



## 7.0 Alternatives Analysis

The analysis described herein adheres to the project development process by examining the various alternatives considered and the Preferred Alternative for this project. Alternatives considered for evaluation include the No Project (No Build) Alternative and Study (Build) Alternatives. The design concepts for this project address the needs of the HART North / South BRT Corridor.

### 7.1 No Project (No Build) Alternative

The No Project (No Build) Alternative assumed no changes to the transit/transportation facilities within the project corridor beyond currently planned and programmed projects already committed within the Hillsborough County Metropolitan Planning Organization *2025 Long Range Transportation Plan Update* and the respective Transportation Improvement Program plans. The No Project Alternative formed the basis of the comparative analysis for each of the viable Study Alternatives.

The benefits of the No Project Alternative were the absence of construction-related and short-term operational impacts associated with the Study Alternatives.

Specifically, the No Project Alternative offered no benefits to future transit users with the additional BRT service and increased frequencies nor improved operating conditions anticipated with the transit signal priority (TSP) within the project study area. Distinct advantages and disadvantages associated with this alternative are listed below.

#### Advantages

- No impedance to traffic flow during construction;
- No expenditure of funds for right-of-way acquisition, engineering, design or construction;
- No impact on the adjacent natural, physical, and human environments; and
- No disruption to existing land uses due to construction-related activities.

#### Disadvantages

- Longer travel times for transit users;
- No transit connection from Park and Ride at the Fletcher Avenue and Interstate (I-75) interchange to USF and downtown Tampa;
- No upgraded passenger amenities at station and on buses;
- No enhanced service for local route; and
- Potential increase in safety-related accidents which includes, but is not limited to, rear end collisions and collisions caused by red light running due to lower levels of service.

The No Project Alternative will remain a viable alternative throughout the study process. The final selection of a preferred alternative will not be made until all impacts are considered and responses to the Final Public Meeting comments have been evaluated.



## 7.2 Study (Build) Alternatives

### 7.2.1 Service Plan

The BRT service along each corridor is designed to be a premium service overlay to the local service. The recommended service concept for the North / South BRT corridor from the *Transit Emphasis Corridor Improvement Plan* (January 2008) is to use 40-foot buses. The BRT system will provide service for a minimum of 14 hours per day (5:30 am to 7:30 pm, tentative), with service headways every 10 minutes during peak hours and 15 minutes at all other times. Headways refer to the frequency of transit service or amount of time between transit vehicles operating on the same route. At this time, the AM and PM peak periods would be 6:00am to 9:00am and 3:00pm to 6:00pm, respectively. These peak periods may be adjusted in response to ridership patterns and/or budgetary constraints. In addition, Telecom Park and Hidden River Corporate Park will be serviced in one direction either the trip to or from University Area Transit Center (UATC) based on the time of day (AM or PM).

In the morning (AM), trips from the UATC will operate through Telecom Park, then to the Hidden River Corporate Park / Park and Ride, and return to the UATC. In the afternoon and evening (PM), trips from the UATC will operate through the Hidden River Corporate Park / Park and Ride and then provide service to Telecom Park and return to the UATC. The recommendation is to serve Telecom Park and Hidden River Corporate Park in only one direction as a way to provide service to the majority of the potential users while minimizing the travel time, vehicles, and annual Operating and Maintenance (O&M) expenses.

While the BRT service only stops at selected stations, local service on Route 2 will continue to operate with buses running every 30 minutes throughout the day. Local buses will serve those passengers who choose to board and alight at intermediate bus stops. BRT service will provide higher frequency, and higher speed service to selected stations. Local service will operate less frequently than BRT yet provide continuous service to bus stops that are beyond walking distance of the BRT stations.

### 7.2.2 Prototype Station Design

Each general station location/intersection was identified in the *Transit Emphasis Corridor Improvement Planning & Design Services* (January 2008), and also included a station type appropriate to the ridership and passenger service expected at each station location. Station prototypes, discussed in greater detail in **Chapter 5**, were classified as either a Type A, Type B, Type C, or as part of a larger existing transit center (U). The station prototypes for each general station location, shown in **Table 7-1**, were considered initial recommendations and were subject to change based upon available right-of-way and other station design parameters.



**Table 7-1 Station Prototypes by Location**

Station Location	Station Prototype	Station Location	Station Prototype
Marion Transit Center	U	Busch Boulevard	B
Jefferson Street	B	Linebaugh Avenue	A
Twiggs Street	A	109 <sup>th</sup> Avenue	A
Estelle Street	A	Fowler Avenue	C
Columbus Drive	A	131 <sup>st</sup> Avenue	A
Floribraska Avenue/ 21 <sup>st</sup> Avenue	B	Fletcher Avenue/ Nebraska Avenue	B
Lake Avenue	A	15 <sup>th</sup> Street	A
MLK Boulevard	C	22 <sup>nd</sup> Street	A
Hillsborough Avenue	C	University Area Transit Center	U
Hanna Avenue	A	Magnolia Drive	B
Sligh Avenue	A	Palm Drive	B
Broad Street	A	50 <sup>th</sup> Street	A
Waters Avenue	C	56 <sup>th</sup> Street	A

Note: U = Existing Transit Center

### 7.2.3 Station Location Alternatives

The project objective is to develop alternative station locations at high trip generators and connection routes along the North / South BRT Corridor and minimize impacts to adjacent property. During the location analysis, each alternative station location was assumed to utilize the footprint of a full-width Type C prototype station, consisting of a 16-foot overall width and 90-foot overall length to include all station-related equipment (e.g. ADA landing pads, shelters, bike racks, kiosks, etc). Alternative station footprints were placed to minimize right-of-way acquisition, business and structure damages, driveway encroachment, and the distance from the intersection. Several alternative locations for each direction of BRT travel were generated at each station based on aerial and field reviews of the corridor. When determining alternative station locations, every effort was made to develop at least one near-side station alternative and at least one far-side station alternative for each direction of BRT travel. However, existing property improvements adjacent to some of the station locations prohibited development of practical station location alternatives. Unless otherwise noted, all of these alternative station locations would be constructed to utilize the existing edge of pavement and not modify the existing travel lane widths. Alternatives for each station location are discussed in the following subsections and are shown in the *Alternative Station Locations Plans* in **Appendix B**.

#### Marion Transit Center

One alternative station location was developed for the Marion Transit Center (MTC), shown on **Sheet 5** in **Appendix B**. **MTC-1** is located on a traffic island on the eastern side of the transit center along Morgan Street. This site was chosen because its station construction would cause the least disruption to the remainder of the MTC and its operation would allow for less interference with other bus routes and rapid transfer to other routes.

#### Marion Street Transit Parkway

The existing bus stops along the Marion Street Transit Parkway (MSTP) between Jackson Street and Tyler Street could be used to serve the North / South BRT corridor. The existing bus stops offer many amenities similar to the proposed BRT stations, including large shelters and additional signage. However, none of the existing bus stops along the MSTP were investigated for BRT station improvements. The existing shelters and amenities provide ample transit enhancement and the MSTP itself provides a separation of transit from surrounding traffic. The addition of BRT



totems would offer a degree of redundancy and may give the existing facilities an appearance of BRT exclusive use, which may deter riders of other routes. Therefore, no improvements were suggested along the MSTP.

#### Jefferson Street and Jackson Street / Kennedy Boulevard

A total of four alternative station locations, two eastbound and two westbound, were considered for the stations at Jefferson Street and the one-way pair of Jackson Street and Kennedy Boulevard, shown on **Sheet 6** in **Appendix B**. Eastbound alternatives **EB-1** and **EB-2** remove several on-street parking stalls and use the existing sidewalk adjacent to the parking lot owned by the Tampa Electric Company. Both stations would require remaining on-street parking spaces to extend the station platform to the outside edge of the existing bike lane. Both **EB-1** and **EB-2** are near-side stations relative to Jefferson Street, but **EB-1** would be constructed as a far-side station given its proximity to Pierce Street.

Westbound alternatives **WB-1** and **WB-2** were developed to utilize the on-street parking and sidewalk adjacent to the Hillsborough County Courthouse. Both stations would require removal of on-street parking spaces to extend the station platform to the outside edge of travel to construct the station platform. Both **WB-1** and **WB-2** are far-side stations relative to Jefferson Street, but **WB-2** would be constructed as a near-side station given its proximity to Pierce Street.

#### Twiggs Street and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and Twiggs Street, shown on **Sheet 7** in **Appendix B**. **NB-1** would be a near-side station constructed adjacent to a parking lot underneath the Selmon Expressway in conjunction with the existing local stop. **NB-2** would be a far-side station constructed adjacent to the Tampa Union Station. **SB-1** would be a near-side station constructed on a traffic island between the southbound right turn ramp and Nebraska Avenue. **SB-2** would be a far-side station constructed along sidewalk underneath the Selmon Expressway in conjunction with the existing local stop.

#### Estelle Street and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and Estelle Street, shown on **Sheet 8** in **Appendix B**. **NB-1** would be a mid-block station constructed to utilize an existing bus shelter adjacent to the Tampa Park Plaza in conjunction with the existing local stop. **NB-2** would be a near-side station constructed adjacent to the Robert W. Saunders, Sr. Public Library in conjunction with the existing local stop. **SB-1**, considered a near-side station relative to Estelle Street, would be constructed as a far-side station adjacent to three vacant parcels at the southwest corner of Nebraska Avenue and Henderson Avenue, and would require the closure of one driveway to a parcel with additional access from Henderson Avenue. **SB-2** would be constructed to utilize an existing bus shelter on the southwest corner of Nebraska Avenue and Kay Street in conjunction with the existing local stop. Additional southbound station locations closer to Estelle Street were not considered due to several driveway and/or building impacts.

#### Columbus Drive and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and Columbus Drive, shown on **Sheet 9** in **Appendix B**. **NB-1** would be a near-side station in conjunction with the existing local stop constructed adjacent to a commercial building owned by the Mardave Company and would require the closure of one of the two driveways to the property. **NB-2** would be a far-side station constructed adjacent to two vacant



parcels between East 17<sup>th</sup> Avenue and 19<sup>th</sup> Avenue. Additional northbound station locations closer to the intersection were not considered due to several building impacts. However, these buildings were vacant at the time of this study and relocation of this station could be incorporated in a future urban renewal/redevelopment project. **SB-1** would be a near-side station constructed adjacent to two vacant parcels on the northwest corner of Nebraska Avenue and Forest Avenue. **SB-2** would be a near-side station constructed adjacent to the Rent King store on the northwest corner of Nebraska Avenue and Columbus Avenue in conjunction with the existing local stop.

#### Floribraska Avenue/21<sup>st</sup> Street and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and Floribraska Avenue/21<sup>st</sup> Avenue, shown on **Sheet 10** in **Appendix B**. **NB-1** would be a far-side station constructed adjacent to a vacant parcel on the northeast corner of Nebraska Avenue and Floribraska Avenue/21<sup>st</sup> Avenue. **NB-2** would be a far-side station constructed adjacent to a vacant parcel on the northeast corner of Nebraska Avenue and 22<sup>nd</sup> Avenue. Additional near-side northbound station locations were not considered due to several building impacts. **SB-1**, considered a distant near-side station to Floribraska Avenue/21<sup>st</sup> Avenue, would be constructed on the southwest corner of Nebraska Avenue and Adalee Street at two vacant parcels. **SB-2** would be a near-side station constructed adjacent to the Checkers fast food restaurant on the northwest corner of Nebraska Avenue and Floribraska Avenue/21<sup>st</sup> Avenue in conjunction with the existing local stop.

