CENTRAL BROWARD
EAST-WEST TRANSIT ANALYSIS

ALIGNMENT ANALYSIS UNIT ASSESSMENT

TECHNICAL MEMORANDUM

CENTRAL BROWARD
EAST-WEST TRANSIT ANALYSIS
BROWARD COUNTY, FLORIDA

FINANCIAL PROJECT ID NUMBER 411189-2-22-01

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT 4

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April 2004

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1. INTRODUCTION

Four alignment alternatives or routes have been identified for the Central Broward East-West Transit Analysis. Two of the alignment alternatives primarily utilize the I-595 right-of-way. The other two alignment alternatives use a combination of east-west arterial streets, Sunrise and Broward Boulevards, with a north-south "connector" of either University Drive or State Road 7 (SR 7). The physical characteristics of the roadways that comprise the alignment alternatives differ, not only from each other, but also along each alignment alternative. Adjacent land uses also vary along the alignments.

To both identify issues and constraints that would affect the design, implementation, and operation of transit service, the alignment alternatives were divided into analysis units to facilitate a more detailed definition and evaluation. The limits of each analysis unit are listed in Appendix A, which displays the guideway type considered for each analysis unit and for each alignment alternative. Maps for each alignment alternative showing the guideway type(s) for each analysis unit are included in each alignment description section.

Given the physical differences in the rights-of-way and the differences in the built environment along each alignment, it was obvious that several configurations of transit guideways should be considered. Good alignment and design choices are critical elements for safe transit operations. System design should also respect the urban environment that exists prior to design and construction of transit infrastructure. Guideway configurations and operational scenarios must give consideration to motor vehicle and pedestrian travel patterns, as well as roadway operating conditions (Transit Cooperative Research Program, TCRP Report 17, *Integration of Light Rail Transit into City Streets*, 1996, pages 65 and 68).

Some goals of alignment choice and guideway design include maximizing speed, capacity and reliability. A system that offers potential patrons reliable service and better travel times will attract more riders. Another goal of alignment choice and guideway design includes minimizing potential conflicts with motor vehicles and pedestrians as to maximize safety. Physical constraints, such as the lack of available right-of-way, may require transit to operate in shared rights-of-way. Safety considerations suggest a preference for guideway placement in the following order:

1. Exclusive alignment (aerial structure or subway);
2. Separated, at-grade right-of-way
3. Median of the roadway, separated by barrier curbs and/or fencing;
4. Median of the roadway, separated by mountable curbs and striping; and
5. Operation in mixed traffic (sharing a lane with other vehicles)

(TCRP Report 17, p.69).

Generally, this same order also reflects the preference from a transit operations perspective in terms of maximizing speed, capacity and reliability. In the initial phase of the Central Broward East-West Transit Analysis (CBEWTA) project, it was assumed that guideway design would be limited to an aerial configuration, a median-separated configuration, or an at-grade, mixed traffic (shared lane) configuration with the transit vehicles operating in the curb lane.

Median, dedicated guideway transit operations in shared rights-of-way are preferable to side-aligned (curb lane) operations. Median placement for the transit guideway allows for good visibility by roadway users, minimizes the impact on driveways and other access points, and

provides recovery areas for errant pedestrians. It also allows left-turn lanes to be integrated into the overall right-of-way design (TCRP Report 17, p.69).

Where conditions require the use of a shared lane, curbside operation was considered. Mixed traffic operations would be considered where the right-of-way is constrained and/or high traffic volumes preclude taking a lane from general-purpose traffic operations and dedicating it to transit use. In such cases, a curbside operation may be preferable, since it would require less property acquisition for boarding areas than a median operation, and low traffic speeds on congested roadways also reduce the likelihood of conflicts.

2. GUIDEWAY TYPES

In conducting the CBEWTA study, the term "alignment" has generally been used to indicate a route for high performance transit service. The term "guideway" will be used to distinguish between the alternative routes and placement of transit facilities within a specific right-of-way segment. Note that the guideway types as shown here could be used for either LRT or BRT. The figures below for each guideway type depict either LRT or BRT. Either transit technology would be feasible within any of the guideway configurations presented below.

Guideways may be classified as exclusive, semi-exclusive or non-exclusive. Exclusive alignments include subways and aerial structures, as well as at-grade sections without motor vehicle or pedestrian crossings. Semi-exclusive and non-exclusive alignments or guideways can be subdivided based on the degree of separation from motor vehicles and pedestrians using fences, curbing and location within the street right-of-way (TCRP Report 17, p. 13). The following four guideway types are proposed for the CBEWTA build alternatives:

2.1 EXCLUSIVE, TYPE A – AERIAL STRUCTURE

Also referred to as "elevated guideway," this type of guideway offers the highest maximum speed, the greatest passenger capacity, the fastest travel times, and the lowest potential for conflicts between motor vehicles and pedestrians. An aerial structure also costs the most to construct. Figures 1, 2 and 3 illustrate this type of guideway within a freeway right-of-way and on an arterial street.

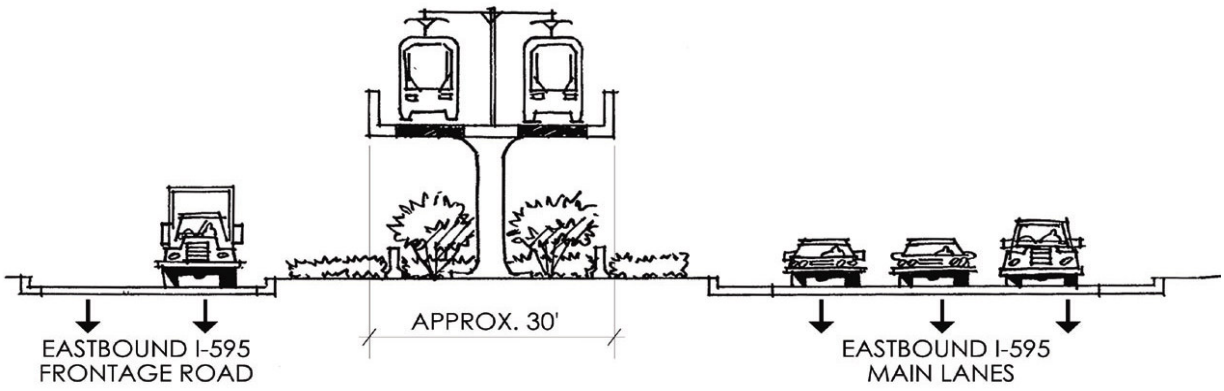

Figure 1. Exclusive Guideway, Type A – aerial structure, freeway right-of-way

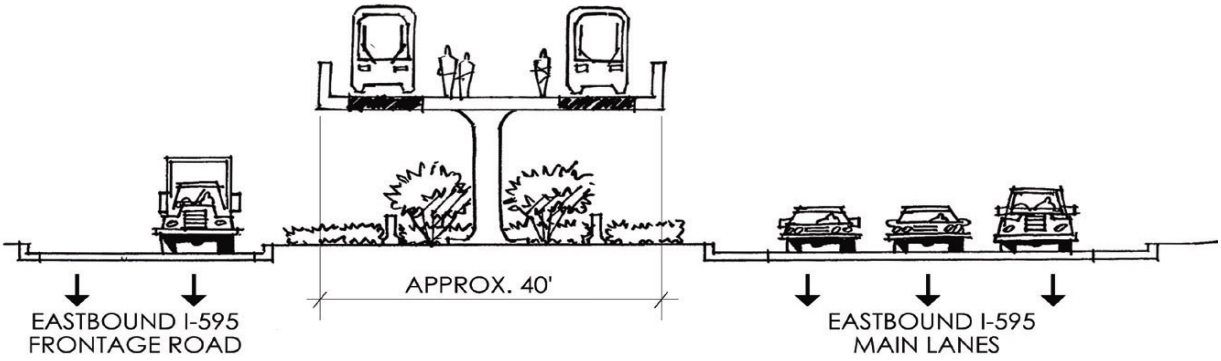

Figure 2. Exclusive Guideway, Type A – aerial structure with platform, freeway right-of-way

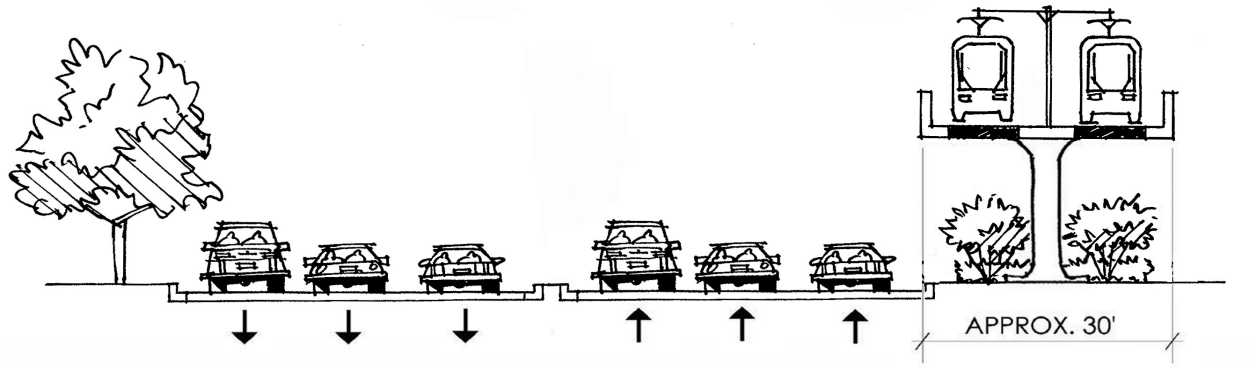

Figure 3. Exclusive Guideway, Type A – aerial structure, arterial street

2.2 SEMI-EXCLUSIVE, TYPE B.1 – MEDIAN OR CURB, BARRIER SEPARATED, DOUBLE-TRACK

Semi-exclusive, barrier separated guideways reduce potential conflicts, but the potential still exists where streets cross the guideway or where left turns are allowed. Speeds are lower than for Type A guideways due to the need for the transit vehicle to stop at intersections. Preferential signal treatment for transit vehicles can reduce this delay. See Figures 4 and 5.

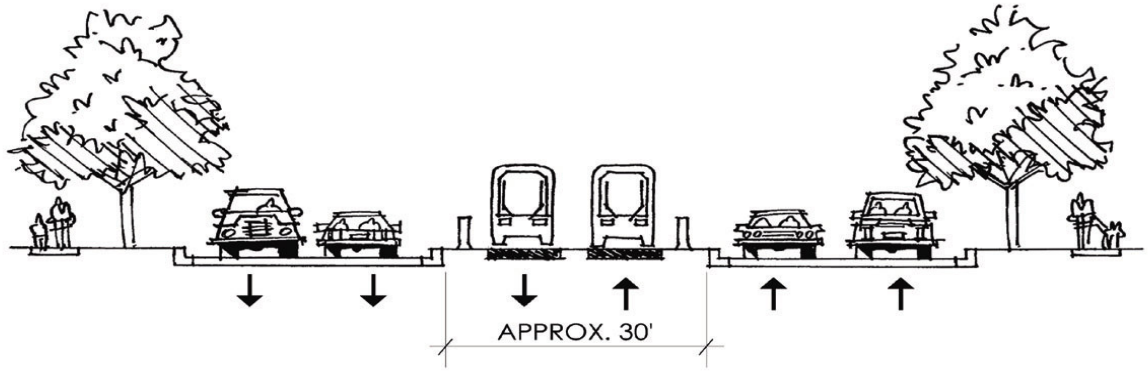

Figure 4. Semi-Exclusive Guideway, Type B.1 – median or curb, barrier separated, double-track

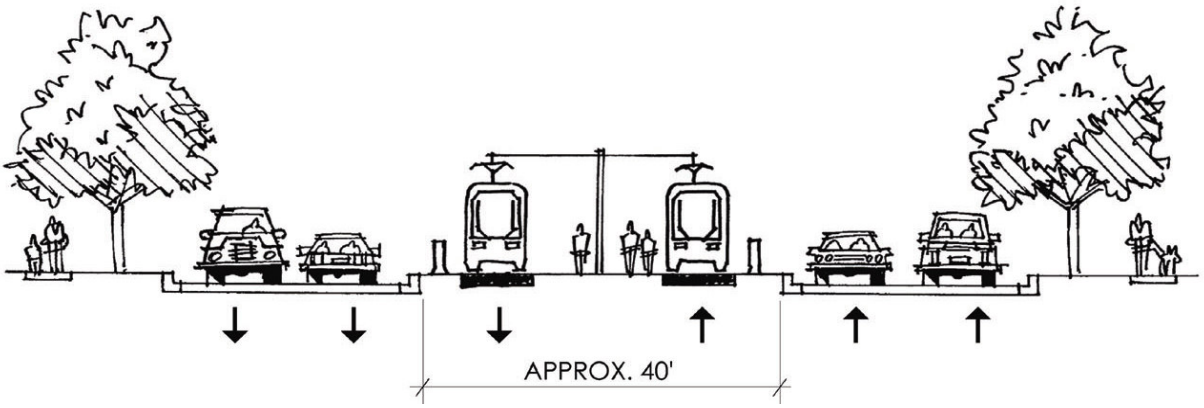

Figure 5. Semi-Exclusive Guideway, Type B.1 – median or curb, barrier separated, double-track with platform

2.3 SEMI-EXCLUSIVE, TYPE B.2 – MEDIAN OR CURB, BARRIER SEPARATED, SINGLE-TRACK

This semi-exclusive guideway would have a single-track operation located either in the median or at one side of a roadway. This configuration is proposed in areas where not only the existing and potential rights-of-way are constrained, but also where existing and projected congestion levels are high, limiting the potential for a semi-exclusive, double-track (taking two lanes) or shared lane operations.

Single-track operations offer lower cost for construction, but present a significant limit on transit operations and, ultimately, system performance. With single track operations, the minimum headway (the shortest period of time between transit vehicles passing a point in the same direction) is limited to twice the amount of time it takes for a vehicle to travel from one end of the single-track section to the other, plus some additional time for switching operations at each end. See Figure 6.

