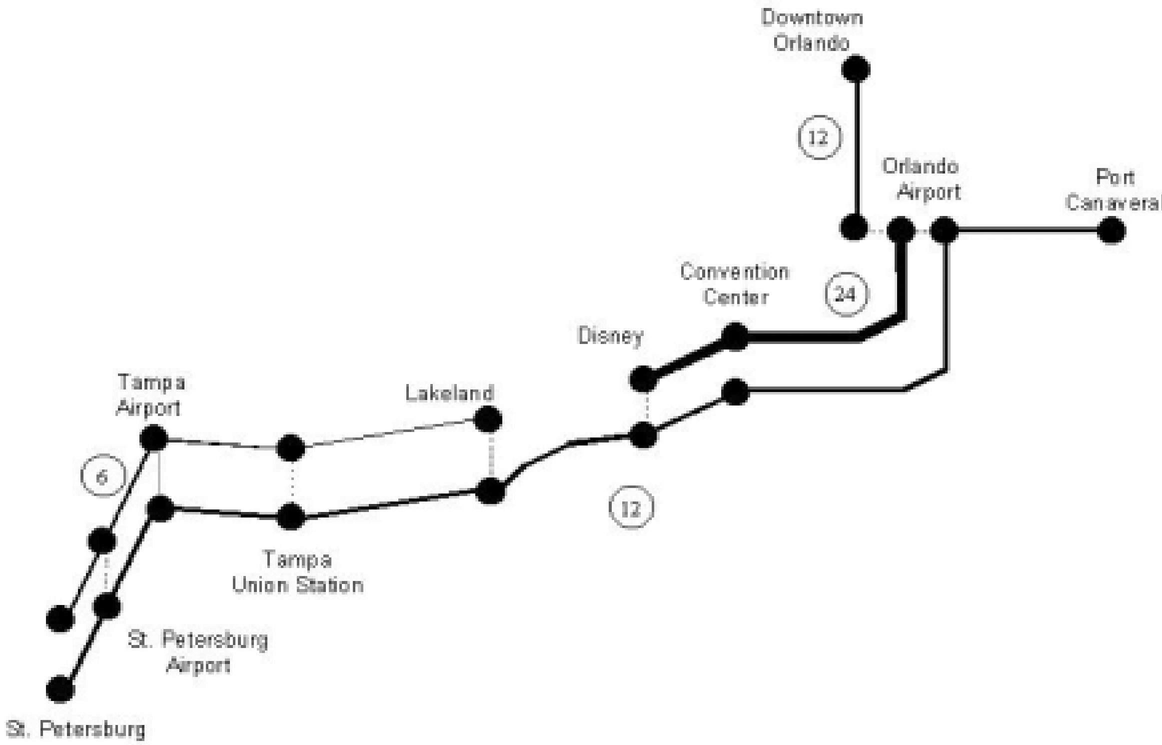
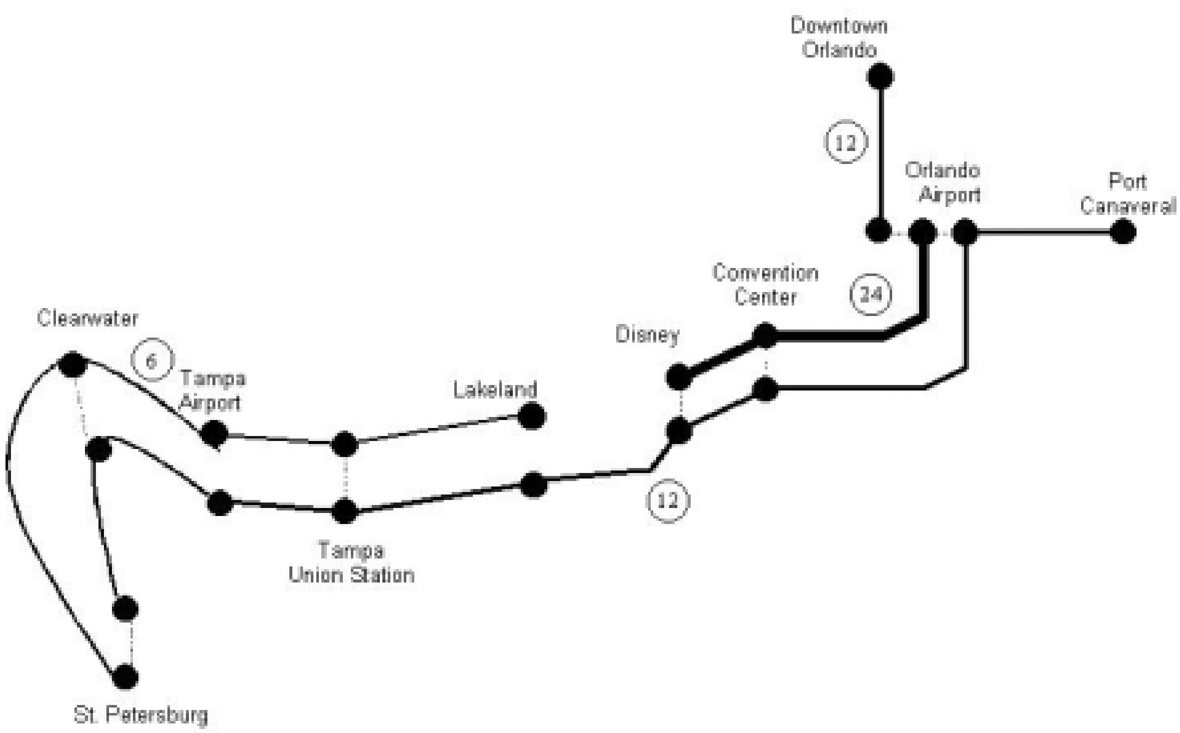


Figure 4.10: Alternative 1 E via existing CSX and Bee-Line– Full System



Alternative 2

This alignment is a partial cutback of Alternative 1. For the following technologies the trains run from Tampa Airport to Orlando Airport. The stations serviced by these alternatives are Tampa Airport, Tampa Union Station, Disney, Convention Center and Orlando Airport

- Maglev - Alternative 2A
- Super High Speed Rail (HSR) – Alternative 2B
- HSR – Alternative 2C

For the following two technologies the trains run between Tampa Union Station and Orlando Airport. The stations serviced by these alternatives are Tampa Union Station, Disney, Convention Center and Orlando Airport

- Intermediate Speed – Alternative 2D
- Low Speed – Alternative 2E

The low speed alternative (Alternative 2E) runs along the CSX Line similar to Alternative 1E. The daily round trip frequencies between important destinations along this alignment are shown in Figures 4.11 and 4.12. The schematics of this alternative are shown in Figures 4.13, 4.14 and 4.15.

Figure 4.11: Daily round trip frequencies for Alternative 2 A, B, C

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	36 trains
Tampa Airport - Tampa Union Station - Lakeland	18 trains

Figure 4.12: Daily round trip frequencies for Alternative 2 D, E

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	36 trains
Tampa Union Station - Lakeland	18 trains

Exhibit 4.13: Alternative 2 A, B, C via I-4 and Bee-Line– Partial System

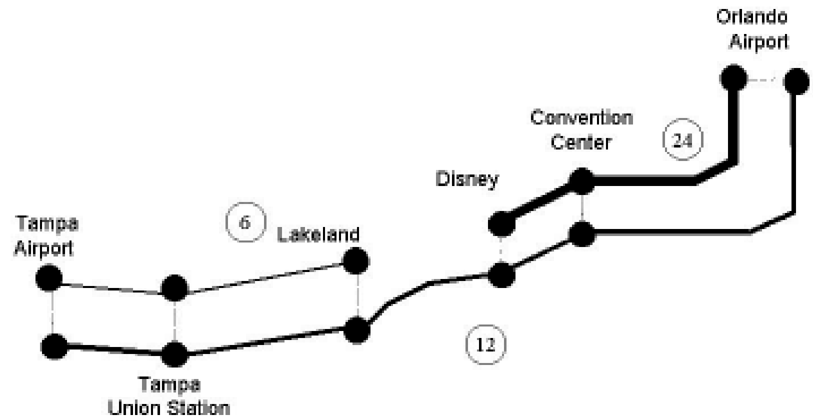


Figure 4.14: Alternative 2 D via I-4 and Bee-Line– Partial System

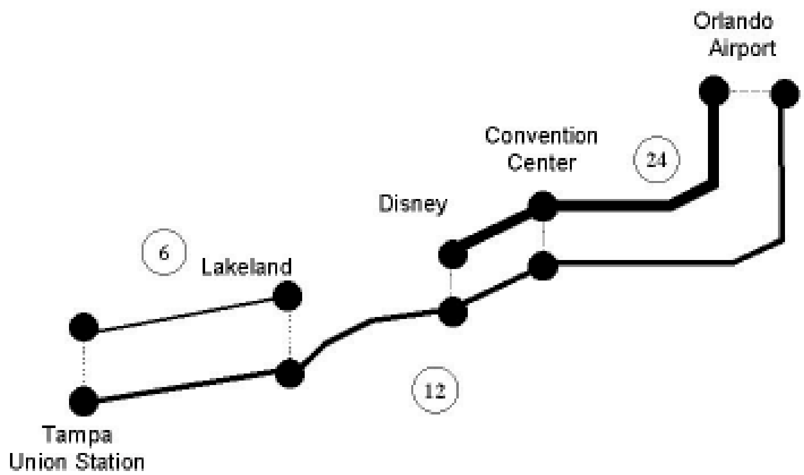
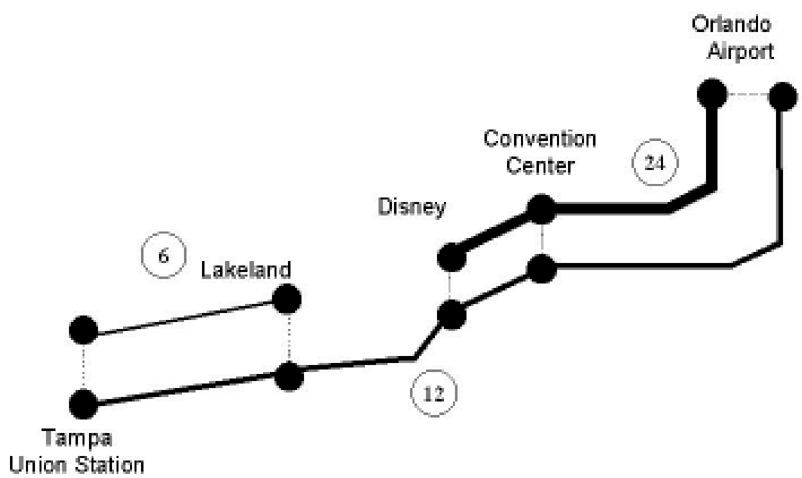


Figure 4.15: Alternative 2 E via existing CSX and Bee-Line– Partial System



Alternative 3

This alignment runs across the bay along the route 1 alternative alignment between St.Petersburg and Tampa Union Station servicing St. Petersburg, St. Petersburg Airport, Tampa Airport and Tampa Union Station. This alignment is adopted for all the technologies:

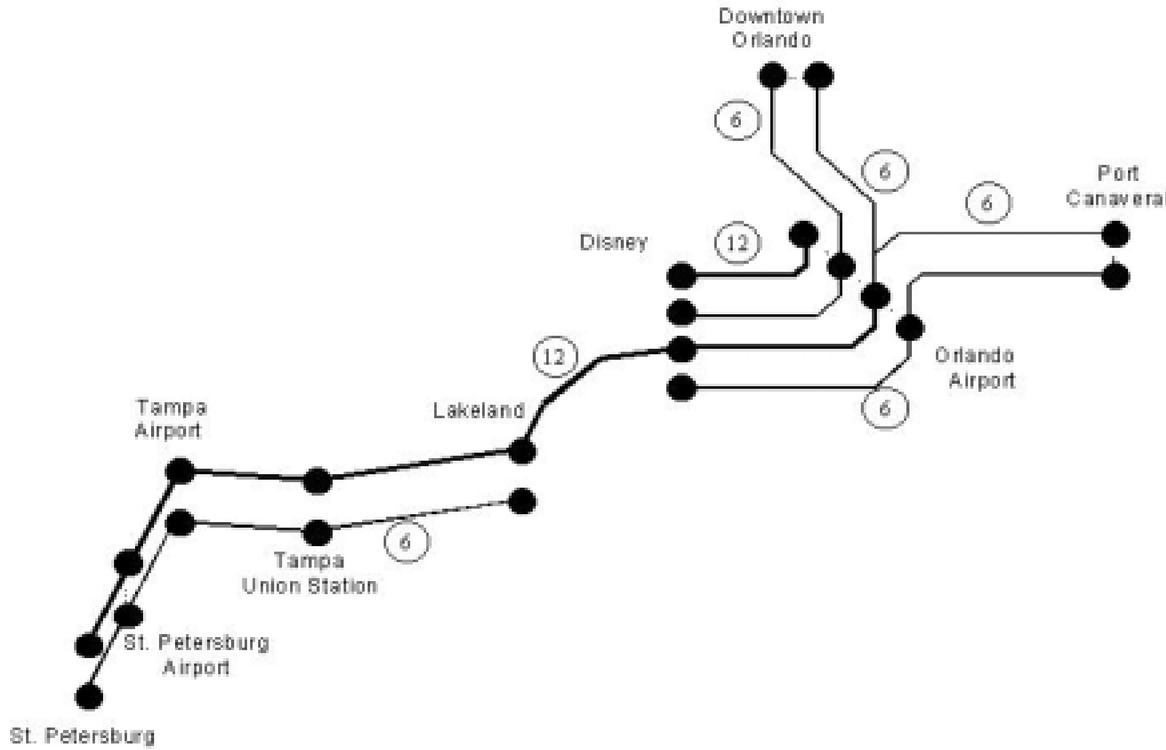
- Maglev – Alternative 3A
- Super High Speed Rail (HSR) – Alternative 3B
- HSR – Alternative 3C
- Intermediate Speed Rail – Alternative 3D

All the alternatives run along the Greeneway between Tampa and Orlando Airport servicing Tampa Union Station, Lakeland, Disney, and Orlando Airport. Airport access is provided by this alternative with service between Downtown Orlando and Orlando Airport. The alignment then runs along the Bee-Line between Orlando Airport and Port Canaveral. The daily round trip frequencies between important destinations along this alignment are shown below in Figure 4.16. The schematics of this alternative are shown in Figure 4.17.

Figure 4.16: Daily round trip frequencies for Alternative 3

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Downtown Orlando - Orlando Airport	12 trains
Port Canaveral - Orlando Airport	12 trains
Disney - Port Canaveral	12 trains
St. Petersburg - Orlando Airport	12 trains
St. Petersburg - Tampa Union Station - Lakeland	18 trains

Figure 4.17: Alternative 3 A, B, C, D via Greeneway and Bee-Line – Full System



Alternative 4

This alignment runs across the bay between St. Petersburg and Tampa Union Station similar to Alternative 3. This alignment is adopted for all the technologies:

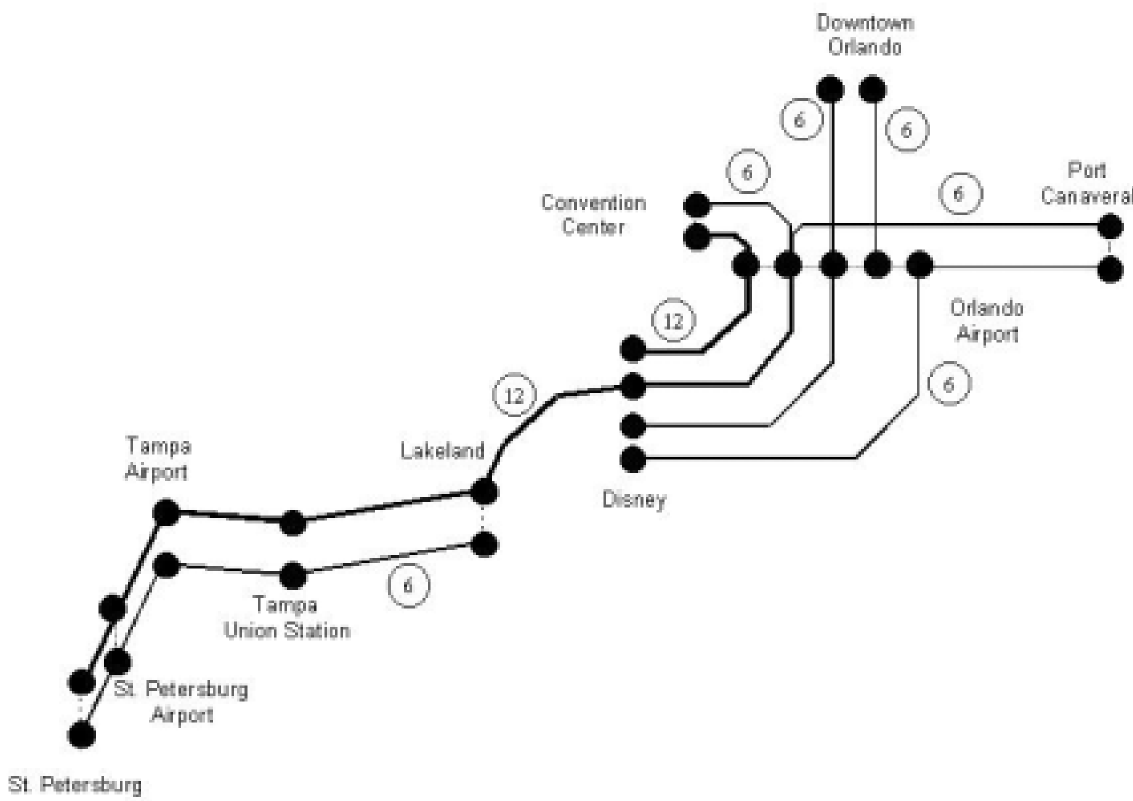
- Maglev – Alternative 3A
- Super High Speed Rail (HSR) – Alternative 3B
- HSR – Alternative 3C
- Intermediate Speed Rail – Alternative 3D

All the alternatives run along the Greeneway between Tampa and Orlando Airport servicing Tampa Union Station, Lakeland, Disney, and Orlando Airport. Airport access is provided by this alternative with service between Downtown Orlando and Orlando Airport. The alignment then runs along the Bee-Line between Orlando Airport and Port Canaveral. This alternative also provides shuttle service between the Convention Center and Orlando Airport. The daily round trip frequencies between important destinations along this alignment are shown below in Figure 4.18. The schematics of this alternative are shown in Figure 4.19.