#### Lake Avenue and Nebraska Avenue

A total of five alternative station locations, three northbound and two southbound, were developed for the intersection of Nebraska Avenue and Lake Avenue, shown on **Sheet 11** in **Appendix B**. **NB-1** would be a near-side station constructed adjacent to a commercial building owned by Borrell Electric. **NB-2** would be a near-side station constructed adjacent to the OK Liquor & Spirits on the southeast corner of Nebraska Avenue and Lake Avenue in conjunction with the existing local stop. **NB-3** would be a far-side station constructed adjacent to a commercial building on the southeast corner of Nebraska Avenue and 31<sup>st</sup> Avenue. **SB-1** would be a near-side station constructed adjacent to Ralph's Generators on the northwest corner of Nebraska Avenue and Lake Avenue in conjunction with the existing local stop. **SB-2** would be a far-side station constructed adjacent to the Borrell Electric parking lot on the northwest corner of Nebraska Avenue and Baker Street.

#### Dr. Martin Luther King, Jr. Boulevard (MLK Boulevard) and Nebraska Avenue

A total of six alternative station locations, three northbound and three southbound, were developed for the intersection of Nebraska Avenue and MLK Boulevard, shown on **Sheet 12** in **Appendix B**. Consideration for joint-use of these stations with the future East / West BRT Corridor was included in the alternative station location development at this intersection. **NB-1** would be a near-side station constructed adjacent to the Tampa Bay Federal Credit Union. **NB-2** would be a near-side station constructed adjacent to the Walgreens on the southeast corner of Nebraska Avenue and MLK Boulevard. **NB-3** would be a distant far-side station constructed adjacent to a commercial building on the northeast corner of Nebraska Avenue and North Bay Street. **SB-1** would be a near-side station constructed adjacent to a vacant parcel on the northwest corner of Nebraska Avenue and Ida Street. **SB-2** would be a near-side station constructed adjacent to the Advance Auto Parts on the northwest corner of Nebraska Avenue and MLK Boulevard. **SB-3** would be a far-side station constructed adjacent to the Sweetbay Supermarket in conjunction with the existing local stop.

#### Hillsborough Avenue and Nebraska Avenue

A total of five alternative station locations, three northbound and two southbound, were developed for the intersection of Nebraska Avenue and Hillsborough Avenue, shown on **Sheet 13** in



**Appendix B.** Consideration for joint-use of these stations with the future East / West BRT Corridor was included in the alternative station location development at this intersection. **NB-1** would be a near-side station constructed adjacent to the Advance Auto Parts on the southeast corner of Nebraska Avenue and Hillsborough Avenue in conjunction with the existing local stop. **NB-2** would be a far-side station constructed adjacent to the Shell gas station on the northeast corner of Nebraska Avenue and Hillsborough Avenue. **NB-3** would be a far-side station constructed adjacent to a towing company lot north of Hillsborough Avenue and would require the closure of one of the two driveways to the parcel in conjunction with the existing local stop. **SB-1** would be a near-side station constructed adjacent to Enterprise Rent-A-Car on the northwest corner of Nebraska Avenue and Hillsborough Avenue in conjunction with the existing local stop. **SB-2** would be a far-side station constructed adjacent to Mission Tampa on the southwest corner of Nebraska Avenue and Hillsborough Avenue.

#### Hanna Avenue and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and Hanna Avenue, shown on **Sheet 14** in **Appendix B**. **NB-1** would be a near-side station adjacent to the Publix supermarket on the southeast corner of Nebraska Avenue and Paris Street in conjunction with the existing local stop. **NB-2** would be a near-side station adjacent to Fire Station No. 7 on the southeast corner of Nebraska Avenue and Hanna Avenue in conjunction with the existing local stop. Northbound far-side station locations were not considered due to several driveway and property impacts. **SB-1** would be a far-side station constructed adjacent to the Alamo Motel on the southwest corner of Nebraska Avenue and Hanna Avenue in conjunction with the existing local stop. **SB-2**, considered a far-side station relative to Hanna Avenue, would be constructed adjacent to the Family Dollar on the northwest corner of Nebraska Avenue and Idlewild Avenue. Southbound near-side locations were not considered due to driveway and property impacts.

#### Sligh Avenue and Nebraska Avenue

A total of five alternative station locations, two northbound and three southbound, were developed for the intersection of Nebraska Avenue and Sligh Avenue, shown on **Sheet 15** in **Appendix B**. **NB-1** would be a near-side station constructed adjacent to GWT Roofing on the southeast corner of Nebraska Avenue and Sligh Avenue. **NB-2** would be a far-side station constructed adjacent to the St. Francis Episcopal Mission on the northeast corner of Nebraska Avenue and Norfolk Street. **SB-1** would be a near-side station constructed adjacent to an auto repair facility north of Sligh Avenue. **SB-2** would be a far-side station constructed adjacent to the Acts Assisted Living Center south of Sligh Avenue in conjunction with the existing local stop. **SB-3** would be a far-side station constructed adjacent to the Oasis Motel on the southwest corner of Nebraska Avenue and Elm Street.

#### Broad Street and Nebraska Avenue

A total of three alternative station locations, one northbound and two southbound, were developed for the intersection of Nebraska Avenue and Broad Street, shown on **Sheet 16** in **Appendix B**. **NB-1** would be a far-side station adjacent to Alpine Liquor on the northeast corner of Nebraska Avenue and Broad Street. Other northbound alternative station locations presented numerous driveway and building impacts. **SB-1** would be a near-side station constructed on the northwest corner of Nebraska Avenue and Robson Street. **SB-2** would be constructed as a far-side station adjacent to three residential parcels on the northwest corner of Nebraska Avenue and Crenshaw Street.



### Waters Avenue and Nebraska Avenue

A total of three alternative station locations, two northbound and one southbound, were developed for the intersection of Nebraska Avenue and Waters Avenue, shown on **Sheet 17** in **Appendix B**. **NB-1**, considered a near-side station relative to Waters Avenue, would be constructed adjacent to a vacant commercial parcel on the northeast corner of Nebraska Avenue and Juneau Street. **NB-2** would be a near-side station constructed adjacent to the Family Dollar on the southeast corner of Nebraska Avenue and Waters Avenue. Northbound far-side stations were not considered due to several driveway and business impacts. **SB-1** would utilize an existing bus shelter area adjacent to the Tampa Greyhound Park on the southwest corner of Nebraska Avenue and Waters Avenue. Other southbound alternative stations were not considered due to several driveway and business impacts as well as the suitability of the existing bus station to accommodate the BRT service.

### Busch Boulevard and Nebraska Avenue

A total of five alternative station locations, three northbound and two southbound, were developed for the intersection of Nebraska Avenue and Busch Boulevard, shown on **Sheet 18** in **Appendix B**. **NB-1** would be a near-side station constructed adjacent to Mike's Drivelines on the southeast corner of Nebraska Avenue and Okaloosa Avenue. **NB-2** would be a near-side station constructed adjacent to Pacific Auto Service on the southeast corner of Nebraska Avenue and Skagway Avenue in conjunction with the existing local stop. **NB-3** would be a far-side station constructed adjacent to the Chevron gas station on the northeast corner of Nebraska Avenue and 93<sup>rd</sup> Avenue. **SB-1** would be a near-side station constructed adjacent to the Comfort Inn retention pond area on the southwest corner of Nebraska Avenue and Wilma Street. **SB-2** would be a far-side station constructed adjacent to Alpaugh Plumbing Supply on the southwest corner of Nebraska Avenue and Skagway Avenue. Additional alternative station locations closer to Busch Boulevard were not considered due to driveway and property impacts as well as proximity to the at-grade railroad crossing immediately south of Busch Boulevard.

### Linebaugh Avenue and Nebraska Avenue

A total of five alternative station locations, three northbound and two southbound, were developed for the intersection of Nebraska Avenue and Linebaugh Avenue, shown on **Sheet 19** in **Appendix B**. **NB-1**, considered a distant near-side station relative to Linebaugh Avenue, would be constructed adjacent to Fusion Automotive on the northeast corner of Nebraska Avenue and Castle Court. **NB-2**, a near-side station, would be constructed adjacent to a vacant parcel owned by the City of Tampa on the northeast corner of Nebraska Avenue and Orchid Avenue. **NB-3**, a far-side station, would be constructed as a mid-block station adjacent to Buddy's Home Furnishings north of Linebaugh Avenue. **SB-1** would be a near-side station constructed adjacent to a used car lot on the northwest corner of Nebraska Avenue and Brawin Avenue. **SB-2** would be a far-side station constructed adjacent to the Why Not Bar on the southwest corner of Nebraska Avenue and Linebaugh Avenue. Alternative station locations closer to Linebaugh Avenue were not considered due to several driveway and business impacts.

### 109<sup>th</sup> Avenue and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and 109<sup>th</sup> Avenue, shown on **Sheet 20** in **Appendix B**. **NB-1** would be a near-side station in conjunction with the existing local stop adjacent to the 7-11 convenience store on the southeast corner of Nebraska Avenue and 109<sup>th</sup> Avenue. **NB-2**, a far-side station, would be constructed as a mid-block station adjacent to the Kindness Animal Hospital north of 109<sup>th</sup> Avenue. Other northbound far-side station locations were not considered due to several driveway impacts. **SB-1** would be a far-side station constructed adjacent to the German Car Care auto repair facility on the southwest corner of Nebraska Avenue and 109<sup>th</sup>



Avenue. **SB-2**, another far-side station, would be constructed to utilize an existing bus shelter adjacent to a Tampa Electric Company substation opposite Seneca Avenue. Southbound near-side stations were not considered due to driveway and property impacts.

#### Fowler Avenue and Nebraska Avenue

Three alternative station locations, two northbound and one southbound, were developed for the intersection of Nebraska Avenue and Fowler Avenue, shown on **Sheet 21** in **Appendix B**. **NB-1** would be a near-side station constructed adjacent to the International Flea Market parking lot on the southeast corner of Nebraska Avenue and Fowler Avenue. **NB-2** would be a far-side station constructed adjacent to a vacant parcel between the McDonald's parking lot and a used car lot north of Fowler Avenue. **SB-1** would be a far-side station constructed in conjunction with the new retail redevelopment on the southwest corner of Nebraska and Fowler Avenue. The station location would be part of a land exchange between the FDOT and parcel owner. Since this location is being provided by the developer, no other southbound alternative station locations were considered at this intersection.

#### 131<sup>st</sup> Avenue and Nebraska Avenue

A total of four alternative station locations, two northbound and two southbound, were developed for the intersection of Nebraska Avenue and 131<sup>st</sup> Avenue, shown on **Sheet 22** in **Appendix B**. **NB-1** and **NB-2** would each be far-side stations adjacent to the Auto Zone on the northeast corner of Nebraska Avenue and 131<sup>st</sup> Avenue, with **NB-1** constructed south of the Auto Zone driveway and **NB-2** constructed north of the driveway. Northbound near-side station locations were not considered due to several driveway and property impacts as well as potential parcel contamination on parcels southeast of Nebraska Avenue and 131<sup>st</sup> Avenue. **SB-1** would be a near-side station constructed adjacent to the Custom World auto repair facility on the northwest corner of Nebraska Avenue and 131<sup>st</sup> Avenue. **SB-2** would be a far-side station constructed adjacent to a vacant parcel on the southwest corner of Nebraska Avenue and 131<sup>st</sup> Avenue.