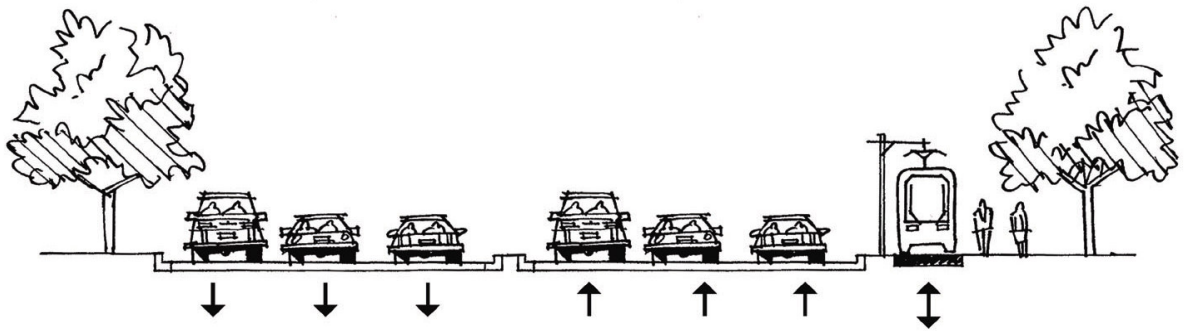

Figure 6. Semi-Exclusive Guideway, Type B.2 – median or curb, barrier separated, single-track

The Type B.2 configuration, whether located to one side or in the median of a roadway right-of-way, would also have periods of "contra flow" operation. Since transit vehicles would move alternately in both directions on the single guideway, for one direction, the transit vehicle would be traveling opposite to the direction of travel of general-purpose traffic. While barriers such as fencing, landscaping and/or six-inch curbs can reduce the potential for

conflicts, drivers may be confused by the sight of vehicle moving toward them in the "wrong" direction, particularly in a side running configuration.

2.4 NON-EXCLUSIVE, TYPE C – MEDIAN OR CURB, MIXED TRAFFIC, DOUBLE-TRACK

Non-exclusive guideways allow for shared use of the transit service by general-purpose traffic and pedestrians. In this configuration, transit operations have lower speeds and there is greater potential for conflicts. While this type of operation is a component of many light rail systems in the United States, it is usually limited to downtown areas, "… where there is willingness to forgo operating speeds in order to access areas with high population [and employment] density and many potential riders (TCRP Report 17, p. 13)." Typically, fixed-route bus service uses the Type C configuration for operations. The Type C configuration would be the lowest cost configuration to build, since it would be constructed primarily within existing roadway rights-of-way. See Figure 7.

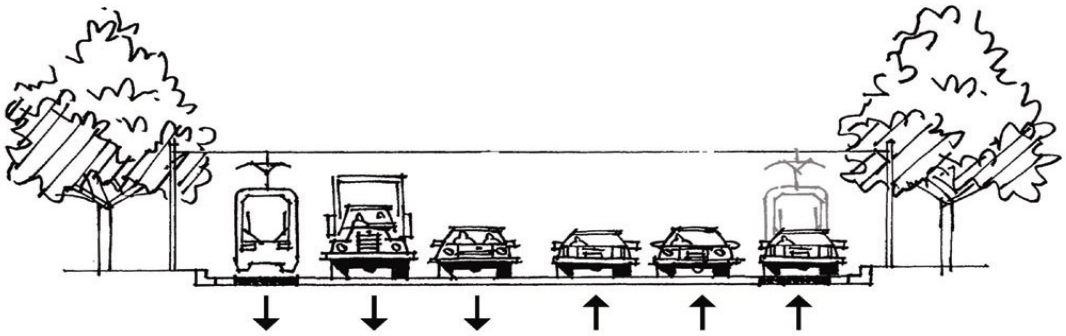

Figure 7. Non-Exclusive Guideway, Type C – median or curb, mixed traffic, double-track

Table 1 below summarizes key advantages and disadvantages of the guideway types identified for consideration.

Table 1. Advantages and Disadvantages of Guideway Types

Guideway Types	Advantages	Disadvantages
A. Exclusive (elevated)	Fastest speed, greatest reliability, least potential for conflicts, can be constructed within existing right-of-way	High construction cost, may not be acceptable in some communities due to visual/aesthetic issues
B.1. Semi-exclusive, double-track	Slower speeds even with preferential signal treatment, potential for conflict with vehicles and pedestrians at crossings	Right-of-way acquisition would be required in some areas or reducing roadway capacity (taking a lane) would be required.
B.2. Semi-exclusive, single-track	May be viable where right-of-way and/or traffic volumes preclude double-track operations	Headways and capacity limited, contra flow operations for alternate transit vehicles, potential for conflict with vehicles and pedestrians
C. Mixed traffic	Lowest capital/construction cost since it would be built at-grade and within existing right-of-way	Greatest potential for conflict with vehicles and pedestrians, lowest operating speeds even with preferential signal treatment

Clearly, the availability and cost of right-of-way for transit guideways will affect the selection of a guideway alternative. The availability and cost of right-of-way is a factor in the identification of appropriate guideway types for a particular area and in the evaluation of alignment alternatives. In this assessment, a Type B.1 guideway is considered where it appears that there is sufficient right-of-way available, such that the transit guideway could be constructed without significant property acquisition and/or displacements. It should also be noted that the construction of a Type B.1 guideway could be accomplished with minimal right-of-way acquisition, if an existing traffic lane in each direction were removed from use for general-purpose traffic and dedicated to transit use. This "take a lane" approach would reduce right-of-way costs and displacement impacts. The impacts on traffic operations for this approach will be considered and addressed in a separate analysis. Two right-of-way scenarios and their implications for guideway types are listed below:

Ample Existing Right-of-Way Scenario

- Where at-grade operations are possible in the existing/planned roadway environment, the Type B.1 guideway best balances operating efficiency with capital cost.
- The operational features of Type B.2 and Type C guideways would make them less desirable in a situation where potentially faster and safer configurations are possible without significantly higher costs or greater impacts.

Limited Existing Right-of-Way Scenario

- Where right-of-way is limited, a Type A guideway may be feasible due to the smaller footprint of the elevated structure. The higher construction costs of an elevated guideway would have to be balanced against additional right-of-way costs and the displacement impacts for an at-grade configuration.
- A Type B.1 guideway would not be feasible without the acquisition of additional right-of-way in this scenario. The cost and potential displacement impacts of acquiring additional right-of-way could offset the operational benefits.
- For a Type B.2 guideway, a single-track configuration may be feasible, since it has less right-of-way requirements. The operational effects and capacity issues of single-track operation would have to be considered.
- A Type C guideway, while least desirable from a transit operations perspective, may be an appropriate approach if right-of-way acquisition cost and/or displacement impacts are high.

To identify both issues and constraints that would affect the design, implementation, and operation of transit service, the alignment alternatives were divided into analysis units to facilitate a more detailed definition and evaluation.

3. ALIGNMENTS

3.1 ALIGNMENT 1. I-595/SR 7/BROWARD ALIGNMENT ALTERNATIVE

Originating near the Sawgrass Mills/Office Depot Center, this alignment follows 136th Avenue south to Interstate 595. The alignment follows the southern right-of-way of I-595 to US 441/SR 7. Turning north on US 441/SR 7, the alignment goes to Broward Boulevard, and then turns east and continues into Downtown Fort Lauderdale. At Andrews Avenue, the alignment turns south and runs to the Fort Lauderdale/Hollywood International Airport, where it terminates at the planned Intermodal Center. (See Figure 8.)

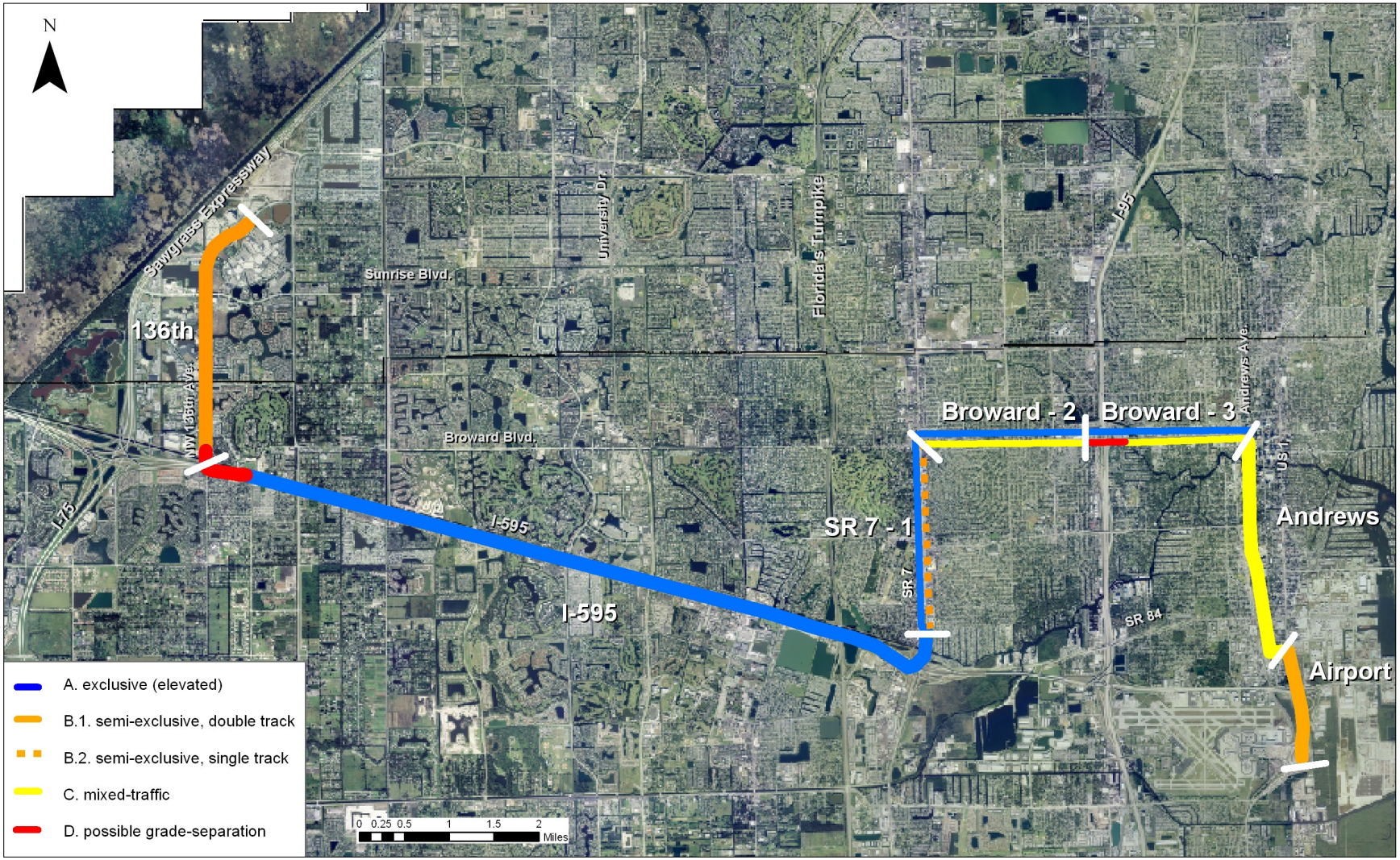

Figure 8. Alignment 1. I-595/SR 7/Broward Alignment Alternative

3.1.1 136th Avenue Analysis Unit (From Orange Grove Lane to I-595)

This analysis unit goes from the vicinity of the Sawgrass Mills Mall and the Office Depot Center to I-595, and is approximately 2.9 miles long. 136th Avenue generally has three travel lanes in each direction with left turn bays at intersections. North of Sunrise Boulevard, the adjacent land use is predominantly retail and special event (Sawgrass Mills Mall and Office Depot Center). South of Sunrise Boulevard, land use on the east side of 136th Avenue is predominantly residential. A large business park, Sawgrass Corporate Park, dominates land use on the west side of 136th Avenue down to its intersection with I-595. Uses within the business park include office, distribution and a water treatment facility. Sawgrass Mills Mall, the Office Depot Center and the Sawgrass Corporate Park are significant trip generators within this analysis unit.

Due to the large setbacks on the west side of 136th Avenue, it appears that it would be possible to form a dedicated, at-grade guideway for transit (Type B.1). A guideway placed in the median of the travel lanes of 136th Avenue would require re-alignment of the street by shifting the southbound travel lanes to the west. While this configuration of the street and the proposed transit facility would require property acquisition, it does not appear that it would result in the displacement of any businesses. This configuration would also avoid any residential displacements.

The I-595/136th Avenue intersection is currently grade separated, with I-595 over 136th Avenue. It may be possible for an LRT guideway to go under the existing I-595 overpass. Further analysis is required to determine if the overhead catenary system would require more vertical clearance than currently exists. Another issue that could affect an at-grade transition from 136th Avenue to I-595 is if there is sufficient distance between SW 13th Street and the I-595 overpass to allow for the change from the elevated level to grade level. This is an issue between 136th Avenue and the access ramp to the eastbound lanes of I-595 as well.

3.1.2 I-595 Analysis Unit (From 136th Avenue to SR 7/Riverland Road)

This analysis unit utilizes the I-595 right-of-way from the vicinity of 136th Avenue to the SR 7 interchange, and is approximately 8.7 miles long. A potential alignment of high performance transit in the I-595 right-of-way was identified in the I-95/I-595 Master Plan. This alignment is along the south side of I-595, generally between the main through lanes of I-595 and the frontage road lanes (SR 84). A unique feature in this analysis unit that affects the guideway configuration is the presence of access ramps to and from the I-595 main lanes. These access ramps could not be crossed safely at-grade with a fixed guideway (Type B.1). Given the spacing between adjacent access ramps and between access ramps and existing grade-separations at arterial streets, it may not be feasible or desirable to construct at-grade sections in those areas. This situation is a function of the distance required to go from grade level to the height required to clear and span the roadway or ramp, and then return to grade level. In light of these factors, an elevated guideway (Type A) appears to be the most appropriate configuration for this analysis unit.

Existing grade separations in this analysis unit are at Flamingo Road, Hiatus Road, Nob Hill Road, Pine Island Road, University Drive, Davie Road and Florida's Turnpike. In all cases, the main through lanes of I-595 go over the north-south arterials. The through lanes of Florida's Turnpike go over the I-595 through lanes. At University Drive and east of Florida's Turnpike, flyover ramps add additional horizontal and vertical clearance issues.

The north side of the I-595 right-of-way is bounded by a canal with primarily residential development along the opposite side. Immediately adjacent to the roadway, land use along the south side of the I-595 right-of-way is predominantly commercial/retail. There are also some areas of residential development including multifamily development. There is a large cemetery located at the southwest corner of Davie Road and I-595. In most cases, residential development is separated from the roadway by commercial/retail development. Since access to I-595 (and the proposed transit guideway) is limited to arterial streets, access to stations would be primarily by driving, resulting in a need for park-and-ride facilities at stations in this analysis unit. In some instances, shared parking at existing retail centers may be possible. Another option would be to build structured parking for shared use by the retail center and transit patrons. It may be possible to defer some cost of parking structures by entering into joint development agreements.