Figure 4.18: Daily round trip frequencies for Alternative 4

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	18 trains
Downtown Orlando - Orlando Airport	12 trains
Port Canaveral - Orlando Airport	12 trains
Disney - Port Canaveral	12 trains
St. Petersburg - Orlando Airport	12 trains
St. Petersburg - Tampa Union Station - Lakeland	18 trains

Figure 4.19: Alternative 4 A, B, C, D via Greeneway and Bee-Line – Full System



Alternative 5

This alignment is a partial cutback of Alternative 3. For the following technologies, trains run from Tampa Airport to Orlando Airport. The stations serviced by these alternatives are Tampa Airport, Tampa Union Station, Disney, Convention Center and Orlando Airport

- Maglev - Alternative 5A
- Super High Speed Rail (HSR) – Alternative 5B
- HSR – Alternative 5C

For the following technology the train runs between Tampa Union Station and Orlando Airport. The stations serviced by these alternatives are Tampa Union Station, Disney, and Orlando Airport

- Intermediate Speed – Alternative 5D

The daily round trip frequencies between important destinations along this alignment are shown in Figures 4.20 and 4.21. The schematics of this alternative are shown in Figures 4.22 and 4.23.

Figure 4.20: Daily round trip frequencies for Alternative 5A, B, C

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Tampa Airport - Tampa Union Station - Lakeland	18 trains

Figure 4.21: Daily round trip frequencies for Alternative 5 D

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Tampa Union Station - Lakeland	18 trains

Figure 4.22: Alternative 5 A, 5B, 5C via I-4 – Partial System

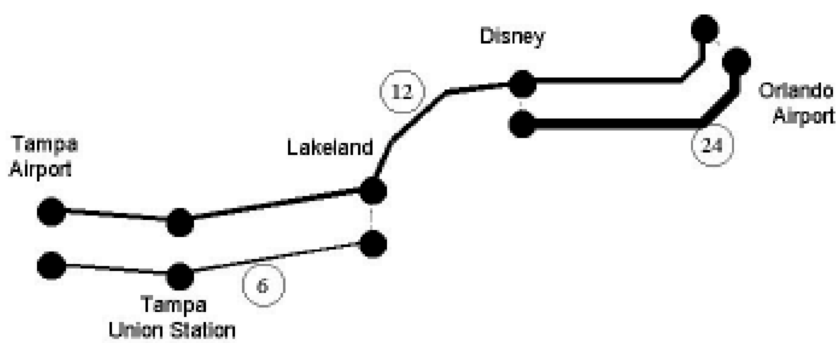
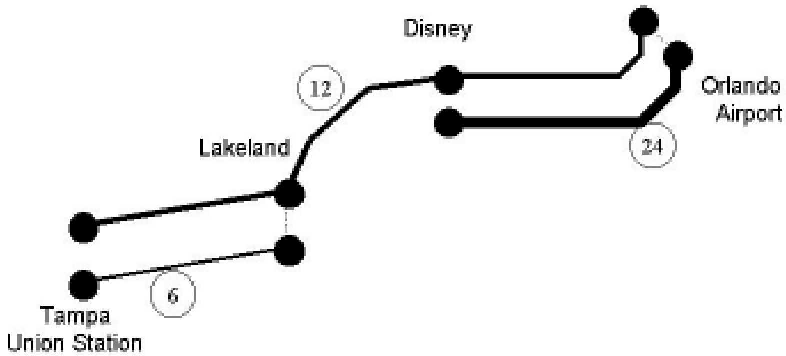


Figure 4.23: Alternative 5 D via I-4 – Partial System



Alternative 6

This alignment is a partial cutback of Alternative 4. For the following technologies, trains run from Tampa Airport to Convention Center. The stations serviced by these alternatives are Tampa Airport, Tampa Union Station, Disney, Orlando Airport and Convention Center

- Maglev - Alternative 6A
- Super High Speed Rail (HSR) – Alternative 6B
- HSR – Alternative 6C

For the following technology, the train runs between Tampa Union Station and Convention Center. The stations serviced by these alternatives are Tampa Union Station, Disney, Orlando Airport and Convention Center

- Intermediate Speed – Alternative 2D

The daily round trip frequencies between important destinations along this alignment are shown in Figures 4.24 and 4.25. The schematics of this alternative are shown in Figures 4.26 and 4.27.

Figure 4.24: Daily round trip frequencies for Alternative 6 A, B, C

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	18 trains
Tampa Airport - Tampa Union Station - Lakeland	18 trains

Figure 4.25: Daily round trip frequencies for Alternative 6 D

Station Pair	Daily Round Trip Frequency
Tampa Union Station - Orlando Airport	12 trains
Disney - Orlando Airport	36 trains
Convention Center - Orlando Airport	18 trains
Tampa Union Station - Lakeland	18 trains

Figure 4.26: Alternative 6 A, B, C via Greeneway and Bee-Line – Partial System

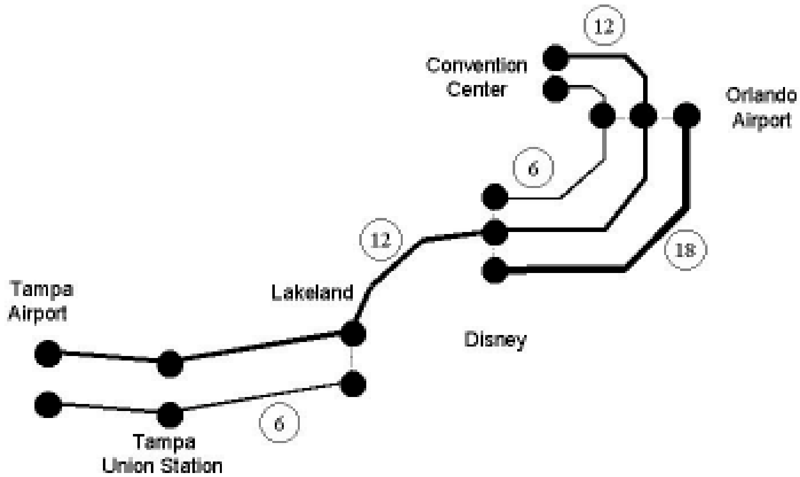
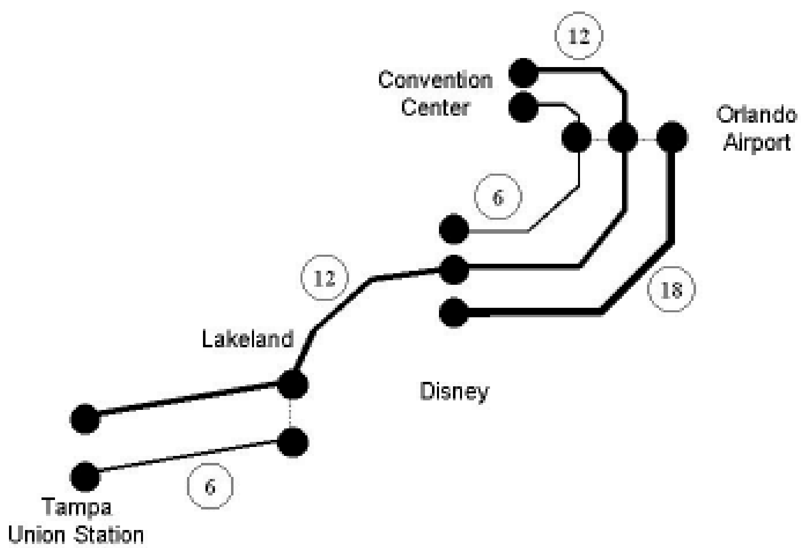


Figure 4.27: Alternative 6 D via Greeneway and Bee-Line – Partial System



4.7 Proposed Fare Structure

The fare structure used in this study separately considered the pricing of intercity and airport access/urban markets. Pricing for the **Intercity** markets was developed after a detailed review of several previous studies performed for the Florida Department of Transportation, including:

- 2000 Florida Vision Plan (2000)
- Florida Overland Express (FOX) High Speed Rail Study (1997)
- Florida High Speed Rail and Intercity Rail Market Ridership Study (1993)

Three different intercity fare levels were considered, referred to as Low, Medium, and High fares. The low fares were based on the 2000 Florida Vision Plan and the high fares were based on the Florida Overland Express (FOX) High Speed Rail Study Fares. The medium fares were then computed as an average of the high and low fares. Each of the intercity fare structures can be represented by the following mileage-based formulas:

- Low Fares: $8.80 + $0.11/mile
- Medium Fares: $8.90 + $0.225/mile
- High Fares: $9.00 + $0.34/mile

Although the resulting fares are reasonable for Intercity travel (and consistent with other intercity studies), they are not competitive within the **Airport Access** and **Urban Travel** markets. Separate pricing was developed for these markets based on average yields typically found in such markets. Within the Tampa Bay and Orlando urban areas, the following flat fares were adopted:

- $4 (under the Low Fares structure)
- $5 (Medium Fares)
- $6 (High Fares)

Similarly, the following fares were used between Port Canaveral and Orlando Airport:

- $8 (Low Fares)
- $10 (Medium Fares)
- $12 (High Fares)

The application of the different fare levels to the different technologies that are part of the Cross-Florida Rail study is shown below in Figure 4.28. However, to facilitate comparisons among technologies, all were first tested with the same Medium fares in addition to the Low, Medium, or High technology-specific fares.

Exhibit 2.23 shows the matrix of Medium fares used in Route Alternatives 1A through 1D.

Figure 4.28- Medium Fare Matrix for Route Alternative 1

		STPA	TPAI	TAMD	LAKI	DSNY	CONC	ORLA	ORLD	PCAN
STPD	St. Pete Downtown	$5.00	$5.00	$5.00	$19.95	$28.61	$30.66	$33.27	$36.89	$42.09
STPA	St. Pete Airport		$5.00	$5.00	$18.15	$26.81	$28.86	$31.47	$35.09	$40.29
TPAI	Tampa Airport			$5.00	$16.12	$24.78	$26.83	$29.44	$33.06	$38.26
TAMD	Tampa Union Sta.				$15.85	$24.51	$26.56	$29.17	$32.79	$37.99
LAKI	Lakeland					$17.56	$19.61	$22.22	$25.84	$31.04
DSNY	Disney Celebration						$5.00	$5.00	$17.18	$22.38
CONC	Orlando Conv. Cntr.							$5.00	$15.13	$20.33
ORLA	Orlando Airport								$5.00	$10.00
ORLD	Orlando Downtown									$21.34
PCAN	Port Canaveral									

Figure 4.29 summarizes how the fare structures were applied to each technology. As discussed above, the medium fare structure was first tested on all technologies. Then, technology-specific fares were tested as follows. The Low fares were used with the lower speed technologies (Low Speed and Intermediate Speed) the Medium fares were used with the middle speed technology (High Speed Rail) and the High fares were used with the higher speed technologies (Super High Speed Rail and Maglev).

Figure 4.29- Fare Structure for Different Technologies

Technology	Low Fares	Medium Fares	High Fares
Low Speed Rail (79 mph)	○	○	
Intermediate Speed Rail (110 mph)	○	○	
High Speed Rail (150 mph)		○	○
Super High Speed Rail (190 mph)		○	○
Maglev (300 mph)		○	○

4.8 Forecast Results

Ridership and revenue forecasts were prepared for the following three scenarios:

- All alternatives with a common fare structure and fixed guideway access in Tampa and Orlando areas as indicated by the 2020 adopted regional plans
- All alternatives with technology-specific fares and fixed guideway access in Tampa and Orlando areas as indicated by the 2020 adopted regional plans
- All alternatives with a common fare structure and no new fixed guideway access (in Tampa and Orlando areas as indicated by the 2020 adopted regional plans

Forecast Overview

The following sections provide a complete set of system wide ridership, revenue, and passenger- mile forecast results for the Cross-State alternatives under each of the three scenarios described above.

Forecast Results for a Common Fare Structure

A common fare structure was used to be able to compare differing technology and route alternatives without the fare difference influencing the results. The medium fares were used as the common fare structure for this analysis. Exhibit 3.1 displays the system total ridership, revenue, and passenger miles for each alternative. Exhibit 3.2 provides a graphical illustration of the ridership totals.

Exhibits 3.1 and 3.2 show Alternative 1 with consistently higher ridership and revenue forecasts than all other alternatives at each train technology. Ridership forecasts for Alternatives 1A-1E range from 6.0 million to 3.6 million passengers annually with revenue ranging from $71.6 million to $36.1 million. Overall, ridership on the full systems range from 6.0 million to 4.2 million passengers annually and the revenue forecasts range from $71.6 million to $36.1 million. The partial systems have ridership forecasts between 3.7 and 1.8 million annual passengers and revenue forecasts between $41.3 and $18.3 million.

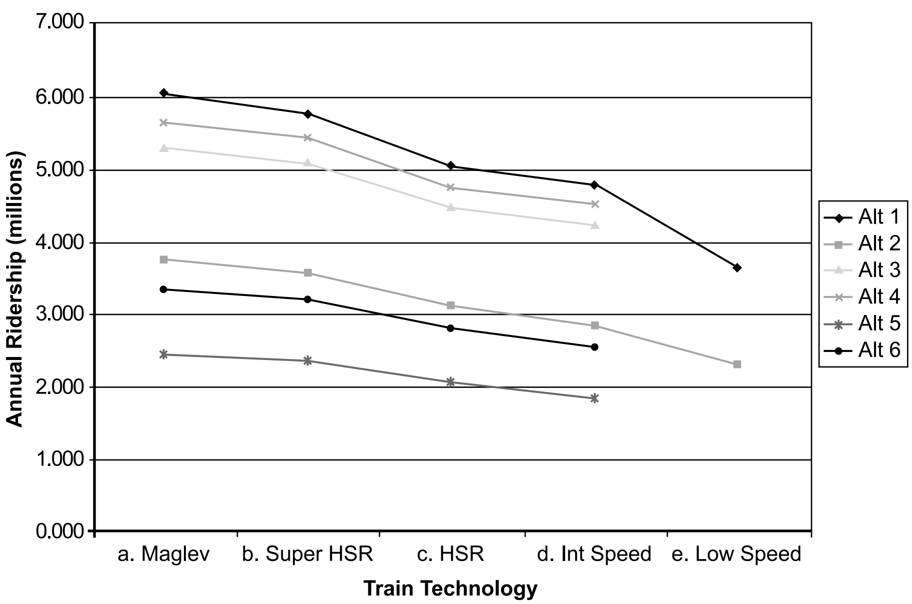
Figure 4.30: Summary of 2010 Forecasted Ridership, Revenue, and Passenger Mile Forecasts for Cross Florida System Alternatives with Medium Fares and Fixed Guideway Access

Route	Alignment	Technology	Ridership (millions)	Revenue (millions)	Passenger Miles (millions)
1a	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando	Maglev (300mph)	6.0	$ 71.6	210.0
1b	same as 1a, with electrification	Super HSR (190mph)	5.7	$ 65.6	191.5
1c	same as 1a, without electrification	HSR (150mph)	5.0	$ 56.6	165.2
1d	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline	Intermediate Speed Rail (110mph)	4.8	$ 51.3	149.2
1e	CSX to Disney, I-4 to Beeline	Low Speed Rail (79 mph)	3.7	$ 36.1	119.5
2a	Tampa Union Station to DT Orlando, I-4 with CSX potential	Maglev (300mph)	3.7	$ 41.3	124.1
2b	Tampa Union Station to DT Orlando, I-4 with CSX potential	Super HSR (190mph)	3.6	$ 37.9	114.2
2c	Tampa Union Station to DT Orlando, I-4 with CSX potential	HSR (150mph)	3.1	$ 32.6	98.2
2d	Tampa Union Station to DT Orlando, I-4 with CSX potential	Intermediate Speed Rail (110mph)	2.8	$ 26.5	80.7
2e	Tampa Union Station to DT Orlando, I-4 with CSX potential	Low Speed Rail (79 mph)	2.3	$ 19.6	60.4
3a	I-4 to Greeneway, DT Orlando and Beeline	Maglev (300mph)	5.2	$ 68.7	199.0
3b	I-4 to Greeneway, DT Orlando and Beeline	Super HSR (190mph)	5.1	$ 63.7	183.4
3c	I-4 to Greeneway, DT Orlando and Beeline	HSR (150mph)	4.4	$ 54.5	156.9
3d	I-4 to Greeneway, DT Orlando and Beeline	Intermediate Speed Rail (110mph)	4.2	$ 48.9	139.5
4a	I-4, Greeneway, CC, DT Orlando, Beeline	Maglev (300mph)	5.6	$ 64.5	190.4
4b	I-4, Greeneway, CC, DT Orlando, Beeline	Super HSR (190mph)	5.4	$ 60.2	177.0
4c	I-4, Greeneway, CC, DT Orlando, Beeline	HSR (150mph)	4.7	$ 51.7	152.1
4d	I-4, Greeneway, CC, DT Orlando, Beeline	Intermediate Speed Rail (110mph)	4.5	$ 47.1	137.8
5a	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Maglev (300mph)	2.4	$ 28.7	89.8
5b	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Super HSR (190mph)	2.4	$ 26.8	84.1
5c	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	HSR (150mph)	2.0	$ 22.8	71.9
5d	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Intermediate Speed Rail (110mph)	1.8	$ 18.3	58.8
6a	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Maglev (300mph)	3.3	$ 37.7	121.2
6b	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Super HSR (190mph)	3.2	$ 34.4	111.2
6c	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	HSR (150mph)	2.8	$ 29.7	96.0
6d	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Intermediate Speed Rail (110mph)	2.6	$ 23.9	78.8

Figure 4.31 clearly demonstrates the differences between the full and partial systems. The partial systems follow the order of the "matching" full systems (Alternatives 1 and 2, 3 and 5, and 4 and 6 are "matching pairs"). Alternative 1 is the highest in terms of ridership and revenue of all alternatives. Alternative 3, the Greenway Alternative, which does not stop at the Orlando Convention Center, has higher revenue but less ridership than Alternative 4, the Greeneway alternative that travels from Disney to the Airport then to the Convention Center. This is caused by the use of Downtown Orlando in alternative 3 instead of the Convention Center station by many Orlando are travelers. Future sections contain more detailed results that show that a majority of the difference in ridership is caused by the lack of Airport access trips. Also, the fare structure contributes to the increase in revenue because some of the trips between Disney Celebration and the Convention Center area are now between Disney Celebration and Downtown Orlando, which does not receive the "urban area" fares.

Figure 4.31 also shows a larger decrease in ridership between Alternative 1D and Alternative 1E than alternative 2D and Alternative 2E. This is because of the long travel time around Tampa Bay defined for alternative 1E, which is not an issue for Alternative 2E because it terminates at Tampa Union Station. The ridership changes by technology are consistent across alternatives.