#### Fletcher Avenue and Nebraska Avenue

A total of four alternative station locations, two eastbound, one westbound, and one southbound, were developed for the intersection of Nebraska Avenue and Fletcher Avenue, shown on **Sheet 23** in **Appendix B**. The BRT route follows Nebraska Ave. north to Fletcher Avenue and to the east. **EB-1** would be a far-side station constructed between the two driveways accessing the Todd Adult Video. **NB-2** would be a far-side station constructed between the eastern driveway of the Todd Adult Video and the driveway for Z-Doc's Auto Repair. Northbound near-side station locations were not considered due to several property and driveway impacts. **WB-1** would be a near-side station constructed adjacent to the Dresses for Less store east of Nebraska Avenue and west of the railroad crossing. **SB-1** would be a far-side station constructed adjacent to Uncle Bobs' Self Storage south of Fletcher Avenue. Additional westbound near-side alternative station locations were not considered due to either the proximity to the at-grade railroad crossing on Fletcher Avenue or insufficient distance for the bus to access the westbound left turn lane once departing the proposed station.

#### 15<sup>th</sup> Street and Fletcher Avenue

A total of four alternative station locations, two eastbound and two westbound, were developed for the intersection of Fletcher Avenue and 15<sup>th</sup> Street, shown on **Sheet 24** in **Appendix B**. **EB-1** would be constructed as a near-side station adjacent to the La Place strip retail center. **EB-2** would be a far-side station constructed adjacent to a vacant parcel on the southeast corner of Fletcher Avenue and 15<sup>th</sup> Street. **WB-1** would be a far-side station constructed adjacent to the Hess gas station on the northwest corner of Fletcher Avenue and 15<sup>th</sup> Street. **WB-2** would be a far-side



station constructed adjacent to a strip retail center west of 15<sup>th</sup> Street. Westbound near-side alternative station locations were not considered due to several driveway and business impacts.

#### 22<sup>nd</sup> Street and Fletcher Avenue

A total of three alternative station locations, two eastbound and one westbound, were developed for the intersection of Fletcher Avenue and 22<sup>nd</sup> Street, shown on **Sheet 25** in **Appendix B**. **EB-1** would be constructed as a near-side station adjacent to the Value Pawn on the southwest corner of Fletcher Avenue and 22<sup>nd</sup> Street. **EB-2** would be a far-side station constructed adjacent to the McDonald's parking lot on the southeast corner of Fletcher Avenue and 22<sup>nd</sup> Street. **WB-1** would be a near-side station constructed adjacent to the Popeye's restaurant east of 22<sup>nd</sup> Street. Westbound far-side alternative station locations were not considered due to several driveway and business impacts.

#### University Area Transit Center

Two alternative station locations were considered for the University Area Transit Center (UATC), shown on **Sheet 26** in **Appendix B**. **UATC-1** and **UATC-2** are located along 27<sup>th</sup> Street and utilize existing bus stop locations adjacent to the UATC center hub. **UATC-1** would be constructed north of the UATC access driveway to 27<sup>th</sup> Street, while **UATC-2** would be constructed south of the UATC access driveway.

#### Magnolia Drive and Fletcher Avenue

Two alternative station locations were considered for the intersection of Fletcher Avenue and Magnolia Drive, shown on **Sheet 27** in **Appendix B**. **EB-1** and **WB-1** would each utilize existing bus bays on Fletcher Avenue, with **EB-1** utilizing the existing far-side bus bay and **WB-1** utilizing the existing near-side bay. Due to the existing bus facilities at this intersection, additional eastbound near-side and westbound far-side alternative station locations were not considered.

#### Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue

A total of three alternative station locations, two eastbound and one westbound, were considered for the intersection of Fletcher Avenue and Palm Drive/42<sup>nd</sup> Street, shown on **Sheet 28** in **Appendix B**. **EB-1** would be a near-side station constructed adjacent to a University of South Florida facility west of the existing eastbound right-turn lane. **EB-2** would be a far side station constructed adjacent to a University of South Florida parking lot on the southeast corner of Fletcher Avenue and Palm Drive. **WB-1** would utilize the existing bus bay adjacent to the Church of Jesus Christ of Latter Day Saints on the northwest corner of Fletcher Avenue and 42<sup>nd</sup> Street. Due to the existing bus facility at this intersection, westbound near-side alternative station locations were not considered.

#### 50<sup>th</sup> Street and Fletcher Avenue

A total of four alternative station locations, two eastbound and two westbound, were considered for the intersection of Fletcher Avenue and 50<sup>th</sup> Street, shown on **Sheet 29** in **Appendix B**. **EB-1** would be a near-side station constructed adjacent to vacant land on the southwest corner of Fletcher Avenue and 50<sup>th</sup> Street. **EB-2** would be a far-side station constructed adjacent to the Palm Lake Apartments on the southeast corner of Fletcher Avenue and 50<sup>th</sup> Street. **WB-1** and **WB-2** would each be constructed adjacent to conservation land owned by the University of South Florida, with **WB-1** as a near-side station and **WB-2** as a far-side station relative to the "T" intersection.



### 56<sup>th</sup> Street and Fletcher Avenue

A total of four alternative station locations, two eastbound and two westbound, were considered for the intersection of Fletcher Avenue and 56<sup>th</sup> Street, shown on **Sheet 30** in **Appendix B**. **EB-1** would be a near-side station constructed adjacent to the Westcoast Brace and Limb building west of 56<sup>th</sup> Street. **EB-2** would be a far-side station constructed adjacent to the 7-11 gas station on the southeast corner of Fletcher Avenue and 56<sup>th</sup> Street. **WB-1** and **WB-2** would each be constructed adjacent to conservation land owned by the University of South Florida, with **WB-1** as a near-side station and **WB-2** as a far-side station relative to the “T” intersection.

### Telecom Park

Several alternative station locations were developed for the service route through Telecom Park, shown on **Sheet 31** in **Appendix B**. These station locations would not include any of the station prototype amenities and would be constructed as flag stations with benches and route signs. No shelters or bay locations were considered for Telecom Park. These locations will be further addressed by HART and the developer through the Development of Regional Impact (DRI) process which will be coordinated by HART.

### Park and Ride/Hidden River Corporate Park

Three alternative Park and Ride locations, shown on **Sheet 32** in **Appendix B**, were developed either within or in close proximity of the Hidden River Corporate Park, which serves as the northern terminus for the North / South BRT Corridor. The Park and Ride locations were only investigated as sites for informational purposes to present to various agencies, stakeholders, and public meetings. Specific plans, facilities, and site location selection are not included within the analysis done for this report, as those analyses are part of a separate study currently underway.

The Hidden River Corporate Park has several existing bus stop locations, shown on **Sheet 32** in **Appendix B**. These station locations would not include any of the station prototype amenities and would be constructed as flag stations with benches and route signs. No additional shelters or bay locations were considered for Hidden River Corporate Park. These existing locations will serve as the BRT stations except for the northernmost potential Park and Ride location. At this location, the large or Prototype C station would be constructed for the Park and Ride lot users.

## **7.2.4 Transit Signal Priority**

Enhancements can be made to the existing traffic signal controllers and controller software that will provide additional travel time benefits and improve schedule adherence reliability for the build project. Signal improvements include communication, detection and control hardware together with controller firmware and software upgrades to enable transit signal priority, as discussed in **Chapter 6** of this report with further details in the *North / South Corridor BRT Traffic and Signal Analysis Report* (October 2009). BRT travel time can be improved with Transit Signal Priority (TSP), allowing additional green time for traffic traveling in the direction of the BRT bus in order for the bus to clear the intersection when approaching at the point when the signal would normally transition from green to red phase indications. Similarly green phase indication can be granted early when BRT vehicles approach the intersection on red to minimize stop and wait time. Priority requests shall only be granted by the signal controller if certain criteria are satisfied, and the request does not adversely affect the surrounding signal control network.

## **7.2.5 Other Roadway / Pedestrian Improvements**

In addition to the station improvements and implementation of TSP, additional improvements may be needed which would complement the BRT route. Improvements were identified in the *North / South Corridor BRT Traffic and Signal Analysis Report* (October 2009). These additional



improvements include side street widening / lane modifications, queue jump lanes for the BRT buses, mid-block pedestrian crossings, pedestrian / bicycle improvements and bus bays to allow for the transit vehicle to pull out of the through traffic flow. Select locations have been chosen based on their benefit to the project.

### 7.2.5.1 Side Streets

To avoid capacity impacts on side streets, improvements could be done to allow for TSP to function better along the BRT corridor. Side street improvements could include widening the roadway to add or extend (left, right or through) travel lanes and/or modifying the pavement striping and signal phasing at the intersection.

#### Sligh Avenue

Based on the traffic analysis, Sligh Avenue was considered for intersection improvements based on the proximity of the signal at the intersection with Nebraska Avenue to the I-275 interchange. The intersection requires improvements without the implementation of the BRT service and/or TSP. Sligh Avenue improvements would allow for higher intersection capacity to keep traffic from queuing back into the interchange and allow for the potential addition of TSP for the BRT buses along Nebraska Avenue. Increased roadway capacity would reduce delays at the intersection. Reduced delays would facilitate an overall increase to the level of service at the intersection, which would lower the BRT system time along the corridor and provide shorter trip times.

The roadway improvements are the addition of a right turn lane for the westbound approach. This would require widening to the north for the right turn lane and modifications to the approach lane. The right turn lane would be approximately 300 feet long and realignment of the through lane approximately another 300 feet. Two parcels would be impacted by the proposed right-of-way for the improvements. The potential impact to the BP gas station on the northeast corner of Nebraska Avenue and Sligh Avenue is to the secondary gas pump island with canopy. This would potentially lead to high right-of-way costs and high contamination potential. Other existing features that may be impacted include the site signage, underground storage tanks and driveway access.

### 7.2.5.2 Queue Jump Lanes

In addition to TSP enhancements, physical improvements may be required at high traffic volume intersections to improve BRT service. Physical improvements would consist of a shared-use right turn lane to serve as a BRT through-lane at an intersection. This lane, often referred to as a queue jump lane, would allow the BRT vehicle to bypass the queue of through traffic waiting at a signal. A queue jump lane would require a right-turn directional signal and a special BRT signal to be installed at the intersection. The right-turn directional signal would allow the right-turn traffic to turn before the BRT vehicle approaches the intersection. The BRT signal would allow the BRT vehicle to cross the intersection without conflicting turning movements or merging conflicts with other traffic as the BRT vehicle crosses the intersection and merges into regular travel lanes ahead of traffic waiting in the through queue or to access a far-side station location.

Any intersection where queue jump lanes would be recommended will require construction or extension of the additional lane. The intersection queue length will be determined through the traffic analysis and the right turn lane would be designed to allow adequate deceleration distance for the BRT vehicle to enter the lane safely. Two intersections were identified in the 2013 No-Build traffic analysis as having significant delays and queuing to warrant investigation of queue jump lane use: Busch Boulevard and Nebraska Avenue, and Fowler Avenue and Nebraska Avenue.