The South Florida Educational Center (SFEC) is located south of this analysis unit. The SFEC is a significant trip generator and destination. The SFEC campus encompasses the following institutions: Broward County Community College Central Campus, Florida Atlantic University – Broward, McFatter Technical Center, Nova Center for Applied Research and Professional Development, Nova Southeastern University and University of Florida/IFAS Fort Lauderdale Research and Educational Center. There are approximately 40,000 total students enrolled in the five institutions of higher learning on the SFEC campus. A station located in the vicinity of College Avenue could provide access to the SFEC through shuttle service.

Another element to be considered in this analysis unit is the transition from the I-595 right-of-way to the SR 7 right-of-way. The existing interchange is four levels. It may be possible for a BRT guideway to connect to existing ramps, reducing the amount of new structure that would have to be built. Lack of sufficient vertical clearance between existing ramps may preclude their use for light rail. A light rail guideway that could not use the existing ramps would need to be above the existing ramps and would require a more extensive structure.

One of the factors in the alternatives evaluation for the CBEWTA is connectivity to other transit services. The location of the northern terminus of the Transit Bridge project is an issue that needs to be considered in the design of this section. Locations, both north and south of I-595, have been identified as the potential terminus for this proposed BRT project. One of the key reasons for the development of the I-595/SR 7/Broward alternative was the connection that could be made to the proposed Transit Bridge project at SR 7. The final location of the northern terminus of the Transit Bridge project has not been determined and could be either north or south of I-595.

3.1.3 SR 7-1 Analysis Unit (From Riverland Road to Broward Boulevard)

The limits of this analysis unit are Broward Boulevard to the north and I-595 to the south, a distance of approximately 2.1 miles. SR 7 is a six-lane thoroughfare with left turn lanes in the median and right turn bays at signalized intersections. Land use adjacent to the roadway is commercial/retail. No large trip generators are located in this analysis unit.

The proposed Transit Bridge BRT project may have its northern terminus at the southeast corner of the intersection of Riverland Road and SR 7, currently a vacant parcel. If this alignment alternative is selected, a key issue in its design will be making an effective connection to the planned Transit Bridge service.

The right-of-way in this analysis unit is constrained, with little opportunity to widen the existing right-of-way without the potential for significant costs and/or displacements. Thus, a semi-exclusive guideway (dedicated lanes) would be difficult to implement. Also, traffic volumes on SR 7 are high, making mixed traffic operations less likely to be effective.

Two guideway configurations are suggested for consideration. Both configurations would utilize the limited space along the east side of SR 7. It may be possible to place an elevated guideway (Type A) within this area. The other proposed approach would be to use a single-track, at grade configuration (Type B.2).

As discussed previously, an elevated guideway would be more expensive to construct but would offer higher speeds (faster travel time), better reliability and less potential for conflict, as well as bi-directional operations. The lower construction cost of a single-track, at-grade guideway is offset by the slower travel time, less reliability and greater potential for conflicts. A single-track section would limit the capacity of the system because the minimum headway would need to correspond to the time needed for a transit vehicle to clear the single-track section, potentially constraining its ultimate capacity.

The intersection of SR 7 and Broward Boulevard is a significant node in terms of both existing and future transit service. The Broward County Metropolitan Planning Organization (BCMPO) 2025 long-range transportation plan (LRTP) identifies a super stop at this intersection, and future expansion of the proposed Transit Bridge service is anticipated to go through this intersection. The southeast quadrant of the intersection contains a number of vacant buildings and has economic development potential that could be supported by fixed guideway transit service.

3.1.4 Broward Boulevard-2 Analysis Unit (From SR 7 to the Fort Lauderdale Tri-Rail Station at I-95)

Broward Boulevard is a six-lane, divided, major, arterial street and is approximately two miles in length. East of I-95, it serves as the major entry to the Fort Lauderdale Central Business District. Between SR 7 and I-95, land use along Broward Boulevard is predominantly commercial/retail with some county facilities, as well as a church.

The Tri-Rail station at I-95 is the most significant feature in this analysis unit. In addition to the connection to Tri-Rail commuter rail service, the flyover ramps that provide access to the station from I-95 both northbound and southbound present significant elements that will have to be addressed in the design of a transit guideway. Patrons of both Tri-Rail and the proposed project could use the existing park-and-ride facility at the Tri-Rail station.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from service for general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). An elevated guideway may be more compatible in a commercial area than a residential neighborhood, although there could be opposition to an elevated guideway from local businesses and/or neighborhood groups. For a Type C guideway, mixed traffic operation would be feasible, but not optimal in terms of transit operations.

3.1.5 Broward Boulevard-3 Analysis Unit (From the Fort Lauderdale Tri-Rail Station at I-95 to the Broward County Transit (BCt) Central Terminal, Downtown Fort Lauderdale)

Broward Boulevard has essentially the same cross-section east of I-95 as it does between SR 7 and I-95. Land use in this analysis unit, which is approximately 1.6 miles in length, is predominantly commercial and retail. The City of Fort Lauderdale Police Department Headquarters is on the south side of Broward Boulevard. There is a residential area on the south side of Broward Boulevard between 9th and 11th Avenues. The BCt Central Terminal is located between NW 2nd Avenue and North Flagler Avenue on the north side of Broward Boulevard.

A significant feature in this section is the Florida East Coast railroad (FEC) that crosses Broward Boulevard between NW 2nd Avenue and North Flagler Avenue. The FEC is a Class I railroad, under the jurisdiction of the Federal Railroad Administration (FRA). The FRA and the Federal Transit Administration (FTA) have issued a joint rule regarding the operation of rail transit service within a freight rail right-of-way. An at-grade crossing of the FEC by light rail transit would have to be negotiated, not only with the FEC, but also with the FRA. There are only a few cases of at-grade crossings of Class I railroads by light rail transit.

In the case where a grade separated crossing of the FEC would be required, the transition from Broward Boulevard to Andrews Avenue could become more complex. Due to the short distance between the FEC right-of-way and Andrews Avenue, a grade separated guideway over the FEC may not be able to return to the existing street level before it would be necessary to make the turn on to Andrews Avenue. As the following section shows, Andrews Avenue would almost certainly require a mixed traffic (Type C) configuration in order to utilize the existing bridge over the New River. If the FEC crossing would create an incompatible transition from Broward Boulevard to Andrews Avenue, alternative rights-of-way west of the FEC and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). Although elevated guideways can be compatible with central business districts such as in this analysis unit, there could be opposition to an elevated guideway from local businesses and/or business groups.

Type C guideway, mixed traffic operation would be feasible. Several new light rail systems operate at-grade in central business districts and dense, central city neighborhoods. At-grade, mixed traffic operations could be seen as compatible with urban environments where traffic is congested and slow, and where the purpose of the transit is for circulation and distribution rather than for longer, line-haul commuter service.

3.1.6 Andrews Avenue Analysis Unit (From the BCt Central Terminal, Downtown Fort Lauderdale to 30th Street/US 1)

This analysis unit, which is approximately two miles in length, has features that impact not only configurations within the unit, but also adjacent units. Starting at Broward Boulevard, the cross-section of Andrews Avenue is two lanes in each direction with no

parking lanes, and retains this cross-section to about SE 11th Street, south of the New River Bridge. The New River Bridge is a single bascule design drawbridge. Its design and proximity to Broward Boulevard create some issues that would need to be addressed in the design of a light rail guideway in order to use the existing bridge. It should be noted that due to the narrower cross-section of Andrews Avenue in this area, the mixed traffic operations (Type C) would be the most appropriate guideway configuration, and perhaps, the only feasible one without construction of a new bridge in this portion of the Andrews Avenue Analysis Unit. If transition issues from the Broward Boulevard-3 Analysis Unit preclude the use of this configuration, an alternative north-south route and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering. There is not sufficient right-of-way for a semi-exclusive, dedicated transit guideway in the area to the north and just south of the New River Bridge, which influences the design of the guideway configuration throughout the southern portion of this analysis unit.

From the vicinity of SE 11th Street to SR 84, Andrews Avenue has two traffic lanes in each direction and a parking lane on both sides of the street. There is a center, left-turn lane in some areas as well. Removal of on-street parallel parking for a dedicated, transit lane will be evaluated during Preliminary Engineering. However, in order to operate a Type B.1, semi-exclusive, guideway in this segment, a transition from mixed-traffic operations (from curb lane to center lane) would require the transit vehicle to cross through traffic lanes. Due to the change in the cross-section of Andrews Avenue, the only feasible alignment configuration option within this analysis unit is non-exclusive, mixed traffic (Type C).

This analysis unit has the most diverse mix of uses within the Central Broward East-West Corridor. The Central Business District (CBD) of Fort Lauderdale on the north side of the New River is within this analysis unit. In addition to city and county offices and high-rise commercial buildings, the CBD encompasses, the art museum, a park with an amphitheater and the Las Olas retail/entertainment district. There is ongoing construction of several high-rise, residential buildings within the CBD, as well. From the New River Bridge to SR 84, lands uses that line Andrews Avenue are predominantly commercial and include two larger institutional uses: Broward General Hospital with associated clinics and physicians offices, and the Broward County and City of Fort Lauderdale courts and jail complex. The portion of the analysis unit from SR 84 to 30th Street/US 1 primarily contains industrial and commercial uses including a large lumberyard.

3.1.7 Airport Analysis Unit (From 30th Street/US 1 to the Intermodal Transfer Center at the Fort Lauderdale/Hollywood International Airport)

Land use in this analysis unit is predominantly commercial and industrial. This analysis unit begins in the vicinity of the intersection of 30th Street and US 1 and extends to the planned Intermodal Transfer Center (ITC) at the Fort Lauderdale/Hollywood International Airport. The transit guideway could operate on a dedicated guideway, Type B.1, in the median of US 1 from the vicinity of SE 28th Street into the ITC. The Airport Analysis Unit is approximately 1.7 miles long.

The ITC is in the airport's 2020 Vision Airport Expansion Proposal. It would be located directly east of the parking garages that are between the terminals. One of the purposes of the ITC is to "Promote use of Mass Transit and create opportunities for commercial development." A transfer could be made at the ITC from the Central Broward East-West premium transit service to the proposed airport-seaport people mover for transit patrons whose destination is a terminal at the airport or at the seaport.

A study is currently being conducted for the development of a people mover system that would connect the airport to the seaport and potentially extend as far north as the convention center on 17th Street. If the convention center is the northern terminus of the airport-seaport people mover system, the convention center would be considered as a possible eastern terminus for the Central Broward East-West premium transit service. From Andrews Avenue, the alignment would follow 17th Street to the convention center. The transit guideway configuration on 17th Street would be mixed traffic (Type C).

3.2 ALIGNMENT 2. I-595/SR 84 ALIGNMENT ALTERNATIVE

Originating near the Sawgrass Mills/Office Depot Center, this alignment runs south on 136 Avenue to Interstate 595. The alignment follows the southern side of the I-595 right-of-way until US 441/SR 7, where it crosses to the north and continues in a northerly direction along State Road 84. At South Andrews Avenue, the alignment runs south to the Fort Lauderdale/Hollywood International Airport and then north along Andrews Avenue to Broward Boulevard. The terminus of the alignment is at the Fort Lauderdale Tri-Rail Station just west of I-95. (See Figure 9.)

3.2.1 136th Avenue Analysis Unit (From Orange Grove Lane to I-595)

This analysis unit goes from the vicinity of the Sawgrass Mills Mall and the Office Depot Center to I-595, and is approximately 2.9 miles long. 136th Avenue generally has three travel lanes in each direction with left turn bays at intersections. North of Sunrise Boulevard, the adjacent land use is predominantly retail and special event (Sawgrass Mills Mall and Office Depot Center). South of Sunrise Boulevard, land use on the east side of 136th Avenue is predominantly residential. A large business park, Sawgrass Corporate Park, dominates land use on the west side of 136th Avenue down to its intersection with I-595. Uses within the business park include office, distribution and a water treatment facility. Sawgrass Mills Mall, the Office Depot Center and the Sawgrass Corporate Park are significant trip generators within this analysis unit.

Due to the large setbacks on the west side of 136th Avenue, it appears that it would be possible to form a dedicated, at-grade guideway for transit (Type B.1). A guideway placed in the median of the travel lanes of 136th Avenue would require re-alignment of the street by shifting the southbound travel lanes to the west. While this configuration of the street and the proposed transit facility would require property acquisition, it does not appear that it would result in the displacement of any businesses. This configuration would also avoid any residential displacements.

The I-595/136th Avenue intersection is currently grade separated, with I-595 over 136th Avenue. It may be possible for an LRT guideway to go under the existing I-595 overpass. Further analysis is required to determine if the overhead catenary system would require more vertical clearance than currently exists. Another issue that could affect an at-grade transition from 136th Avenue to I-595 is if there is sufficient distance between SW 13th Street and the I-595 overpass to allow for the change from the elevated level to grade level. This is an issue between 136th Avenue and the access ramp to the eastbound lanes of I-595 as well.

