4. TRANSPORTATION IMPACTS

This chapter describes the public transportation and traffic impacts of the Locally Preferred Alternative (LPA) in comparison to the No Build Alternative.[1,2] The chapter is organized into sections describing potential impacts on public transportation, highways, parking, freight train and trucking movements, and bikeways and major pedestrianways.

As described in Section 2.3.2 of Chapter 2, Alternatives Considered, the LPA provides for Light Rail Transit (LRT) service operating along a line extending from downtown Houston to a terminus on Griggs Road at Beekman Road. It connects the downtown Houston district with the universities area, including Texas Southern University (TSU) and the University of Houston (UH), and the Palm Center. The service would operate in restricted lanes along Capitol and Rusk west of Avenida de las Americas. Between Hamilton and Nagle it would operate in a fully exclusive, bi-directional trackway on Texas. From Texas and Nagle to the intersection of Polk Street and Scott Street this trackway would traverse various land parcels. Within this segment, the trackway would occupy the south side of Dallas Street between Roberts and Scott. South of Polk the trackway would be situated in or along Scott Street, Wheeler Street, Martin Luther King Boulevard, and Griggs Road.

Travel data used for analysis of impacts were obtained from the Houston-Galveston Area Council (H-GAC) travel demand model. Transit input data and transit ridership estimates were developed using METRO's long-range travel demand model (EMME/2 model). In general, the roadway impacts have been assessed for a horizon year of 2025. This is consistent with the data available from the H-GAC 2035 *Regional Transportation Plan* (*RTP*). The transit impacts have been assessed using a horizon year of 2030 in order to be consistent with the requirements of the Federal Transit Administration.

4.1 Transit Impacts

The public transportation impacts of the No Build Alternative and the LPA are measured by their effects on route miles, revenue vehicles in service, and vehicle miles and hours of service operated within the study area. These measures form the basis for the transit level of service (LOS) analysis of the LPA. The result of the improvement in LOS under the LPA should be reflected by an increase in the number of transit patrons or riders.

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1 This SFEIS incorporates by reference all technical information, studies, and other public documents produced for the Southeast-Universities-Hobby Corridor Planning Study Alternatives Analysis (AA) and the *METRO Solutions Transit System Plan*, and DEIS that support the SFEIS. These documents are considered part of the environmental compliance record and can be requested for review at the METRO offices.

2 Acronyms and abbreviations are defined at their first use in each chapter. A complete list of acronyms and abbreviations used in this SFEIS is contained in Appendix A.

4.1.1 Transit Levels of Service

The transit system in 2030 under the No Build Alternative would be composed almost exclusively of services provided by METRO. However, within the Southeast Corridor the existing campus area shuttle bus service operated by the UH would continue.

Under the LPA, the fixed-guideway line would be implemented and minor modifications would be made to the existing and proposed bus route operations. These modifications would include: 1) limited reductions in bus headways where the new fixed guideway line would divert passengers from local bus routes; and 2) the elimination of the freeway portion of bus trips that currently serve Southeast Corridor neighborhoods and then travel along State Highway (SH) 288 between the Southeast Transit Center and downtown Houston.

Additionally, two new bus routes would be added to support the fixed-guideway services under the LPA. One would be a new bus route connecting the Wheeler Station on the METRORail Red Line with the universities area via Blodgett, continuing via Scott and Elgin Streets to the Eastwood Transit Center. The second new bus route would be a Signature Express Service connecting the Texas Medical Center (TMC) Transit Center to the Southeast Transit Center and continuing to Palm Center and the Gulfgate Mall. The Signature Express Service concept is an enhanced bus service, not operating within an exclusive guideway, which is intended to employ distinctive buses and special bus stops to provide limited-stop service in mixed traffic or in diamond lanes on arterial streets.

As a result of the minor bus route modifications under the LPA:

- Overall regional route miles operated during peak and off-peak periods would increase by 31.5 miles per day.
- Revenue vehicles in service would increase by 22 vehicles during the peak period and 22 vehicles during the off peak period.
- Overall regional vehicle miles and hours of service would increase by 2,613 miles and 177 hours respectively.
- The average speed of transit service within the study area would increase slightly (2.1 mph).