### Busch Boulevard and Nebraska Avenue

The intersection of Busch Boulevard and Nebraska Avenue has no existing right turn lane on either northbound or southbound Nebraska Avenue, so the addition of a queue jump lane would require widening the existing roadway, shown on **Sheet 18** in **Appendix B**. For northbound traffic, widening approximately 600 feet to the east, south of Busch Boulevard, would impact several businesses and auto repair facilities, leading to high right-of-way acquisition costs and high contamination potential. For southbound traffic, widening approximately 850 feet to the west, north of Busch Boulevard, would impact a hotel parking lot and an auto dealership, which would lead to high right-of-way costs. In addition, the intersection is approximately 600 feet from the I-275 interchange with Busch Boulevard, so TSP would have to be carefully coordinated so as to not cause the queues on Busch Boulevard to interfere with I-275. The CSXT railroad crosses Nebraska Avenue directly adjacent to the intersection which would require potential upgrades / modifications to the railroad signal equipment.

### Fowler Avenue and Nebraska Avenue

Fowler Avenue is the only intersection on Nebraska Avenue which includes existing right turn lanes in the direction of BRT travel. However, these lanes would require extension to allow the BRT vehicle to maneuver around the future through queue shown on **Sheet 21** in **Appendix B**. The northbound queue jump lane would require widening to extend the existing right turn lane approximately 350 feet to terminate just north of the EZ Pawn in front of the International Flea Market. The widening would impact one driveway and a portion of the parking lot for the flea market. The southbound queue jump lane would require extension of the existing right turn lane approximately 275 feet to terminate at the north end of the Public Storage driveway, which would impact the Public Storage driveway and parking circulation. The intersection of Fowler Avenue and Nebraska Avenue is approximately 1,000 feet from the I-275 interchange. Careful coordination with TSP would be required such that the queues from Fowler Avenue would not interfere with the interchange.

#### **7.2.5.3 Bus Bays**

Bus bays could also be implemented to allow the BRT vehicle to separate from through traffic. Through traffic would not be blocked by the BRT vehicle during passenger boarding operations, providing a safer operating condition for the buses, other vehicles, and the transit users. The bus bays would be design based on the FDOT Transit Facilities Guidelines. Bus bays were considered at several intersections, including:

- Estelle Street and Nebraska Avenue (northbound);
- Hanna Avenue and Nebraska Avenue (southbound);
- Linebaugh Avenue and Nebraska Avenue (northbound);
- Fowler Avenue and Nebraska Avenue (northbound and southbound);
- 15<sup>th</sup> Street and Fletcher Avenue (eastbound);
- 22<sup>nd</sup> Street and Fletcher Avenue (eastbound);
- Magnolia Drive and Fletcher Avenue (eastbound and westbound);
- Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue (eastbound and westbound);
- 50<sup>th</sup> Street and Fletcher Avenue (eastbound and westbound); and
- 56<sup>th</sup> Street and Fletcher Avenue (eastbound and westbound).



Many of the existing HART stops along Nebraska Avenue between Jackson Street and Hillsborough Avenue include a striped bus bay. These mid-block bus bays are created by widening the bicycle lane to eight feet, shifting the travel lane closer to the center of the roadway, and eliminating the two-way left turn lane. These bus bays allow for much of the same effect of removing the bus from traffic, but do not require widening the roadway. The following intersections have station locations which could utilize the existing striped bus bays:

- Estelle Street and Nebraska Avenue (**NB-1, NB-2, SB-2**); and
- Columbus Drive and Nebraska Avenue (**NB-1**).

#### 7.2.5.4 Mid-Block Pedestrian Crossings

Station locations are typically placed close to signalized intersections which allow pedestrians to complete safe and legal crossings of the roadway. However, based on potential trip generators, stations are sometimes located further away than desired from these signalized intersections. Mid-block pedestrian crossings allow for a single location for crossing which is signed, marked and identified with a flasher or in some cases signalized. For the locations within the project, it is recommended that pedestrian actuated Rectangular Rapid Flashing Beacons (RRFB) be located on the crosswalk sign. The *Bicycle and Pedestrian Integration Technical Memorandum* (June 2009) prepared for this report identified locations which meet spacing and other criteria provided in the *FDOT Plans Preparation Manual* (January 2009) Chapter 8 for a potential mid-block crossing. Two locations were identified for potential mid-block crossings on Nebraska Avenue near Estelle Street and Hanna Avenue BRT stations.

##### Nebraska Avenue and Estelle Street

The proposed BRT stations are located between signalized intersections at Scott Street and Henderson Avenue. The station locations have several potential trip generators including the library and schools. The proposed mid-block crossing would be located near the library where an existing painted median would be converted to a raised median with curb and gutter and the pedestrian actuated flashers.

##### Nebraska Avenue and Hanna Avenue

The southern alternative station locations are adjacent to two trip generators with the Family Dollar and Publix. These stations are located between Hillsborough Boulevard and Hanna Avenue. The crossing would be the installation of curb ramps on either side of the roadway with the pedestrian actuated flashers.

#### 7.2.5.5 Other Pedestrian / Bicycle Improvements

The *Bicycle and Pedestrian Integration Technical Memorandum* (June 2009) recommended several other improvements along the study corridor. Some of the improvements are recommended for the BRT project while others are considered for the general corridor not related to the BRT improvements. The types of improvements include using high visibility crosswalk markings, installation of pedestrian signal heads, refuge islands and ADA upgrades. The full recommendation is provided on Table 1 of the *Bicycle and Pedestrian Integration Technical Memorandum* (June 2009).



## 7.3 Evaluation of Alternatives

### 7.3.1 Station Alternative Locations

The No Build and Build Alternative station locations were evaluated to provide a basis for proceeding to the Preferred Alternative Station Location for each intersection. The elements evaluated include station proximity, distance to intersection, floodplain impacts, wetland impacts, potential contamination, right-of-way required, right-of-way cost, access impacts, adjacent parcel type, nearby land use compatibility, and historic site impacts. The impact evaluation for the alternative station locations considered is shown on **Table 7-2**.

#### Station Proximity

The proximity of station (near-side or far-side) relative to the intersection was evaluated. In general, far-side stations are preferred due to the reduced delay and ability to rejoin traffic flow quickly after boarding maneuvers.

#### Distance to Intersection

The distance to intersection is defined as the distance in feet from the center of the alternative station footprint to the center of the intersection.

#### Floodplain Impacts

The floodplain impacts were determined based upon the area in square feet of the alternative station footprint which would encroach on the 100-year floodplain as defined on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). Only one station, located at the intersection of Fletcher Avenue and 50<sup>th</sup> Street, has a potential for floodplain impacts.

#### Wetland Impacts

The wetland impacts were determined based upon the area in square feet of the alternative station footprint which would encroach on designated wetlands as delineated by the US Department of Agriculture Natural Resources Conservation Service National Wetlands Inventory. Only one station, located at the intersection of Fletcher Avenue and 50<sup>th</sup> Street, has a potential for wetland impacts.

#### Potential Contamination

The potential contamination of an alternative station location was rated as either low, medium, or high based upon the adjacent property type and GIS data regarding contamination sites.

#### Approximate Right-of-Way Required

The approximate right-of-way in square feet for each station footprint was determined based upon the area of encroachment of each station into adjacent parcels using the GIS parcel data from the Hillsborough County Property Appraiser.

#### Right-of-Way Cost

The right-of-way cost was estimated by comparing the right-of-way needed for each alternative station footprint with the estimated damage value of each parcel affected. The market value of each parcel was obtained from the Hillsborough County Property Appraiser and divided into a per-square-foot value. A factor based on the functional remainder of the parcel was applied to the per-square-foot value to obtain an estimated damage cost per



Table 7-2 Station Evaluation Matrix

Station Location		Station Direction	Alternative	Station Proximity	Distance to Intersection	Floodplain Impacts	Wetland Impacts	Potential Contamination	Approx. R/W Required	R/W Cost	Access Impacts	Adjacent Parcel Type	Nearby Land Use Compatability	Historic Site Impacts
Main Street	Cross Street	[-]	[-]	[-]	[ft]	[sf]	[sf]	[L/M/H]	[sf]	[\$]	[L/M/H]	[-]	[L/M/H]	[Y/N]
Kennedy Avenue	Jefferson St. (Prototype B)	WB	1	Far	80	N/A	N/A	N/A	0	\$0	L	County Office	H	N
			2	Far	190	N/A	N/A	N/A	0	\$0	L	County Office	H	N
Jackson Avenue	Jefferson St. (Prototype B)	EB	1	Near	180	N/A	N/A	N/A	0	\$0	L	Parking Lot	H	N
			2	Near	80	N/A	N/A	N/A	0	\$0	L	Parking Lot	H	N
Nebraska Avenue	Twiggs Street (Prototype A)	NB	1	Near	150	N/A	N/A	L	0	\$0	L	Parking	H	N
			2	Far	150	N/A	N/A	N/A	0	\$0	L	Train Station	H	Y
		SB	1	Near	80	N/A	N/A	N/A	0	\$0	L	R/W	L	N
			2	Far	120	N/A	N/A	N/A	0	\$0	L	R/W	L	Y
	Estelle Street (Prototype A)	NB	1	Near	550	N/A	N/A	N/A	0	\$0	M	Apartments/Retail	H	N
			2	Near	150	N/A	N/A	N/A	0	\$0	L	Public Library	H	Y
		SB	1	Far	240	N/A	N/A	L	580	\$21,000	H	Vacant Commercial	M	N
			2	Far	550	N/A	N/A	L	500	\$19,000	M	Vacant Commercial	M	N
	Columbus Drive (Prototype A)	NB	1	Near	250	N/A	N/A	L	700	\$17,000	H	Convenience Store	L	Y
			2	Far	550	N/A	N/A	L	850	\$14,000	H	Vacant Commercial	L	Y
		SB	1	Near	330	N/A	N/A	L	820	\$17,000	H	Vacant Commercial	L	N
			2	Near	80	N/A	N/A	L	350	\$21,000	L	Store	L	N
	Floribraska Ave. / 21st Ave. (Prototype B)	NB	1	Far	70	N/A	N/A	L	1,030	\$23,000	M	Vacant Commercial	L	N
			2	Far	200	N/A	N/A	L	0	\$0	L	Vacant Commercial	L	N
		SB	1	Near	520	N/A	N/A	L	610	\$11,000	H	Vacant Residential	L	N
			2	Near	80	N/A	N/A	L	720	\$32,000	L	Fast Food	L	N
	Lake Ave. (Prototype A)	NB	1	Near	200	N/A	N/A	L	100	\$4,000	M	Warehouse	L	N
			2	Near	80	N/A	N/A	L	250	\$11,000	M	Night Club	L	N
			3	Far	200	N/A	N/A	L	620	\$27,000	H	Light Manufacturing	L	N
		SB	1	Near	70	N/A	N/A	N/A	0	\$0	M	Auto Repair	L	N
2			Far	170	N/A	N/A	N/A	0	\$0	L	Warehouse	L	N	
MLK Blvd. (Prototype C)	NB	1	Near	480	N/A	N/A	L	1,050	\$43,000	M	Financial	M	N	
		2	Near	100	N/A	N/A	L	700	\$72,000	M	Drugstore	M	N	
		3	Far	730	N/A	N/A	L	460	\$26,000	H	Office	L	N	
	SB	1	Near	410	N/A	N/A	L	220	\$4,000	M	Vacant Commercial	L	N	
		2	Near	106	N/A	N/A	L	620	\$35,000	L	Store	M	N	
		3	Far	270	N/A	N/A	L	750	\$46,000	L	Supermarket	H	N	
Hillsborough Ave. (Prototype C)	NB	1	Near	100	N/A	N/A	L	730	\$46,000	L	Store	M	N	
		2	Far	100	N/A	N/A	M	520	\$22,000	M	Gas Station	L	N	
		3	Far	360	N/A	N/A	L	370	\$7,000	H	Open Storage	L	Y	
	SB	1	Near	90	N/A	N/A	L	960	\$38,000	L	Auto Sales	L	N	
		2	Far	200	N/A	N/A	L	760	\$49,000	L	Church	L	N	
Hanna Avenue (Prototype A)	NB	1	Near	430	N/A	N/A	L	480	\$29,000	H	Supermarket	H	Y	
		2	Near	90	N/A	N/A	L	760	\$48,000	L	Fire Station	L	Y	
	SB	1	Far	100	N/A	N/A	L	100	\$3,000	M	Hotel&Utility	L	N	
		2	Far	540	N/A	N/A	N/A	0	\$0	L	Store	M	N	