Figure 4.31: Summary of 2010 Ridership Forecasts for Cross Florida System Alternatives with Medium Fares and Fixed Guideway Access



The most interesting result shown in Figures 4.30 and 4.31 is the importance of serving either Downtown Orlando or the Convention Center Stations. The forecasts show that Alternative 3, which does not serve the Convention Center station, has slightly lower ridership than Alternative 4, which does serve the Convention Center. The Downtown Orlando station in Alternative 3 is able to still attract many of the riders who use the Convention Center in Alternative 4. However, when the partial system that does not serve Downtown or the Convention Center (Alternative 5) is examined, the forecasts show much lower ridership than the partial system that serves the Convention Center but not Downtown (Alternative 6). The loss of reasonable access times to the system in that area drives the ridership down significantly.

Forecast Results for Technology Specific Fares

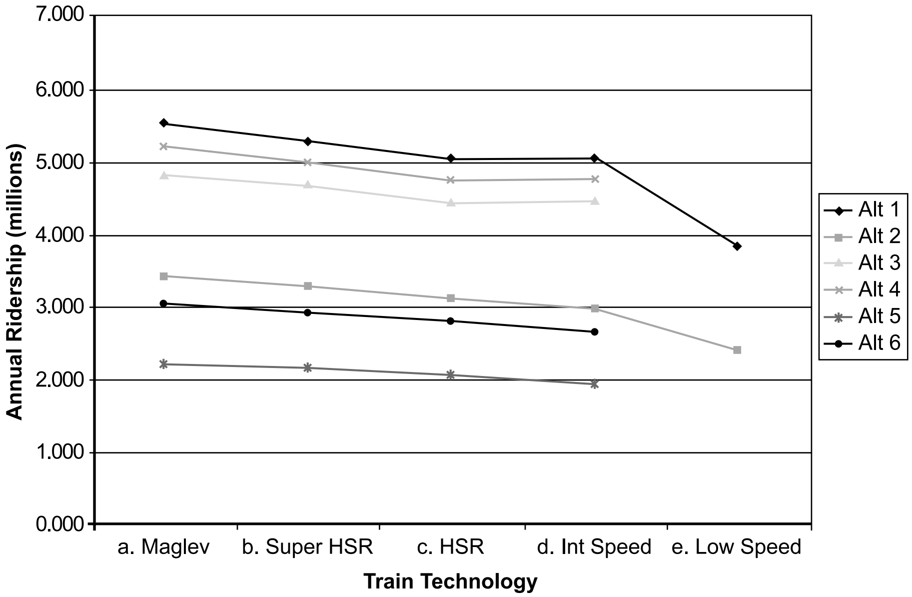
Ridership, revenue and passenger mile forecasts were prepared for Technology Specific fares in the same manner as the common fare analysis. The "Super High Speed" alternatives (Maglev, Super High Speed Rail) were run assuming the high fare, the "High Speed" alternative (High Speed Rail) was run at the medium fare level, and the "Low Speed" alternatives (Intermediate Speed Rail and Low Speed Rail) were run at low fares Figures 4.32 and 4.33 show the results in both tabular and graphical format.

The varying fare structures acts to lower the difference in riders between technology alternatives because more passengers are willing to travel on a slower service if it costs less. At the same time it tends to increase the variation in revenue between technology alternatives. The relative change in ridership between alignment alternatives remains constant with the medium fare structure. These results follow *a priori* expectations: the technology specific fares will cause increased revenue and decreased ridership in the higher cost alternatives and decreased revenue and increased ridership in the lower cost and speed alternatives.

Figure 4.32: Summary of 2010 Forecasted Ridership, Revenue, and Passenger Mile Forecasts for Cross Florida System Alternatives with Technology Specific Fares and Fixed Guideway Access

Route	Alignment	Technology	Ridership (millions)	Revenue (millions)	Passenger Miles (millions)
1a	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando	Maglev (300mph)	5.5	$ 76.4	173.8
1b	same as 1a, with electrification	Super HSR (190mph)	5.3	$ 70.2	159.7
1c	same as 1a, without electrification	HSR (150mph)	5.0	$ 56.6	165.2
1d	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline	Intermediate Speed Rail (110mph)	5.0	$ 40.6	166.5
1e	CSX to Disney, I-4 to Beeline	Low Speed Rail (79 mph)	3.8	$ 28.8	132.4
2a	Tampa Union Station to DT Orlando, I-4 with CSX potential	Maglev (300mph)	3.4	$ 44.0	103.9
2b	Tampa Union Station to DT Orlando, I-4 with CSX potential	Super HSR (190mph)	3.3	$ 40.6	96.1
2c	Tampa Union Station to DT Orlando, I-4 with CSX potential	HSR (150mph)	3.1	$ 32.6	98.2
2d	Tampa Union Station to DT Orlando, I-4 with CSX potential	Intermediate Speed Rail (110mph)	2.9	$ 21.0	88.4
2e	Tampa Union Station to DT Orlando, I-4 with CSX potential	Low Speed Rail (79 mph)	2.4	$ 15.6	65.7
3a	I-4 to Greeneway, DT Orlando and Beeline	Maglev (300mph)	4.8	$ 72.9	162.7
3b	I-4 to Greeneway, DT Orlando and Beeline	Super HSR (190mph)	4.6	$ 66.9	148.9
3c	I-4 to Greeneway, DT Orlando and Beeline	HSR (150mph)	4.4	$ 54.5	156.9
3d	I-4 to Greeneway, DT Orlando and Beeline	Intermediate Speed Rail (110mph)	4.4	$ 39.0	157.0
4a	I-4, Greeneway, CC, DT Orlando, Beeline	Maglev (300mph)	5.2	$ 69.0	158.9
4b	I-4, Greeneway, CC, DT Orlando, Beeline	Super HSR (190mph)	4.9	$ 63.7	146.5
4c	I-4, Greeneway, CC, DT Orlando, Beeline	HSR (150mph)	4.7	$ 51.7	152.1
4d	I-4, Greeneway, CC, DT Orlando, Beeline	Intermediate Speed Rail (110mph)	4.8	$ 37.5	153.0
5a	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Maglev (300mph)	2.2	$ 30.2	74.2
5b	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Super HSR (190mph)	2.1	$ 28.3	70.0
5c	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	HSR (150mph)	2.0	$ 22.8	71.9
5d	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Intermediate Speed Rail (110mph)	1.9	$ 14.5	64.9
6a	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Maglev (300mph)	3.0	$ 39.4	99.5
6b	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Super HSR (190mph)	2.9	$ 36.2	92.2
6c	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	HSR (150mph)	2.8	$ 29.7	96.0
6d	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Intermediate Speed Rail (110mph)	2.7	$ 19.0	87.3

Figure 4.33: Summary of 2010 Ridership Forecasts for Cross Florida System Alternatives with Technology Specific Fares and Fixed Guideway Access



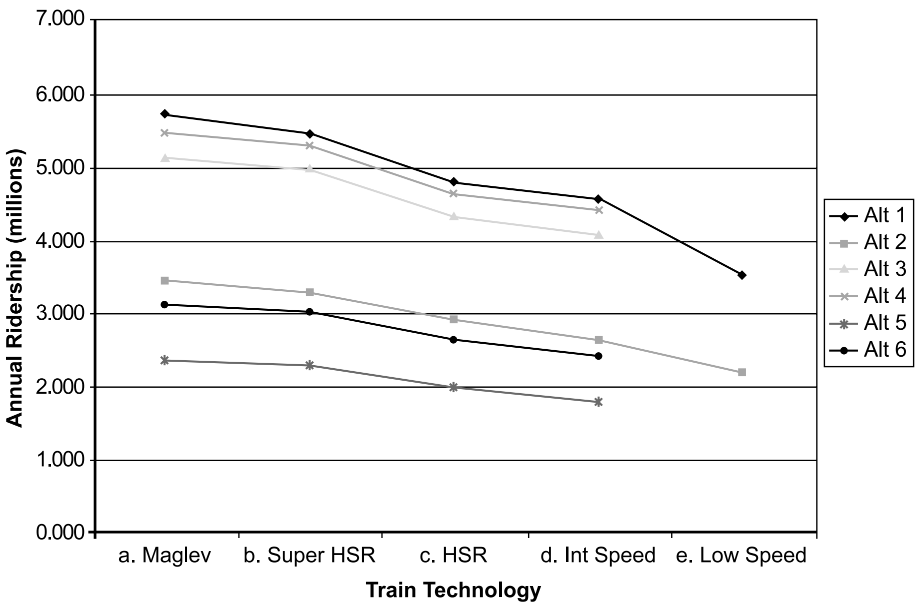
Forecast Results for Common Fares with No New Fixed Guideway Service

In addition, forecasts were prepared assuming that the adopted plan of Fixed Guideway access to the Cross Florida System is not available in the Tampa or Orlando urban areas. The loss of the fixed guideway access accounts for a loss of approximately five percent of the ridership per alternative and five to ten percent of the revenue. Figure 4.34 and 4.35 display the forecast results in tabular and graphical formats as provided previously.

Figure 4.34: Summary of 2010 Forecasted Ridership, Revenue, and Passenger Mile Forecasts for Cross Florida System Alternatives with Medium Fares and no Fixed Guideway Access

Route	Alignment	Technology	Ridership (millions)	Revenue (millions)	Passenger Miles (millions)
1a	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando	Maglev (300mph)	5.7	$ 65.5	192.1
1b	same as 1a, with electrification	Super HSR (190mph)	5.5	$ 60.1	175.4
1c	same as 1a, without electrification	HSR (150mph)	4.8	$ 51.8	151.4
1d	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline	Intermediate Speed Rail (110mph)	4.6	$ 47.1	137.2
1e	CSX to Disney, I-4 to Beeline	Low Speed Rail (79 mph)	3.5	$ 33.5	111.1
2a	Tampa Union Station to DT Orlando, I-4 with CSX potential	Maglev (300mph)	3.5	$ 36.1	109.2
2b	Tampa Union Station to DT Orlando, I-4 with CSX potential	Super HSR (190mph)	3.3	$ 33.3	100.9
2c	Tampa Union Station to DT Orlando, I-4 with CSX potential	HSR (150mph)	2.9	$ 28.6	86.9
2d	Tampa Union Station to DT Orlando, I-4 with CSX potential	Intermediate Speed Rail (110mph)	2.7	$ 23.1	71.3
2e	Tampa Union Station to DT Orlando, I-4 with CSX potential	Low Speed Rail (79 mph)	2.2	$ 17.3	54.2
3a	I-4 to Greeneway, DT Orlando and Beeline	Maglev (300mph)	5.1	$ 66.1	191.3
3b	I-4 to Greeneway, DT Orlando and Beeline	Super HSR (190mph)	5.0	$ 61.4	176.5
3c	I-4 to Greeneway, DT Orlando and Beeline	HSR (150mph)	4.3	$ 52.6	151.0
3d	I-4 to Greeneway, DT Orlando and Beeline	Intermediate Speed Rail (110mph)	4.1	$ 47.2	134.6
4a	I-4, Greeneway, CC, DT Orlando, Beeline	Maglev (300mph)	5.5	$ 62.2	183.6
4b	I-4, Greeneway, CC, DT Orlando, Beeline	Super HSR (190mph)	5.3	$ 58.2	171.1
4c	I-4, Greeneway, CC, DT Orlando, Beeline	HSR (150mph)	4.6	$ 49.9	146.8
4d	I-4, Greeneway, CC, DT Orlando, Beeline	Intermediate Speed Rail (110mph)	4.4	$ 45.6	133.4
5a	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Maglev (300mph)	2.4	$ 27.3	85.8
5b	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Super HSR (190mph)	2.3	$ 25.5	80.5
5c	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	HSR (150mph)	2.0	$ 21.8	68.8
5d	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Intermediate Speed Rail (110mph)	1.8	$ 17.2	55.7
6a	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Maglev (300mph)	3.1	$ 33.6	108.5
6b	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Super HSR (190mph)	3.0	$ 31.0	100.2
6c	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	HSR (150mph)	2.7	$ 26.7	86.6
6d	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Intermediate Speed Rail (110mph)	2.4	$ 21.4	70.9

Figure 4.35: Summary of 2010 Ridership Forecasts for Cross Florida System Alternatives with Medium Fares and no Fixed Guideway Access



4.9 Detailed Forecast Results for the Common Fare Structure

The following sections provide more a detailed summary of the ridership and revenue forecast results for the scenario with common fares in the following dimensions:

- Forecast Results by Type of Market
- Forecast Results by Type of Service
- Forecast Results by Station

The first provides a sense of how much ridership and revenue are accounted for by different types of markets served by the Cross-State alternatives – Intercity, Airport Access, and Urban Travel within Tampa and Orlando. The second provides a similar breakout in terms of the type of service that is being provided – longer haul intercity trains versus the shorter haul local/urban service – and ultimately the basis for evaluating the performance of each. The last provides station ridership forecasts in terms of total station activity, ons and offs, which shows the relative changes in station usage among route/technology alternatives.

Forecast Results by Travel Market

Figure4.36 displays the ridership, revenue, and passenger miles by market: Intercity (includes Port Canaveral trips), Orlando Airport Access, Orlando Urban, and Tampa Urban. This market summary provides important insight to the ridership forecasts. While the intercity riders make up between twenty and thirty percent of the total ridership, they make up between fifty to seventy percent of the total revenue. This is due to differences in trip length and pricing, the intercity markets have higher average trip lengths and higher average revenue yields per mile.

Figure 4.36: System Total Ridership by Travel Market

Route 1 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	1.671	2.100	1.077	1.178	6.025
b - Super HSR (190 mph)	1.487	2.052	1.053	1.152	5.744
c - HSR (150 mph)	1.262	1.840	0.923	1.002	5.027
d - Intermediate Speed Rail (110 mph)	1.101	1.801	0.897	0.980	4.779
e - Low Speed Rail (79 mph)	0.665	1.567	0.760	0.669	3.662

Route 2 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	1.105	1.839	0.738	0.050	3.732
b - Super HSR (190 mph)	0.988	1.794	0.726	0.049	3.556
c - HSR (150 mph)	0.829	1.614	0.639	0.043	3.125
d - Intermediate Speed Rail (110 mph)	0.610	1.584	0.630	0.019	2.842
e - Low Speed Rail (79 mph)	0.393	1.381	0.537	0.014	2.325

Route 3 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	1.342	1.590	1.189	1.178	5.299
b - Super HSR (190 mph)	1.200	1.579	1.173	1.152	5.104
c - HSR (150 mph)	1.011	1.405	1.020	1.002	4.438
d - Intermediate Speed Rail (110 mph)	0.859	1.375	0.980	0.980	4.194
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 4 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	1.258	1.991	1.201	1.178	5.628
b - Super HSR (190 mph)	1.134	1.971	1.182	1.152	5.440
c - HSR (150 mph)	0.958	1.755	1.031	1.002	4.746
d - Intermediate Speed Rail (110 mph)	0.835	1.722	0.995	0.980	4.532
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 5 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	0.768	1.284	0.330	0.050	2.431
b - Super HSR (190 mph)	0.698	1.276	0.328	0.049	2.352
c - HSR (150 mph)	0.584	1.139	0.287	0.043	2.054
d - Intermediate Speed Rail (110 mph)	0.429	1.120	0.283	0.019	1.850
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 6 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	0.914	1.730	0.625	0.050	3.319
b - Super HSR (190 mph)	0.808	1.713	0.616	0.049	3.186
c - HSR (150 mph)	0.685	1.529	0.541	0.043	2.799
d - Intermediate Speed Rail (110 mph)	0.498	1.505	0.531	0.019	2.554
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Figure 4.36 (continued): System Total Passenger Miles by Travel Market

Route 1 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$44.3	$10.5	$10.1	$6.7	$71.7
b - Super HSR (190 mph)	$39.0	$10.3	$9.8	$6.5	$65.6
c - HSR (150 mph)	$33.0	$9.2	$8.6	$5.7	$56.5
d - Intermediate Speed Rail (110 mph)	$28.4	$9.0	$8.3	$5.5	$51.3
e - Low Speed Rail (79 mph)	$17.7	$7.8	$7.0	$3.5	$36.1

Route 2 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$28.0	$9.2	$3.7	$0.5	$41.3
b - Super HSR (190 mph)	$25.0	$9.0	$3.6	$0.4	$38.0
c - HSR (150 mph)	$21.0	$8.1	$3.2	$0.4	$32.6
d - Intermediate Speed Rail (110 mph)	$15.3	$7.9	$3.1	$0.1	$26.5
e - Low Speed Rail (79 mph)	$9.9	$6.9	$2.7	$0.1	$19.6

Route 3 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$37.8	$7.9	$16.2	$6.7	$68.7
b - Super HSR (190 mph)	$33.3	$7.9	$15.9	$6.5	$63.7
c - HSR (150 mph)	$28.0	$7.0	$13.9	$5.7	$54.5
d - Intermediate Speed Rail (110 mph)	$23.2	$6.9	$13.3	$5.5	$48.9
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 4 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$34.4	$9.9	$13.4	$6.7	$64.5
b - Super HSR (190 mph)	$30.6	$9.9	$13.2	$6.5	$60.2
c - HSR (150 mph)	$25.8	$8.8	$11.5	$5.7	$51.7
d - Intermediate Speed Rail (110 mph)	$21.9	$8.6	$10.9	$5.5	$47.1
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 5 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$20.2	$6.4	$1.6	$0.5	$28.7
b - Super HSR (190 mph)	$18.3	$6.4	$1.6	$0.4	$26.8
c - HSR (150 mph)	$15.3	$5.7	$1.4	$0.4	$22.8
d - Intermediate Speed Rail (110 mph)	$11.2	$5.6	$1.4	$0.1	$18.3
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 6 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	$25.4	$8.649	$3.1	$0.5	$37.7
b - Super HSR (190 mph)	$22.4	$8.565	$3.1	$0.4	$34.4
c - HSR (150 mph)	$18.9	$7.646	$2.7	$0.4	$29.7
d - Intermediate Speed Rail (110 mph)	$13.6	$7.527	$2.7	$0.1	$23.9
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 1 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	131.078	37.017	23.974	17.969	210.039
b - Super HSR (190 mph)	114.626	36.116	23.324	17.484	191.551
c - HSR (150 mph)	97.041	32.433	20.441	15.273	165.188
d - Intermediate Speed Rail (110 mph)	82.950	31.710	19.712	14.838	149.209
e - Low Speed Rail (79 mph)	52.817	27.611	16.648	22.433	119.509

Route 2 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	79.338	32.807	10.508	1.482	124.135
b - Super HSR (190 mph)	70.479	31.962	10.302	1.452	114.195
c - HSR (150 mph)	59.057	28.799	9.077	1.286	98.220
d - Intermediate Speed Rail (110 mph)	42.969	28.217	8.928	0.589	80.703
e - Low Speed Rail (79 mph)	27.785	24.617	7.605	0.431	60.438

Route 3 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	115.856	29.067	36.127	17.969	199.019
b - Super HSR (190 mph)	101.456	28.866	35.606	17.484	183.411
c - HSR (150 mph)	84.944	25.690	30.969	15.273	156.875
d - Intermediate Speed Rail (110 mph)	69.883	25.163	29.650	14.838	139.534
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 4 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	103.911	33.520	35.008	17.969	190.408
b - Super HSR (190 mph)	91.877	33.217	34.432	17.484	177.009
c - HSR (150 mph)	77.167	29.578	30.039	15.273	152.057
d - Intermediate Speed Rail (110 mph)	65.017	29.021	28.903	14.838	137.779
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 5 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	58.024	24.130	6.206	1.482	89.842
b - Super HSR (190 mph)	52.522	23.991	6.174	1.452	84.140
c - HSR (150 mph)	43.807	21.419	5.399	1.286	71.912
d - Intermediate Speed Rail (110 mph)	31.823	21.051	5.317	0.589	58.779
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Route 6 Alternative

Rail Technology	Intercity	Airport Access	Orlando Urban	Tampa Urban	Alternative Total
a - Maglev (300 mph)	75.484	29.306	14.891	1.482	121.164
b - Super HSR (190 mph)	66.026	29.059	14.644	1.452	111.181
c - HSR (150 mph)	55.908	25.941	12.906	1.286	96.042
d - Intermediate Speed Rail (110 mph)	40.066	25.525	12.640	0.589	78.820
e - Low Speed Rail (79 mph)	#N/A	#N/A	#N/A	#N/A	#N/A

Due to the dual nature of the service provided by the cross Florida system, an important breakout of the forecast results is by the type of service operated. The system operates two general types of service, Intercity and Local. The local service provides only urban service in Tampa and Orlando and Airport Access trips in Orlando. The intercity service provides end-to-end service across the study area and carries urban as well as intercity trips. Figure 4.37 displays the ridership, revenue, revenue passenger miles, and revenue train miles for all route and technology alternatives by the intercity and urban services.