3.2.2 I-595/SR 84 Analysis Unit (From 136th Avenue to SW 15th Avenue)

This analysis unit is 10.9 miles long and utilizes the I-595 right-of-way from the vicinity of 136th Avenue to the SR 84 interchange, where it moves north into the SR 84 right-of-way. A potential alignment of high performance transit in the I-595 right-of-way was identified in

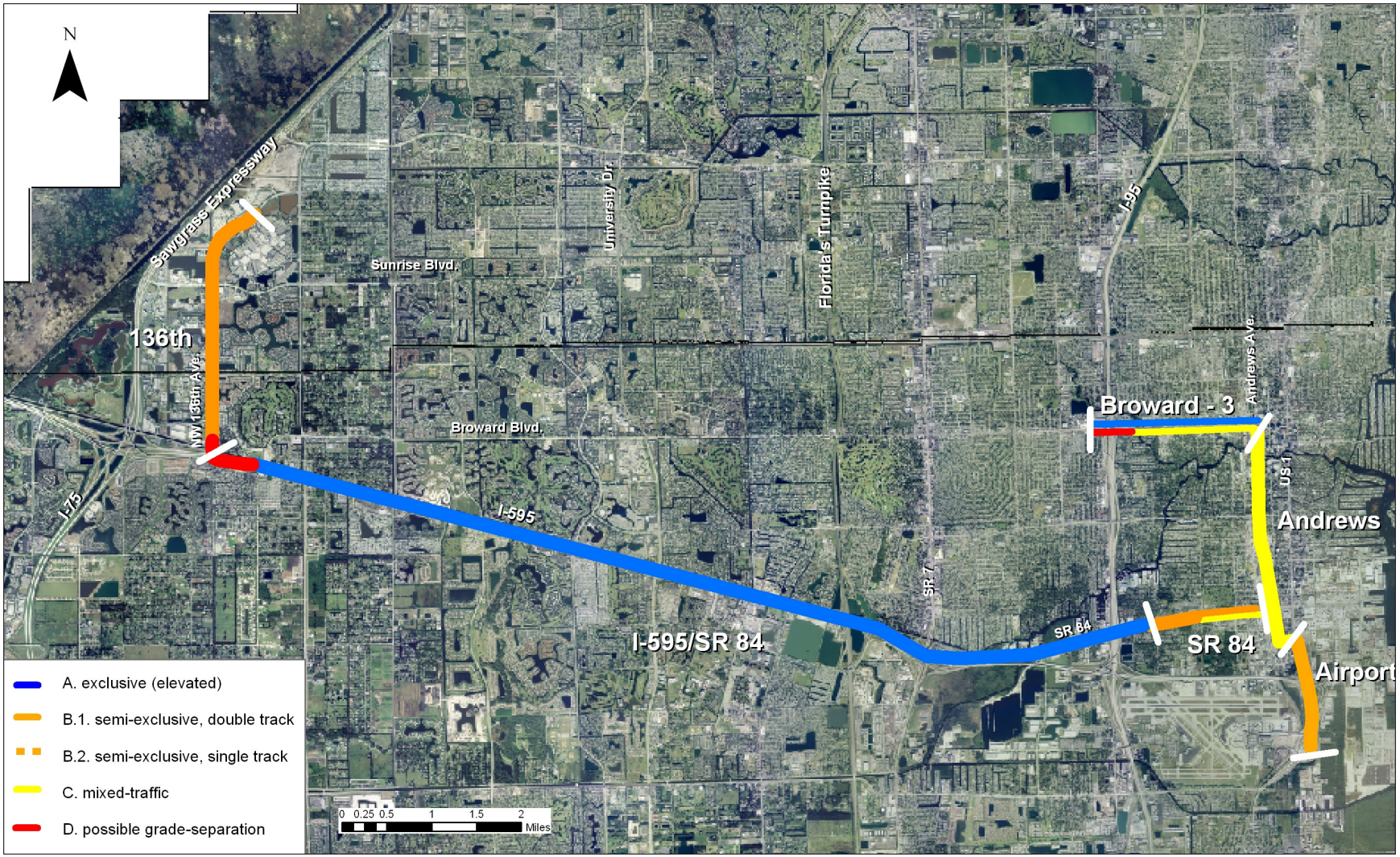

Figure 9. Alignment 2. I-595/SR 84 Alignment Alternative

the I-95/I-595 Master Plan. This alignment is along the south side of I-595, generally between the main through lanes of I-595 and the frontage road lanes (SR 84). A unique feature in this analysis unit that affects the guideway configuration is the presence of access ramps to and from the I-595 main lanes. These access ramps could not be crossed safely at-grade with a fixed guideway (Type B.1). Given the spacing between adjacent access ramps and between access ramps and existing grade-separations at arterial streets, it may not be feasible or desirable to construct at-grade sections in those areas. This situation is a function of the distance required to go from grade level to the height required to clear and span the roadway or ramp, and then return to grade level. In light of these factors, an elevated guideway (Type A) appears to be the most appropriate configuration for this analysis unit.

Existing grade separations in this analysis unit are at Flamingo Road, Hiatus Road, Nob Hill Road, Pine Island Road, University Drive, Davie Road and Florida's Turnpike. In all cases, the main through lanes of I-595 go over the north-south arterials. The through lanes of Florida's Turnpike go over the I-595 through lanes. At University Drive and east of Florida's Turnpike, flyover ramps add additional horizontal and vertical clearance issues.

The north side of the I-595 right-of-way is bounded by a canal with primarily residential development along the opposite side. Immediately adjacent to the roadway, land use along the south side of the I-595 right-of-way is predominantly commercial/retail. There are also some areas of residential development including multifamily development. There is a large cemetery located at the southwest corner of Davie Road and I-595. In most cases, residential development is separated from the roadway by commercial/retail development. Since access to I-595 (and the proposed transit guideway) is limited to arterial streets, access to stations would be primarily by driving, resulting in a need for park-and-ride facilities at stations in this analysis unit. In some instances, shared parking at existing retail centers may be possible. Another option would be to build structured parking for shared use by the retail center and transit patrons. It may be possible to defer some cost of parking structures by entering into joint development agreements.

The South Florida Educational Center (SFEC) is located south of this analysis unit. The SFEC is a significant trip generator and destination. The SFEC campus encompasses the following institutions: Broward County Community College Central Campus, Florida Atlantic University – Broward, McFatter Technical Center, Nova Center for Applied Research and Professional Development, Nova Southeastern University and University of Florida/IFAS Fort Lauderdale Research and Educational Center. There are approximately 40,000 total students enrolled in the five institutions of higher learning on the SFEC campus. A station located in the vicinity of College Avenue could provide access to the SFEC through shuttle service.

Another element to be considered in this analysis unit is the transition from the I-595 right-of-way to the SR 84 right-of-way, north of I-595. The existing interchange is four levels. It may be possible for a BRT guideway to connect to existing ramps, reducing the amount of new structure that would have to be built. Lack of sufficient vertical clearance between existing ramps may preclude their use for light rail. A light rail guideway that could not use the existing ramps would need to be above the existing ramps and would require a more extensive structure.

One of the factors in the alternatives evaluation for the CBEWTA is connectivity to other transit services, which is complicated in this analysis unit. The location of the northern terminus of the Transit Bridge project is an issue that needs to be considered in the design of this section. Locations, both north and south of I-595, have been identified as the potential terminus for this proposed BRT project. If the northern terminus of the Transit Bridge is not immediately adjacent to the south side of the SR 84 right-of-way, the transit guideway would need to be constructed in such a way as to allow transit vehicles to go to the Transit Bridge terminal and then return to the SR 84 guideway. This movement would be inefficient in terms of transit operations and it could be difficult and costly to construct a structure that would accommodate it.

SR 84 is grade separated over the Tri-Rail right-of-way that is just east of I-95 and over the I-95 through lanes. A station for the Central Broward East-West premium transit service would require some means of vertical connection to a platform of a Tri-Rail station. It should be noted that currently there is no Tri-Rail station at this location; nor does South Florida Regional Transportation Authority (SFRTA) have plans to develop one and has indicated that SR 84 is not a desirable location for a new station. A Tri-Rail station introduced at this location would have less than optimal station spacing between the Griffin Road and Fort Lauderdale Tri-Rail stations to the south and north, respectively.

SFRTA has begun construction of a new, fixed bridge over the New River with navigation clearance (approximately 65 feet). Placing a platform for commuter rail service in this area will be further complicated by the construction of the approach to the span over the New River since the platform needs to be located where the track is level.

3.2.3 SR 84 Analysis Unit (From SW 15th Avenue to Andrews Avenue)

The proposed alignment configuration in this analysis unit would return to existing grade in the vicinity of SW 15th Avenue and continue at-grade to Andrews Avenue. The predominant land use on SR 84 is commercial. This analysis unit is only 1.3 miles in length. A cemetery is located on the north side of SR 84 between SW 9th Avenue and SW 4th Avenue.

The median of SR 84 is very wide from SW 15th Avenue to 9th Avenue. A semi-exclusive, double track guideway (Type B.1) is recommended in this area. At SW 9th Avenue, the median and the overall right-of-way width is narrower. The transit guideway could either shift to mixed traffic operations (Type C) or it may be possible to acquire additional right-of-way to maintain a semi-exclusive guideway.

Andrews Avenue is one block east of the FEC right-of-way. If the transit guideway is grade separated over the FEC, it may not be possible to utilize Andrews Avenue to continue the alignment to downtown and the airport. Due to the short distance between the FEC right-of-way and Andrews Avenue, a grade separated guideway over the FEC may not be able to get back to grade before it would be necessary to make the turn on to Andrews Avenue to go to either downtown or the airport. In the case where an FEC crossing would preclude the turn to Andrews Avenue, alternative rights-of-way would be considered and evaluated during Preliminary Engineering.

3.2.4 Airport Analysis Unit (From 30th Street/US 1 to the Intermodal Transfer Center at the Fort Lauderdale/Hollywood International Airport)

Land use in this analysis unit is predominantly commercial and industrial. This analysis unit begins in the vicinity of the intersection of 30th Street and US 1 and extends to the

planned Intermodal Transfer Center (ITC) at the Fort Lauderdale/Hollywood International Airport. The transit guideway could operate on a dedicated guideway, Type B.1, in the median of US 1 from the vicinity of SE 28th Street into the ITC. The Airport Analysis Unit is approximately 1.7 miles long.

The ITC is in the airport's 2020 Vision Airport Expansion Proposal. It would be located directly east of the parking garages that are between the terminals. One of the purposes of the ITC is to "Promote use of Mass Transit and create opportunities for commercial development." A transfer could be made at the ITC from the Central Broward East-West premium transit service to the proposed airport-seaport people mover for transit patrons whose destination is a terminal at the airport or at the seaport.

A study is currently being conducted for the development of a people mover system that would connect the airport to the seaport and potentially extend as far north as the convention center on 17th Street. If the convention center is the northern terminus of the airport-seaport people mover system, the convention center would be considered as a possible eastern terminus for the Central Broward East-West premium transit service. From Andrews Avenue, the alignment would follow 17th Street to the convention center. The transit guideway configuration on 17th Street would be mixed traffic (Type C).

3.2.5 Andrews Avenue Analysis Unit (From 30th Street/US 1 to the BCt Central Terminal, Downtown Fort Lauderdale)

This analysis unit, which is approximately two miles in length, has features that impact not only configurations within the unit, but also adjacent units. From SR 84 to the vicinity of SE 11th Street, Andrews Avenue has two traffic lanes in each direction and a parking lane on both sides of the street. There is a center, left-turn lane in some areas as well. Removal of on-street parallel parking for a dedicated, transit lane will be evaluated during Preliminary Engineering.

Starting at about SE 11th Street, the cross-section of Andrews Avenue is two lanes in each direction with no parking lanes, and retains this cross-section to Broward Boulevard, north of the New River Bridge. The New River Bridge is a single bascule design drawbridge. Its design and proximity to Broward Boulevard create some issues that would need to be addressed in the design of a light rail guideway in order to use the existing bridge. It should be noted that due to the narrower cross-section of Andrews Avenue in this area, the mixed traffic operations (Type C) would be the most appropriate guideway configuration, and perhaps, the only feasible one without construction of a new bridge in this portion of the Andrews Avenue Analysis Unit. If transition issues to the Broward Boulevard-3 Analysis Unit preclude the use of this configuration, an alternative north-south route and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering.

Because there is not sufficient right-of-way for a semi-exclusive, dedicated transit guideway in the area to the north and just south of the New River Bridge, the design of the guideway configuration throughout the southern portion of this analysis unit is influenced. In order to operate a Type B.1, semi-exclusive, guideway south of SE 11th Street, a transition to mixed-traffic operations (from center lane to curb lane) would require the transit vehicle to cross through traffic lanes. Due to the change in the cross-section of Andrews Avenue, the only feasible alignment configuration option within this analysis unit is non-exclusive, mixed traffic (Type C).

This analysis unit has the most diverse mix of uses within the Central Broward East-West Corridor. The portion of the analysis unit from 30th Street/US 1 to SR 84 primarily contains industrial and commercial uses including a large lumberyard. From SR 84 to the New River Bridge, lands uses that line Andrews Avenue are predominantly commercial and include two larger institutional uses: Broward General Hospital with associated clinics and physicians offices, and the Broward County and City of Fort Lauderdale courts and jail complex. The Central Business District (CBD) of Fort Lauderdale on the north side of the New River is within this analysis unit. In addition to city and county offices and high-rise commercial buildings, the CBD encompasses, the art museum, a park with an amphitheater and the Las Olas retail/entertainment district. There is ongoing construction of several high-rise, residential buildings within the CBD, as well.

3.2.6 Broward Boulevard-3 Analysis Unit (From the BCt Central Terminal, Downtown Fort Lauderdale to the Fort Lauderdale Tri-Rail Station at I-95)

Broward Boulevard is a six-lane, divided, major, arterial street and is approximately 1.6 miles in length. East of I-95, it serves as the major entry to the Fort Lauderdale Central Business District. Land use in this analysis unit is predominantly commercial and retail. The BCt Central Terminal is located between NW 2nd Avenue and North Flagler Avenue on the north side of Broward Boulevard. There is a residential area on the south side of Broward Boulevard between 9th and 11th Avenues. The City of Fort Lauderdale Police Department Headquarters is on the south side of Broward Boulevard. The Tri-Rail station at I-95 is another significant feature in this analysis unit. In addition to the connection to Tri-Rail commuter rail service, the flyover ramps that provide access to the station from I-95 both northbound and southbound present significant elements that will have to be addressed in the design of a transit guideway. Patrons of both Tri-Rail and the proposed project could use the existing park-and-ride facility at the Tri-Rail station.

A significant feature in this section is the Florida East Coast railroad (FEC) that crosses Broward Boulevard between NW 2nd Avenue and North Flagler Avenue. The FEC is a Class I railroad, under the jurisdiction of the Federal Railroad Administration (FRA). The FRA and the Federal Transit Administration (FTA) have issued a joint rule regarding the operation of rail transit service within a freight rail right-of-way. An at-grade crossing of the FEC by light rail transit would have to be negotiated, not only with the FEC, but also with the FRA. There are only a few cases of at-grade crossings of Class I railroads by light rail transit.

In the case where a grade separated crossing of the FEC would be required, the transition from Andrews Avenue to Broward Boulevard could become more complex. Due to the short distance between the FEC right-of-way and Andrews Avenue, there may not be enough room to achieve the clearance height for a grade separated guideway over the FEC. The mixed traffic (Type C) configuration on Andrews Avenue is necessary in order to utilize the existing bridge over the New River. If the FEC crossing would create an incompatible transition from Andrews Avenue to Broward Boulevard, alternative rights-of-way west of the FEC and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and

operate an exclusive, elevated guideway (Type A). Although elevated guideways can be compatible with central business districts such as in this analysis unit, there could be opposition to an elevated guideway from local businesses and/or business groups.

Type C guideway, mixed traffic operation would be feasible. Several new light rail systems operate at-grade in central business districts and dense, central city neighborhoods. At-grade, mixed traffic operations could be seen as compatible with urban environments where traffic is congested and slow, and where the purpose of the transit is for circulation and distribution rather than for longer, line-haul commuter service.