4.1.2 Transit Ridership

The mode choice model used by METRO for travel forecasting, estimates the number of person trips by trip purpose (i.e., work and non-work) and by mode (i.e., automobile and transit). The model also estimates the number of trips by mode of access. For automobile trips, the modes of access are drive alone and shared ride with two occupants, three occupants, and four or more occupants. The transit modes of access are walk, park-and-ride (commuter only), and kiss-and-ride (commuter only). The transit trips are expressed in linked transit trips in the region. A linked passenger trip includes all segments of travel from point of origin to point of final destination as a single trip, regardless of transfers or intermediate destinations.

As such, the number of linked passenger trips provides an estimate of the number of people using the transit system.

The results of the forecast of transit ridership indicate that the transit improvements proposed under the LPA would increase the number of transit work trips in the region by 1.01 percent, and transit non-work trips by 1.39 percent. The percentages are small because the transit improvements for the Southeast Corridor would be focused on only a small portion of the overall METRO service area. The results indicate an increase of about 19,785 additional passenger boardings, 37,375 additional passenger miles and 400 additional passenger hours under the LPA.

4.1.2.1 Fixed-Guideway Ridership

Experience during the first several months of start-up of the METRORail Red Line found that conventional travel demand mode choice models do not capture all of the trips using fixed-guideway transit. To account for the additional trips, supplementary methods were used to forecast what is referred to as "off-model ridership", or the additional ridership that could not be forecasted with METRO's EMME/2 model. LRT ridership estimates (boardings) for the LPA were adjusted to account for the additional trips related to special events and non-home based trips that cannot be generated using the conventional modeling process.

Table 4-1 presents the forecasts of 2030 average weekday LRT ridership estimates for the LPA, the METRORail Red Line, and the total fixed-guideway system using the EMME/2 model and supplementary methods.

Table 4-1. Total Average Weekday LRT Ridership

	LPA	METRORail Red Line	Total
EMME/2 Model Results	26,650	42,850	69,500
NHB[a] -Direct Demand Trips	1,070	8,100	9,170
Special Event Trips	1,030	3,400	4,430
Smith Lands Lot Trips	-	15,000	15,000
Total	28,750	69,350	98,100

[a] NHB – Non-Home Based
Source: METRO, January, 2008.

The results indicate that total daily ridership in 2030 for the LPA would be approximately 28,750 boardings. Overall, total fixed-guideway ridership, including the METRORail Red Line and LPA, is forecast to be 98,100.

4.1.2.2 Fixed Guideway Station Boardings

Table 4-2 summarizes the ridership estimates, or station boardings for the LPA in 2030.

Table 4-2. Average Weekday Station Boardings

Station Name	LPA
Smith (Brazos/Rusk)	5,750
Smith (Milam/Capitol)	4,350
Fannin (Fannin/Capitol)	1,300
Fannin (Rusk)	3,900
Crawford (Capitol)	750
Crawford (Jackson/Rusk)	900
Bastrop	1,200
Leeland	750
Elgin	1,900
Cleburne	2,200
East University	400
MacGregor Park	400
Palm Center	2,850
Total	26,650

Source: METRO/GPC Travel Demand Forecasts, February, 2008.

The results of the station level analysis for the LPA indicate:

- The Smith Station and Main Station, where the Southeast Corridor service line intersects with the METRORail Red Line, would have the highest number of daily boardings;
- The stations located at Cleburne/Scott and the Palm Center would have more than 2,000 boardings daily.

4.1.3 Mitigation Measures

No mitigation is required because the LPA would have not adverse effects on the transit system. The transit service and ridership effects would be beneficial to persons residing and working in the study area.

4.2 Highway and Roadway Impacts

This section presents the results of the analysis of the impacts to the highway and roadway system under the LPA in comparison to the No Build Alternative. On a corridor level, the proposed transit improvements would improve mobility by providing an alternative mode of travel to the automobile; as a result, travel by auto may be reduced by the proposed transit improvement. However, at a localized level, some negative impacts may result from: fixed guideway vehicle movements along and across public streets; physical impacts from station and fixed guideway features, pedestrian access to the fixed guideway stations, and changes to the local or express bus service feeding into the proposed fixed guideway stations.

4.2.1 Regional Traffic Impacts

Travel on the regional highway system would be anticipated to be only minimally affected by the implementation of the LPA. The inclusion of a park-and-ride facility at the southeastern end of the LPA is anticipated to attract some vehicle trips in the Southeast Corridor to transit. However, the reduction in overall regional vehicle trips is expected to be minimal.