In these tables the ridership is shown as total unlinked riders. That is, those passengers who must transfer to make trips that are not possible on direct service (i.e. transfer at the Orlando Airport or Disney stations to go to Downtown Orlando or Port Canaveral) are counted twice. The revenue and passenger miles for these trips are allocated proportionally to route distance on each type of service. Trips which do not have a transfer and can be served by both Local and Intercity trains are allocated based on the percent of service available in that market.

The ridership between the service types is relatively equal among most alternatives, however the revenue carried on the intercity trains is two to three times the urban service revenue. This follows expectation because of the shorter trip lengths and lower fares offered in the urban areas for local trips and airport access.

Figure 4.38 displays general measures of service performance for each route alternative: Passenger Revenue per Passenger Mile, Passenger Mile per Revenue Train Mile, and Passenger Revenue per Revenue Train Mile. Because technology specific fares were not used in this analysis there is relatively little variation in the revenue per passenger mile across alternatives. Route Alternative 1E is a possible exception, however the change in this measure can be attributed to the different alignment in Tampa more that the technology variation

The passenger miles per revenue train mile and passenger revenue per revenue train mile is always higher for intercity trips, the later sometimes as much as twice the local value. Generally, this corresponds to higher operating ratios for the intercity service over the local service, as more full fare passengers are collected on the intercity trains.

Figure 4.37: Summary of Forecast Results by Type of Service

Route	Alignment	Technology	Ridership		Revenue		Passenger Miles		Train Miles	
			Intercity Train	Local Train	Intercity Train	Local Train	Intercity Train	Local Train	Intercity Train	Local Train
1a	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando	Maglev	3,615,400	2,898,800	$55,207,000	$16,438,000	161,722,000	48,313,000	1,292,100	718,800
1b	same as 1a, with electrification	Super HSR	3,385,800	2,816,400	$49,664,000	$15,938,000	144,729,000	46,821,000	1,292,100	718,800
1c	same as 1a, without electrification	HSR	2,935,800	2,491,400	$42,473,000	$14,078,000	123,692,000	41,492,000	1,292,100	718,800
1d	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline	Int. Speed Rail	2,735,100	2,417,900	$37,675,000	$13,615,000	109,036,000	40,171,000	1,292,100	718,800
1e	CSX to Disney, I-4 to Beeline	Low Speed Rail	2,055,700	1,923,200	$25,488,000	$10,605,000	84,763,000	34,745,000	1,567,200	856,300
2a	Tampa Union Station to DT Orlando, I-4 with CSX potential	Maglev	1,962,200	1,769,600	$32,020,000	$9,312,000	93,781,000	30,354,000	799,800	503,300
2b	Tampa Union Station to DT Orlando, I-4 with CSX potential	Super HSR	1,826,700	1,729,300	$28,901,000	$9,089,000	84,609,000	29,587,000	799,800	503,300
2c	Tampa Union Station to DT Orlando, I-4 with CSX potential	HSR	1,579,700	1,545,300	$24,479,000	$8,109,000	71,744,000	26,476,000	799,800	503,300
2d	Tampa Union Station to DT Orlando, I-4 with CSX potential	Int. Speed Rail	1,339,400	1,502,900	$18,733,000	$7,731,000	55,202,000	25,503,000	789,300	498,000
2e	Tampa Union Station to DT Orlando, I-4 with CSX potential	Low Speed Rail	1,026,900	1,297,800	$12,930,000	$6,627,000	38,456,000	21,983,000	789,300	498,000
3a	I-4 to Greeneway, DT Orlando and Beeline	Maglev	3,167,000	2,220,000	$50,937,000	$17,730,000	150,170,000	48,845,000	1,174,300	786,600
3b	I-4 to Greeneway, DT Orlando and Beeline	Super HSR	2,999,300	2,189,300	$46,263,000	$17,429,000	135,322,000	48,088,000	1,174,300	786,600
3c	I-4 to Greeneway, DT Orlando and Beeline	HSR	2,586,700	1,924,600	$39,270,000	$15,268,000	114,629,000	42,242,000	1,174,300	786,600
3d	I-4 to Greeneway, DT Orlando and Beeline	Int. Speed Rail	2,392,600	1,869,500	$34,169,000	$14,718,000	98,674,000	40,858,000	1,174,300	786,600
4a	I-4, Greeneway, CC, DT Orlando, Beeline	Maglev	3,508,800	2,430,600	$51,110,000	$13,377,000	146,397,000	44,006,000	1,154,600	958,800
4b	I-4, Greeneway, CC, DT Orlando, Beeline	Super HSR	3,350,700	2,352,200	$47,266,000	$12,926,000	134,405,000	42,603,000	1,154,600	958,800
4c	I-4, Greeneway, CC, DT Orlando, Beeline	HSR	2,899,800	2,070,300	$40,341,000	$11,365,000	114,527,000	37,527,000	1,154,600	958,800
4d	I-4, Greeneway, CC, DT Orlando, Beeline	Int. Speed Rail	2,724,000	1,955,300	$36,361,000	$10,729,000	102,281,000	35,498,000	1,154,600	958,800
5a	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Maglev	1,306,700	1,124,400	$22,629,000	$6,086,000	68,184,000	21,659,000	783,100	470,000
5b	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Super HSR	1,235,500	1,116,300	$20,777,000	$6,024,000	62,660,000	21,480,000	783,100	470,000
5c	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	HSR	1,062,700	991,500	$17,510,000	$5,340,000	52,845,000	19,067,000	783,100	470,000
5d	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Int. Speed Rail	890,700	959,600	$13,275,000	$5,014,000	40,498,000	18,282,000	772,600	464,700
6a	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Maglev	1,698,000	1,620,600	$29,086,000	$8,567,000	90,219,000	30,945,000	884,800	520,800
6b	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Super HSR	1,584,100	1,601,400	$25,986,000	$8,449,000	80,631,000	30,550,000	884,800	520,800
6c	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	HSR	1,376,000	1,423,100	$22,192,000	$7,498,000	68,915,000	27,128,000	884,800	520,800
6d	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Int. Speed Rail	1,169,200	1,384,300	$16,792,000	$7,138,000	52,635,000	26,186,000	874,200	515,500

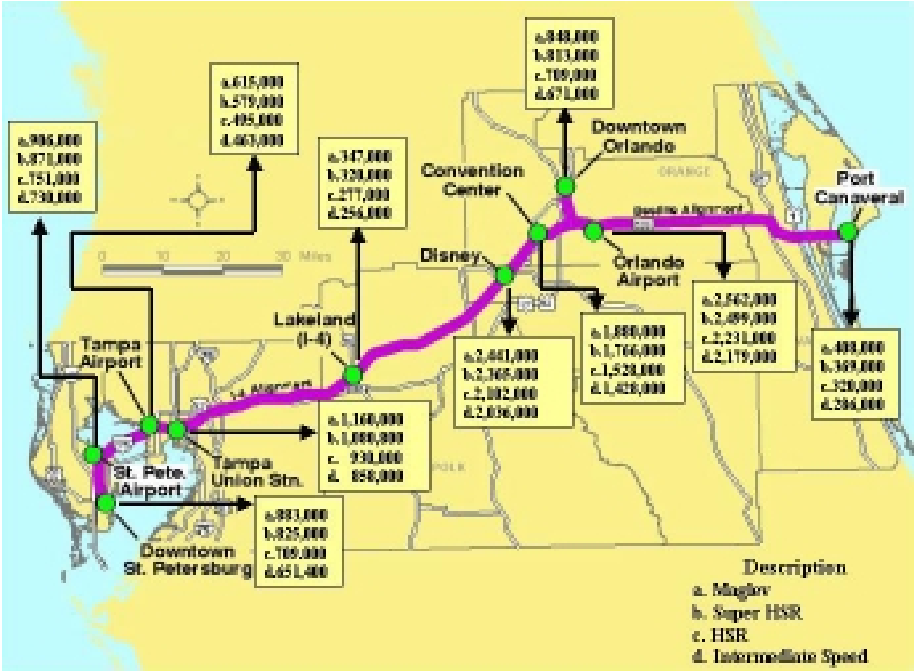
Figure 4.38: Operation Parameters by Service Type

			Revenue/ Pass Mile		Pass Mile/ Train Mile		Revenue/ Train Mile	
Route	Alignment	Technology	Intercity Train	Local Train	Intercity Train	Local Train	Intercity Train	Local Train
1a	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando	Maglev	$0.341	$0.340	125.2	67.2	$42.73	$22.87
1b	same as 1a, with electrification	Super HSR	$0.343	$0.340	112.0	65.1	$38.44	$22.17
1c	same as 1a, without electrification	HSR	$0.343	$0.339	95.7	57.7	$32.87	$19.59
1d	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline	Int. Speed Rail	$0.346	$0.339	84.4	55.9	$29.16	$18.94
1e	CSX to Disney, I-4 to Beeline	Low Speed Rail	$0.301	$0.305	54.1	40.6	$16.26	$12.38
2a	Tampa Union Station to DT Orlando, I-4 with CSX potential	Maglev	$0.341	$0.307	117.3	60.3	$40.04	$18.50
2b	Tampa Union Station to DT Orlando, I-4 with CSX potential	Super HSR	$0.342	$0.307	105.8	58.8	$36.14	$18.06
2c	Tampa Union Station to DT Orlando, I-4 with CSX potential	HSR	$0.341	$0.306	89.7	52.6	$30.61	$16.11
2d	Tampa Union Station to DT Orlando, I-4 with CSX potential	Int. Speed Rail	$0.339	$0.303	69.9	51.2	$23.73	$15.52
2e	Tampa Union Station to DT Orlando, I-4 with CSX potential	Low Speed Rail	$0.336	$0.301	48.7	44.1	$16.38	$13.31
3a	I-4 to Greeneway, DT Orlando and Beeline	Maglev	$0.339	$0.363	127.9	62.1	$43.38	$22.54
3b	I-4 to Greeneway, DT Orlando and Beeline	Super HSR	$0.342	$0.362	115.2	61.1	$39.40	$22.16
3c	I-4 to Greeneway, DT Orlando and Beeline	HSR	$0.343	$0.361	97.6	53.7	$33.44	$19.41
3d	I-4 to Greeneway, DT Orlando and Beeline	Int. Speed Rail	$0.346	$0.360	84.0	51.9	$29.10	$18.71
4a	I-4, Greeneway, CC, DT Orlando, Beeline	Maglev	$0.349	$0.304	126.8	45.9	$44.27	$13.95
4b	I-4, Greeneway, CC, DT Orlando, Beeline	Super HSR	$0.352	$0.303	116.4	44.4	$40.94	$13.48
4c	I-4, Greeneway, CC, DT Orlando, Beeline	HSR	$0.352	$0.303	99.2	39.1	$34.94	$11.85
4d	I-4, Greeneway, CC, DT Orlando, Beeline	Int. Speed Rail	$0.355	$0.302	88.6	37.0	$31.49	$11.19
5a	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Maglev	$0.332	$0.281	87.1	46.1	$28.89	$12.95
5b	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Super HSR	$0.332	$0.280	80.0	45.7	$26.53	$12.82
5c	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	HSR	$0.331	$0.280	67.5	40.6	$22.36	$11.36
5d	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA	Int. Speed Rail	$0.328	$0.274	52.4	39.3	$17.18	$10.79
6a	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Maglev	$0.322	$0.277	102.0	59.4	$32.87	$16.45
6b	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Super HSR	$0.322	$0.277	91.1	58.7	$29.37	$16.22
6c	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	HSR	$0.322	$0.276	77.9	52.1	$25.08	$14.40
6d	Tampa Union Station to DT Orlando, I-4, Greeneway, CC	Int. Speed Rail	$0.319	$0.273	60.2	50.8	$19.21	$13.85

Forecast Results by Station

The following eight exhibits display the station ridership activity on a map of each alternative. Figure 4.39 displays the station activity for route alternatives 1A-1D. Figure 4.40 displays the station activity for alternative 1E. They are shown on different maps because of different alignments in Tampa and along the I-4 corridor between Tampa and Orlando. Route Alternative 1E, the low speed rail alternative, is along existing CSX rail line while the higher speed alternatives, A-D, are on new track in some locations. This holds for Route Alternative 2 in Figures 4.41 and 4.42 as well.

Figure 4.39: Station Activity for Alternatives 1A-1D



In Figure 4.40, the Orlando Airport station is consistently the most active station, followed closely by the Disney Celebration station. Lakeland is consistently the least active station. The large drop in ridership between technology alternatives 1D and 1E shown in a previous chart is repeated in the difference between Figure 4.39 and 4.40. The different alignment and slower travel speeds in Alternative 1E cause a larger decrease in ridership than between the other technology alternatives. Examination of the specific differences shows that the difference in ridership in the Tampa area is approximately 35%. However the Orlando Airport difference is only 13%. This relative difference in ridership is caused by the increase in travel time around Tampa Bay in alternative 1E.

Figure 4.40: Station Activity for Alternative 1E

The changes in station activity due to train technology remain consistent across alternatives. These exhibits aid in demonstrating the importance of station location and inclusion in the route alternative.

Figure 4.41 displays the station activity for Alternatives 2A, B, C, and D. This partial system alternative follows the general trends of the full system in alternative 1 with the exception that Tampa Airport, the Convention Center, and Orlando Airport have less of a drop of from the full system as the other alternatives because they are able to attract trips from the St. Petersburg and Downtown Orlando Areas which are no longer served. Route Alternative 2D does not have a Station Activity value for Tampa Airport because low speed technology alternatives terminate at Tampa Union Station for all partial systems. Alternative 2E is displayed in Figure 4.42 and has similar changes to Alternative 1, except not a dramatic because the change in distance is much less since the route alternative terminates at Tampa Union Station.

Figure 4.41: Station Activity for Alternative 2A-AD

Figure 4.42: Station Activity for Alternative 2E

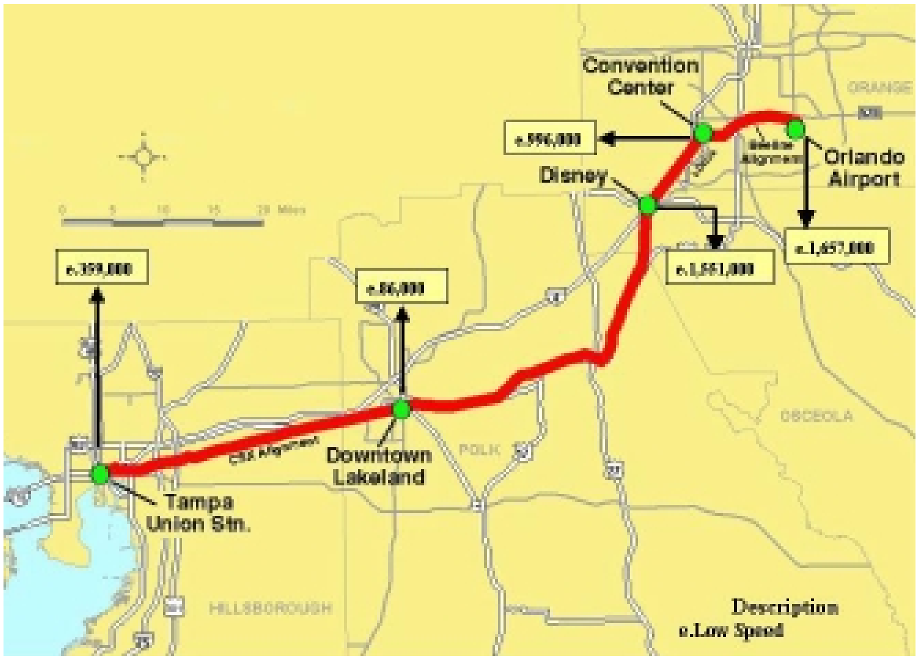
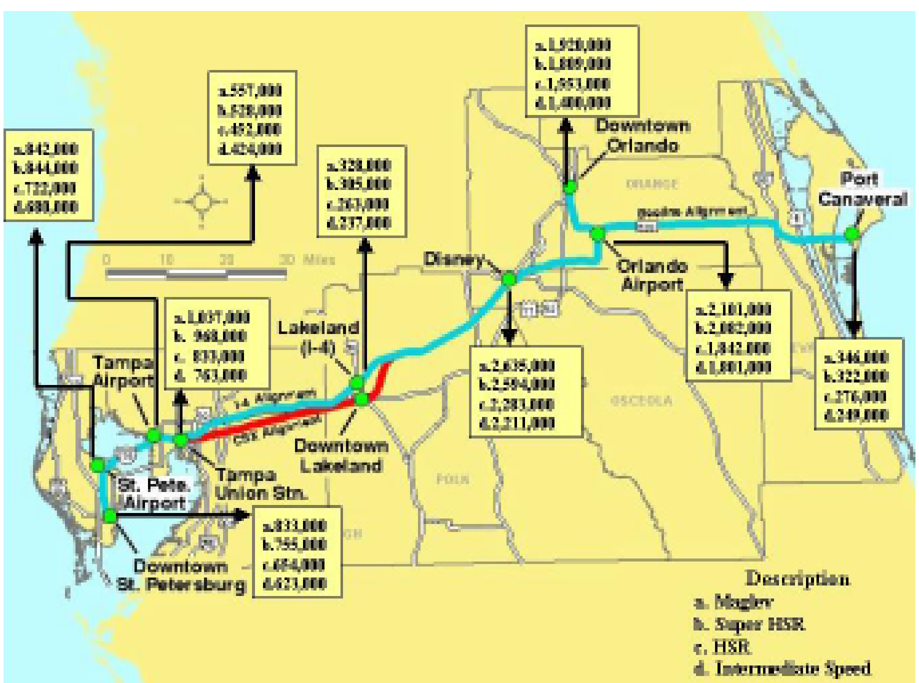


Figure 4.43 shows the Station Activity for Route Alternative 3. This exhibit displays the large increase in activity at the Downtown Orlando station when the Convention Center Station is removed. Although the Disney station also increases over Alternative 1, the general trend of the stations is down, especially for the Orlando Airport station.