Table 7-2 Station Evaluation Matrix (continued)

Station Location		Station Direction	Alternative	Station Proximity	Distance to Intersection	Floodplain Impacts	Wetland Impacts	Potential Contamination	Approx. R/W Required	R/W Cost	Access Impacts	Adjacent Parcel Type	Nearby Land Use Compatability	Historic Site Impacts
Main Street	Cross Street	[-]	[-]	[-]	[ft]	[sf]	[sf]	[L/M/H]	[sf]	[\$]	[L/M/H]	[-]	[L/M/H]	[Y/N]
Nebraska Avenue	Sligh Avenue (Prototype A)	NB	1	Near	250	N/A	N/A	L	1,090	\$26,000	M	Warehouse	L	N
			2	Far	230	N/A	N/A	L	1,130	\$26,000	L	Church	M	Y
		SB	1	Near	280	N/A	N/A	N/A	0	\$0	M	Auto Repair	L	N
			2	Far	180	N/A	N/A	N/A	0	\$0	H	Non-Profit&Financial	M	N
			3	Far	420	N/A	N/A	N/A	0	\$0	L	Motel	M	N
	Broad Street (Prototype A)	NB	1	Far	170	N/A	N/A	L	300	\$9,000	H	Store	M	N
		SB	1	Near	330	N/A	N/A	N/A	0	\$0	L	Auto Repair	L	N
			2	Far	280	N/A	N/A	N/A	0	\$0	M	Residential	L	N
	Waters Avenue (Prototype C)	NB	1	Near	370	N/A	N/A	L	10	\$1,000	H	Parking Lot	L	N
			2	Near	100	N/A	N/A	L	180	\$11,000	L	Store	M	N
		SB	1	Far	300	N/A	N/A	L	1,440	\$16,000	L	Racetrack	L	N
	Busch Blvd. (Prototype B)	NB	1	Near	640	N/A	N/A	M	130	\$8,000	M	Auto Repair	L	N
			2	Near	330	N/A	N/A	M	240	\$11,000	H	Auto Repair	L	N
			3	Far	370	N/A	N/A	M	1,440	\$43,000	M	Gas Station	L	N
		SB	1	Near	630	N/A	N/A	N/A	0	\$0	L	Hotel	M	N
			2	Far	330	N/A	N/A	L	530	\$25,000	H	Store	L	N
	Linebaugh Ave. (Prototype A)	NB	1	Near	680	N/A	N/A	M	1,440	\$67,000	L	Auto Repair	L	N
			2	Near	200	N/A	N/A	M	1,060	\$16,000	H	Vacant&Gas Station	L	N
			3	Far	470	N/A	N/A	L	1,440	\$88,000	M	Store	L	N
		SB	1	Near	440	N/A	N/A	N/A	0	\$0	L	Open Storage	L	N
			2	Far	170	N/A	N/A	L	360	\$23,000	L	Night Club	L	N
	109th Avenue (Prototype A)	NB	1	Near	90	N/A	N/A	L	1,440	\$64,000	L	Gas Station	M	N
			2	Far	290	N/A	N/A	L	1,440	\$53,000	L	Store&Auto Sales	L	N
		SB	1	Far	70	N/A	N/A	L	140	\$5,000	H	Auto Repair	L	N
2			Far	570	N/A	N/A	L	340	\$6,000	L	Utility	M	N	
Fowler Avenue (Prototype C)	NB	1	Near	310	N/A	N/A	L	150	\$3,000	H	Shopping Center	H	N	
		2	Far	370	N/A	N/A	L	110	\$12,000	L	Parking Lot&Auto Sales	M	N	
	SB	1	Far	300	N/A	N/A	M	0*	\$0	L	Shopping Center	H	N	
131st Avenue (Prototype A)	NB	1	Far	100	N/A	N/A	L	500	\$26,000	L	Store	L	N	
		2	Far	270	N/A	N/A	L	460	\$24,000	L	Store	L	N	
	SB	1	Near	80	N/A	N/A	L	340	\$13,000	L	Auto Repair	L	N	
		2	Far	110	N/A	N/A	L	0	\$0	M	Vacant Commercial	M	N	
Fletcher Avenue (Prototype B)	NB/EB	1	Far	220	N/A	N/A	L	660	\$22,000	L	Theater&Parking Lot	L	N	
		2	Far	340	N/A	N/A	M	640	\$18,000	M	Parking Lot&Auto Sales	L	N	
	WB/SB	1	Near	470	N/A	N/A	L	200	\$18,000	L	Strip Center	M	N	
		2	Far	340	N/A	N/A	L	0	\$0	L	Mini Warehouse	L	N	



Table 7-2 Station Evaluation Matrix (continued)

Station Location		Stop Direction	Alternative	Stop Type	Distance to Intersection	Floodplain Impacts	Wetland Impacts	Potential Contamination	Approx. R/W Required	R/W Cost	Access Impacts	Adjacent Parcel Type	Nearby Land Use Compatability	Historic Site Impacts	
Main Street	Cross Street	[-]	[-]	[-]	[ft]	[sf]	[sf]	[L/M/H]	[sf]	[\$]	[L/M/H]	[-]	[L/M/H]	[Y/N]	
Fletcher Avenue	15th Street (Prototype A)	EB	1	Near	240	N/A	N/A	L	1,020	\$70,000	L	Strip Center	M	N	
			2	Far	100	N/A	N/A	L	1,020	\$23,000	M	Open Storage	M	N	
		WB	1	Far	100	N/A	N/A	L	570	\$27,000	L	Gas Station	L	N	
			2	Far	330	N/A	N/A	L	310	\$17,000	L	Strip Center	L	N	
	22nd Street (Prototype A)	EB	1	Near	310	N/A	N/A	L	350	\$10,000	H	Mixed Use Retail	H	N	
			2	Far	370	N/A	N/A	L	1,270	\$57,000	L	Fast Food	M	N	
		Magnolia Dr. (Prototype B)	WB	1	Near	300	N/A	N/A	M	1,140	\$55,000	L	Fast Food	H	N
				1	Far	200	N/A	N/A	N/A	1,440	\$13,000	L	University	H	N
		Palm Drive/ 42nd Street (Prototype B)	WB	1	Near	140	N/A	N/A	N/A	0	\$0	L	Medical Office	H	N
				1	Far	800	N/A	N/A	L	0	\$0	L	University	H	N
		50th Street (Prototype A)	EB	2	Far	130	N/A	N/A	L	0	\$0	L	University	H	N
				1	Far	400	N/A	N/A	L	0	\$0	L	Church	H	N
		56th Street (Prototype A)	WB	1	Near	110	N/A	1280	L	0	\$0	L	University	L	N
				2	Far	110	N/A	N/A	L	0	\$0	L	Multi-Family Residential	H	N
			EB	1	Near	90	870	600	L	1,440	\$13,000	L	University	L	N
				2	Far	90	190	770	L	1,440	\$13,000	L	University	L	N
	56th Street (Prototype A)	WB	1	Near	220	N/A	N/A	L	0	\$0	L	Medical Office	L	N	
			2	Far	340	N/A	N/A	M	0	\$0	L	Gas Station	M	N	
	56th Street (Prototype A)	WB	1	Near	470	N/A	N/A	L	1,440	\$13,000	L	University	L	N	
			2	Far	340	N/A	N/A	L	1,440	\$13,000	L	University	L	N	



square foot. The approximate square footage of right-of-way for each alternative station footprint was then multiplied by the estimated damage cost per square foot to determine the estimated right-of-way cost of each alternative station.

Access Impacts

The potential of each alternative station footprint to interfere with existing property access was evaluated on a low, medium, or high scale, with low meaning no interference, medium meaning driveway adjustment would be necessary, and high meaning driveway closure would be necessary.

Adjacent Parcel Type

The adjacent parcel type for each alternative station footprint was determined using zoning codes from the Hillsborough County Property Appraiser and from field observation.

Nearby Land Use Compatibility

The nearby land use compatibility of each alternative station location was rated low, medium, or high based upon the adjacent parcel’s development and land use. Facilities were compared based upon their ability to either generate ridership or ability to incorporate the station design into their location.

Historic Site Impacts

An alternative station location was determined to have historic site impacts if the location would encroach into a parcel designated as a historic site, as recorded in GIS data.

**7.3.2 Transit Signal Priority (TSP)**

The North / South BRT service operating with TSP is compared to the local service along Nebraska Avenue from Columbus Avenue to Fletcher Avenue, shown in **Table 7-3**. Since the Local Route #2 does not currently follow the entire North / South BRT route, this section was used for comparison to the existing transit travel times. Travel time is computed from 10 VISSIM runs from the 2013 model with TSP for BRT and local service, which does not receive TSP along the same corridor. Schedule reliability is computed from the standard deviation of the computed VISSIM travel times for both BRT and Local Service along this corridor. These results show that the BRT with TSP improves travel time on average 20 to 25 percent during the peak hours (AM and PM) over the existing local service travel times along Nebraska Avenue. Schedule reliability is also shown to improve between 8 – 10 percent.

**Table 7-3 BRT VISSIM Travel Time Savings**

	Build		No-Build		Results Comparison	
	BRT w/ TSP		Local Service		% Change	
	AM	PM	AM	PM	AM	PM
Travel Time <sup>1</sup> - Nebraska: (SB) Fletcher to Columbus	26.6	24.9	33.8	31.4	-21%	-24%
Travel Time <sup>1</sup> - Nebraska: (NB) Columbus to Fletcher	23.0	27.9	31.0	36.2	-26%	-23%
Schedule Reliability <sup>1</sup> - Columbus to Fletcher	1.2	1.9	1.3	2.1	-8%	-10%

<sup>1</sup> Travel Time in minutes, VISSIM Results: 2013 Local Service operating with TSP along the corridor



### 7.3.3 Other Roadway / Pedestrian Improvements

The additional improvements discussed in the following sections were evaluated on the potential impacts to the adjacent parcel, access and contamination, right-of-way area required, right-of-way cost and construction costs.

#### 7.3.3.1 Side Streets

The improvements at Sligh Avenue have a high potential for contamination from the existing gas station, and impacts to the gas islands and canopy. The right-of-way cost would be approximately \$2.68 million, which is high for the benefit of improved service. The construction cost would be approximately \$523,000. The improvement is required to satisfy the existing traffic demand even without the addition of BRT service. The side street improvement is therefore not recommended to be implemented with the BRT project.

#### 7.3.3.2 Queue Jump Lanes

The queue jump lanes were evaluated based on the criteria for implementation at the following two intersections. For purposes of the preliminary traffic evaluation, it was assumed that the queue jump lane would share the right turn lane on the intersection approach. In order to accomplish the queue jump maneuver, the vehicles queued in front of the bus in the right turn lane must be cleared by providing a protected/ right turn phase in order to position the bus at the stop bar. Once the bus is properly positioned, all conflicting movements must be stopped and a transit only phase (with transit signal head) is inserted into the timing plan to allow for the bus to safely cross the intersection to the far side. Once the bus has cleared the intersection, the intersection may resume normal operations; however, the signal delay incurred by inserting the transit only phase requires the intersection to operate in transition until coordinated signal operation can be achieved. This operation is not the same as transit signal priority which is examined and discussed in Chapter 6.