3.3 ALIGNMENT 3. SUNRISE/UNIVERSITY/BROWARD ALIGNMENT ALTERNATIVE

Originating near the Sawgrass Mills/Office Depot Center, the alignment runs south on 136 Avenue to Sunrise Boulevard, where it turns east. The alignment runs east on Sunrise Boulevard and connects to Broward Boulevard via a north-south connector. The possible north-south connectors for this alignment include Pine Island Road and University Drive. For purposes of the analysis, a connection along University Drive was considered as the north-south connector. Thus, the alignment turns south on University Drive to Broward Boulevard and then runs east on Broward Boulevard to Andrews Avenue, where it turns south again and terminates at the Fort Lauderdale/Hollywood Airport. (See Figure 10.)

3.3.1 136th Avenue/Sunrise Boulevard Analysis Unit (From Orange Grove Lane to Hiatus Road)

This analysis unit goes from the vicinity of the Sawgrass Mills Mall and Office Depot Center to Hiatus Road. It is approximately three miles long. 136th Avenue generally has three travel lanes in each direction with left turn bays at intersections. Adjacent land use is predominantly retail and special event (Sawgrass Mills Mall and Office Depot Center). On Sunrise Boulevard, east of 136th Avenue to 118th Avenue, land use is predominantly retail and commercial. Volunteer Park is in the southeastern quadrant of the intersection of Sunrise Boulevard and 118th Avenue. Land use between 118th Avenue and Hiatus Road along Sunrise Boulevard is low density single-family residential.

Sunrise Boulevard is a six-lane, divided arterial. It appears that there may be sufficient right-of-way to allow construction of a dedicated transit guideway (Type B.1) within the median between travel lanes. This approach would require reconstruction/realignment of the traffic lanes, which would add to the cost of its implementation.

3.3.2 Sunrise Boulevard-1 Analysis Unit (From Hiatus Road to University Drive)

Land use in this analysis unit, which is about 2.6 miles in length, is primarily single-family, residential. There is a small retail development in the northeast quadrant of the intersection of Sunrise Boulevard and Nob Hill Road. There is additional retail and commercial development at the intersection of Sunrise Boulevard and Pine Island Road. The Motorola campus in the southeast quadrant of the intersection of Sunrise Boulevard and University Drive is a significant employment node. Between Hiatus Road and Pine Island Road, Sunrise Boulevard is four lanes wide. The City of Plantation and Broward County are in negotiations regarding the possibility of widening Sunrise Boulevard to six lanes in this area.

In this area, a single-track configuration (Type B.2) is under consideration. East of Pine Island Road, commercial and retail uses are more prevalent. Expanding the roadway to accommodate a Type B.1 guideway configuration in the median may be perceived as an

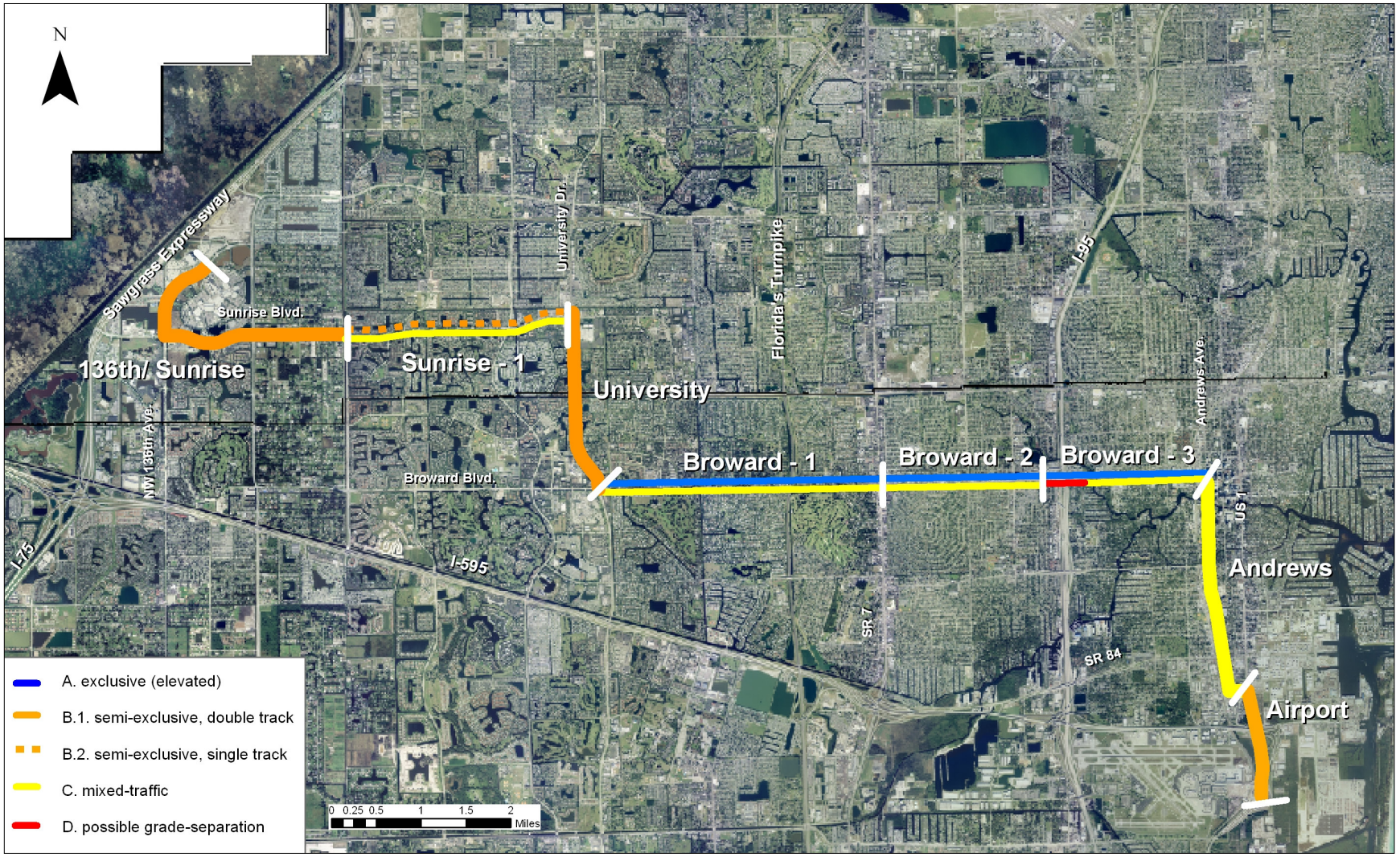

Figure 10. Alignment 3. Sunrise/University/Broward Alignment Alternative

unacceptable neighborhood impact. Putting a Type B.1 guideway in place, thus dedicating two lanes to transit use, would probably not be feasible, since that approach would leave only two lanes for general purpose traffic in the road current configuration. The two guideway configurations that appear to be feasible in this analysis unit are Type B.2, single-track and Type C, mixed traffic.

3.3.3 University Drive Analysis Unit (From Sunrise Boulevard to Broward Boulevard)

University Drive is a six-lane, divided thoroughfare. Land use in this analysis unit is largely residential. The University Drive Analysis Unit is approximately two miles in length. There is a significant commercial retail node at University Drive and Sunrise Boulevard. The Broward Mall is in the southwestern corner of the intersection of University Drive and Broward Boulevard.

The Fashion Mall fronts University Drive, approximately ½ mile north of Broward Boulevard. The West Regional Medical Center and BCt West Terminal are west of the Fashion Mall.

There is a parallel "frontage road" on the west side of University Drive and a wide, landscaped swale on the east side. There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway, Type B.1. Addition of the guideway would require reconstruction and realignment of the street and eliminate some existing landscaping and/or existing frontage roads. Elimination of the frontage roads could impact access to existing residential development.

3.3.4 Broward Boulevard-1 Analysis Unit (From University Drive to SR 7)

This unit goes from University Drive east to SR 7 along Broward Boulevard and is approximately 3.1 miles in length. Land use in this analysis unit is predominantly residential. A commercial/retail district is on the north side of Broward Boulevard centered on NW 70th Street. From 65th Street east to SR 7, land use is predominantly single-family residential with some, limited multi-family development. The Fort Lauderdale County Club is south of Broward Boulevard and east of Florida's Turnpike. There are some commercial and retail uses on both sides of Broward Boulevard immediately west of SR 7.

Florida's Turnpike is grade separated over Broward Boulevard. There is no interchange between Broward Boulevard and Florida's Turnpike. The existing grade separation may be a potential constraint to the development of an LRT alternative due to height and horizontal clearance issues. Development of LRT in this analysis unit may require reconstruction of the overpass at Florida's Turnpike.

The Broward Boulevard right-of-way is constrained in this analysis unit. There is a canal on the south side of Broward Boulevard from University Drive to NW 65th Street. Residential development is immediately adjacent to the right-of-way on both sides from 65th Street going east toward SR 7. Widening the right-of-way would not be feasible due to the cost and displacements that would be required. Due to high traffic volumes, dedicating a lane exclusively for transit use may not be feasible. Given these issues, the two guideway options under consideration are Type A, exclusive, elevated, and Type C, mixed traffic. Type A, which is feasible in terms of construction and operation, may not be acceptable to the adjacent communities. Type C would offer little operational advantage to transit over existing in-street bus operations.

3.3.5 Broward Boulevard-2 Analysis Unit (From SR 7 to the Fort Lauderdale Tri-Rail Station at I-95)

Broward Boulevard is a six-lane, divided, major, arterial street and is approximately two miles in length. East of I-95, it serves as the major entry to the Fort Lauderdale Central Business District. Between SR 7 and I-95, land use along Broward Boulevard is predominantly commercial/retail with some county facilities, as well as a church.

The Tri-Rail station at I-95 is the most significant feature in this analysis unit. In addition to the connection to Tri-Rail commuter rail service, the flyover ramps that provide access to the station from I-95 both northbound and southbound present significant elements that will have to be addressed in the design of a transit guideway. Patrons of both Tri-Rail and the proposed project could use the existing park-and-ride facility at the Tri-Rail station.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from service for general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). An elevated guideway may be more compatible in a commercial area than a residential neighborhood, although there could be opposition to an elevated guideway from local businesses and/or neighborhood groups. For a Type C guideway, mixed traffic operation would be feasible, but not optimal in terms of transit operations.

3.3.6 Broward Boulevard-3 Analysis Unit (From the Fort Lauderdale Tri-Rail Station at I-95 to the BCt Central Terminal, Downtown Fort Lauderdale)

Broward Boulevard has essentially the same cross-section east of I-95 as it does between SR 7 and I-95. Land use in this analysis unit, which is approximately 1.6 miles in length, is predominantly commercial and retail. The City of Fort Lauderdale Police Department Headquarters is on the south side of Broward Boulevard. There is a residential area on the south side of Broward Boulevard between 9th and 11th Avenues. The BCt Central Terminal is located between NW 2nd Avenue and North Flagler Avenue on the north side of Broward Boulevard.

A significant feature in this section is the Florida East Coast railroad (FEC) that crosses Broward Boulevard between NW 2nd Avenue and North Flagler Avenue. The FEC is a Class I railroad, under the jurisdiction of the Federal Railroad Administration (FRA). The FRA and the Federal Transit Administration (FTA) have issued a joint rule regarding the operation of rail transit service within a freight rail right-of-way. An at-grade crossing of the FEC by light rail transit would have to be negotiated, not only with the FEC, but also with the FRA. There are only a few cases of at-grade crossings of Class I railroads by light rail transit.

In the case where a grade separated crossing of the FEC would be required, the transition from Broward Boulevard to Andrews Avenue could become more complex. Due to the short distance between the FEC right-of-way and Andrews Avenue, a grade separated guideway over the FEC may not be able to return to the existing street level before it would be necessary to make the turn on to Andrews Avenue. As the following section shows, Andrews Avenue would almost certainly require a mixed traffic (Type C) configuration in order to utilize the existing bridge over the New River. If the FEC crossing would create an incompatible transition from Broward Boulevard to Andrews Avenue,

alternative rights-of-way west of the FEC and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). Although elevated guideways can be compatible with central business districts such as in this analysis unit, there could be opposition to an elevated guideway from local businesses and/or business groups.

Type C guideway, mixed traffic operation would be feasible. Several new light rail systems operate at-grade in central business districts and dense, central city neighborhoods. At-grade, mixed traffic operations could be seen as compatible with urban environments where traffic is congested and slow, and where the purpose of the transit is for circulation and distribution rather than for longer, line-haul commuter service.

3.3.7 Andrews Avenue Analysis Unit (From the BCt Central Terminal, Downtown Fort Lauderdale to 30th Street/US 1)

This analysis unit, which is approximately two miles in length, has features that impact not only configurations within the unit, but also adjacent units. Starting at Broward Boulevard, the cross-section of Andrews Avenue is two lanes in each direction with no parking lanes, and retains this cross-section to about SE 11th Street, south of the New River Bridge. The New River Bridge is a single bascule design drawbridge. Its design and proximity to Broward Boulevard create some issues that would need to be addressed in the design of a light rail guideway in order to use the existing bridge. It should be noted that due to the narrower cross-section of Andrews Avenue in this area, the mixed traffic operations (Type C) would be the most appropriate guideway configuration, and perhaps, the only feasible one without construction of a new bridge in this portion of the Andrews Avenue Analysis Unit. If transition issues from the Broward Boulevard-3 Analysis Unit preclude the use of this configuration, an alternative north-south route and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering. There is not sufficient right-of-way for a semi-exclusive, dedicated transit guideway in the area to the north and just south of the New River Bridge, which influences the design of the guideway configuration throughout the southern portion of this analysis unit.

From the vicinity of SE 11th Street to SR 84, Andrews Avenue has two traffic lanes in each direction and a parking lane on both sides of the street. There is a center, left-turn lane in some areas as well. Removal of on-street parallel parking for a dedicated, transit lane will be evaluated during Preliminary Engineering. However, in order to operate a Type B.1, semi-exclusive, guideway in this segment, a transition from mixed-traffic operations (from curb lane to center lane) would require the transit vehicle to cross through traffic lanes. Due to the change in the cross-section of Andrews Avenue, the only feasible alignment configuration option within this analysis unit is non-exclusive, mixed traffic (Type C).

This analysis unit has the most diverse mix of uses within the Central Broward East-West Corridor. The Central Business District (CBD) of Fort Lauderdale on the north side of the New River is within this analysis unit. In addition to city and county offices and high-rise commercial buildings, the CBD encompasses, the art museum, a park with an amphitheater and the Las Olas retail/entertainment district. There is ongoing construction

of several high-rise, residential buildings within the CBD, as well. From the New River Bridge to SR 84, lands uses that line Andrews Avenue are predominantly commercial and include two larger institutional uses: Broward General Hospital with associated clinics and physicians offices, and the Broward County and City of Fort Lauderdale courts and jail complex. The portion of the analysis unit from SR 84 to 30th Street/US 1 primarily contains industrial and commercial uses including a large lumberyard.