Figure 4.43: Station Activity for Alternative 3



The Route Alternative 4 Station Activity is shown in Figure 4.44. This exhibit shows the relatively small increase across the entire system when the Convention Center is reinserted into the system. Due to the service plan in and around Orlando, the station activity in Tampa is slightly lower. The Convention Center station has much lower station activity than in Alternative 1 due to the longer travel times in the intercity and Orlando Urban markets. The Airport Access market is however improved due to more direct times to the airport from Disney Celebration.

Figure 4.44: Station Activity for Alternative 4

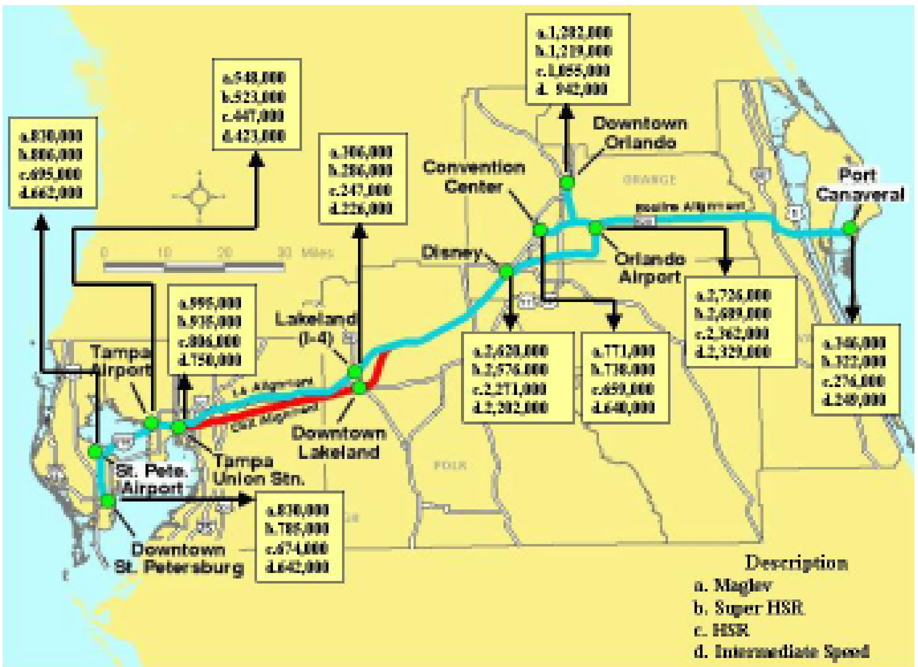
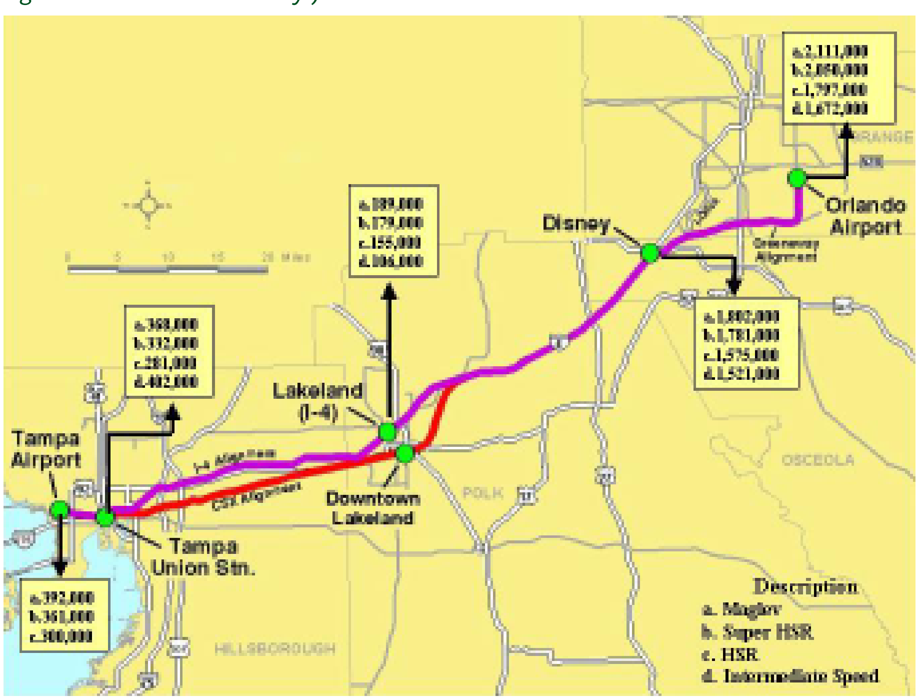


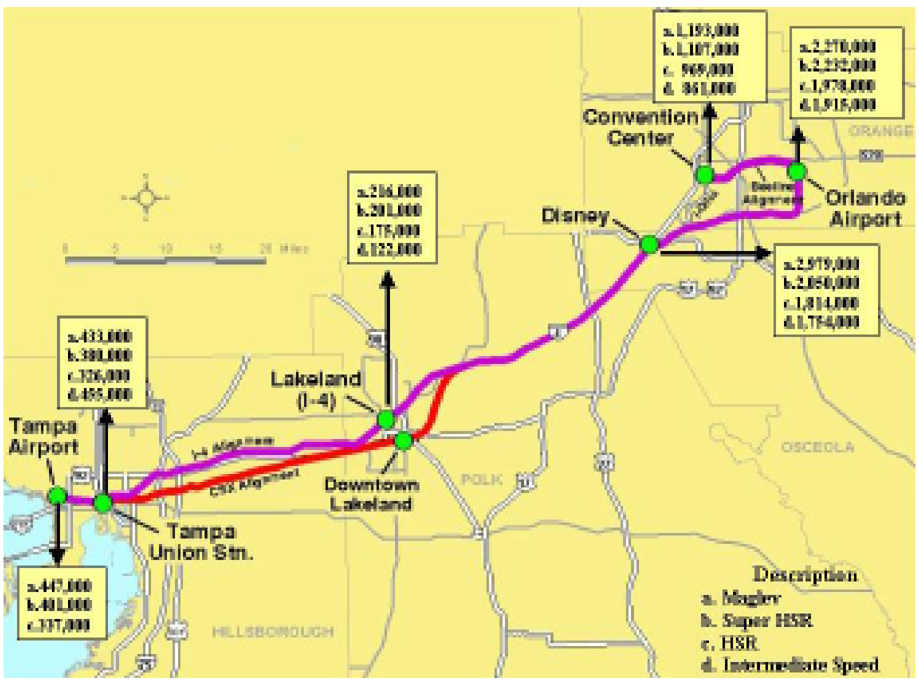
Figure 4.45: Station Activity for Alternative 5



Alternative 5 is the partial system of Alternative 3 and is displayed in Figure 4.45. The large decrease in the Tampa Urban markets is evident from the very low Station Activity at the Tampa Airport and Tampa Union Station. Additionally, the exclusion of both the Convention Center and Downtown Orlando lowers the total station activity in the Orlando Area from over seven million in Route Alternative 1 to three million in Route Alternative 5. The Tampa Airport Station does not have Station Activity values for Technology Alternative D in Route Alternative 5 and 6 because Technology Alternative D terminates at Tampa Union Station.

Alternative 6, the partial system version of Alternative 4, displayed in Figure 4.46, shows the importance of serving either Downtown Orlando or the Convention Center, as Total Station Activity in the Orlando Area increases to over six million.

Figure 4.46: Station Activity for Alternative 6



5.0 Freight Analysis

Revenues from freight transport are one source that could help defray the need for outside sources of funding. The following freight analysis evaluates whether express/parcel, specialized services or other potential freight or products that heretofore have not moved by rail or are presently carried by truck or parcel van could help support new railroad construction or operations.

5.1 Potential Freight Markets

In determining the potential freight market, it is necessary to identify the types and amounts of freight currently moving within the six-county study area; study the logistics patterns of how and why existing freight moves in this manner; and ultimately suggest potential future freight opportunities.

The source of this freight data is 1999 commodity flow data extracted from the TRANSEARCH commodity flow database by Reebie Associates. The source of the truck freight information is a data exchange program between Reebie and motor carriers. The rail data is based on the national Waybill Sample. Information from these sources was used to estimate freight transport patterns and volumes. It is important to note that large databases of this kind are largely statistical. That being said, the TRANSEARCH database is the best available source of its kind. TRANSEARCH is in use by virtually all major U.S. railroads and by more than a hundred motor carrier companies and several container ship lines and air cargo carriers. This database is also used by state and federal planning agencies, as well as port authorities, equipment suppliers, investment banks, and judicial and regulatory bodies. This information source is reliable and has been validated in use by other successful studies; it is considered by the Study Team to be more than adequate to evaluate freight market potential within the Cross-Florida study region.

The counties evaluated include Pinellas, Hillsborough, Polk, Osceola, Orange and Brevard. The study area is comprised of four distinct areas:

1. Greater Tampa Bay (Pinellas and Hillsborough Counties)

2. Polk County

3. Central Florida (Osceola and Orange Counties)

4. Brevard County

The reason for dividing the study area in this manner is to determine type and amount of freight moving within, between, and through it.

5.2 Study Region Freight Flows

To understand potential opportunities for future freight capture, it is important to evaluate logistical patterns of existing freight flows. Florida's major transportation patterns and infrastructure are geographically configured in a north/south manner. These patterns follow the state's peninsular layout, on a north/south axis with major urbanized areas arrayed in a north-south configuration,. Jacksonville to the north, Orlando/Tampa/Lakeland in the center of the state, and Ft. Lauderdale/ Miami to the south. The state's inherent layout was the basis for designing and constructing the railroad access lines such as the Atlantic Coast Line in West Florida and the Florida East Coast Railway in the late1800s and early 20th century, respectively. Much later, in the 1960s and 70s, due largely to the geography and population growth patterns initiated by the railroads, the Federal Eisenhower Interstate Highway System, I-75 and I-95, was designed and constructed to provide direct access for personal travel and commerce into Central and South Florida population centers. East-west patterns of population growth and consumption were a much later phenomenon. In fact the Tampa/Lakeland/ Orlando/Spacecoast corridor is today Florida's first east-west megalopolis for the 21st century. Because this is a "new" phenomenon for this region, trade and commerce patterns in this east-west corridor are underdeveloped and contingent upon the effects of next generation global trade patterns and developing markets.

5.3 Existing Market Freight Movements

There is a projected 15.8 million tons of freight travel within the study area via all modes of transport (Appendix C). Greater Tampa Bay is the largest destination accounting for more that half of this tonnage at over 8.6 million followed by Polk County at over 5 million tons. Of the 8.6 million tons destined for Greater Tampa Bay, only 2.5 million tons originate in that area. The same cannot be said of Polk County with 3.8 of the 5 million tons originating within the county.

However, Polk County exports over 5.5 million tons to Greater Tampa Bay, the majority of which is dry bulk and liquid bulk. A majority of this freight is phosphate aggregate transported short-haul by rail and some by truck from the "Bone Valley" mines southeast of Tampa and south of Lakeland in Polk County.

Express/Parcel Service represent a negligible volume of freight traffic moving between the Greater Tampa Bay region and Brevard County. As the data tables indicate, the majority of such parcels originate and terminate in the Central Florida region (Osceola and Orange Counties) at 60 thousand tons with the Greater Tampa Bay region a close second at 58 thousand tons. Less than one percent (178 thousand tons) of the total tons of freight for all commodities between the regions (15.8 million tons) is represented by this commodity category. No significant traffic in this category moved in 1999 by surface transport between the endpoints of Brevard County and the Greater Tampa Bay region.

A full 81 percent of Express/Parcel Service moves exclusively by truck and over 76 percent moves within the urbanized areas in Greater Tampa and Central Florida (Appendix C). None of this traffic currently moves by rail. The data suggests that this commodity is moving into the Tampa and Central Florida region by long-haul truck and by air. Recent discussions with Greater Orlando Aviation Authority personnel confirm that all such traffic is handled exclusively by private express mail/parcel carriers that own long-haul trucks, local delivery straight trucks and aircraft such as UPS, FEDEX, DHL. Deliveries are made to central sorting facilities in proximity to the Tampa and Orlando International Airports and distributed daily throughout urban areas. The data appears to validate this observation. Mail/Parcel Service as a potential revenue source for the Cross-Florida Rail initiative appears questionable. Diversion of this traffic would be in direct competition with private carriers specializing in such movements; not capturing "new" traffic as intended.

The 15.8 million tons of freight moving within the study region in 1999, 5.5 million tons or 35 percent representing all commodity groups moved exclusively by truck (Appendix C). The most significant commodity moved for all regions is containerized, representing 44 percent of the truck total volume or 2.4 million tons. Containerized products, a potential source and significant volume for at least some high value, a low volume freight, at first glance appears to be a market that offers a potential for diversion to rail. Noteworthy for all commodity groups (break bulk, container, dry bulk, trailer on flatcar, express and liquid bulk), a full 65 percent of all truck movements occur exclusively within the Greater Tampa Bay region. Containerized truck traffic representing 44 percent of total truck freight volume is a fairly large potential market for such traffic. However, because of the short-haul nature of these moves (around 150 miles) between Brevard County and the Greater Tampa Bay region and their associated cost considerations, the success of diverting truck flows to rail is highly dependent on the level of service offered by rail. In other words, although containers are an opportunity cargo for rail in general, this freight lane is shorter than what is conventionally considered as truck-competitive. Therefore, the likelihood of diverting container cargo in this corridor from truck to rail is likely dependent on non-market influences, or on technological innovations that will make the service in question more truck-competitive.

Of all of the total 1999 rail tons by commodity group within the study region, nearly all of the 9.6 million-tons total originates and/or terminates within the Hillsborough, Pinellas and Polk Counties (Appendix C). The majority of this tonnage represents dry bulk (phosphate-related) product moving either within Polk County (48 percent) or from Polk County to Hillsborough or Pinellas (48 percent). Liquid bulk commodities are second at 2 million tons or 21 percent of the total tons moving by rail. Again, the data emphasizes that dry bulk phosphate-related product is moving to and from the Port of Tampa via truck and rail primarily for foreign export.

Very little product of the six major freight commodity groups is transported modally by air or water within or between end points of the study region[6]. This would indicate that all such movements originate and/or terminate at points outside the study region.

5.4 Future Market Freight Movements

Given existing freight levels and existing consumption patterns, empirical data (presented in the previous section) confirms that long-term potential for capture of freight moving east-west within this corridor, represents a marginal prospect for securing complementary revenues in support of either operations or capital requirements for an additional rail carrier within the region. Recent discussions with regional freight stakeholders, coupled with review of the existing data, suggest the potential for growth in certain rail transported bulk commodity if public policy decisions are made to support changes in logistics patterns within the region. However, coal, the commodity involved is highly market competitive, subject to proprietary contract rates, and moves based on demand sensitivity.

Discussions with freight carriers and intermodal facility operators about future freight potential reveals the following issues (Appendix C):

Originating and terminating freight moves within the Brevard /Hillsborough-Pinellas corridor are 150 miles or less. As a result, cost factors which favor truck over rail are prevalent. It is important to note that for intermodal freight traffic (trailers/containers) to move by rail, the accepted minimum distance is 500 miles. For rail, it requires this minimum distance to effectively erase the transport savings by truck and terminal costs associated with double-handling at origin and destination.

Additionally, several recent studies were examined as to their relevance to freight diversion analysis on systems similar to the Cross-Florida Rail Initiative (Appendix C). Each of these studies attempted to quantify and project freight revenues that could be captured or diverted to offset operating costs of a “new” fixed-guideway system. Perhaps the most relevant and recent was the *Florida Maglev Deployment Program* study, conducted by Frederic R. Harris, Inc. In this study, potential for capture of freight container traffic between Port Canaveral and the Orlando Urban area was examined.

The *Florida Maglev Deployment Program* study found that projections for container movements between the Port and Orlando were estimated to increase by 25 percent in year 2000 (to 29,635 containers annually). Thereafter they would increase modestly, by 4 percent on average per year, through 2011. However, recent discussions with representatives of Port Canaveral confirm that although they have completed the Phase I six acre container roll-on/roll-off (Ro-Ro) facility at the port in late 1999, they have yet to secure a scheduled move or port call by a ship line for the facility. The total number of containers generated to date from the seaport according to the Year 2000 Seaport Mission Plan is 787. Marketing personnel at the port are working diligently to secure a contract move for lightering operations with the Hutchison Group-Freeport, Bahamas. This contract would involve either citrus-based containerized product or other containerized consumer products which could be broken down at the Freeport container hub and transloaded to smaller, faster, "lighter" ships and barges for delivery to east coast ports (i.e. Canaveral). Port management indicates that all such containerized traffic will move by truck to consumer markets including Orlando and Tampa due to flexibility, frequency, and lower operating costs of truck over rail.

Estimates from the *Florida Maglev Deployment Program* study indicate that total trucking cost for container movements including shipping costs, port transfer fees and inland transportation costs from Port Canaveral to the Orlando Urban area are approximately $225 dollars per box. This is high when compared to drayage from other regional seaports such as Miami or Ft. Lauderdale. These costs are high because of the large number of "dead-head" back-hauls from Orlando in an easterly direction to the seaport. Net revenues per box were estimated between $50-$150 or approximately $2-$6 dollars per ton on average. Total revenues per box were estimated between $9-$15 dollars per ton on average, and were used in the WSA revenue projection analysis (Appendix).

When asked what was the seaport's highest priority freight mobility project for the region, widening of the Beeline Expressway, S.R. 528, from four lanes to six lanes was the answer. When asked whether rail access would provide a revenue-producing alternative for the port, the answer was that high-speed rail technology (conventional rail, maglev, etc.) would be beneficial to the port, but only for movement of passengers and baggage to and from Orlando's attractions and the seaport's cruise operations areas. Likewise, when these same inquiries were made of personnel at the Port of Tampa and Port Manatee, the response given was that because of the bulk nature of marine facilities in the Tampa Bay region, rail traffic to and from the port (Port Tampa) is driven by bulk phosphate export; including chemicals and phosphates transported by CSX Transportation through Lakeland on their "S" Line via Ocala and points north. To move such products east or west over a "new" railroad would add an additional handling move (and cost) when transloaded for a northbound destination. Further, even if the move were a one-train, one-haul operation, the routing would be circuitous and add prohibitive operating costs per ton-mile (fuel and labor) to the cost of transport making it uncompetitive versus truck or the present railroad routing.