4.2.2 Localized Traffic Impacts

Traffic volumes along the principal study area roadways are anticipated to increase at an annual growth rate of 1 percent per year. This growth rate was used to project 2025 peak hour turning movement volumes for use in the intersection LOS analysis and in the projection of 2025 average daily traffic (ADT) volumes. Based on this growth rate and using existing ADT information, forecasted ADT volumes for 2025 were determined for the major roadways in the study area.

Figure 4-1 shows the forecasted 2025 ADT volumes for the study area roadways. Forecast 2025 ADT volumes along the roadways outside of the downtown area are projected to range from 18,480 to 30,450 vehicles daily along Scott Street; from 12,840 to 18,800 vehicles daily along Griggs Road; approximately 15,800 vehicles daily along Wheeler Street; and from 7,620 to 15,020 vehicles daily along Martin Luther King Boulevard. These volumes represent an approximate 27 percent increase from the existing ADT volumes observed along these roadways. Traffic volume projections are anticipated to be similar between the No Build Alternative and the LPA.

Traffic volumes in the downtown area would not be impacted under the LPA alignment on Capitol and Rusk.

4.2.3 Corridor Street Modifications

This section discusses the impacts related to modification of the street system to accommodate the LPA.

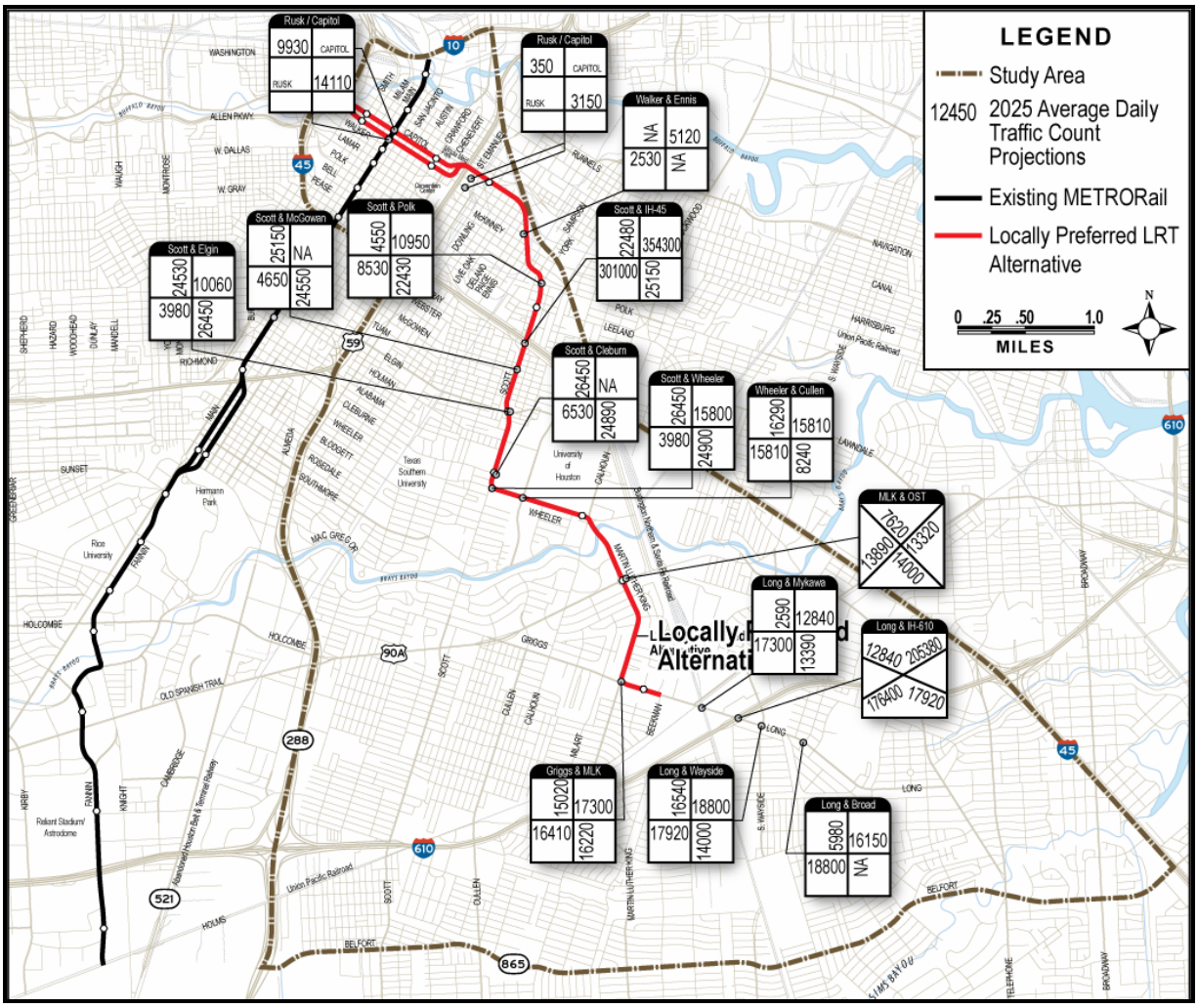
4.2.3.1 Locally Preferred Alternative

LPA between IH 45 and Polk Street

The LPA alignment would have a terminus in downtown Houston on a reserved trackway in the median between Capitol and Rusk west of Bagby beneath the IH-45 overpass. The eastbound trackway would extend eastward along the south (right) side of Rusk to Avenida de las Americas and the westbound trackway would be situated on the south (left) side of Capitol and would extend westward from Avenida de las Americas to the downtown terminus.

On each street the track would be installed in a lane along the south curb from which through traffic would be excluded in the peak hours. All turning movements from Capitol and Rusk that are currently permitted would continue. Vehicles executing left turns from Capitol and right turns from Rusk would be permitted to enter the track

Figure 4-1. Forecast 2025 Average Daily Traffic Volumes



Source: Parsons Brinckerhoff, 2006.

lanes for that purpose, but only on the immediate approaches to mid-block driveways and intersections with southbound and two-way cross streets. When the restriction is in force it would reduce by one the number of travel lanes on each of these streets that would be available to through traffic. During off-peak hours on weekdays and at all times on weekends and holidays the lanes would be open to all traffic. Station platforms would be incorporated into the sidewalks and would have no impact on vehicular traffic.