##### Busch Boulevard and Nebraska Avenue

The approaches (especially the southern approach) of the intersection have a high potential for contamination, impacts to the adjacent businesses and railroad. The right-of-way cost for the improvements would be approximately \$6.67 million. The queue jump lanes at this location would not provide sufficient time saving benefit to the BRT in relation to the cost. Busch Boulevard is the major street at this intersection. Any signal time required for the independent transit phase would impact the delays experienced on the major street and not improve traffic conditions on the overall corridor. The queue jump lane at Busch Boulevard is not recommended to be implemented with the BRT project.

##### Fowler Avenue and Nebraska Avenue

Both the northbound and southbound approaches as noted previously in **Section 7.2.5.2** will require the extension of right turn lanes to accommodate the proposed improvements. There is low potential for contamination and impacts to the adjacent parcel and right-of-way are required. The right-of-way cost would be approximately \$561,000 for the entire improvement. The construction of this queue jump lane is considered feasible. However, due to the location of stations, TSP is a more cost effective solution and fewer traffic impacts would occur without the additional transit-only signal phase. The queue jump lane at Fowler Avenue is not recommended to be implemented with the BRT project.



### 7.3.3.3 Bus Bays

Bus Bays provide an area for the bus to pull out of the travelled way. All the locations identified in **Section 7.2.5.3** were evaluated based on potential impacts to the adjacent parcels. All bus bay locations will be subject to re-evaluation based on preferred station location.

#### Estelle Street and Nebraska Avenue (northbound)

The southern portion of Nebraska Avenue was converted to a 3-lane section and added bus bay bays at select locations. Adding a bus bay at the alternative northbound stations would potentially impact the adjacent parcels and existing large diameter trees, which would shade the station. These alternative station locations have existing striped bus bays. The existing striped bus bays function the same as a standard bus bay and will minimize impacts at the station location.

#### Hanna Avenue and Nebraska Avenue (southbound)

A bus bay at either of the southbound alternative station locations would potentially impact driveway access and parking of the adjacent parcels. This section of Nebraska Avenue is four lanes allowing traffic to switch lanes and pass the bus in the left hand lane. A bus bay is not recommended for these alternative station locations.

#### Linebaugh Avenue and Nebraska Avenue (northbound)

A bus bay at alternative stations **NB-1** and **NB-3** would impact the adjacent parcels' parking and driveway access. **NB-2** location could potentially utilize the adjacent access street for the approach of the bus bay if selected as the preferred station.

#### Fowler Avenue and Nebraska Avenue (northbound and southbound)

The northbound alternative locations (**NB-1** and **NB-2**) would impact the adjacent parcels by requiring removal of site signage or driveway access. In addition, **NB-1** is located in the right turn lane which is not an ideal location for a bus bay since the bus will continue to travel north through the intersection. The southbound location is being provided by the developer of the adjacent parcel. The location includes a right turn lane which will be shared with a bus only lane from the intersection. This condition will be maintained for the BRT station for this southbound movement.

#### 15<sup>th</sup> Street and Fletcher Avenue (eastbound)

The eastbound alternative station location **EB-2** will provide the ideal location for a bus bay since the parcel is vacant land. Right-of-way would be required at this location to accommodate the bus bay. A bus bay at alternative station location **EB-1** would impact the parking, driveway access and site signage for the La Place Center. If the **EB-2** location is selected, it is recommended that a bus bay be constructed.

#### 22<sup>nd</sup> Street and Fletcher Avenue (eastbound)

The alternative station locations selected for the eastbound direction could include a bus bay. **EB-1** would have fewer impacts to the adjacent parcel and is further away from the intersection. **EB-2** would potentially impact the McDonald's parking lot which would incur higher right-of-way costs. It is recommended that if **EB-1** is selected as the preferred a bus bay be constructed.

#### Magnolia Drive and Fletcher Avenue (eastbound and westbound)

Both the eastbound and westbound alternative station locations contain existing bus bays. It is recommended to maintain this condition and to combine the BRT station with the local service.



#### Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue (eastbound and westbound)

The eastbound alternative station locations would allow for the construction of a bus bay at either location. However, the pedestrian access to **EB-1** will be restricted due to the existing retaining wall adjacent to the right-of-way. However, **EB-2** is located where there is right-of-way is available from USF. It is recommended that a bus bay be constructed for the eastbound movement. The westbound alternative station location contains an existing bus bay. It is recommended to maintain this condition and to combine the BRT station with the local service.

#### 50<sup>th</sup> Street and Fletcher Avenue (eastbound and westbound)

This portion of Fletcher Avenue is a high speed roadway, so the construction of a bus bay would improve the safety for the bus, operators and users. The construction of the bus bay for alternative station locations **EB-1** and **EB-2** could be accomplished within the existing right-of-way and does not impact the adjacent parcels. The alternative station locations for the westbound direction are adjacent to undeveloped property owned by USF. However, this location does contain wetlands and any construction would need to minimize impacts. It is recommended that the bus bays be constructed for both directions at this location.

#### 56<sup>th</sup> Street and Fletcher Avenue (eastbound and westbound)

This portion of Fletcher Avenue is a high speed roadway, so the construction of a bus bay would improve the safety for the bus, operators and users. The construction of the bus bay for alternative station locations **EB-1** and **EB-2** could be accomplished within the existing right-of-way and does not impact the adjacent parcels. The alternative station locations for the westbound direction are adjacent to undeveloped property owned by USF. However, this location is part of a conservation area and any construction would need to minimize impacts. It is recommended that the bus bays be constructed for both directions at this location.

#### **7.3.3.4 Mid-Block Pedestrian Crossings**

The mid-block crossings along Nebraska Avenue will need to meet applicable criteria and be approved by FDOT. The design will need to provide a safe crossing for pedestrians and appropriate signage for vehicular traffic. Both locations on Nebraska Avenue at Estelle Street and Hanna Avenue described in **Section 7.2.5.4** are recommended for construction to promote the safe crossing of pedestrians. Further coordination will be required during the final design phase to obtain the needed approvals.

#### **7.3.3.5 Other Pedestrian / Bicycle Improvements**

The pedestrian improvements which will improve the connection with the BRT station locations will be implemented as part of the project. However, other non-BRT recommendations were provided which will not be included in the construction costs. HART will coordinate these additional non-BRT improvements with the appropriate maintaining agency.

## **7.4 Initially Recommended Alternative**

### **7.4.1 Initially Recommended Station Alternatives**

Through the alternatives evaluation process, one alternative station in each direction of BRT travel was recommended for each general station location.

#### Marion Transit Center

**MTC-1** was recommended; it was the only alternative evaluated.



Jefferson Street and Jackson Street / Kennedy Boulevard

**EB-1** and **WB-1** were each recommended due to no right-of-way costs and as desirable far-side stations.

Twiggs Street and Nebraska Avenue

**NB-2** was recommended for the accessibility to the Tampa Union Station and no interference with the substructure of the Selmon Expressway. **SB-1** was recommended due to no right-of-way cost and no interference with the substructure of the Selmon Expressway.

Estelle Street and Nebraska Avenue

**NB-2** was recommended due to no right-of-way cost and close proximity to public facilities and existing bus routes. **SB-2** was recommended due to low right-of-way costs, close proximity to new development and existing bus routes.

Columbus Drive and Nebraska Avenue

**NB-1** and **SB-2** were each recommended due to their close proximity to the intersection, reduced access impacts, and their ability for combined use with other bus routes.

Floribraska/21<sup>st</sup> Avenue and Nebraska Avenue

**NB-2** was recommended due to no right-of-way cost and its proximity to the intersection. **SB-2** was recommended due to its close proximity to the intersection, the ability for combined station use with the other bus routes, and a compatible adjacent land use.

Lake Avenue and Nebraska Avenue

**NB-1** was recommended due to low right-of-way cost and minimal access impacts. **SB-2** was recommended as a far-side station due to minimal access impacts and no right-of-way cost.

MLK Boulevard and Nebraska Avenue

**NB-2** was recommended due to its proximity to the intersection and compatible adjacent land use. **SB-2** was recommended due to its proximity to the intersection, and ability for combined station use with the future East / West BRT corridor.

Hillsborough Avenue and Nebraska Avenue

**NB-1** and **SB-2** were each recommended due to their close proximity to the intersection and their ability for combined station use with the future East / West BRT corridor.

Hanna Avenue and Nebraska Avenue

**NB-1** and **SB-2** were each recommended due to their compatible adjacent land use and trip generation capability as well as their low right-of-way costs and ability for combined station use with other bus routes.

Sligh Avenue and Nebraska Avenue

**NB-2** was recommended as a far-side station with a compatible adjacent land use and low access impacts. **SB-2** was recommended as a far-side station due its proximity to the intersection.



Broad Street and Nebraska Avenue

**NB-1** was recommended as it was the only alternative northbound station location considered. **SB-1** was recommended due to no right-of-way cost and low access impacts.

Waters Avenue and Nebraska Avenue

**NB-2** was recommended due to its proximity to the intersection, compatible adjacent land use and the ability for combined station use with other bus routes. **SB-1** was recommended as it was the only alternative southbound station location considered.

Busch Boulevard and Nebraska Avenue

**NB-3** was recommended as a far-side station due to the lowest access impacts and no conflict with pedestrians or railroad. **SB-1** was recommended due to the reduced contamination potential, no right-of-way cost, no impacts to property access and no conflict with pedestrians or railroad.

Linebaugh Avenue and Nebraska Avenue

**NB-2** was recommended due its proximity to the intersection and low right-of-way cost. **SB-2** was recommended as a far-side station due to its proximity to the intersection and low access impacts.

109<sup>th</sup> Avenue and Nebraska Avenue

**NB-1** was recommended due to its proximity to the intersection and the ability for combined station use with other bus routes. **SB-2** was recommended due its low access impacts and the ability for combined station use with other bus routes.

Fowler Avenue and Nebraska Avenue

**NB-1** was recommended due to its proximity to the intersection adjacent land use compatibility, and its ability for combined station use with other bus routes. **SB-1** was recommended as it was the only southbound alternative station location considered.

131<sup>st</sup> Avenue and Nebraska Avenue

**NB-1** was recommended due to its close proximity to the intersection. **SB-2** was recommended as a far-side station due to its close proximity to the intersection and no right-of-way cost.

Fletcher Avenue and Nebraska Avenue

**EB-1** was recommended due its proximity to the intersection, low contamination potential, and low access impacts. **SB-1** was recommended as a far-side station due to no right-of-way cost and ease of bus access regarding the required left turn from westbound Fletcher Avenue to southbound Nebraska Avenue.

15<sup>th</sup> Street and Fletcher Avenue

**EB-2** was recommended as a far-side station due to its low right-of-way cost and minimal access impacts. **WB-1** was recommended due to its close proximity to the intersection and minimal impacts to adjacent parcels.

22<sup>nd</sup> Street and Fletcher Avenue

**EB-1** was recommended due to low right-of-way cost and compatible adjacent land use. **WB-1** was recommended as it was the only westbound alternative station location considered.