The other cited studies examined corridors of 300-800 miles in length having established consumption and hub freight operations where substantial domestic container movements were prevalent in volume and frequency providing opportunity for diversion from truck to rail. Even with these distances, the greatest being the Atlanta to Dallas corridor examined in the Gulf Coast Maglev Deployment Project at 800 miles in length, corridor level freight projections yielded only $763 million dollars by year 2020 or approximately $27 million dollars per year assuming a modest 4% per year growth rate in a much longer, high density freight corridor. These conditions and synergies are not prevalent in the existing east-west trade lanes between Brevard County and the Greater Tampa-Bay Urban Area.

Discussions were also held with Orlando-area United States Postal Service traffic management as to their likelihood of utilizing an east-west railroad network for moving mail and/or small parcels via this mode. Indications are that loaded semi-trailers essentially bring mail from the south (Miami/Ft. Lauderdale) and from the north (Jacksonville) daily for sorting and delivery within the Tampa Bay and Orlando regions. However, east-west loaded postal moves and major north-south loaded postal moves out of the corridor region are not prevalent. Long-haul postal drivers utilize the Florida Turnpike and I-4 and I-75 almost exclusively for *empty* back-haul transport to points north and south. Management indicated that potentially, once cost factors are evaluated and known, empty boxes moving from the Tampa/Orlando areas could be considered for movement by an east-west train to postal hubs located in the Jacksonville and Miami areas. Sorting and local urban distribution would continue to be made by straight trucks and short-haul delivery trucks within the urban areas of Tampa and Orlando regardless of whether a Cross-Florida Rail network were available.

CSX Transportation (CSXT) and Florida East Coast (FEC) Railway were also consulted regarding their positions and interest in the Cross-Florida Rail initiative. From both carriers' perspectives, it appears to be a matter of market share preservation, or in the case of the FEC, also market share enhancement. Currently, from a Central Florida regional perspective, significant volumes of coal from mines located in the State of Kentucky move by single line-haul on CSXT's network through Jacksonville and south along the company's "A" line through Palatka, Sanford, and urban Orlando to a coal-fired plant located south and to the east of Orlando International Airport (Orlando Utilities Company Stanton Plant). Currently, this coal moves in seven (7) day cycles by dedicated unit trains. Projections from railroad sources indicate that this volume could potentially increase by 2007. FEC currently does not have access to this revenue move. Should an east-west connection be constructed at public expense (or at public expense with assistance from the FEC), such access and a competitive situation might be created to that railroad's benefit. Although slow-moving coal trains are not usually compatible with high-speed passenger operations in the same operating corridor (for operational and safety reasons), because frequency for the projected freight move for coal in the corridor is low and initial capacity created by an east-west rail link would be high, scheduling passenger and limited coal train movements on the same track might prove feasible. It should be emphasized that tonnage movements, such as coal, grain, ores, etc. of any significance, demand excessive track maintenance (costs), which is further exacerbated on track maintained for high-speed trains and passenger operating standards. Further, terminal times related to pick-ups and set-outs necessarily reduce passenger train speeds on single-track railroads; when financially feasible carload freight should, in almost all cases, run in separate trains preferably on separate tracks, at slower speeds.

Conversations with cargo management at Greater Orlando Aviation Authority validate the TRANSEARCH data presented in Table 2 that express/parcel business is flown and trucked into the corridor region by privately owned specialized carriers from points North (outside Florida's state boundary) and from the South (Miami) from regional hubs and then sorted at company- owned facilities in close proximity to airport facilities in the Tampa Bay and Orlando urban areas. Straight trucks and specialized delivery trucks then distribute such parcels and express packages as demand warrants on a daily basis.

Mail/express operations are typically associated with passenger rail services. Amtrak express has the federal franchise (contract) on this business and handles United States Mail, i.e., predominantly second class magazines which command fairly high revenues; it also handles first class mail in the northeast and Florida markets. Amtrak express has also recently expanded into the premium truckload and less-than-truckload business that can be loaded in 48 and 53 foot Roadrailers (truck boxes with rail chassis), and 60-foot boxcars. This has been accomplished because this is truck business that can afford to pay premium rates for premium services, but only in certain highly competitive markets. Amtrak express will not handle hazardous materials under any circumstances.

5.5 Estimates for Revenues and Future Freight Volumes

Wilbur Smith Associates, through review of past study methodologies and from recent discussions with regional freight stakeholders, has developed a very basic model for estimating freight volumes and associated revenues for the time horizons of 2005, 2010, 2015, and 2020 as an element of this preliminary freight analysis (Appendix A – Freight Diversion Tables)

It must be emphasized that due to the Cross-Florida Rail Initiative being at this time non-existent, that current historical traffic patterns for freight are north-south moves and not east-west, i.e.- no significant freight volumes for detail analysis, and that data are limited for commodity specific targets that may be candidates for possible future diversions to the rail system. ***The revenue and volume predictions highlighted in this preliminary analysis are highly speculative and should only be viewed as a means to display possible future scenarios given various assumptions.***

The Study Team looked at existing freight volumes in the Corridor by commodity group and based on the significance of those volumes and contact with carriers and freight stakeholders in the region, determined that express/parcel and freight moving in containers (primarily by truck), may possibly have some future potential for diversion to an east-west rail network (although not significant unless global trade patterns change). All other commodities and their volumes now moving in the region were grouped together to determine (if aggregated), whether diversions from that group may be of significance for future east-west rail freight capture. A "Low", "Mid", and "High" scenario for future revenue and volume diversions was developed. Modest annual growth rates were assumed for all years (3 percent), a diversion rate based on professional judgment and past experience of 10 percent (low), 15 percent (mid), and 20 percent (high) were applied. Market Saturation rates of 50 percent for 2005, 100 percent for 2010, 100 percent for 2015 and 100 percent (maximum diversion) for 2020 were assumed for the container and express/parcel commodity categories. Rates of 50 percent, 75 percent, 100 percent and 100 percent were used for the "All Other Commodity" category as diversions for this catch-all category would take longer to occur. Average revenue rates per ton for each commodity group were developed using system-wide data, data provided by stakeholders, or from previous related study efforts. Given these assumptions and existing corridor freight volumes, the following estimates for **future revenues (R)** and **volumes (V)** for possible diversions were developed:

Capture & Diversions - Express/Parcel ((R) millions of $ & (V) millions of tons)

Scenario	2005 (R)	2005 (V)	2010 (R)	2010 (V)	2015 (R)	2015 (V)	2020 (R)	2020 (V)
Low	.48	.008	1.11	.019	1.29	.023	1.49	.026
Mid	**1.25**	**.013**	**2.91**	**.029**	**3.37**	**.034**	**3.91**	**.039**
High	2.38	.017	5.53	.039	6.41	.045	7.43	.052

Capture & Diversions - Containers ((R) millions of $ & (V) millions of tons)

Scenario	2005 (R)	2005 (V)	2010 (R)	2010 (V)	2015 (R)	2015 (V)	2020 (R)	2020 (V)
Low	.85	.14	2.16	.33	2.92	.38	3.86	.44
Mid	**1.89**	**.21**	4.83	**.49**	**6.22**	**.57**	**7.93**	**.66**
High	3.36	.28	8.56	.65	10.8	.75	13.4	.87

Capture & Diversions - Other Commodities ((R) millions of $ & (V) millions of tons)

Scenario	2005 (R)	2005 (V)	2010 (R)	2010 (V)	2015 (R)	2015 (V)	2020 (R)	2020 (V)
Low	.84	.073	1.45	.13	2.25	.20	2.61	.23
Mid	**1.25**	**.11**	**2.17**	**.19**	**3.36**	**.29**	**3.89**	**.34**
High	1.7	.14	2.89	.25	4.5	.39	5.17	.45

.Mid-range freight capture projections for the Florida Cross-State Rail Corridor for the commodity groups of Express/Parcel, Containers and Other Commodities (the most likely groups where growth will occur for both revenues and volumes) in five year increments from year 2005 through year 2020 are as follows:

Capture & Diversions - All Freight Commodity Groups
((R) millions of $ & (V) millions of tons)

Scenario	2005 (R)	2005 (V)	2010 (R)	2010 (V)	2015 (R)	2015 (V)	2020 (R)	2020 (V)
Mid-range Projection	4.39	.33	9.91	.71	12.95	.894	15.73	1.04

Given the uncertainty of global market conditions and future trade patterns within the Central Florida region, it is very difficult and highly speculative to project future freight potentials within a corridor that currently does not have east-west rail service. ***That being said, over the twenty-year horizon, should an east-west rail link be built within the next five years, approximately 3 million tons of freight could conservatively be expected to be diverted from existing systems or captured due to consumption growth within the region over that time period. Likewise, corresponding total revenues over that 20-year time period given that expected freight volume is estimated to be approximately $43 million dollars.***

5.6 Summary

Review of the commodity flow data and discussions with regional carriers reveal that significant freight movements within the study region at the present time represent short-haul truck (containers) and rail moves of phosphate-related products (originating primarily within the "Bone Valley" region of Polk County). Significant volumes of containerized products (high value/low volume perishables, electronics, jewelry, etc.) move within and between the Brevard/Pinellas County corridor, the most significant commodity group from which one would assume market share might be diverted from truck to rail. Given that existing and potential future container movements are short-haul in nature and in most cases represent service delivery to local consumption points within the greater metropolitan areas and not longer haul high revenue producing movements, the additional capital investment required for freight movement by rail would necessarily require a non-market driven stimulus to be accomplished.

A recent freight market analysis in the Orlando region Mobility Study, revealed that Port Canaveral recently completed the first phase of a container yard to accommodate containerized cargo to capitalize on feeder service opportunities with the Freeport, B.W.I. container transshipment hub. This work included construction of a roll-on/roll-off ramp as well as the widening and strengthening of two north cargo piers and the provision of cargo handling equipment. The facility became operational in late 1999. The port is also extending its south cargo Pier 4 to provide additional berthing capacity on the busy south side of the port, and is building an intermodal gate there for freight access in conjunction with the widening of its main access road, George King Boulevard. These improvements, coupled with ongoing negotiations with potential clients in the Central Florida region, project an estimated 700 containers per year above current levels might be expected near-term. Given existing modal alternatives and cost structures, it is expected that these containers would likely move by truck and utilize the Bee Line Expressway for access to and from the Central Florida region based largely on conversations with Port Canaveral management.

Future coal and container movements within the region will be driven by global trade and consumption patterns and can be influenced to some degree by public policy initiatives (i.e. –building the railroad to influence land use and consumption patterns). These two rail market segments show very limited prospect for diversion from existing transport patterns, however, although expected growth statewide for each commodity group (coal and containers) over the next several years is estimated at 3-4 percent, annually. Potential revenues that may be captured/diverted to Cross-Florida Rail from these sources should it be built are speculative at best.

Express/Parcel shipments do not appear to be a viable revenue source for potential future rail operations in the corridor based on traffic patterns for this commodity and established hub spoke private carrier operations. Recent literature reviews undertaken by consultants to the Midwest Railroad Initiative (a Tri-State High Speed Rail Feasibility Study undertaken by the Wisconsin DOT) with regards to the regional and national express/parcel markets and the previous secondary sources mentioned previously in this study indicates that the overnight shipment market has been increasing at over ten percent annually, however, the major moves occur primarily in north-south and not east-west directions.

It is the STV Team's collective opinion, that freight opportunity for revenue enhancement of the proposed system either near-term (10 years) or longer-term (20 years) is not significant by either volume or by value, and therefore should not be considered a reliable source for future revenues to offset operations or construction of the proposed system.

6.0 Environmental Assessment

The following Environmental Alternatives Evaluation presents the findings of the Central Florida Rail Corridor route alternatives impact evaluation. The six proposed corridor alignments, spanning from St. Petersburg to Port Canaveral, can be found in the Route and Technology Alternatives table (See Figure __ Purpose and Needs). All variations to each individual route can be attributed to the five proposed transit technologies.

The Impact Evaluation Matrix for the proposed alignments was prepared using the four topical categories developed by the Florida Department of Transportation, which is comprised of the following:

- Social Impacts
- Cultural Impacts
- Natural Environment
- Physical Impacts

Each category is further subdivided into several related criteria, for which a designation of "No Involvement", "None", "Minimal", or "Significant" can be assigned as an impact level. The determined designations for each criteria presented in the following evaluation matrix are discussed herein.

6.1 Social Impacts

Land Use Changes

Due to the broad geographic project area and the densely populated neighborhoods that this corridor will be traversing, the potential for land use changes around route alignments and station areas has been assigned a "Significant" level of impact although some of the proposed stations may help to promote transit oriented development (TOD) and spur some commercial and office development.

Community Cohesion

While the Cross-State rail line would utilize an existing right-of-way in many of the proposed routes, it is anticipated that the different types of rail technology along each route might significantly impact the physical and social stability of certain communities. Along Route Alternatives 1, 3 and 4, the proposed project is expected to divide or separate neighborhoods or other community areas. However, along the remaining routes, the project is expected to have a minimal impact on community cohesion.

Relocation Potential

The potential for relocation along most of the rail corridor would be minimal, because the proposed alignments are contained within existing rights-of-way. However, those routes proposed within Pinellas County could require relocation of businesses and residences. As a result, these routes were assigned a "Significant" level of impact.

Community Services

Various schools and public parks are in close proximity to the proposed routes. However the impact of the rail route alternatives on these services are expected to be minimal, since the proposed rail route alternatives lie mostly within existing rights-of-way.

Title VI Considerations

Title VI, Sec. 601 of the *Civil Rights Act of 1964* states that "No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance."

Because the proposed rail route alternatives will follow existing transportation corridors that in many cases predated the surrounding development or have been developed in accordance with the Civil *Rights Act of 1964* (amended by the *Civil Rights Act of 1968*), each rail route alternative was assigned an impact level of "None".

Public Involvement

The potential for public opposition is considered "Significant" for route alternatives that feature the implementation of high-speed technology or that utilize the Beeline Expressway through the wetlands and the St. Johns River area.

Utilities and Railroads

The operation of certain route alternatives on existing CSX tracks in Pinellas, Hillsborough, and Polk Counties to Downtown Orlando will have a significant impact on railroad operations. The implementation of electrified high-speed rail will also have a "Significant" impact on local power demand.

6.2 Cultural Impacts

Section 4(f) Lands

Alignments have been developed to avoid Section 4(f) impacts to maximum extent possible. This criterion has been a "Minimum" level of impact.

Historic Sites/Districts

The project has been assigned a "Minimum" impact level since it is not expected to impact any historic sites/districts.

Archaeological Sites

The project has been assigned a "Minimum" impact level since it is not expected to impact any archaeological sites.

Recreation Areas

The project has been assigned an impact level of "Minimum".

6.3 Natural Environmental

Wetlands

The CSX line runs adjacent to Saddle Creek in Polk County and crosses the Upper Basin Lakes Watershed in Osceola County and Shingle Creek in Orange County. The proposed alignment along I-4 from Tampa to Orlando would pass through the Green Swamp in Polk County, Davenport Creek Swamp, and Reedy Creek Swamp in Osceola County. SR 528 runs from Orlando to Port Canaveral and crosses the Wide Cypress Swamp in Orange County, Econlockhatchee River, Tosohatchee State Reserve in Orange and Brevard Counties, St. Johns River located in the Tosohatchee State Reserve, Indian River Lagoon, Sykes Creek, and Banana River in Brevard County.

Aquatic Preserves

The Banana River located in Brevard County is classified as an Aquatic Preserve. Those alignments that terminate in Cape Canaveral, thereby crossing the Banana River have been assigned a “Significant” level of impact. Additionally, all projects crossing Tampa Bay along I-275 will impact the Pinellas County Aquatic Preserve and have thus been rated as “Significant”.

Water Quality

The project is expected to have “Minimal” impact on water quality.

Outstanding Florida Waters

The Econlockhatchee Water System, St Johns River and the Indian River Lagoon are located within the project area and are classified as Outstanding Florida Water (OFWs). Routes 1, 3 and 4 traverse these OFWs and therefore have been assigned a “Significant” level of impact. There are no OFWs known to run along any of the other routes; therefore they have been designated as “No Involvement” in the matrix.

Wild and Scenic Rivers

Both the St. Johns and the Econlockhatchee Rivers crosses the Beeline Expressway (SR 528) and are listed as wild and scenic rivers. Routes 1, 3 and 4 extend to Cape Canaveral, therefore these routes have been assigned a “Significant” level of impact.

Flood Plains

Protection of floodplains and floodways is required to avoid or minimize encroachments within the 100-year (base) floodplain by transportation projects, where practicable, and to avoid supporting land use development that is incompatible with floodplain values. Based on this premise, Routes 1, 3 and 4 are expected to significantly impact flood plains within the proposed corridors. It is anticipated that the remaining routes would pose little effect to area floodplains and therefore they have been assigned an impact level of “Minimum”.

Coastal Zone Consistency

This criterion is to be determined by the Department of Community Affairs (DCA).

Coastal Barrier Islands

Cape Canaveral is listed as a coastal barrier island and therefore Routes 1, 3 and 4 have been assigned a “Significant” level of impact.

Wildlife and Habitat

The project area traverses through the Ulumay Wildlife Sanctuary (Merritt Island Bird Sanctuary), St. Johns National Wildlife Refuge, and the Banana River Aquatic Preserve. Routes 1, 3 and 4 are expected to pose a “Significant” impact on these habitats. Alternatives 2, 5 and 6 do not cross these areas and thus are considered to have less of an impact on wildlife and habitat areas.

Farmlands

No farmlands are present along the proposed routes.

6.4 Physical Impacts

Noise

The proposed corridor would pass through noise sensitive areas in the cities of Tampa, Plant City, Lakeland, Auburndale, Winter Haven, Haines City, Orlando, Canaveral Groves, Cocoa, Merritt Island as well as noise sensitive areas classified as bird and wildlife sanctuaries or reserves. Due to technology of the high-speed trains, these trains are less likely to cause a substantial increase in the existing noise levels within the corridors. Routes featuring this technology have been assigned an impact level of “Minimum”.

However the low and intermediate speed rail systems that would travel along the existing CSX rail line are expected to produce a significant increase due to the technology and increased train frequency. Intermittent noise will also be a problem with all modes. Sudden noise such as whistles or the noise made by high-speed passing will cause a startle affect for wildlife along the corridor. The non-grade separated technologies will create “Significant” noise impacts due to the whistle law, requiring trains to sound a whistle at all grade crossings.