3.3.8 Airport Analysis Unit (From 30th Street/US 1 to the Intermodal Transfer Center at the Fort Lauderdale/Hollywood International Airport)

Land use in this analysis unit is predominantly commercial and industrial. This analysis unit begins in the vicinity of the intersection of 30th Street and US 1 and extends to the planned Intermodal Transfer Center (ITC) at the Fort Lauderdale/Hollywood International Airport. The transit guideway could operate on a dedicated guideway, Type B.1, in the median of US 1 from the vicinity of SE 28th Street into the ITC. The Airport Analysis Unit is approximately 1.7 miles long.

The ITC is in the airport's 2020 Vision Airport Expansion Proposal. It would be located directly east of the parking garages that are between the terminals. One of the purposes of the ITC is to "Promote use of Mass Transit and create opportunities for commercial development." A transfer could be made at the ITC from the Central Broward East-West premium transit service to the proposed airport-seaport people mover for transit patrons whose destination is a terminal at the airport or at the seaport.

A study is currently being conducted for the development of a people mover system that would connect the airport to the seaport and potentially extend as far north as the convention center on 17th Street. If the convention center is the northern terminus of the airport-seaport people mover system, the convention center would be considered as a possible eastern terminus for the Central Broward East-West premium transit service. From Andrews Avenue, the alignment would follow 17th Street to the convention center. The transit guideway configuration on 17th Street would be mixed traffic (Type C).

3.4 ALIGNMENT 4. SUNRISE/SR 7/BROWARD ALIGNMENT ALTERNATIVE

Originating near the Sawgrass Mills/Office Depot Center, the alignment runs south on 136 Avenue to Sunrise Boulevard, where it turns east. The alignment runs east on Sunrise Boulevard and connects to Broward Boulevard via a north-south connector. The possible north-south connectors for this alignment include SR 7 and 31st Avenue. For purposes of the analysis, a connection along SR 7 was considered as the north-south connector. Thus, the alignment follows Sunrise Boulevard as it turns south and then back east, and then heads south on SR 7 to Broward Boulevard. From Broward Boulevard, the alignment runs east to Andrews Avenue, where it turns south again and terminates the Fort Lauderdale/Hollywood Airport. (See Figure 11.)

3.4.1 136th Avenue/Sunrise Boulevard Analysis Unit (From Orange Grove Lane to Hiatus Road)

This analysis unit goes from the vicinity of the Sawgrass Mills Mall and Office Depot Center to Hiatus Road. It is approximately three miles long. 136th Avenue generally has three travel lanes in each direction with left turn bays at intersections. Adjacent land use is predominantly retail and special event (Sawgrass Mills Mall and Office Depot Center). On Sunrise Boulevard, east of 136th Avenue to 118th Avenue, land use is predominantly retail and commercial. Volunteer Park is in the southeastern quadrant of the intersection

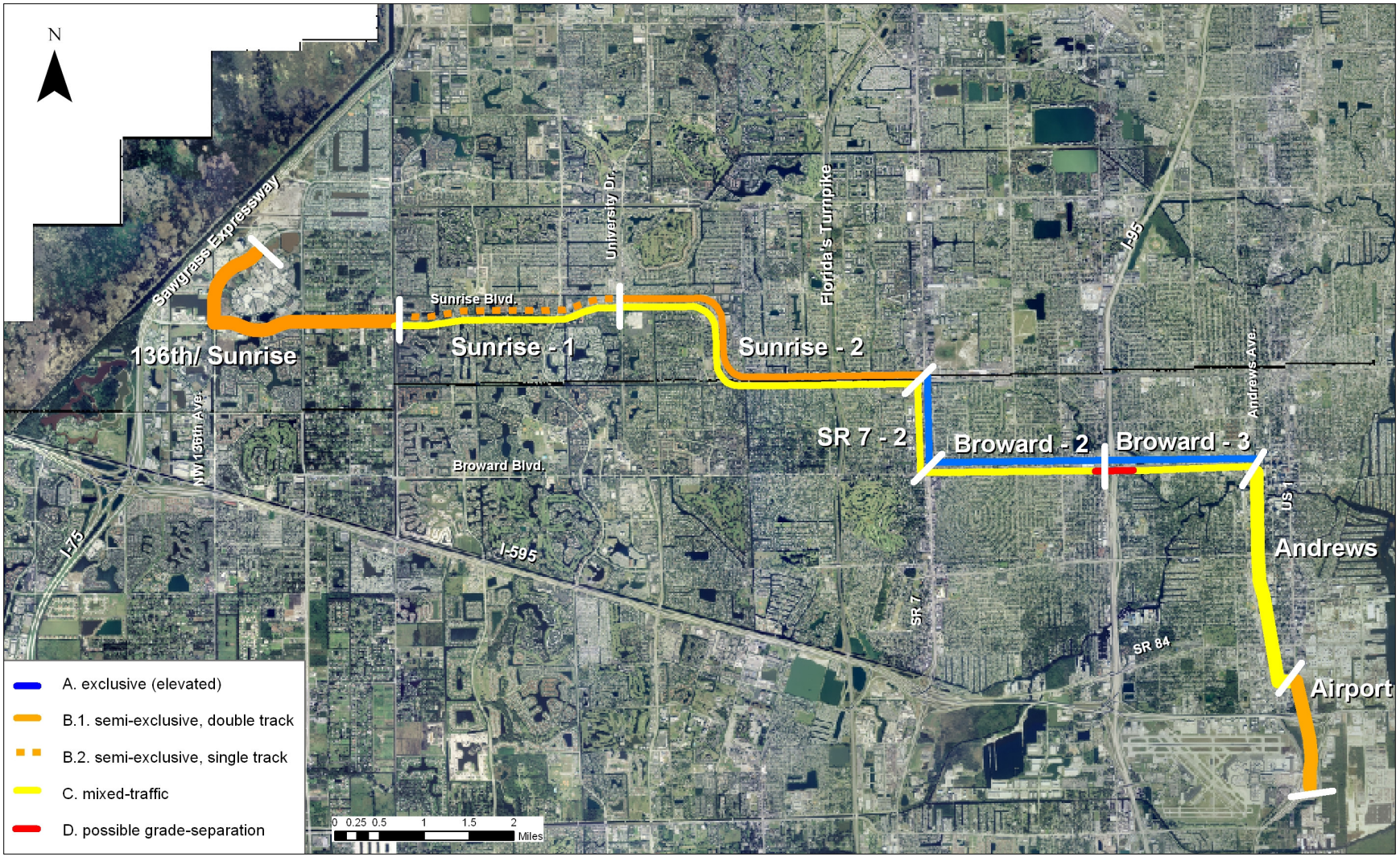

Figure 11. Alignment 4. Sunrise/SR 7/Broward Alignment Alternative

of Sunrise Boulevard and 118th Avenue. Land use between 118th Avenue and Hiatus Road along Sunrise Boulevard is low density single-family residential.

Sunrise Boulevard is a six-lane, divided arterial. It appears that there may be sufficient right-of-way to allow construction of a dedicated transit guideway (Type B.1) within the median between travel lanes. This approach would require reconstruction/realignment of the traffic lanes, which would add to the cost of its implementation.

3.4.2 Sunrise Boulevard-1 Analysis Unit (From Hiatus Road to University Drive)

Land use in this analysis unit, which is about 2.6 miles in length, is primarily single-family, residential. There is a small retail development in the northeast quadrant of the intersection of Sunrise Boulevard and Nob Hill Road. There is additional retail and commercial development at the intersection of Sunrise Boulevard and Pine Island Road. The Motorola campus in the southeast quadrant of the intersection of Sunrise Boulevard and University Drive is a significant employment node. Between Hiatus Road and Pine Island Road, Sunrise Boulevard is four lanes wide. The City of Plantation and Broward County are in negotiations regarding the possibility of widening Sunrise Boulevard to six lanes in this area.

In this area, a single-track configuration (Type B.2) is under consideration. East of Pine Island Road, commercial and retail uses are more prevalent. Expanding the roadway to accommodate a Type B.1 guideway configuration in the median may be perceived as an unacceptable neighborhood impact. Putting a Type B.1 guideway in place, thus dedicating two lanes to transit use, would probably not be feasible, since that approach would leave only two lanes for general purpose traffic in the road current configuration. The two guideway configurations that appear to be feasible in this analysis unit are Type B.2, single-track and Type C, mixed traffic.

3.4.3 Sunrise Boulevard-2 Analysis Unit (From University Drive to SR 7)

Sunrise Boulevard is a six-lane, divided roadway throughout this analysis unit, which is fairly diverse in terms of land use types and is approximately four miles long. It begins at the intersection of University Drive and Sunrise Boulevard. East of that intersection, the Motorola campus is a significant employment node on the south side of Sunrise Boulevard with retail and commercial development on the north side of the thoroughfare. Continuing to the east, multi-family residential development can be found on both sides of Sunrise Boulevard. As the alignment of Sunrise Boulevard changes from east-west to north-south, the land use begins to transition also with some institutional and industrial uses, as well as multi-family and single family residential development. Plantation High School and Plantation Middle School are at the northern and southern ends, respectively, and on the west side of this north-south oriented section of Sunrise Boulevard. The east side of this portion of Sunrise Boulevard contains some light industrial/warehouse uses and some medical facilities, the Universal Medical Center.

As Sunrise Boulevard returns to its east-west alignment in the vicinity of 65th Avenue, there is a canal adjacent on the south side from 65th Avenue to SR 7. Land use adjacent to the canal is predominantly single-family residential. The north side of Sunrise Boulevard in this area is primarily commercial/retail uses with some multi-family residential development.

Sunrise Boulevard is grade separated over Florida's Turnpike, with an interchange between these two roadways. A structural analysis would be required to determine the

extent of modification necessary so that the overpass over Florida's Turnpike could accommodate LRT vehicles.

Sunrise Boulevard is also grade separated over SR 7. The existing grade separation, associated ramps and the canal will complicate the transition of a transit guideway from Sunrise Boulevard to SR 7. The northeast quadrant of the Sunrise Boulevard/SR 7 intersection is the location of planned redevelopment by the City of Lauderhill. The southwest quadrant of the intersection is designated as the Plantation Business Park.

Alignment configuration options within this analysis unit include Type B.1, semi-exclusive, double-track and Type C, mixed traffic. In some areas, there may be sufficient right-of-way to allow construction of a dedicated transit guideway within the median between travel lanes. This approach would require reconstruction/realignment of the traffic lanes, which would add to the cost of its implementation. In most of this analysis unit, construction of Type B.1 guideway would require taking 2 lanes from general purpose traffic use and dedicating it to transit use. Given existing and future traffic volumes and levels of service, removing a lane from general-purpose traffic use, may have unacceptable, negative affects. The Type C, mixed traffic guideway configuration may be the only feasible option in this analysis unit.

3.4.4 SR 7-2 Analysis Unit (From Sunrise Boulevard to Broward Boulevard)

SR 7 is a six-lane, divided roadway. In this analysis unit, which is approximately one mile in length, adjacent land uses are predominantly commercial/retail with some institutional uses. Plantation General Hospital is located on the west side of SR 7.

Alignment configuration options considered for this analysis unit include Type B.1, semi-exclusive, double-track and Type C, mixed traffic. In order to accommodate the additional right-of-way required to maintain the existing number of traffic lanes and to construct a transit guideway, property acquisition and displacement of some existing businesses would be necessary. This approach would also require reconstruction/realignment of the traffic lanes, which would add to the cost of its implementation. If property acquisitions and displacements were to be minimized, construction of Type B.1 guideway would require taking a lane from general-purpose traffic use and dedicating it to transit use. Given existing and future traffic volumes and levels of service, removing a lane from general-purpose traffic use may have unacceptable, negative affects. The Type C, mixed traffic guideway, configuration appears to be the only feasible option in this analysis unit.

3.4.5 Broward Boulevard-2 Analysis Unit (From SR 7 to the Fort Lauderdale Tri-Rail Station at I-95)

Broward Boulevard is a six-lane, divided, major, arterial street and is approximately two miles in length. East of I-95, it serves as the major entry to the Fort Lauderdale Central Business District. Between SR 7 and I-95, land use along Broward Boulevard is predominantly commercial/retail with some county facilities, as well as a church.

The Tri-Rail station at I-95 is the most significant feature in this analysis unit. In addition to the connection to Tri-Rail commuter rail service, the flyover ramps that provide access to the station from I-95 both northbound and southbound present significant elements that will have to be addressed in the design of a transit guideway. Patrons of both Tri-Rail and the proposed project could use the existing park-and-ride facility at the Tri-Rail station.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from service for general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). An elevated guideway may be more compatible in a commercial area than a residential neighborhood, although there could be opposition to an elevated guideway from local businesses and/or neighborhood groups. For a Type C guideway, mixed traffic operation would be feasible, but not optimal in terms of transit operations.

3.4.6 Broward Boulevard-3 Analysis Unit (From the Fort Lauderdale Tri-Rail Station at I-95 to the BCt Central Terminal, Downtown Fort Lauderdale)

Broward Boulevard has essentially the same cross-section east of I-95 as it does between SR 7 and I-95. Land use in this analysis unit, which is approximately 1.6 miles in length, is predominantly commercial and retail. The City of Fort Lauderdale Police Department Headquarters is on the south side of Broward Boulevard. There is a residential area on the south side of Broward Boulevard between 9th and 11th Avenues. The BCt Central Terminal is located between NW 2nd Avenue and North Flagler Avenue on the north side of Broward Boulevard.

A significant feature in this section is the Florida East Coast railroad (FEC) that crosses Broward Boulevard between NW 2nd Avenue and North Flagler Avenue. The FEC is a Class I railroad, under the jurisdiction of the Federal Railroad Administration (FRA). The FRA and the Federal Transit Administration (FTA) have issued a joint rule regarding the operation of rail transit service within a freight rail right-of-way. An at-grade crossing of the FEC by light rail transit would have to be negotiated, not only with the FEC, but also with the FRA. There are only a few cases of at-grade crossings of Class I railroads by light rail transit.

In the case where a grade separated crossing of the FEC would be required, the transition from Broward Boulevard to Andrews Avenue could become more complex. Due to the short distance between the FEC right-of-way and Andrews Avenue, a grade separated guideway over the FEC may not be able to return to the existing street level before it would be necessary to make the turn on to Andrews Avenue. As the following section shows, Andrews Avenue would almost certainly require a mixed traffic (Type C) configuration in order to utilize the existing bridge over the New River. If the FEC crossing would create an incompatible transition from Broward Boulevard to Andrews Avenue, alternative rights-of-way west of the FEC and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering.