Between Avenida de las Americas and Hamilton each track would pass obliquely through vacated land parcels on its own course. The eastbound trackway would emerge on Hamilton at a point south of Capitol and between there and Texas it would occupy an exclusive lane along the east side of Hamilton. The westbound track would follow a direct path from just south of Texas and Hamilton to Capitol and Avenida de las Americas.

Between Hamilton and Nagle a double-track alignment for bi-directional LRT operation would be installed next to the south sidewalk of Texas, which would reduce the current number of travel lanes. From Hamilton to Bastrop there would be two eastbound lanes along the north side of the trackway, which would be wide enough to accommodate a center platform station west of Bastrop. In the block between Bastrop and Dowling the northern traffic lanes veer northeastward to form a connector to Harrisburg Boulevard and this movement would not be affected. The large triangular island that separates those diverging movements from those continuing eastward would be reconstructed to provide passage for the eastward movements on Texas currently using the lanes on the south side that would be taken over by the trackway.

Texas is one-way eastbound west of Live Oak and two-way between Live Oak and Nagle. West of Live Oak all of the lanes that would remain after installation of the trackway and would continue to operate eastbound. East of Live Oak the two surviving lanes on the north side would continue to operate in a westbound direction while those on the south side would be supplanted by the trackway, making this segment of Texas one-way westbound.

East of Nagle the trackway would curve southward along the west edge of the Burlington Northern Santa Fe (BNSF) right-of-way, following an off-street alignment to the intersection of Roberts and Dallas. It would pass through the existing L-shaped intersections of Capitol and Paige and of Rusk and Ennis. The trackway would cross McKinney and Lamar Street at non-intersection locations. South of Lamar it would curve eastward to cross Roberts at Dallas.

The trackway would occupy more than half of the street width on the south side of Dallas in the block between Roberts and Sampson Street. It would appear that the surviving roadway width would only be sufficient for a single lane, which could necessitate one-way traffic operation.

From there it would curve southward, across and then along the left (east) side of the southbound lanes of Scott Street to Polk Street. There it would align with the median of Scott on the south side of Polk Street.