Air Quality

The greatest impact to air quality would be observed in the low speed train technology and routes utilizing this technology have therefore been assigned an impact level of “Significant”. Since combustion engines are not used in magnetic levitation and the electrified high-speed trains, these technologies would not result in an impact on air quality. However, it is anticipated that the intermediate-speed train, with combustion engines would result in a "Minimal" impact to air quality.

Construction

Construction along existing rail lines, particularly in urban areas, would have significant impacts due to the length of time required to construct road crossings. The construction in the median of I-4, the Greeneway, and the Beeline would have a significant impact because of the requirement to rebuild the bridges, and overpasses along the mainline. Otherwise construction in the median would only have a minimal impact as long as appropriate traffic management policies are followed. The construction of new bridges over Tampa Bay, the Indian and Banana Rivers will require significant coordination during planning and design to assure that any potential impact is thoroughly avoided, minimized, and/or mitigated.

Contamination

Historically, contamination has generally been an issue along existing rail corridors. As a result, Routes Alternatives 1E and 2E are expected to encounter contaminated areas within the railroad right-of-way. Contamination is typically encountered in areas where petroleum and/or hazardous materials spill occur during a transfer between rail cars, tanker trucks and supply depots. Based on this probability, these routes have been assigned a "Significant" level of impact. Those routes along the existing roadway right-of-ways are expected to encounter little or no contamination and have thus been assigned an impact level of "Minimum".

Navigable Water Crossings

Routes 1, 3 and 4 cross over the navigable waterways of Tampa Bay, Hillsborough River, Indian River, and Banana River and have therefore been assigned a "Significant" level of impact.

Visual/Aesthetics

The high-speed technology would require dedicated elevated lines and would therefore pose a "Significant" visual impact for those routes. The low and intermediate speed technology would operate at grade and would follow the existing CSX line and thus the impact is considered to be "None".

Safety

Because the high-speed technology would require dedicated elevated lines, the safety concern for these routes is considered to be "None". Double tracking of the

CSX line would result in bi-directional traffic and increased train frequency along the numerous existing public grade crossings. Therefore a "Significant" impact is expected along Route Alternatives 1E and 2E.

6.5 Summary

If implemented, the Cross-State rail project would span a broad geographic area, impacting land use along the alignments and creating transit-oriented development opportunities at stations across the state. The preferred alignment, recommended by the STV team, would have minimal environmental impact because of its use of existing right-of-way. Moreover, in the first phase, there would be no eastern extension over the sensitive wetland regions. Nor would there be a western extension across Tampa Bay, where there are significant water crossing issues.

7.0 Cost-Benefit Analysis

The cost-benefit analysis has been divided into two tasks. The first task will involve making a qualitative assessment of technologies and narrow the range of potential technologies and alignments to a manageable level. Component two will address alignment alternatives and based on comparing similar alignment alternatives provide a recommendation as to the most cost-effective.

Task 1: Narrowing the Technology Choices

As has been shown in earlier report elements, including the range of technologies with the alignment options provides some 26 different potential options (Figure 7.1). This is clearly too many choices, with too many variables to consider at once. So the challenge is to reduce this number through a reasonable qualitative assessment of technologies that seem to provide the most cost-effective solutions

Figure 7.1: Alternatives, Costs, Ridership, and Revenue

Route	Technology	Capital Cost (in billions)	Operating Cost (in millions)	Ridership (in millions)	Revenue (in millions)	Alignment
1a	Maglev (300mph)	$9.2	$173.1	6.0	$ 71.6	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando
1b	Super HSR (190mph)	$3.9	$73.9	5.7	$ 65.6	same as 1a, with electrification
1c	HSR (150mph)	$3.1	$58.4	5.0	$ 56.6	same as 1a, without electrification
1d	Intermediate Speed Rail (110mph)	$3.0	$47.7	4.8	$ 51.3	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline
1e	Low Speed Rail (79 mph)	$2.3	$60.1	3.6	$ 36.1	CSX to Disney, I-4 to Beeline
2a	Maglev (300mph)	$5.1	$132.6	3.7	$ 41.3	Tampa Union Station to DT Orlando, I-4 with CSX potential
2b	Super HSR (190mph)	$1.4	$46.2	3.6	$ 37.9	Tampa Union Station to DT Orlando, I-4 with CSX potential
2c	HSR (150mph)	$1.2	$38.2	3.1	$ 32.6	Tampa Union Station to DT Orlando, I-4 with CSX potential
2d	Intermediate Speed Rail (110mph)	$1.1	$29.7	2.8	$ 26.5	Tampa Union Station to DT Orlando, I-4 with CSX potential
2e	Low Speed Rail (79 mph)	$1.0	$31.9	2.3	$ 19.6	Tampa Union Station to DT Orlando, I-4 with CSX potential
3a	Maglev (300mph)	$9.0	$171.7	5.3	$ 68.7	I-4 to Greeneway, DT Orlando and Beeline
3b	Super HSR (190mph)	$4.0	$71.2	5.1	$ 63.7	I-4 to Greeneway, DT Orlando and Beeline
3c	HSR (150mph)	$3.3	$60.5	4.4	$ 54.5	I-4 to Greeneway, DT Orlando and Beeline
3d	Intermediate Speed Rail (110mph)	$3.0	$47.9	4.2	$ 48.9	I-4 to Greeneway, DT Orlando and Beeline
4a	Maglev (300mph)	$9.7	$184.3	5.6	$ 64.5	I-4, Greeneway, CC, DT Orlando, Beeline
4b	Super HSR (190mph)	$4.4	$71.3	5.4	$ 60.2	I-4, Greeneway, CC, DT Orlando, Beeline
4c	HSR (150mph)	$3.6	$59.5	4.7	$ 51.7	I-4, Greeneway, CC, DT Orlando, Beeline
4d	Intermediate Speed Rail (110mph)	$3.3	$53.0	4.5	$ 47.1	I-4, Greeneway, CC, DT Orlando, Beeline
5a	Maglev (300mph)	$5.0	$90.9	2.4	$ 28.7	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5b	Super HSR (190mph)	$1.5	$36.4	2.4	$ 26.8	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5c	HSR (150mph)	$1.3	$30.6	2.0	$ 22.8	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5d	Intermediate Speed Rail (110mph)	$1.3	$26.2	1.9	$ 18.3	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
6a	Maglev (300mph)	$5.7	$101.5	3.3	$ 37.7	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6b	Super HSR (190mph)	$1.9	$40.5	3.2	$ 34.4	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6c	HSR (150mph)	$1.7	$34.8	2.8	$ 29.7	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6d	Intermediate Speed Rail (110mph)	$1.7	$29.7	2.6	$ 23.9	Tampa Union Station to DT Orlando, I-4, Greeneway, CC

to get to a manageable set of alternatives that can than be screened through a more empirical process.

The summary of alternatives suggests that there are essentially two route alternatives with derivatives of each of these two comprising the remaining alternatives. Route 1A-E, and Route 2A-E, are essentially the I-4 or CSX corridor with a direct connection to the Orange County Convention Center at the Beeline and an extension to the Orlando International Airport. The Route 1 Alternative is essentially a full build-out alternative, while Route 2 Alternative, the truncated option, represents what might be referred to as a Minimum Operable Segment (MOS).

- Given the extensive research and development that has gone into Maglev technology development over the past twenty years Maglev does appear viable operationally. The challenge has always been cost considerations. As the Table below suggests the capital cost to implement Maglev at this time appears to be prohibitive. Therefore, the STV team is not recommending that Maglev technology be carried further through the analysis (Figure 7.2).

- On the other end of the technology continuum, it is impractical to suggest that a traditional low-speed diesel operation on a new double-track system utilizing the I-4 right-of-way. If we were to propose a low speed system utilizing existing railroad rights-of-way than the 79 mph alternative would remain viable. However, for the purposes of this analysis the 79mph option appears impractical. Therefore, all 79 mph options have been dropped from further consideration (Figure 7.2). Thus it has been established that the technology range will now constrain the analysis around the technologies in the 110 mph-190 mph range.

Figure 7.2: Reducing the Technology Choices

Route	Technology	Capital Cost (in billions)	Operating Cost (in millions)	Ridership (in millions)	Revenue (in millions)	Alignment
1b	Super HSR (190mph)	$3.9	$73.9	5.7	$ 65.6	DT St. Petersburg, I-4, Beeline, CSX to DT Orlando w/ elec.
1c	HSR (150mph)	$3.1	$58.4	5.0	$ 56.6	same as 1b, without electrification
1d	Intermediate Speed Rail (110mph)	$3.0	$47.7	4.8	$ 51.3	DT St. Petersburg, CSX through Lakeland, I-4 to Beeline
2b	Super HSR (190mph)	$1.4	$46.2	3.6	$ 37.9	Tampa Union Station to DT Orlando, I-4 with CSX potential
2c	HSR (150mph)	$1.2	$38.2	3.1	$ 32.6	Tampa Union Station to DT Orlando, I-4 with CSX potential
2d	Intermediate Speed Rail (110mph)	$1.1	$29.7	2.8	$ 26.5	Tampa Union Station to DT Orlando, I-4 with CSX potential
3b	Super HSR (190mph)	$4.0	$71.2	5.1	$ 63.7	I-4 to Greeneway, DT Orlando and Beeline
3c	HSR (150mph)	$3.3	$60.5	4.4	$ 54.5	I-4 to Greeneway, DT Orlando and Beeline
3d	Intermediate Speed Rail (110mph)	$3.0	$47.9	4.2	$ 48.9	I-4 to Greeneway, DT Orlando and Beeline
4b	Super HSR (190mph)	$4.4	$71.3	5.4	$ 60.2	I-4, Greeneway, CC, DT Orlando, Beeline
4c	HSR (150mph)	$3.6	$59.5	4.7	$ 51.7	I-4, Greeneway, CC, DT Orlando, Beeline
4d	Intermediate Speed Rail (110mph)	$3.3	$53.0	4.5	$ 47.1	I-4, Greeneway, CC, DT Orlando, Beeline
5b	Super HSR (190mph)	$1.5	$36.4	2.4	$ 26.8	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5c	HSR (150mph)	$1.3	$30.6	2.0	$ 22.8	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
5d	Intermediate Speed Rail (110mph)	$1.3	$26.2	1.9	$ 18.3	Tampa Union Station to DT Orlando, I-4, Greeneway, OIA
6b	Super HSR (190mph)	$1.9	$40.5	3.2	$ 34.4	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6c	HSR (150mph)	$1.7	$34.8	2.8	$ 29.7	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6d	Intermediate Speed Rail (110mph)	$1.7	$29.7	2.6	$ 23.9	Tampa Union Station to DT Orlando, I-4, Greeneway, CC

Task 2: Refining the alignment options.

Reviewing the alignment alternatives suggests there are two "clusters" of service: one mainly focused on the I-4/Beeline connection and the second "cluster" focused mainly on I-4/Greeneway connection. By focusing on the first route "cluster", Route Alternatives 1 and 2, the number of options can be quickly reduced. By comparing the capital cost, ridership, and operating & maintenance costs we can ascertain that the alternative that provides the most cost-effective utilization of resources is the Route 2 Alternative, the truncated alternative linking Tampa to Orlando via I-4 and the Beeline.

Now that the Route 2 Alternative has been recommended as the preferred alternative in the first stage of the analysis, it is important to identify a comparable alternative from route "clusters" Route Alternatives 3-6, and compare them to the Route 2 Alternative. The Route 6 Alternative provides essentially the same station locations and truncated route alignment as the Route 2 Alternative, with the exception of the former using the Beeline and the latter using the Greeneway.

Conducting the same analysis comparing the Route 2 to the Route 6 Alternative provides us with the basis for comparing similar corridor alternatives, linking similar destinations, and utilizing the same range of technology solutions. Thus the two alternatives can be evaluated evenly.

Figure 7.3: Route 2 vs Route 6 Alternatives

Route	Technology	Capital Cost (in billions)	Operating Cost (in millions)	Ridership (in millions)	Revenue (in millions)	Alignment
2b	Super HSR (190mph)	$1.4	$46.2	3.6	$ 37.9	Tampa Union Station to DT Orlando, I-4 with CSX potential
2c	HSR (150mph)	$1.2	$38.2	3.1	$ 32.6	Tampa Union Station to DT Orlando, I-4 with CSX potential
2d	Intermediate Speed Rail (110mph)	$1.1	$29.7	2.8	$ 26.5	Tampa Union Station to DT Orlando, I-4 with CSX potential
6b	Super HSR (190mph)	$1.9	$40.5	3.2	$ 34.4	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6c	HSR (150mph)	$1.7	$34.8	2.8	$ 29.7	Tampa Union Station to DT Orlando, I-4, Greeneway, CC
6d	Intermediate Speed Rail (110mph)	$1.7	$29.7	2.6	$ 23.9	Tampa Union Station to DT Orlando, I-4, Greeneway, CC

A comparison of the two alternatives suggests that the Route 2 Alternative, truncated Orlando International Airport to Tampa Union Station utilizing the I-4/ Beeline alternative a non-electrified, high-speed technology provides the most cost-effective alternative. Both the Route 2 and Route 6 options are close in terms of costs and benefits. The Route 2 alternative, along I-4, is cheaper to build and has higher ridership revenues. These factors, combined with providing direct connection among major activity centers in Orlando makes it the more favorable option. In both instances the technology option that appears to provide the most ridership for the unit cost is the high speed, non-electrified, 150 mph option.

8.0 Recommended Implementation Strategy

There are a number of key points that have been identified through the course of this analysis. Clearly, this project represents a challenging undertaking, both with regard to technical as well as institutional issues. It is noted that:

- The "best" alternative for implementation would be the full build-out of the Route 1 Alternative, the alignment from St. Petersburg to Port Canaveral using non-electrified steel wheel/steel rail technology. However, given the high capital cost associated with building the entire system as one project and the extensive costs associated with providing the I-4/I-275 median rail envelope in Hillsborough county, it is recommended by the STV team that the project be implemented in phases, thus reducing the initial capital outlay required. The first phase would include building a new double track rail line in the median of I-4 connecting Tampa (Union station) to Disney and the Orange County Convention Center and utilizing portions of the Beeline Expressway from I-Drive/OCCC to the Orlando International Airport. The project team recognizes this will result in lower ridership, however, the incremental cost to build-out the system west to St. Petersburg and east to Port Canaveral is so great that the recommendation to implement the first phase as a new, double-track system from Tampa to Orlando utilizing the I-4 right-of way is the most prudent recommendation at this time. The STV team recognizes that the I-4 corridor rail envelope in Polk county may not be available in the short term due to the Department's plan to construct two additional lanes in the median of I-4 and due to the lack of funding for the full implementation of the I-4 master plan in this section. It is important to the ultimate success of the project that the Florida Department of Transportation recognize the importance of the I-4 corridor in the development of this system. As was pointed out in Chapter 3, the cost to implement an early stage rail envelope in the Polk County corridor could cost upwards of $160 million beyond what the Florida Department of Transportation has programmed at this time. By comparison, if the project was forced to utlize the CSX right-of-way it is expected to cost upwards of $200 million for construction alone. There would likely be additional right-of-way costs that the CSX would impose on the project as well. Therefore, financially, the utility of using the I-4 corridor through Polk County from the outset of the project is not only readily apparent, it is really quite essential to overall project implementation.

- Because the system as studied includes both urban and intercity passenger rail service, the operation of the system will require that some element of public support be provided to supplement project revenues. As with most systems of this nature the public utility is anticipated to exceed the actual farebox revenue and, as such, merits some level of public support. The creative financing work that will be undertaken over the next 90 days will determine how best to structure this additional required revenue.

- This suggests the need for a highly creative financial analysis that maximizes the potential for all revenues that can be brought to bear on the project.

- Freight revenues can help to reduce the operating shortfall.

- Capital costs for the recommended first phase of the system, Route Alternative 2c, will be approximately $1.2 billion. The source of this funding remains uncertain, but in all likelihood the State of Florida will have to contribute a significant share of this capital cost.

The critical elements remaining in the project analysis include the development of a project financing plan that addresses the recommended Route 2 alternative. In addition an economic impact study assessing the potential corridor-wide economic benefits will be conducted. The purpose of these efforts will be to demonstrate that the potential public utility of investing considerable public resources into this project more than outweigh the public cost to invest in the infrastructure and operation of the system. It is critical to the overall viability of the project that these benefits be identified given the understanding that projected revenues will be less than projected costs to implement the project.

Subsequent phases would be implemented based on community support, funding availability, and ridership forecasts that show increased support for the system. There has been considerable interest in eventually linking the proposed Cross-State system to the tourist attraction located in the Space Coast area, in particular the Kennedy Space Center. There is currently a Maglev project undergoing testing that would provide local distribution in the Kennedy Space Center area. Linking to this system ultimately could provide a strong link to a highly attractive tourist destination. A proposed routing from the Beeline to SR 407 through Titusville to the Kennedy Space Center might make for a reasonable second phase of this project, assuming that the local distribution system currently being contemplated is implemented.

Another crucial element of project success involve ensuring that all institutional, business, and community groups throughout the corridor continue to be involved in all levels of the project planning process. To date the Florida Department of Transportation and the STV team have endeavored to meet regularly with all interested groups to maximize the opportunity for public involvement. The process requires that all interested groups participate actively throughout the process and that these groups ultimately support the project in order to maximize the opportunity for successful implementation.

There are other project issues addressed in the body of the report. Specifically, there are a number of critical "institutional" issues that arose during the course of the study that must not be ignored, lest the project lay idle. It is important to bring these issues out early in the process so that if the project can be rationalized technically, other issues don't scuttle it. These "institutional" issues include:

- **Developing Institutional Consensus:** There are a number of potentially viable options and alignments that *could* work in this corridor. The STV team has merely recommended the alignment that we believe, all other things being equal, represents the most effective and efficient alignment to begin the project. Other options are available. What's important is that all entities involved feel that they have had a meaningful opportunity to participate in the process during the course of this study and that all opinions and ideas were given equal time. There are going to be disagreements over the exact route of the alignment. Every rail project undertaken starts with some of these same issues and concerns. The important element is that everyone must agree that the process involves some give, and some take. There is little likelihood of any one particular entity getting everything done the way they would like. The process is designed so that compromise is essential in order for projects to proceed to implementation. It is this process of "checks and balances" that ultimately ensures the integrity of the process.