Due to the relatively small setbacks of most businesses, widening the right-of-way to accommodate a Type B.1 guideway in the median would not be feasible due to costs and extensive displacements. High traffic volumes and poor level of service in this analysis unit indicate that removing a lane from general-purpose traffic and dedicating it to exclusive transit use may not be feasible either. It would be possible to construct and operate an exclusive, elevated guideway (Type A). Although elevated guideways can be compatible with central business districts such as in this analysis unit, there could be opposition to an elevated guideway from local businesses and/or business groups.

Type C guideway, mixed traffic operation would be feasible. Several new light rail systems operate at-grade in central business districts and dense, central city neighborhoods. At-grade, mixed traffic operations could be seen as compatible with urban environments where traffic is congested and slow, and where the purpose of the transit is for circulation and distribution rather than for longer, line-haul commuter service.

3.4.7 Andrews Avenue Analysis Unit (From the BCt Central Terminal, Downtown Fort Lauderdale to 30th Street/US 1)

This analysis unit, which is approximately two miles in length, has features that impact not only configurations within the unit, but also adjacent units. Starting at Broward Boulevard, the cross-section of Andrews Avenue is two lanes in each direction with no parking lanes, and retains this cross-section to about SE 11th Street, south of the New River Bridge. The New River Bridge is a single bascule design drawbridge. Its design and proximity to Broward Boulevard create some issues that would need to be addressed in the design of a light rail guideway in order to use the existing bridge. It should be noted that due to the narrower cross-section of Andrews Avenue in this area, the mixed traffic operations (Type C) would be the most appropriate guideway configuration, and perhaps, the only feasible one without construction of a new bridge in this portion of the Andrews Avenue Analysis Unit. If transition issues from the Broward Boulevard-3 Analysis Unit preclude the use of this configuration, an alternative north-south route and the possibility of a new bridge over the New River would be considered and evaluated during Preliminary Engineering. There is not sufficient right-of-way for a semi-exclusive, dedicated transit guideway in the area to the north and just south of the New River Bridge, which influences the design of the guideway configuration throughout the southern portion of this analysis unit.

From the vicinity of SE 11th Street to SR 84, Andrews Avenue has two traffic lanes in each direction and a parking lane on both sides of the street. There is a center, left-turn lane in some areas as well. Removal of on-street parallel parking for a dedicated, transit lane will be evaluated during Preliminary Engineering. However, in order to operate a Type B.1, semi-exclusive, guideway in this segment, a transition from mixed-traffic operations (from curb lane to center lane) would require the transit vehicle to cross through traffic lanes. Due to the change in the cross-section of Andrews Avenue, the only feasible alignment configuration option within this analysis unit is non-exclusive, mixed traffic (Type C).

This analysis unit has the most diverse mix of uses within the Central Broward East-West Corridor. The Central Business District (CBD) of Fort Lauderdale on the north side of the New River is within this analysis unit. In addition to city and county offices and high-rise commercial buildings, the CBD encompasses, the art museum, a park with an amphitheater and the Las Olas retail/entertainment district. There is ongoing construction of several high-rise, residential buildings within the CBD, as well. From the New River Bridge to SR 84, lands uses that line Andrews Avenue are predominantly commercial and include two larger institutional uses: Broward General Hospital with associated clinics and physicians offices, and the Broward County and City of Fort Lauderdale courts and jail complex. The portion of the analysis unit from SR 84 to 30th Street/US 1 primarily contains industrial and commercial uses including a large lumberyard.

3.4.8 Airport Analysis Unit (From 30th Street/US 1 to the Intermodal Transfer Center at the Fort Lauderdale/Hollywood International Airport)

Land use in this analysis unit is predominantly commercial and industrial. This analysis unit begins in the vicinity of the intersection of 30th Street and US 1 and extends to the

planned Intermodal Transfer Center (ITC) at the Fort Lauderdale/Hollywood International Airport. The transit guideway could operate on a dedicated guideway, Type B.1, in the median of US 1 from the vicinity of SE 28th Street into the ITC. The Airport Analysis Unit is approximately 1.7 miles long.

The ITC is in the airport's 2020 Vision Airport Expansion Proposal. It would be located directly east of the parking garages that are between the terminals. One of the purposes of the ITC is to "Promote use of Mass Transit and create opportunities for commercial development." A transfer could be made at the ITC from the Central Broward East-West premium transit service to the proposed airport-seaport people mover for transit patrons whose destination is a terminal at the airport or at the seaport.

A study is currently being conducted for the development of a people mover system that would connect the airport to the seaport and potentially extend as far north as the convention center on 17th Street. If the convention center is the northern terminus of the airport-seaport people mover system, the convention center would be considered as a possible eastern terminus for the Central Broward East-West premium transit service. From Andrews Avenue, the alignment would follow 17th Street to the convention center. The transit guideway configuration on 17th Street would be mixed traffic (Type C).

4. ALIGNMENT CAPACITIES

An assessment was conducted to identify the effects of replacing a general-purpose traffic lane with a dedicated transit guideway in those analysis units for which an at-grade configuration is being considered as an option, and where it may not be feasible to acquire additional right-of-way. Using average annual daily traffic volumes (AADT), level of service (LOS) data for 2002 and 2025, and volume to capacity ratios for 2025 prepared by the Broward County Department of Planning and Environmental Protection, the roadway capacity was then re-calculated under the assumption that a lane would be removed from use for general-purpose traffic and then used as a dedicated transit guideway (see Table 2). Using maximum transit vehicle capacity and the frequency of service in peak and off-peak periods, a maximum transit capacity was calculated for both BRT and LRT transit modes. (The capacity of BRT and LRT differ due to the size of the vehicles.) This maximum transit capacity (23,760 for BRT and 36,720 for LRT with single-car trains) was then added to the "Take-A-Lane" roadway capacity to establish the "Alignment Capacity – Dedicated Transit Lane – take-a-lane" scenario. The maximum transit capacities were also added to a 2025 LOS D roadway capacity to establish the "Alignment Capacity – with Separate Transit Guideway," a maximum alignment capacity for each analysis unit. Note that the alignment capacity figures combine traffic volumes (roadway capacity) and passengers (maximum transit capacity). For purposes of this analysis, auto occupancy was assumed to be 1.0, slightly less than current auto occupancy rates which are on the order of 1.1, such that the effect of not including an auto occupancy rate in the calculation of Alignment Capacity is negligible.

A review of Table 2 reveals that there are some analysis units for which the projected 2025 AADT exceeds the Alignment Capacity in the take-a-lane scenario for BRT and some instances in which the 2025 AADT exceeds the Alignment Capacity for both BRT and LRT. In the Broward Boulevard-3 Analysis Unit (used in all four alignment alternatives), the 2025 AADT is just over 81,000. Under the Alignment Capacity with Separate Transit scenario - keeping all existing traffic lanes and adding a dedicated transit guideway - the alignment capacity with BRT is approximately 68,000 (less than the 2025 AADT) and the alignment capacity with LRT is just over 81,000, essentially the same volume as the 2025 AADT.

Table 2. Roadway and Alignment Capacities

Alignment 1. I-595/SR7/Broward			Annual Average Daily Traffic		Level of Service		V/C	LOS "D" Roadway Capacity	Take-A-Lane Roadway Capacity	Alignment Capacity Dedicated Transit Lane ("Take-A-Lane")		Alignment Capacity w/ Separate Transit Guideway	
Analysis Unit:	**FROM:**	**TO:**	**2002**	**2025**	**2002**	**2025**	**2025**	**2025**	**2025**	**BRT**	**LRT**	**BRT**	**LRT**
136th Avenue	Orange Grove Ln.	I-595	27,500	52,655	B	D	0.98	53,500	N/A	N/A	N/A	76,180	91,300
I-595	136th Ave.	SR7/Riverland Rd.	162,500	237,414	E	F	1.30	182,600	N/A	N/A	N/A	205,280	220,400
SR 7-1	Riverland Rd.	Broward Blvd.	50,000	75,890	C	F	1.42	53,500	N/A	N/A	N/A	76,180	91,300
Broward Boulevard-2	SR7	Tri-Rail	55,000	65,507	F	F	1.33	49,200	N/A	N/A	N/A	71,880	87,000
Broward Boulevard-3	Tri-Rail	BCt Central Terminal	72,000	81,172	F	F	1.82	44,700	28,900	51,580	66,700	67,380	82,500
Andrews Avenue	BCt Central Terminal	30th St./US 1	17,800	41,077	C	F	1.26	32,700	15,400	N/A	N/A	55,380	70,500
Airport	30th St./US 1	Intermodal Center	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22,680	37,800

Alignment 2. I-595/SR84			Annual Average Daily Traffic		Level of Service		V/C	LOS "D" Roadway Capacity	Take-A-Lane Roadway Capacity	Alignment Capacity Dedicated Transit Lane ("Take-A-Lane")		Alignment Capacity w/ Separate Transit Guideway	
Analysis Unit:	**FROM:**	**TO:**	**2002**	**2025**	**2002**	**2025**	**2025**	**2025**	**2025**	**BRT**	**LRT**	**BRT**	**LRT**
136th Avenue	Orange Grove Ln.	I-595	27,500	52,655	B	D	0.98	53,500	N/A	N/A	N/A	76,180	91,300
I-595/SR 84	136th Ave.	SW 15th Ave.	179,500	266,969	F	F	1.46	182,600	N/A	N/A	N/A	205,280	220,400
SR 84	SW 15th Ave.	Andrews Ave.	53,000	80,349	C	F	1.26	63,800	N/A	N/A	N/A	86,480	101,600
Andrews Avenue	BCt Central Terminal	30th St./US 1	17,800	41,077	C	F	1.26	32,700	15,400	N/A	N/A	55,380	70,500
Airport	30th St./US 1	Intermodal Center	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22,680	37,800
Broward Boulevard-3	BCt Central Terminal	Tri-Rail	72,000	81,172	F	F	1.82	44,700	28,900	51,580	66,700	67,380	82,500

Alignment 3. Sunrise/University/Broward			Annual Average Daily Traffic		Level of Service		V/C	LOS "D" Roadway Capacity	Take-A-Lane Roadway Capacity	Alignment Capacity Dedicated Transit Lane ("Take-A-Lane")		Alignment Capacity w/ Separate Transit Guideway	
Analysis Unit:	**FROM:**	**TO:**	**2002**	**2025**	**2002**	**2025**	**2025**	**2025**	**2025**	**BRT**	**LRT**	**BRT**	**LRT**
136th Ave./Sunrise Blvd.	Sawgrass Mills/ODC	Hiatus Rd.	37,400	57,588	C	F	1.17	49,200	32,700	55,380	70,500	71,880	87,000
Sunrise Boulevard-1	Hiatus Rd.	University Dr.	35,900	60,942	C	F	1.14	53,500	35,700	58,380	73,500	76,180	91,300
University Drive	Sunrise Blvd.	Broward Blvd.	59,000	62,049	F	F	1.26	49,200	32,700	55,380	70,500	71,880	87,000
Broward Boulevard-1	University Dr.	SR 7	48,000	61,052	D	F	1.24	49,200	32,700	55,380	70,500	71,880	87,000
Broward Boulevard-2	SR 7	Tri-Rail	55,000	65,507	F	F	1.33	49,200	32,700	55,380	70,500	71,880	87,000
Broward Boulevard-3	Tri-Rail	Andrews Ave.	72,000	81,172	F	F	1.82	44,700	28,900	51,580	66,700	67,380	82,500
Andrews Avenue	BCt Central Terminal	30th St./US 1	17,800	41,077	C	F	1.26	32,700	15,400	38,080	53,200	55,380	70,500
Airport	30th St./US 1	Intermodal Center	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22,680	37,800

Alignment 4. Sunrise/SR7/Broward			Annual Average Daily Traffic		Level of Service		V/C	LOS "D" Roadway Capacity	Take-A-Lane Roadway Capacity	Alignment Capacity Dedicated Transit Lane ("Take-A-Lane")		Alignment Capacity w/ Separate Transit Guideway	
Analysis Unit:	**FROM:**	**TO:**	**2002**	**2025**	**2002**	**2025**	**2025**	**2025**	**2025**	**BRT**	**LRT**	**BRT**	**LRT**
136th Ave./Sunrise Blvd.	Sawgrass Mills/ODC	Hiatus Rd.	37,400	57,588	C	F	1.17	49,200	32,700	55,380	70,500	71,880	87,000
Sunrise Boulevard-1	Hiatus Rd.	University Dr.	35,900	60,942	C	F	1.14	53,500	35,700	58,380	73,500	76,180	91,300
Sunrise Boulevard-2	University Dr.	SR 7	54,500	78,250	F	F	1.59	49,200	32,700	55,380	70,500	71,880	87,000
SR 7-2	Sunrise Blvd.	Broward Blvd.	46,500	69,359	C	F	1.30	53,500	35,700	58,380	73,500	76,180	91,300
Broward Boulevard-2	SR 7	Tri-Rail	55,000	65,507	F	F	1.33	49,200	32,700	55,380	70,500	71,880	87,000
Broward Boulevard-3	Tri-Rail	Andrews Ave.	72,000	81,172	F	F	1.82	44,700	28,900	51,580	66,700	67,380	82,500
Andrews Avenue	BCt Central Terminal	30th St./US 1	17,800	41,077	C	F	1.26	32,700	15,400	38,080	53,200	55,380	70,500
Airport	30th St./US 1	Intermodal Center	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22,680	37,800

Transit capacity calculation was based on the following assumptions:
Peak period headways are 6 minutes.
10 runs/hour in each peak period hour.
There are 6 peak period hours (3 in the A.M. peak; 3 in the P.M. peak.)
Peak period runs (one direction) = 60 (10 X 6).
Off-peak period headways are 15 minutes.
4 runs/hour in each off peak period hour.
There are 12 off-peak period hours.
Off-peak period runs (one direction) = 48 (4 X 12).
Total runs in one direction per day = 108 (48 + 60).
Total runs in both directions per day = 216 (2 X 108).

	LRT Maximum Capacity (two way, daily) @175 riders/veh.	BRT Maximum Capacity (two way, daily) @105 riders/veh.
1 car trains	36,720	23,760

For the I-595 Analysis Unit in Alignments 1 and 2, the 2025 AADT exceeds the Alignment Capacity with Separate Transit for both BRT and LRT. The Alignment Capacity with Separate Transit for BRT and LRT is approximately 206,000 and 219,000, respectively, compared to the 2025 AADT of approximately 267,000. For the I-595 Analysis Unit (Alignments 1 and 2) and in the Broward Boulevard-3 Analysis Unit (Alignments 1, 2, 3 and 4), it could be argued that since the 2025 AADT is at or below the Alignment Capacity with Separate Transit, a separate transit guideway would be needed to meet the mobility needs of the alignment.