LPA between Polk Street and Wheeler Street

Between Polk Street and the intersection of the northbound IH-45 off-ramp and between Hadley Street and a point just north of Reeves Street the trackway would be constructed in the median of Scott Street. There is no median where Scott Street underpasses IH-45, nor is there sufficient width between support structures to construct one. In that short zone the tracks would be embedded in the paving of the inside through lanes and the trains would operate in those lanes mixed with general traffic in the manner of any other large vehicle. Because of inadequate clearance at IH-45, the IH-45 Bridge would be modified to increase the clearance. METRO is currently finalizing design options with TxDOT. The preferred option at IH-45 includes maintaining the same profile of the existing bridge while increasing the clearance by replacing elements of the bridge structure, as opposed to lowering the elevation of the street. Coordination with TxDOT to determine a feasible and cost effective solution is in its final stages of negotiation. It has been determined that high

load detection may be required, though the detouring of standard sized trucks should not be necessary.

Although the roadway geometry would be modified to accommodate the trackway and stations at Leeland Street and Elgin Street, the existing number of traffic lanes would be maintained. In these segments localized impacts are anticipated at 13 non-signalized intersections because installation of the trackway in the median would eliminate left-turn and cross street through movements. Traffic that currently makes these movements would need to divert to adjacent signalized intersections. While the volumes of this diversion of traffic are not anticipated to be substantial, they have been accounted for in the analysis. In addition, pedestrian movements across the median at these intersections would be prohibited. These 13 non-signalized Scott Street intersections are Denver, Bell, Pease, Jefferson, Coyle, McIlhenny, Bremond, Dennis, Drew, Tuam, Anita, Rosalie and Simmons.

Between Reeves and Wheeler Street the trackway would be constructed along the east side of Scott in back of the sidewalk. Land would be acquired for this and the existing geometry of the Scott Street roadway would be largely unchanged. There would be three roadway crossings in this segment, which are Holman Street and two driveways serving the parking lot at the Robertson Stadium. For traffic control purposes it would be desirable to construct right-turn lanes on the northbound approach to these intersections.

LPA between Wheeler Street and Sunrise Road

Beginning at a point about 200 feet north of Wheeler Street the trackway would curve eastward into an exclusive right-of-way along the north side of Wheeler. East of Cullen Boulevard the tracks would transition from that right-of-way obliquely across Wheeler at grade into another exclusive right-of-way along the south side. The existing one lane of travel in each direction would be maintained along Wheeler between Scott and Calhoun Road.

East of University Oaks Boulevard the trackway would curve south into the median of Martin Luther King (MLK) Boulevard. Although the roadway geometry would be modified to accommodate the trackway and a station at MacGregor Park, the existing number of through traffic lanes on Martin Luther King Boulevard would be maintained. In this segment localized impacts are anticipated at five non-signalized intersections because installation of the trackway in the median would eliminate left-turn and cross street through movements. Traffic that currently makes these movements would need to divert to adjacent signalized intersections. While the volumes of this diversion of traffic are not anticipated to be substantial, they have been accounted for in the analysis. In addition, pedestrian movements across the median at these intersections would be prohibited. These five non-signalized Martin Luther King Boulevard intersections are Winnetka Avenue, Marietta Lane, Ventura Lane, Albemarle Drive and Stuyvesant Lane.

There is specialized roadway geometry where Martin Luther King Boulevard intercepts Old Spanish Trail (OST) comprising a separate intersection on OST for each direction of Martin Luther King Boulevard. The introduction of the LRT trackway would entail

reconfiguring this geometry to consolidate the train movements and the through and left-turn movements on Martin Luther King Boulevard at a single intersection with OST.

North of Griggs Road the trackway would curve eastward from the median of Martin Luther King Boulevard into the median of Griggs Road, bypassing the intersection of these two streets. In this curved segment the tracks would cross at grade the northbound lanes of Martin Luther King Boulevard and the westbound lanes of Griggs at oblique angles.

On Griggs between Martin Luther King Boulevard and Sunrise Road the roadway geometry would be modified to accommodate a median trackway and the terminal station at Beekman Road; however, the existing number of through traffic lanes on Griggs would be maintained. In this segment localized impacts are anticipated at two non-signalized intersections because installation of the trackway in the median would eliminate left-turn and cross street through movements. Traffic that currently makes these movements would need to divert to adjacent signalized intersections. These two non-signalized intersections on Griggs are Cavanaugh Street and Royal Palms Drive.

At Sunrise Road the tracks would angle northeastward across the westbound lane of Griggs into the line's Storage and Inspection Facility where they would terminate.