- **Importance of Local Connecting Systems:** In the development of the ridership forecasts the STV team indicated that the process assumed that local distribution systems, ie., light rail systems would be in place by 2020 to connect with the Cross-State system at key station locations. Interestingly, the ridership forecasting process showed that even without these systems in place overall ridership would not decline greatly. So we have used the ridership forecasts that assumed the systems were in place. It seems apparent that, having completed the balance of this analysis, any system that is implemented "cross-state" regardless of the alignment, must be part of a broader system plan effort that involves all the transportation providers in the major metropolitan areas the corridor traverses. It is critical to the success of any alternative transportation project implemented in the urbanized areas of the corridor that they be viewed as part of an integrated network. Regardless of what the travel forecasts show, intuitively it would seem, that absent connecting light rail systems in each of the metropolitan areas, the Cross-State system will always be less than it could be. Integrated with local systems there is the very real prospect of creating a network "greater than the sum of the individual parts".

  Conversely, the notion that the Cross-State project could be used as a "substitute" for communities not willing to confront challenging local issues is fallacious. The Cross-State project cannot be all things to everybody. It is not designed to serve as a local light rail system. However, integrated with local light rail systems could provide the Central Florida region with an alternative transportation network that could be the envy of the nation.

- **I-4 Corridor Availability:** Concerns have been raised at the conclusion of this work about the potential availability of the I-4 median in selected locations along the corridor. Existing long range plans by FDOT indicate that the median utilization in Polk County, in particular, could be problematic. Existing plans call for expanding general purpose freeway lanes into the median. FDOT has provided the project team with cost estimates indicating the cost to build on the outside of the existing lanes, thus preserving the rail "envelope" in the median. These costs have been identified in Chapter 3 but have not been included as part of the rail system capital cost estimates provided in this report.

- **Bridge Crossings in Tampa/ St. Petersburg area:** A number of questions were raised during the course of numerous meetings over the potential use of the Gandy bridge as a rail crossing to provide a cost effective means of traversing the bay. It has been determined that this is not a viable option. The Gandy alignment would require additional new track to the existing CXT corridor through a highly urbanized part of Tampa, with many at-grade crossings. Additionally, a new bridge would be required to cross the Bay, similar to the I-275 alignment. Finally, a Gandy crossing would deliver the train to a point in Pinellas County less desirable for connectivity with the proposed local commuter system and would circumvent the highly developed Tampa Airport/ West Shores areas of Tampa. The I-275 alignment would make it much easier to bring the train to the St. Petersburg/Clearwater International Airport, a designated connection center on the Pinellas County preferred routing plan for their local commuter system.

9.0 Financing Opportunities

Assessing creative funding opportunities starts first with determining how much funding is needed. What is the "gap" that needs to be closed to bring the project to fruition? The gap consists of what is required to be financed and the existing resources that can be applied to the financing effort. Assessing creative funding opportunities starts with assessing the basic economics of the project.

This process takes the forecast of revenues and compares them to operating conditions and costs for varying service levels. The result should be a "net of revenue over operations" so that operating costs would be covered by ridership revenues and other contributions such as freight concessions. If system revenues do not cover system operating costs at this basic level, other "subsidy" amounts need to be factored into the operating equations to produce a "net" or "breakeven" result. This factoring of other sources of funding at this level will detract from the same or similar sources of funding that can be applied to financing the capital cost of the development equations whether through debt or pay-as-you-go financing.

Simultaneous with the development of operating pro-formas for the system (incrementally and as a whole), the capital side needs to be addressed. The number of alignments and permutations from these alignments present far too many potential variable capital costing scenarios to adequately address at the present time. Refinement and winnowing of the alternatives needs to be accomplished. These capital cost developments also need to be addressed in the staged implementation of the system itself. Once a more modest set of alignment alternatives and implementation time horizons are chosen, the financial alternatives analysis can be begun in earnest to identify the funding solutions or gaps required to implement the resulting program.

9.1 Capital Cost Adjustments – Development Contributions

The first of the funding opportunities to be pursued would be that of capital cost adjustments by virtue of constituency contributions. These would be development contributions at major stations or nodes from the outset primarily derived from major users or beneficiaries of the system. Conceptually, contributions could be received for the major Orlando station adjacent to the Convention Center. Similarly, contributions could be forecast near the terminus on the East Coast from, or in support of, the cruise ship industry. Traffic and passenger distribution enhancements in proximity of Orlando and Tampa stations could also be received through joint development efforts with transit providers, Lynx and Hartline at these locations. Furthermore, there could be right of way contributions from the public sector to further development of the system from an economic, political or environmental perspective or from the private sector to encourage further development around nodal or terminal stations.

While the project development effort will look to these contributions as reductions of project cost, the contributors may, themselves, be financing the capital. Based on expected regional economic stimuli of the system at stations, tax increment financing ("TIF") could be utilized by municipal entities expecting to benefit from the increased economic development. Likewise, major corporate players could benefit through cost abatement in station location or development to give them a competitive advantage over others in having direct proximity or direct connections to the stations themselves.

Lastly, there could be contributions from major vendors or suppliers, contributions or "in kind" donations from concessionaires, "naming rights" for major stations or the like. Assuming that technology, alignment, station location and other system critical decisions are made in the best interest of the project and its successful development, these additional contributions would also flow to reduce the magnitude of the financeable cost of the program during the peak periods of development. Actions such as profit subjugation or deferral or equipment contributions for the rights of providing service all go to lower the bar for financing either in an absolute sense or from a magnitude standpoint.

The impact of these initial contributions is to lower the cost burden of system development that must be sourced elsewhere. The remaining "net" system development cost is that which must be financed or otherwise leveraged from both system and non-system resources.

Without definitive alignment decisions and underlying staging of system development represented by design/development/implementation cost over time, it is not practical to present detailed financing scenarios at this time. Coupling this with evolving developments of revenues and operating costs for the emerging alignment scenarios, the resulting "net operating revenue" is difficult to assess with clarity.

In developing a sense of the magnitude of the resources necessary to proceed with any or all parts of the project, a simple matrix of the resources needed under varying generic funding methodologies that would be required to accomplish the financing of approximately $1.0 billion of assets was developed. These are benchmarks only and do not include refinements for inclusion of varying costs of issuance, reserve funds or surety policies and other costs of issuance. This chart is presented below in the context of annual financing requirement resources. It includes estimates for tax-exempt financing, taxable financing and TIFIA funding.

Financing Methodology	Assumed Interest Rate	Annual Sources Required
Tax Exempt Bonds	6.00%	$ 90,820,000
Taxable Bonds	8.00%	$111,040,000
TIFIA Loan	5.75%	$ 70,725,000

Assumptions: 30-year debt, level debt service
125% coverage from sources (except TIFIA @ 100% coverage)
Bond Insurance (Except TIFIA)

Simply put, if the required project costs, after all contributions to reduce them have been received, equal $2.0 billion and tax-exempt financing is desired, then there will have to be a source of funding of $181.6 million annually for the next 30 years.

9.2 Funding Opportunities

Tax Increment Financing

Tax Increment Financing or TIF is the ability to leverage the economic development of an area or a region over and above the tax base and receipts generated on a current basis. In effect, the tax receipts for general governmental purposes are frozen at current levels and the increment received above the "frozen" base accrues to the project or developmental effort for which the tax increment district was originally established.

In the case of the Cross-Florida Rail Project, TIF districts could be established in one of two ways to benefit the project. The first would be through municipal activity on the behalf of constituent bodies affected or contributing to the project. These could be cities, counties or municipal taxing districts that would establish the TIF's to generate the resources to support their contribution to the project development efforts. The second way would be for these same cities, counties or municipal taxing entities to assign the TIF rights to the project itself and have the project leverage the increase based on economic development. TIF districts also require the ability of the municipal entity to forego the future tax receipts in lieu of the economic development even if the economic development puts an additional burden on the municipal entity for increased services.

In any event, however, TIF leveraging of future growth in tax base or economic activity also require an additional source of credit until such time as the TIF increment has grown to an extent sufficient to support the financings issued.

Public/Private Partnership Funding Potentials

From the "net" system development costs, a certain amount of these costs can be financed through traditional leveraging of "net" system revenues. This presupposes that there are net system revenues that can be leveraged at traditional coverage levels. Coverage levels are the multiple of debt service resulting from the financing that are "covered" by the net revenues. These levels must be more than 100% times the debt service (otherwise a default situation exists) and are typically in the 125% times to 150% times debt service for project finance activities. The differential between what the net revenues will finance and the capital costs requiring financing is the "gap".

In the catalogue of options to fund the "gap", certain development options can be utilized to transfer risks and rewards to the private sector or otherwise try to further leverage resources by more efficiently utilizing the "coverage" component of net revenues. This "coverage" component is that amount of net revenues in excess of actual debt service requirements (developed on a prospective basis). It is the 0.25% to 0.50% referenced earlier.

These developmental finance opportunities will be reviewed and applied where practical to finalize a preferred funding strategy:

Design-Build-Own-Operate: The private sector designs, builds, owns and operates the resulting project. The project is designed and constructed in accordance with specified criteria that control the system development as well as operations. Standards are set for all activities. Efficiencies of the private sector in coordinating the efforts and fast tracking development can lead to reduced project costs. The private sector reaps all of the rewards based on their bid price and assumes all risks. This type of effort is usually dependent on ridership or patronage levels that would allow the private sector to take the risks tantamount to a return on investment typical of their need – usually 15% to 20% on equity. Otherwise, the private sector would look for a patronage or revenue guarantee.

Design-Build-Operate-Transfer: In this development model, the private sector is given a concession to design, build, own and operate the project for a specified period of time. At the end of the concession period, the project reverts to public ownership. The concession is granted based on competition between the various private sector providers. Like the foregoing, the project is designed, built and operated in accordance with pre-established design criteria and must obtain a return on investment; however, the time to do so is only within the concession term in this model.

Design-Build-Transfer-Operate: This development model utilizes the skills and efficiencies of the private sector to design and build the project. Once constructed, however, it is transferred to the public sector for ownership. The public sector would then lease the project to the private sector for operations. Private sector retains financial responsibility subject to the similar conditions previously referenced for the other structures with respect to returns on investment. Public ownership, however, does have some benefits that accrue to the private developer and operator. These benefits are the ability to acquire rights of way usually under eminent domain auspices of the sponsoring public agency or governmental relationship and certain levels of tort protection for liabilities.

Turnkey: This development model incorporates private design/build activities but full public ownership of the project. It solely leverages the efficiencies of the private sector on project coordination and construction. The public sector receives a fully operational project and is liable for the operating costs and financing elements of this operable entity. More traditional means of financing and leveraging net revenues are required here.

Project Balance to be Financed

At some point in the development of the project, there will be a capital cost balance that will need to be financed away from joint development efforts, public/private partnership opportunities or the ability of the project itself to support additional senior lien debt based on revenue generation or resources pledged. Again, there are potential innovative opportunities to achieve these goals. Apart from grant funding from Federal, State and Local agencies, these opportunities are available on either a subordinate lien basis and/or at lower costs of capital.

Transportation Infrastructure Financing and Innovation Act

The Transportation Infrastructure Financing and Innovation Act or TIFIA is a relatively new program under TEA-21 which brings innovative financing efforts from the U. S. Department of Transportation to major transportation projects of national or regional significance. While limited to the current authorization of TEA-21, re-authorizations of the transportation bills into the future will carry a similar program as an integral part of such re-authorizations.

TIFIA is designed to aid the financing of marginal projects. It is a multi-million dollar program of providing loans, loan guarantees and lines of credit to transportation initiatives that may not be able to secure credit on their own to complete the full range of project development envisioned. While the interest rates are taxable, they are taxable at the rates at which the U. S. treasury borrows. Current taxable rates at this level compare very favorably or are actually lower than tax-exempt rates for the marginal types of credits for which TIFIA was intended. The federal government, in extending credit to TIFIA transportation initiatives, is also willing to take a subordinate position with respect to liens on project revenues and is also willing to permit multi-year deferrals of principal repayment. While the government can be lenient on the credit side, this program is not a grant. The Department of Transportation must be repaid at some time and has established other threshold criteria for successful applicants to ensure that it is.

These threshold criteria include some key factors. The first is that the senior debt of the project being financed must have an investment grade rating from one of the major bond rating agencies. This requires that the senior debt must have passed "muster" in the eyes of the rating agencies in order to obtain this investment grade rating. It must, therefor, be a "real" credit. The TIFIA borrowing would then be subordinate to this senior debt. Secondly, although subordinate, the TIFIA borrowing must ascend to parity status with the senior debt is there is a default. This effectively precludes having the government be the lender of last resort by bringing the TIFIA borrowing up to the same status as the senior debt in a default situation. Failure to pay the government would then jeopardize all of the project's finances.

In return for these and other rules, the TIFIA program brings financing benefits. As mentioned above, the financing is subordinate to project senior debt so it does not have to meet "senior debt" criteria. It is also at attractive rates considering the marginal credit quality (i.e., barely investment grade) of some of the projects for which TIFIA was designed. This financing also does not require a reserve fund nor does it require a multiple of coverage over debt service effectively lowering the amount of debt required to be issued. That is why, in the previous table, the TIFIA loan requirement is less to service on an annual basis when compared with traditional tax-exempt financing with an assumed 25% coverage cushion.

State Infrastructure Bank

As a part of recent transportation initiatives on a national basis, states have been encouraged and authorized to establish State Infrastructure Banks (SIBs) to aid the development of transportation in their respective states. Modeled after similarly successful State revolving funds for wastewater treatment, these SIBS can be a source of low cost financing for transportation projects. While the magnitude of the project cost for the cross State Rail System will, most likely, dwarf the Florida SIB program, it could, nonetheless, be a source of seed capital for design or development efforts for the project. The current Florida SIB has been further capitalized this year pursuant to state legislation and should be in a better and more mature position as a funding source as the Cross State rail program proceeds in development.

As is the case with most SIB's, they are a source of low interest loans that still need to be repaid. They are not, for the most part, sources of grant funding.

Gap Financing

When all is said and done and all other sources of leverageable moneys have been exhausted and there is still a "gap" to be filled, this is the resource. There may be a source of capital at the State level to fund a gap in the project's plan of finance or, more importantly, a potential source of debt service payments on debt that could be constituted as "senior lien" debt for the project and thus qualify in passing one of the more stringent criteria of the federal TIFIA program requiring that the project's senior debt have, at least, an investment grade rating from one of the major rating agencies.

9.3 Summary

Project costs and operating economics will dictate whether or not innovative financing opportunities will be required to succeed in project implementation. Currently, the project operations are forecast to be at the fringes of a "break even" basis. If this project is like others of the genre, innovative financing strategies will be needed to bolster direct contributions (in-kind, grants or the like) to reduce project costs to a level that can be financed with alternative resources. The magnitude and extent of need, however, will depend on project economics and the ability of the identified finance programs as well as others yet to be identified in meeting these needs.

10.0 Economic Impact Analysis

Once a preferred route alternative is recommended, an economic impact and benefit/cost analysis will be conducted. The STV team will base its estimates of the impacts of the preferred route alternative on estimates of transportation benefits, impacts of construction operation and maintenance, and land use impacts.

Transportation Benefits

The STV team will collect the necessary travel data (e.g. Vehicles Miles Traveled, ridership) and quantify those travel estimates into the following monetary economic benefits:

- Travel time benefits (based on prevailing local wage rates)
- Vehicle operating costs savings (based on IRS mileage allowances)
- Reduced emissions (based on US EPA estimates of cost/ton)
- Accident costs avoided (based on FHWA values for property damage, injury, and fatalities)
- Mobility benefits (based on the value of induced trips)

These benefits will be estimated for through year 2020, discounted back and stated in year 2000 dollars so that they may be compared to the capital and operating costs of the Florida Cross-State project.

Impacts from Construction and Operations and Maintenance

The STV team will assess the economic impacts from (1) construction activities generated from transportation investments and (2) operations and maintenance expenditures to support system operations. The economic impacts resulting from implementation and operation of the Florida Cross-State railroad consist of one-time impacts from construction activities to the recurring economic impacts from continuing operations and maintenance.

Second, economic impacts will be experienced from the direct operation and maintenance of the system after its initial construction. This, in turn, would also have a multiplier effect on the economy.

The RIMS II Input-Output model will be used to estimate indirect and induced growth of the state economy, given a direct change in jobs and business sales created by an investment in rail. Essentially, the model predicts, for each year in the future, the number and distribution of income, output and employment in the state for each industry sector and each occupational category. The RIMS II model is ideally suited to define economic impacts from investments and operations in the following forms:

- Output multipliers
- Earnings multipliers
- Employment multipliers
- Total final-demand multipliers for output, earnings, and employment
- Total direct-effect multipliers for earnings and employment

Basically, the RIMS II model provides impacts in terms of the dollar value of gross receipts (output) dollar value of wages and salaries (earnings) and the number of full-time equivalent jobs (employment). For a highly leveraged transportation project, the economic impact measures indicate the returns to Florida residents and businesses compared to state investment in the project.

Land Use Impacts

The STV team will examine regional development potential that could be induced by improved access stemming from the proposed transportation investment. These land use impacts take the form of *redistributive* impacts, which occur when development is shaped or focused in a rail corridor as a result of rail access combined with land use policies.

The methodology for assessing station area redistributive impacts relies on a top-down approach to create scenarios for potential development. The initial analysis focuses on the area where the station would be located. A prospective is developed for the region and areas within the region, which addresses the following factors:

- Demographics;
- Major Industries and firms;
- Growth factors;

- Growth Corridors;
- Scale of Development, and;
- Location of major commercial, retail and entertainment uses.

This analysis is structured to provide information to test the potential for focused growth at station areas. This provides the underlying support (or lack thereof) for further growth associated with the implementation of the project. Specifically, scenarios regarding potential development would be associated with increasing population, personal income, and improving an economic base consisting of industries with favorable growth potential.

On-site visits to each station area will be conducted to perform the following analyses as background for preparing development scenarios to include characterizing station areas and their relationships to growth corridors and performing on-site visual inventory of land uses citing complementary/conflicting land use conditions. Additionally, development potential from local real estate professionals, developers, economic development agency executives, planning professionals and elected officials will be solicited to determine the best suited areas for future stations.

11.0 Next Steps

The project is at a critical juncture. The STV team has determined, with a high degree of certainty, that project revenues will not cover project costs. This suggests that it must be demonstrated that there are compelling economic and financing issues that can make the project viable. The two critical remaining tasks are:

- **Economic Impact Analysis:** With a recommendation for a preferred alternative now in hand the STV team must complete an economic impact analysis that will help determine the potential for the project to help nurture and expand the regional economy. To the extent that the economic impact analysis shows a potential regional impact greater than the capital cost to build and/ or operate the system, it can be argued that some public funding of the capital or O&M costs can be justified.

- **Creative Funding Opportunities:** Developing a creative funding plan that helps identify potential sources of capital to build and support the operation of the system is also critical to the potential implementation of the project. If private and/or third-party funding can be brought to the project that helps to minimize the public investment, or as important, demonstrates to the public sector the commitment and significance of the project to the private-sector, then some level of public support is likely to be easier to justify.

The project schedule for completing the economic impact analysis and the creative funding analysis calls for completion of these two tasks by March 31, 2001.