In Alignment 3 in the take-a-lane scenario, with BRT, the alignment capacity is slightly less than the 2025 AADT for the 136th Avenue/Sunrise Boulevard, Sunrise Boulevard-1, University Drive, Broward Boulevard-1 and Broward Boulevard-2 Analysis Units. In the Broward Boulevard-3 Analysis Unit, the BRT alignment capacities are significantly less than the 2025 AADT for both the take-a-lane and with a separate transit guideway scenarios. In the take-a-lane scenario, the alignment capacity is projected to be less than the 2002 AADT in the Broward Boulevard-3 Analysis Unit. In the Broward Boulevard-3 Analysis Unit, the LRT alignment capacity is about the same as the 2025 AADT for the separate transit guideway scenario.

In Alignment 4 in the take-a-lane scenario, with BRT, the alignment capacity is slightly less than the 2025 AADT for the 136th Avenue/Sunrise Boulevard, Sunrise Boulevard-1, Sunrise Boulevard-2, SR 7-2, and Broward Boulevard-2 Analysis Units. In the Broward Boulevard-3 Analysis Unit, the BRT alignment capacities are significantly less than the 2025 AADT for both the take-a-lane and with a separate transit guideway scenarios. In the take-a-lane scenario, the alignment capacity is projected to be less than the 2002 AADT in the Broward Boulevard-3 Analysis Unit. In the Broward Boulevard-3 Analysis Unit, the LRT alignment capacity is about the same as the 2025 AADT for the separate transit guideway scenario.

5. CONCLUSIONS

The purpose of this report was to refine the proposed build alternatives by dividing each of the alignment alternatives into “analysis units.” Analysis units were developed as a means to examine the feasibility, and advantages and disadvantages of different types of guideways in more detail.

Four types of guideway configurations were defined for consideration. Each type or configuration, offers a different set of advantages and disadvantages. The importance of those advantages and disadvantages varies from one analysis unit to the next.

The Type A, elevated, exclusive guideway offers the highest speed and greatest reliability, which in turn, contribute to higher ridership. It has two key disadvantages: higher construction costs and that it may not be acceptable in some neighborhoods for aesthetic reasons.

The Type B.1, barrier separated, at-grade, guideway would be slower than the elevated guideway since it would stop at some intersections, even with preferential signal timing in place. At signalized intersections, if the transit vehicle did not make the green light, it would have to wait for vehicles to complete turning movements, as well as have its own signal in order to make a turn. In between intersections, there would be less potential for accidents due to the barrier and/or curb separating the transit vehicle from parallel traffic as compared to the Type C, mixed traffic operation. At intersections, the risk of potential conflicts would be the same for both types.

Cost for the Type B.1 guideway would vary depending on the availability of right-of-way. If additional right-of-way is available outside existing curbs, it may be possible to use that right-of-

way for the transit guideway and maintain the existing number of roadway lanes without acquiring additional property. Under this approach there would be costs from reconstructing the roadway to accommodate the transit guideway.

Another approach to placing a Type B.1 transit guideway within an existing roadway would be to dedicate existing travel lanes to transit use. This method would require minimal additional right-of-way. This approach, however, is not without its costs, in terms of potential impacts to traffic operations. Current levels of service and average annual daily traffic on the proposed alignments range from B to F and from less than 20,000 vehicles to almost 180,000 vehicles, respectively. Projected 2025 levels of service and average annual daily traffic on the proposed alignments will range from C to F and from over 37,000 vehicles to almost 270,000 vehicles, respectively. Ideally, a sufficient number of new transit riders would be attracted to the proposed service such that it would compensate for the loss of roadway capacity.

It may be possible to accommodate the transit guideway within the existing right-of-way by using a single-track configuration (Type B.2), if cost of additional right-of-way is too high (either in dollars or in terms of displacements), or traffic volumes are so high that sharing a lane would not be feasible. Type B.2, single-track operation is proposed in limited areas where traffic volumes are high and the existing right-of-way is restricted. Obviously, a single-track configuration would require less space than a double-track configuration. The Type B.2 alignment configuration is proposed in limited areas because of the significant operational issues that its use would create. Single-track operation would limit the headway (the time between transit vehicles traveling in the same direction, which would in turn limit the capacity of the system). For example, an out-bound transit vehicle would have to wait at the station at one end of the single-track section for the in-bound transit vehicle to pass through the single-track section, before the out-bound transit vehicle could proceed. The shortest headway would be limited to the twice the amount of time it would take a transit vehicle to travel the length of the single-track section plus some switching time (required for the transit vehicle to make the transition from the single-track section to the double-track section).

Another option would be to use a lane for use by both transit vehicles and general-purpose traffic (Type C, mixed traffic). The Type C, mixed traffic or shared lane configuration is the least desirable in terms of transit operations in that it tends to be slower and les reliable (and thus less attractive to potential riders) and more likely to have conflicts with other vehicles. It is, however, the lowest cost option in terms of construction and would require the least additional right-of-way. In most areas, it probably represents the best fit within the existing infrastructure and urban character.

Identification of a potential guideway type within a given analysis unit was based on consideration of the factors discussed above as well as an assessment of what appears to be feasible in terms of construction and operation. For example, any at-grade guideway type is not feasible within the right-of-way of I-595 due to physical constraints - the need to cross access ramps to and from the main travel lanes and the high speeds and traffic volumes on those ramps that would preclude crossing them safely at-grade.

Appendix A summarizes issues and roadway conditions and recommendations for guideway types for each alignment alternative.

Developing and evaluating transit alternatives is a matter of balancing costs and benefits. The terms “costs” and “benefits” encompass a broad range of issues – costs in financial terms, as well as in effects, such as possible displacement of homes and businesses; benefits in terms of

riders and effects such as improved air quality and economic development. Guideway types have been identified for each of the analysis units. For some analysis units multiple guideway types have been identified. At this stage of the project development process, a single guideway type has been used for the purposes of developing cost estimates and ridership projections. The final selection of a guideway type in a particular analysis unit will be based on a number of evaluation factors and the balance of cost and benefits, not just physical constraints and operational issues as discussed in this report. In some cases, the selection of a guideway configuration may be made during the Preliminary Engineering/Environmental Impact Statement phase of the project.

Appendix A. Analysis Units – Summary of Characteristics

Alignment 1. I-595/SR 7/Broward			**GUIDEWAY TYPE(S)**				
Analysis Unit:	**FROM:**	**TO:**	**A**	**B.1**	**B.2**	**C**	**Comments:**
136th Avenue	Orange Grove Lane	I-595		•			There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway. Addition of the guideway would require reconstruction of the street and eliminate some existing landscaping. Can the existing grade separation at I-595 accommodate LRT under the bridge? Barrier separated, median guideway would require property acquisition and realignment of 136th Avenue.
I-595	136th Avenue	SR 7/Riverland Road	•				LRT would require construction of new flyovers to make transition form I-595 to SR 7. BRT guideway could use existing ramps.
SR 7-1	Riverland Road	Broward Boulevard	•		•		Placement of platform and final location of Transit Bridge station need to be coordinated. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. Single-track operation would constrain the capacity of the system. An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community and may not be consistent with plans and urban design of the SR 7 Collaborative.
Broward Boulevard–2	SR 7	Tri-Rail	•			•	High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community.
Broward Boulevard-3	Tri-Rail	BCt Central Terminal	•			•	If at–grade, will a grade separation be required at the FEC? How will the transition to Andrews Avenue be made, if there is a grade separation? An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community. High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts.
Andrews Avenue	BCt Central Terminal	30th Street/ US 1				•	Bridge over the New River would have to be modified or reconstructed. Mixed traffic operations would be feasible, and may even be preferable, in the CBD and central city neighborhoods. Dedicated transit lanes would require elimination of on-street parking south of 11th Street..
Airport	30th Street/ US 1	Intermodal Ctr.		•			Transit vehicles would follow Andrews Avenue to 30th Street, then use 30th to US 1. From 30th Street south, transit vehicles would operate in a dedicated guideway in the median of US 1 to the planned ITC at the airport.

Alignment 2. I-595/SR 84			**GUIDEWAY TYPE(S)**				
Analysis Unit:	**FROM:**	**TO:**	**A**	**B.1**	**B.2**	**C**	**Comments:**
136th Avenue	Orange Grove Lane	I-595		•			There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway. Addition of the guideway would require reconstruction of the street and eliminate some existing landscaping. Can the existing grade separation at I-595 accommodate LRT under the bridge? Barrier separated, median guideway would require property acquisition and realignment of 136th Avenue.
I-595/SR 84	136th Avenue	SW 15th Street	•				Construction of LRT/BRT flyovers over I-95 would be complex and costly. LRT/BRT platforms would have a significant elevation difference from a Tri-Rail station. Tri-Rail has indicated that a station at SR 84/I-95 is not consistent with their plans.
SR 84	SW 15th Street	Andrews Avenue		•		•	From 15th Street to 9th Street, there is a wide median that would accommodate a barrier separated guideway. From 9th Street to Andrews Avenue, the right-of-way is narrower and would require property acquisition to maintain median operations or a transition to mixed traffic operations. There is a cemetery on the north side of SR 84, between 9th and 4th Avenues.
Andrews Avenue	BCt Central Terminal	30th Street/ US 1				•	Bridge over the New River would have to be modified or reconstructed. Mixed traffic operations would be feasible, and may even be preferable, in the CBD and central city neighborhoods. Dedicated transit lanes would require elimination of on-street parking south of 11th Street..
Airport	30th Street/ US 1	Intermodal Center		•			Transit vehicles would follow Andrews Avenue to 30th Street, then use 30th to US 1. From 30th Street south, transit vehicles would operate in a dedicated guideway in the median of US 1 to the planned ITC at the airport.
Broward Boulevard-3	Tri-Rail	BCt Central Terminal	•			•	If at–grade, will a grade separation be required at the FEC? How will the transition to Andrews Avenue be made, if there is a grade separation? An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community. High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts.

Alignment 3. Sunrise/University/Broward			**GUIDEWAY TYPE(S)**				
Analysis Unit:	**FROM:**	**TO:**	**A**	**B.1**	**B.2**	**C**	**Comments:**
136th Avenue / Sunrise Boulevard	Orange Grove Lane	Hiatus Road		•			There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway. Addition of the guideway would require reconstruction of the street and eliminate some existing landscaping. There could be a possible Section 4(f) issues at Volunteer Park.
Sunrise Boulevard-1	Hiatus Road	University Drive			•	•	Single-track operation would constrain the capacity of the system. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. Mixed traffic operations would be feasible.
University Drive	Sunrise Boulevard	Broward Boulevard		•			There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway. Addition of the guideway would require reconstruction of the street and eliminate some existing landscaping and/or existing frontage roads. Elimination of the frontage roads could impact access to existing residential development.
Broward Boulevard-1	University Drive	SR 7	•			•	At-grade transit guideway may require modification or reconstruction of existing grade separation at Florida Turnpike to provide adequate horizontal and/or vertical clearance. High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community.
Broward Boulevard-2	SR 7	Tri-Rail	•			•	High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community.
Broward Boulevard-3	Tri-Rail	Andrews Avenue	•			•	If at–grade, will a grade separation be required at the FEC? How will the transition to Andrews Avenue be made, if there is a grade separation? An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community. High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts.
Andrews Avenue	BCt Central Terminal	30th Street/ US 1				•	Bridge over the New River would have to be modified or reconstructed. Mixed traffic operations would be feasible, and may even be preferable, in the CBD and central city neighborhoods. Dedicated transit lanes would require elimination of on-street parking south of 11th Street..
Airport	30th Street/ US 1	Intermodal Center		•			Transit vehicles would follow Andrews Avenue to 30th Street, then use 30th to US 1. From 30th Street south, transit vehicles would operate in a dedicated guideway in the median of US 1 to the planned ITC at the airport.

Alignment 4. Sunrise/*SR 7*/Broward			**GUIDEWAY TYPE(S)**				
Analysis Unit:	**FROM:**	**TO:**	**A**	**B.1**	**B.2**	**C**	**Comments:**
136th Avenue / Sunrise Boulevard	Orange Grove Lane	Hiatus Road		•			There appears to be sufficient right-of-way width to allow construction of a barrier separated, median guideway. Addition of the guideway would require reconstruction of the street and eliminate some existing landscaping. There could be a possible Section 4(f) issue at Volunteer Park.
Sunrise Boulevard -1	Hiatus Road	University Drive			•	•	Single-track operation would constrain the capacity of the system.
Sunrise Boulevard-2	University Drive	SR 7		•		•	High traffic volumes on Sunrise Boulevard make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts.
SR 7-2	Sunrise Boulevard	Broward Boulevard	•			•	High traffic volumes on SR 7 would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. High costs for additional right-of-way may make a dedicated guideway infeasible.
Broward Boulevard-2	SR 7	Tri-Rail	•			•	High traffic volumes on Broward Boulevard would make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts. An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build, but may not be acceptable to the community.
Broward Boulevard-3	Tri-Rail	Andrews Avenue	•			•	If at–grade, will a grade separation be required at the FEC? How will the transition to Andrews Avenue be made, if there is a grade separation? An elevated structure would avoid traffic impacts, insure faster, more reliable transit operations, cost more to build and may not be acceptable to the community. High traffic volumes on Broward Boulevard make mixed traffic LRT/BRT operations slower and less reliable. It may not be feasible to convert a traffic lane to transit use without significant, negative traffic impacts.
Andrews Avenue	BCt Central Terminal.	30th Street/ US 1				•	Bridge over the New River would have to be modified or reconstructed. Mixed traffic operations would be feasible, and may even be preferable, in the CBD and central city neighborhoods. Dedicated transit lanes would require elimination of on-street parking south of 11th Street..
Airport	30th Street/ US 1	Intermodal Center		•			Transit vehicles would follow Andrews Avenue to 30th Street, then use 30th to US 1. From 30th Street south, transit vehicles would operate in a dedicated guideway in the median of US 1 to the planned ITC at the airport.

Notes:
1. Average Annual Daily Traffic and Level of Service data is from *Roadway Capacity Analysis for Years 2002 and 2025*, Appendices B and C, Broward Co. Department of Planning and Environmental Protection, Transportation Planning Division, Oct. 2003.
2. Guideway Types: A. - Exclusive, aerial structure; B.1 - Semi-Exclusive, median or curb, barrier separated, double-track; B.2 - Semi-Exclusive,– median or curb, barrier separated, single-track; C. – Non-Exclusive, median or curb, mixed traffic, double-track based on TCRP Report No. 17, *Integration of Light Rail Transit into City Streets*, 1996.