4.2.3.2 LPA Storage and Inspection Facility

There would be a Storage and Inspection Facility at the outer end of the line. It would comprise a track yard sufficient to accommodate overnight storage of the 34 light rail vehicles assigned to the line, the structures and equipment necessary to inspect and clean the trains and an employee parking lot. This facility would be constructed on land along the north side of Griggs Road a short distance east of Sunrise Road. No existing streets or sidewalks would be closed to accommodate the facility.

To provide access to the facility the median trackway on Griggs Road would extend eastward beyond the passenger terminal at Beekman Road to Sunrise Road. There the tracks would leave the median and cross the westbound lane of Griggs to enter the southwest corner of the facility. There would be minimal local impact since this trackage would be used primarily at the beginning and end of the service day. Trains carrying passengers would operate only west of the Palm Center Station.

4.2.4 Signalized Intersection Modifications

Signalized intersections along the proposed LPA alignment would be impacted by the inclusion of transit operations along the roadways; however, the modifications and impacts would vary based on the technology and the alignment location. In general, the signalized intersections along the fixed guideway alignment would operate on a predictive-priority condition that would allow the parallel through traffic to move during the same signal phase as the fixed guideway vehicle. As a result, the inclusion of the LRT movements in the signal phase is not anticipated to substantially impact operations along the corridor roadway and at signalized intersections. The inclusion of the fixed-guideway alignment in the roadway network would require all interfaces of LRT movements with vehicle and general pedestrian traffic to be controlled by active devices. That control may be supplemented by additional measures, such as passive

and active signing to alert motorists and pedestrians to trains approaching the intersection. Incorporating these supplemental traffic control devices into the design of the project would further minimize impacts to the safety of the traveling public associated with new transit movements through intersections.

4.2.4.1 Locally Preferred Alternative

LPA between IH 45 and Polk Street

As eastbound LRT trains depart from the downtown terminus in the median under IH-45 they would transition across the eastbound through lanes of Rusk. New traffic signal control would be needed at this mid-block location to time-separate these two conflicting movements. Westbound rail and vehicle movements would not be in mutual conflict and no additional signalization would be needed in that direction.

Between Bagby and Avenida de las Americas the trains on both Capitol and Rusk would travel on a course parallel to through traffic. At signalized intersections these two movements could share a common phase. Any measures that might be taken to give some preference to that phase in order to favor transit movements would not be likely to materially impact intersection capacity.

At the intersections of Avenida de las Americas with Capitol and with Rusk train movements would not follow the path of any normal vehicle movements. It would be necessary to install signalization with an exclusive, callable phase for the trains at those locations.

To satisfy the criterion that all conflicting movements of trains and roadway traffic are to be controlled by active devices it would be necessary to signalize the intersections on Jackson at Rusk; on Hamilton at Capitol and on Texas at St Emanuel, Bastrop, St Charles, Live Oak and Nagle. Also, track crossings of Hamilton south of Texas and north of Rusk would require the installation of non-intersection signal control.

Between Nagle and Polk the trackway would not follow any street right-of-way. It would pass diagonally through two intersections. One is the “L” intersection of Capitol and Paige, which includes a private roadway connection to the adjacent BNSF property. The other is the “T” intersection of Rusk and Ennis, from which the east leg of Rusk continues as a private roadway into the BNSF property. All of the approaches to the trackway crossing, public and private, would be controlled by flashers and automatic gates. There would be two non-intersection crossings, one on McKinney Avenue east of Palmer and Lamar east of Palmer. These crossings would be controlled with railroad-type flashing lights and automatic gates.

LPA between Polk Street and Wheeler Street

Along Scott between Polk and Elgin all conflicts of rail and traffic movements would occur at intersections that are now, or would be, signalized. The currently signalized intersections are Polk, Leeland, northbound IH-45 on-ramp, southbound IH-45 frontage road, McGowan and Elgin. At each of these intersections the train movements would utilize the phase serving through movements on Scott. Left-turn movements from Scott would be served by a separate phase and would not be

permitted on the through phase. Measures that might be taken to provide preference to that phase in order to favor transit movements would not be likely to impact intersection capacity significantly. New signalization would be installed at the IH-45 northbound off-ramp and at Hadley Street. This signalization would serve two purposes. The primary purpose would be to provide active control of conflicts between train movements and left-turn traffic movements. A corollary purpose would be to halt conflicting parallel rail and roadway movements when trains transition from the reserved trackway in the median into the inside through traffic lane. The use of general traffic lanes for rail movements is necessary in this zone because, without nearly total reconstruction of the freeway overpass structure, there would be insufficient roadway width to install a median trackway.