### University Area Transit Center (UATC)

**UATC-1** was recommended due to the least impacts to the UATC.

### Magnolia Drive and Fletcher Avenue

**EB-1** and **WB-1** were each recommended as they were the only eastbound and westbound alternative station locations considered, respectively. Both locations contain existing bus bays.

### Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue

**EB-2** was recommended as a far-side station due to its close proximity to the intersection and no right-of-way cost. **WB-1** was recommended as it was the only westbound alternative station location and contains an existing bus bay.

### 50<sup>th</sup> Street and Fletcher Avenue

**EB-2** was recommended as a far-side station due to its compatible adjacent land use as a trip generator. **WB-1** was recommended due to its use of the existing crosswalk and pedestrian signal.

### 56<sup>th</sup> Street and Fletcher Avenue

**EB-2** was recommended as a far-side station due to its compatible adjacent land use and preferred position for pedestrian signal operation. **WB-1** was recommended due to its preferred position for pedestrian signal operation.

## **7.4.2 Compatibility with the Future East / West BRT Corridor**

The future East / West BRT Corridor is planned to share a portion of the North / South BRT corridor on Nebraska Avenue between MLK Boulevard and Hillsborough Avenue. Therefore, the recommended station locations were compared for their ability to be used either as combined stations for both corridors or have East / West stations in close proximity in order to facilitate easy transfers between the two BRT routes. There would be eight possible transfer movements. Each of these movements was evaluated to determine if the recommended station locations would facilitate easy transfers for future use.

### Northbound to Eastbound

Passengers transferring from the northbound North / South BRT route to the eastbound East / West BRT route could disembark at the Hillsborough Avenue near-side station and board the East / West BRT before it would turn east onto Hillsborough Avenue. Passengers would wait at the station, as both routes could use the same station, and would not cross any streets or walk any distance.

### Northbound to Westbound

Passengers transferring from the northbound North / South BRT route to the westbound East / West BRT route could disembark at the MLK Boulevard near-side station and cross both MLK Boulevard and Nebraska Avenue at the intersection to board the East / West BRT at the near-side station before it would turn west onto MLK Boulevard. Passengers would have to cross the two streets at the intersection, but would have pedestrian signals for both crossings.

### Southbound to Eastbound

Passengers transferring from the southbound North / South BRT route to the eastbound East / West BRT route could disembark at the Hillsborough Avenue far-side station and



cross Nebraska Avenue at the intersection to board the East / West BRT at the near-side station before it would turn east onto Hillsborough Avenue. Passengers would have to cross one street, but would have a pedestrian signal for the crossing at the intersection.

#### *Southbound to Westbound*

Passengers transferring from the southbound North / South BRT route to the westbound East / West BRT route could disembark at the MLK Boulevard near-side station and board the East / West BRT before it would turn west onto MLK Boulevard. Passengers could also transfer at the Hillsborough Avenue far-side station, as both routes would also use this station. Passengers would wait at the station, as both routes could use the same station, and would not cross any streets or walk any distance.

#### *Eastbound to Northbound*

Passengers transferring from the eastbound East / West BRT route to the northbound North / South BRT route could disembark at the Hillsborough Avenue near-side station and board the North / South BRT before it would continue north on Nebraska Avenue. Passengers would wait at the station, as both routes could use the same station, and would not cross any streets or walk any distance.

#### *Eastbound to Southbound*

Passengers transferring from the eastbound East / West BRT route to the southbound North / South BRT route could disembark at the Hillsborough Avenue near-side station and cross Nebraska Avenue and board the North / South BRT at the Hillsborough Avenue far-side station before it would continue south on Nebraska Avenue. Passengers would not only have to cross one street, with a pedestrian signal, but would have to ride the East / West BRT route north for almost one mile before transferring south. The far-side station at MLK Boulevard for the North / South route was not practical due to property impacts. However, if conditions change prior to implementation of the East / West corridor, a station location for both the North / South or East / West routes may become viable.

#### *Westbound to Northbound*

Passengers transferring from the westbound East / West BRT route to the northbound North / South BRT route could disembark at the Hillsborough Avenue far-side station and cross Nebraska Avenue and board the North / South BRT at the Hillsborough Avenue near-side station and board the North / South BRT before it would continue north on Nebraska Avenue. Passengers would have to cross one street, but would have a pedestrian signal for the crossing.

#### *Westbound to Southbound*

Passengers transferring from the westbound East / West BRT route to the southbound North / South BRT route could disembark at the MLK Boulevard near-side station and board the North / South BRT before it would continue south on Nebraska Avenue. Passengers could also transfer at the Hillsborough Avenue far-side station, as both routes would also use this station. Passengers would wait at the station, as both routes could use the same station, and would not cross any streets or walk any distance.



### 7.4.3 HART BRT Demonstration Ride

The study team and HART personnel further evaluated each recommended station location using a bus similar to one which will be used for the route during a field visit on January 22, 2009. The evaluation included comparison of each recommended station location with bus operation in mixed traffic, sizing of each recommended station using the bus as a guide, and the input of HART staff. Most of the recommended stations were found to be acceptable for use. However, several station locations were recommended for improvement through either station placement/adjustment, changing the recommended alternative station location, a new alternative station location, or other physical improvements which were not originally considered.

#### Jefferson Street and Jackson Street / Kennedy Boulevard

The demonstration ride provided a new station alternative for the westbound station on Kennedy Boulevard to utilize an existing far-side bus bay flag station adjacent to the Courthouse Square Park on the northwest corner of Kennedy Boulevard and Pierce Street. HART personnel agreed that this station could be utilized with few modifications such as a totem and information displays and would not include a shelter or other station amenities. This new alternative station location was designated as **WB-3**.

#### Estelle Street and Nebraska Avenue

It was recommended that the northbound location, **NB-2**, could be constructed with a bus bay due to the adjacent parcel being a public library and close to a new development. However, due to impacts to existing mature trees adjacent to the stop location, a bus bay was not added. The recent FDOT improvements provide a wider shoulder area for a bus bay.

#### Columbus Drive and Nebraska Avenue

During the demonstration ride, HART staff noted that the recommended northbound location, **NB-1**, could be shifted north closer to the intersection of Nebraska Avenue and 15<sup>th</sup> Avenue to take advantage of an existing bus lane and stop at that location.

#### Lake Avenue and Nebraska Avenue

The demonstration ride revealed a new northbound alternative station location to be constructed over an existing middle driveway at the Borrell Electric parcel. The middle driveway did not provide access to the property and the bus could easily fit between the two remaining driveways which are used to access the parking lot behind the security wall and fence. This new alternative station location was designated as **NB-4**.

#### Hanna Avenue and Nebraska Avenue

During the demonstration ride, a suggestion was made that the existing northbound shelter location adjacent to Publix could be utilized for the northbound BRT station. Recommended station **NB-1** was adjusted to utilize this location. HART staff also noted that the southbound recommended station location, **SB-2**, was directly across from **NB-1**. This configuration encourages unsafe pedestrian crossings of Nebraska Avenue. The preferred southbound station (**SB-2**) was relocated north of the driveway to avoid impacts to the front doors of the Family Dollar and discourage unsafe crossings of Nebraska Avenue. HART staff also requested that **SB-2** incorporate a bus bay, but an investigation revealed that a bay would require closure of the Family Dollar's only driveway, which was deemed unacceptable. **SB-2** was relocated, but without a bus bay.



### Busch Boulevard and Nebraska Avenue

This intersection experiences high traffic volumes and does not have right turn lanes for Nebraska Avenue. HART staff suggested that this intersection may delay BRT service because of the high traffic volume and that construction of queue jump lanes to allow BRT buses to bypass traffic flow may be needed to ensure timely service. This intersection warranted an investigation into queue jump lanes for BRT signal priority. However, investigation revealed that the construction and right-of-way acquisition required for these queue jump lanes would prove too costly to be considered viable. The intersection was left in the existing condition.

### Linebaugh Avenue and Nebraska Avenue

Project and HART staff noted that the recommended northbound station, **NB-2**, could be constructed with a bus bay. The adjacent parcel is owned by the City of Tampa and currently has a large pond constructed on it. Several bay types were investigated to either utilize the existing Orchid Avenue turnout or to close it as part of the bay construction. All concepts impacted either the auto repair facility south of Orchid Avenue or the CITGO gas station on the southeast corner of Nebraska Avenue and Linebaugh Avenue, which was deemed undesirable. **NB-2** remained as recommended at the existing curb location. HART staff noted that the recommended southbound alternative station, **SB-2**, was in an undesirable location directly in front of the adjacent business entrance. The vacant parcel on the northwest corner of Nebraska Avenue and Linebaugh Avenue contained an abandoned wood building in disrepair, which made for a more desirable location and would be closer to the intersection. This new preferred alternative station location was designated **SB-3**.

### 109<sup>th</sup> Avenue and Nebraska Avenue

The recommended southbound station location, **SB-2**, was deemed too far from the intersection. The other southbound alternative station location, **SB-1**, adjacent to the German Car Care could be constructed without interference with the driveway access to the property. **SB-1** was then recommended as the preferred alternative southbound station location.

### Fowler Avenue and Nebraska Avenue

HART staff noted that the existing right-of-way on Nebraska Avenue immediately north of Fowler Avenue may be able to accommodate a far-side station with a bus bay adjacent to the auto repair facility on the northeast corner of the intersection. An investigation revealed that a bus bay at this location could be constructed with minimal effect to the driveway access to the auto repair facility. This location was designated **NB-3** and is the new preferred alternative northbound station location. This intersection experiences high traffic volumes and suggested that the existing right turn lanes could be used for BRT queue jump lanes. A preliminary traffic analysis was completed and determined that the right turn lanes would require extension to be fully effective as queue jump lanes.

### Nebraska and Fletcher Avenue Intersection

The impedance to traffic flow when the bus stops caused a long back-up for the eastbound traffic. HART staff suggested adding bus bays to all recommended stations on Fletcher Avenue, where possible.

### 15<sup>th</sup> Street and Fletcher Avenue

The recommended eastbound station, **EB-2**, would be adjacent to a vacant parcel. While property impacts and right-of-way costs would be greater, this location was recommended to include the bus



bay to avoid impedance to traffic flow. After an investigation, the recommended eastbound alternative station **EB-2** was adjusted to include a bus bay. The recommended westbound alternative station, **WB-1**, was found to have several property impacts with a bus bay and would remain at the curb.

#### 22<sup>nd</sup> Avenue and Fletcher Avenue

A bus bay was suggested for the recommended eastbound station, **EB-1**, as parcel encroachment would not adversely affect the adjacent businesses. The recommended westbound station, **WB-1**, which is adjacent to a Popeye's fast food restaurant, presented little room for the proposed station improvements and was seen as impeding traffic as a near-side station. A new alternative location was suggested adjacent to a strip center on the northeast corner of Fletcher Avenue and 20<sup>th</sup> Street. The new preferred westbound station location, **WB-2**, would be between the two driveways for the strip center, would not inhibit access to the property, and would have less impacts on traffic flow as a far-side station away from the signalized intersection.

#### Palm Drive and Fletcher Avenue

A bus bay was suggested for the recommended eastbound station, **EB-2**, as sufficient right-of-way was available or could be acquired at little or no cost from the University of South Florida. In addition the property and construction impacts were expected to be minimal. The preferred eastbound station was then recommended to include a bus bay.