Between Reeves Street and Wheeler Street the trackway would be located along the east side of Scott. The intersection of Scott and Reeves would be signalized to time-separate movements of the trains across the northbound lanes of Scott as they transition between a median and roadside trackway alignment. The intersection of Scott and Holman is already signalized. This signalization would be re-configured to provide time separation of the additional conflicting movements that would result from the roadside trackway alignment. Between Holman and Wheeler there are two driveways that serve the Robertson Stadium parking lot. These driveways would cross the trackway and some type of active traffic control would be needed. At the northern driveway which is approximately, but not precisely, opposite Alabama Street, two types of control are under consideration: traffic signals with a callable phase for train movements and flashing lights with automatic gates. The southern driveway is directly opposite Cleburne Street and is already controlled by the signalization at that intersection. This signalization would be enhanced to encompass the track crossing. At all three of these trackway crossings along the east side of Scott the roadway should be reconfigured to include an exclusive northbound right-turn lane. Without such a lane it would be necessary to halt all northbound traffic whenever the phase serving the train movements is called.

LPA between Wheeler Street and Beekman Road

South of Cleburne the trackway would curve eastward from the alignment along the east side of Scott to one along the north side of Wheeler. On that alignment the tracks would cross Cougar Place and Cullen Boulevard and then transition obliquely across Wheeler at grade into a similar right-of-way along the south side where they would cross Rockwood Street and University Oaks Boulevard. Traffic on Wheeler at the oblique track crossing would be controlled by flashing lights and automatic gates. The crossings of Cougar Place, Cullen Boulevard, Rockwood Street and University Oaks Boulevard would be controlled by traffic signals. Because of the close proximity of these crossings to the intersections of these streets with Wheeler Street it would be necessary to design the signalization of each of the track crossings to encompass the adjacent street intersection. The signalization at the street intersection of Wheeler and University Oaks and the associated trackway crossing would serve to protect pedestrians walking between the station and points north of Wheeler.

East of University Oaks Boulevard the trackway would curve southward across south leg of Calhoun Road and the southbound lanes of Martin Luther King Boulevard into the median. At present, the intersection of the south leg of Calhoun and Martin

Luther King Boulevard is not signalized, given that only right-turn movements are permitted. However, the introduction of a track crossing would create new angular conflicts that would require signalization. That signalization would be designed to include the control of the southbound lanes of Martin Luther King Boulevard where they cross the tracks.

There are five intersections along Martin Luther King Boulevard where the median would have an opening to allow left-turn and cross traffic movements. These intersections are South MacGregor Drive, OST, Arvilla Lane, Madalyn Lane and Cortelyou Lane. Currently, only the OST intersection is signalized. New signalization would be installed at the other four. At OST the signalization and the roadway geometry would be revised significantly to time-separate train and vehicular movements and to accommodate the lengthy queues that build at this intersection.

The trackway would bypass the intersection of Martin Luther King Boulevard and Griggs Road as it curves from the median of one road to the other. In that segment the tracks would cross at grade the northbound lanes of Martin Luther King Boulevard and the westbound lanes of Griggs north and east of the intersection, respectively. These crossings would be controlled either by flashers and automatic gates or mid-block traffic signals. This control would be coordinated with the existing signalization at Martin Luther King Boulevard and Griggs.

From the crossing of the westbound lanes of Griggs Street the trackway would extend eastward in the median to Sunrise Road where it would curve northeastward, again across the westbound lanes of Griggs, into the Storage and Inspection Facility. All existing median openings at driveways and side streets in that segment would be closed, except those at Beekman Road and Sunrise Road. These two intersections would be signalized. The signal control at Beekman Road would also accommodate pedestrian movements to and from the terminal station immediately west of this intersection and vehicle movements to and from the Palm Center park and ride facility and transit center. At Sunrise Road the signalization would be required to time-separate train movements into and out of the Storage and Inspection Facility from vehicle movements on Sunrise Road and westbound Griggs Road. At the non-signalized intersections of Cavanaugh Street and Royal Palms Drive and at driveways only right-turn and through movements on Griggs would be permitted. Pedestrian crossing of the trackway would be prohibited at these intersections.