#### 50<sup>th</sup> Street and Fletcher Avenue

A bus bay was suggested for the recommended eastbound station, **EB-2**, as sufficient right-of-way was available and construction impacts were expected to be few. A bus bay was also suggested for the recommended westbound station, **WB-1**, despite expected impacts to right-of-way, wetlands, and floodplains. However, these impacts could be limited through the use of retaining wall. The bus bays would be beneficial at this location to allow the bus to be removed from the high speed traffic flow. The preferred eastbound and westbound stations were then each recommended to include a bus bay.

#### 56<sup>th</sup> Street and Fletcher Avenue

A bus bay was suggested for the recommended eastbound station, **EB-2**. The existing right turn lane for the Campus Club Apartments would require extension to accommodate a bus bay and station construction could then encroach on the adjacent 7-11 property. A bus bay was also suggested for the recommended westbound station, **WB-1**, despite right-of-way and potential environmental impacts. However, these impacts could be limited through the use of retaining wall. The preferred eastbound and westbound stations were then each recommended to include a bus bay.

### **7.4.4 Other Roadway / Pedestrian Improvements**

#### **7.4.4.1 Side Streets**

The additional westbound right turn lane at Sligh Avenue is not recommended for implementation. The improvement is required to satisfy the existing traffic demand even without the addition of BRT service. HART will coordinate with the maintaining agencies on the implementation of this improvement.



#### **7.4.4.2 Queue Jump Lanes**

The queue jump lanes at Busch Boulevard and Nebraska Avenue are not recommended for implementation due to the high cost for right-of-way and impacts to the adjacent parcels. The queue jump lanes at Fowler Avenue and Nebraska Avenue are physically feasible but not recommended to be constructed for the BRT project due to the high anticipated traffic delays associated with servicing an inserted transit signal phase. Similar benefits can be achieved at this location with transit signal priority without significant impact to the east-west Fowler Avenue conflicting movements.

#### **7.4.4.3 Bus Bays**

Existing bus bays along the corridor will be maintained. Bus bays are proposed at eastbound 15th Street and Fletcher Avenue, eastbound 22nd Street and Fletcher Avenue, eastbound Palm Drive/42nd Street and Fletcher Avenue, eastbound and westbound 50<sup>th</sup> Street and Fletcher Avenue and eastbound and westbound 56<sup>th</sup> Street and Fletcher Avenue.

#### **7.4.4.4 Mid-Block Pedestrian Crossings**

Both locations on Nebraska Avenue at Estelle Street and Hanna Avenue described in **Section 7.2.5.4** are recommended for construction to promote the safe crossing of pedestrians. Further coordination will be required during the final design phase to obtain the needed approvals.

#### **7.4.4.5 Other Pedestrian / Bicycle Improvements**

The pedestrian improvements which will improve the connection with the BRT station locations will be implemented as part of the project. However, other non-BRT recommendations were provided which will not be included in the construction costs. HART will coordinate these additional non-BRT improvements with the appropriate maintaining agency.

#### **7.4.5 Local Agency Coordination**

Local agencies were provided the opportunity to review the initially recommended stations and improvements within their jurisdictions. Several locations were suggested to be modified to be compatible with future plans / projects.

#### FDOT

FDOT provided comments concerning the station amenities, station locations and alternative improvements. FDOT recommended that bicycle racks be placed at all stations along the BRT route. Where right-of-way is available bicycle racks will be installed. Several locations cannot accommodate a bicycle rack without impacts to the adjacent parcels. This will be further coordinated during the final design phase.

With the addition of station amenities such as the shelters, totem, advertising signs, and above ground features, both driver and pedestrian sight lines will need to be examined to verify that proper sight distance is maintained at the intersection locations. The final design will coordinate this effort with actual topographic survey and the design of the physical improvements.

The southbound station at Twiggs Street and Nebraska Avenue is located in a raised island between the through and right turn lanes. FDOT recommends that this island be expanded to provide additional area for the station and amenities which will provide additional clear distance around the location. The island size was increased to accommodate this request and will not impact the existing parking and traveled way.



Mid-block pedestrian crossings at the locations previously discussed on Nebraska Avenue at Estelle Street and Hanna Street will be required to meet applicable FDOT and MUTCD criteria. FDOT will provide ultimate approval of crossing locations and associated traffic control devices (i.e. pedestrian actuated flashers). This will be further coordinated during the final design phase of the project.

### City of Temple Terrace

The City of Temple Terrace recommended replacing the type 'A' prototype station for the westbound station at 56<sup>th</sup> Street and Fletcher Avenue with type 'B' prototype station. The structure will enhance transit's visibility in an area that is anticipated to increase in density. The City is adopting a new Urban Village-25 overlay district for the intersection at 56<sup>th</sup> Street and Fletcher Avenue. New development will be required to have access to transit and modal-split centers and connectivity to the greater urban area using bicycles and sidewalks and other pedestrian friendly amenities. The intersection is also in the City's Multimodal Transportation District which allows the City to leverage proportionate fair-share funds for alternative transportation improvements including transit. The westbound station at 56<sup>th</sup> Street and Fletcher Avenue has been modified to a type 'B' prototype station, while the eastbound station will remain a type 'A' prototype station.

### USF

Entrance signs are proposed at the Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue intersection. USF recommends that the **EB-1** station be moved east to avoid potential visibility and sight line issues with the proposed station design and entrance signs. The adjacent vacant land at the westbound stations for both 50<sup>th</sup> and 56<sup>th</sup> Streets is owned by USF as a conservation area. USF requested that the proposed stations not acquire any additional right-of-way or impact this conservation area. These stations have been redesigned to remain within the existing right-of-way and minimize any potential impact to the conservation area.

## **7.5 Preferred Alternatives**

The following station locations and other roadway / pedestrian improvements were selected as the preferred alternatives based on the alternatives analysis, BRT demonstration ride and agency comments.

### **7.5.1 Station Locations**

The following station locations were selected as the preferred alternative.

#### Marion Transit Center

**MTC-1** was selected as the preferred alternative, shown on **Sheet 5 in Appendix B**.

#### Jefferson Street and Jackson Street / Kennedy Boulevard

**EB-1** and **WB-3** were each selected, shown on **Sheet 6 in Appendix B**, as the preferred alternative eastbound and westbound stations, respectively.

#### Twiggs Street and Nebraska Avenue

**NB-2** and **SB-1** were each selected, shown on **Sheet 7 in Appendix B**, as the preferred alternative northbound and southbound stations, respectively. Additional improvements at the southbound



station will include expanding the traffic island to enhance the passenger amenities and provide buffer around the station from the adjacent traffic.

*Estelle Street and Nebraska Avenue*

**NB-2** and **SB-2** were each selected, shown on **Sheet 8** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Columbus Drive and Nebraska Avenue*

The adjusted **NB-1** and **SB-2** were each selected, shown on **Sheet 9** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Floribraska/21<sup>st</sup> Avenue and Nebraska Avenue*

**NB-2** and **SB-2** were each selected, shown on **Sheet 10** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Lake Avenue and Nebraska Avenue*

**NB-4** and **SB-2** were each selected, shown on **Sheet 11** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*MLK Boulevard and Nebraska Avenue*

**NB-2** and **SB-2** were each selected, shown on **Sheet 12** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Hillsborough Avenue and Nebraska Avenue*

**NB-1** and **SB-2** were each selected, shown on **Sheet 13** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Hanna Avenue and Nebraska Avenue*

The shifted **NB-1** and the shifted **SB-2** were each selected, shown on **Sheet 14** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Sligh Avenue and Nebraska Avenue*

**NB-2** and **SB-2** were each selected, shown on **Sheet 15** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Broad Street and Nebraska Avenue*

**NB-1** and **SB-1** were each selected, shown on **Sheet 16** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Waters Avenue and Nebraska Avenue*

**NB-2** and **SB-1** were each selected, shown on **Sheet 17** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

*Busch Boulevard and Nebraska Avenue*

**NB-3** and **SB-1** were each selected, shown on **Sheet 18** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.



Linebaugh Avenue and Nebraska Avenue

**NB-2** and **SB-3** were each selected, shown on **Sheet 19** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

109<sup>th</sup> Avenue and Nebraska Avenue

**NB-1** and **SB-1** were each selected, shown on **Sheet 20** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

Fowler Avenue and Nebraska Avenue

**NB-3** and **SB-1** were each selected, shown on **Sheet 21** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

131<sup>st</sup> Avenue and Nebraska Avenue

**NB-1** and **SB-2** were each selected, shown on **Sheet 22** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

Fletcher Avenue/Nebraska Avenue and Nebraska Avenue

**EB-1** and **SB-1** were each selected, shown on **Sheet 23** in **Appendix B**, as the preferred alternative eastbound and southbound stations, respectively.

15<sup>th</sup> Street and Fletcher Avenue

**EB-2** with the addition of a bus bay was selected as the preferred alternative eastbound station. **WB-1** was selected as the preferred alternative westbound station. These stations are shown on **Sheet 24** in **Appendix B**.

22<sup>nd</sup> Street and Fletcher Avenue

**EB-1** with the addition of a bus bay was selected as the preferred alternative eastbound station. **WB-2** was selected as the preferred alternative westbound station. These stations are shown on **Sheet 25** in **Appendix B**.

University Area Transit Center (UATC)

**UATC-1** was recommended selected as the preferred alternative, shown on **Sheet 26** in **Appendix B**.

Magnolia Drive and Fletcher Avenue

**EB-1** and **WB-1** were each selected, shown on **Sheet 27** in **Appendix B**, as the preferred alternative northbound and southbound stations, respectively.

Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue

**EB-2** with the addition of a bus bay was selected as the preferred alternative eastbound station. **WB-1** was selected as the preferred alternative westbound station. These stations are shown on **Sheet 28** in **Appendix B**.

50<sup>th</sup> Street and Fletcher Avenue

With the addition of bus bays at each station, **EB-2** and **WB-1** were each selected, shown on **Sheet 29** in **Appendix B**, as the preferred alternative eastbound and westbound stations, respectively.



### 56<sup>th</sup> Street and Fletcher Avenue

With the addition of bus bays at each station, **EB-2** and **WB-1** were each selected, shown on **Sheet 30** in **Appendix B**, as the preferred alternative eastbound and westbound stations, respectively. The westbound station will be a type 'B' prototype station, while the eastbound station will remain a type 'A' prototype station.

## **7.5.2 Other Roadway / Pedestrian Improvements**

### **7.5.2.1 Side Streets**

There are no side street improvements that are part of the preferred alternative.

### **7.5.2.2 Queue Jump Lanes**

There are no queue jump lanes that are part of the preferred alternative.

### **7.5.2.3 Bus Bays**

Existing bus bays along the corridor will be maintained. Bus bays are proposed at eastbound 15<sup>th</sup> Street and Fletcher Avenue, eastbound 22<sup>nd</sup> Street and Fletcher Avenue, eastbound Palm Drive/42<sup>nd</sup> Street and Fletcher Avenue, eastbound and westbound 50<sup>th</sup> Street and Fletcher Avenue and eastbound and westbound 56<sup>th</sup> Street and Fletcher Avenue.

### **7.5.2.4 Mid-Block Pedestrian Crossings**

Both locations on Nebraska Avenue at Estelle Street and Hanna Avenue, described in **Section 7.2.5.4** are preferred locations to promote the safe crossing of pedestrians. Further coordination will be required during the final design phase to obtain the needed approvals.

### **7.5.2.5 Other Pedestrian / Bicycle Improvements**

The preferred pedestrian improvements which will improve the connection with the BRT station locations will be implemented as part of the project as outlined in the *Bicycle and Pedestrian Integration Technical Memorandum* (June 2009).