4.2.5 Impacts on Level of Service at Intersections

Levels of service at signalized intersections during the a.m. and p.m. peak hours in 2025 were identified for the No Build Alternative and the LPA. The analysis was conducted using procedures as described in the Transportation Research Board's 2000 Edition Highway Capacity Manual (HCM). The results of the analysis are summarized in the following sections. A roadway operating at LOS A through D is considered to be operating at an acceptable condition, while a roadway operating at LOS E or F is considered to be operating at a deficient LOS.

4.2.5.1 Impacts under No Build Alternative

A LOS analysis was conducted for signalized intersections in the downtown area and outside of downtown along Scott Street, Griggs Road, Wheeler Street, and Martin Luther King Boulevard under the No Build Alternative in 2025. The purpose of the analysis was to determine what conditions would be in 2025 without the project. The results of the analysis are discussed below.

No Build Alternative between Bagby and St. Emanuel

Table 4-3 presents the results of the analysis of delay and LOS for signalized intersections in downtown under the No Build Alternative. The signalized intersections analyzed are those on the proposed LRT alignment on Capitol, Rusk and Texas under the LPA.

As indicated in the table, all intersections analyzed are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from A to B for overall operations, with most intersections operating at LOS A or B during both a.m. and p.m. peak hours. Average vehicle delays range from 2.6 seconds/vehicle to 19.6 seconds/vehicle at the signalized intersections during both peak hours.

No Build Alternative between St. Emanuel and Wheeler Street

Table 4-4 presents the results of the analysis of delay and LOS for signalized intersections between St. Emanuel and Wheeler Street under the No Build Alternative.

The results of the analysis indicate that all of the intersections are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from A to D for overall operations, with most intersections operating at LOS B or C during both the a.m. and p.m. peak hours. Average vehicle delays for all the intersections are expected to range from 8.3 seconds/vehicle to 41.3 seconds/vehicle at the signalized intersections during both peak hours.

No Build Alternative on Wheeler Street and Martin Luther King Boulevard

Table 4-5 presents the results of the analysis of delay and LOS for signalized intersections along Wheeler Street and Martin Luther King Boulevard under the No Build Alternative.

The results of the analysis indicate that all of the intersections are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from B to D for overall operations, with most intersections operating at LOS C during both the a.m. and p.m. peak hours. Average vehicle delays for all the intersections are expected to range from 19.8 seconds/vehicle to 46.9 seconds/vehicle at the signalized intersections during both peak hours.

Table 4-3. No Build Alternative Level of Service Analysis for Signalized Intersections in Downtown

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Capitol at Bagby	17.4	B	8.6	A
Capitol at Smith	14.0	B	8.0	A
Capitol at Louisiana	4.0	A	11.4	B
Capitol at Milam	16.8	B	10.8	A
Capitol at Travis	2.6	A	6.4	A
Capitol at Main	11.5	A	8.7	A
Capitol at Fannin	15.7	B	14.3	B
Capitol at San Jacinto	4.8	A	5.5	A
Capitol at Caroline	7.9	A	7.8	A
Capitol at Austin	6.7	A	13.2	B
Capitol at LaBranch	12.8	B	8.2	A
Capitol at Crawford	4.8	A	5.9	A
Capitol at Americas	17.2	B	19.6	B
Capitol at Chartres	3.9	A	12.8	B
Capitol at St. Emanuel	16.5	B	12.4	B
Rusk at Bagby	9.4	A	11.4	B
Rusk at Smith	16.0	B	13.7	B
Rusk at Louisiana	14.1	B	14.8	B
Rusk at Milam	18.1	B	15.0	B
Rusk at Travis	10.3	B	15.7	B
Rusk at Main	18.7	B	17.0	B
Rusk at Fannin	14.4	B	12.4	B
Rusk at San Jacinto	11.9	B	12.3	B
Rusk at Caroline	10.0	A	10.1	B
Rusk at Austin	8.0	A	9.5	A
Rusk at LaBranch	6.1	A	9.8	A
Rusk at Crawford	8.2	A	8.8	A
Rusk at Americas	4.0	A	7.5	A
Rusk at Chartres	14.7	B	19.3	B
Rusk at St. Emanuel	6.0	A	11.3	B
Texas at Americas	9.8	A	5.6	A
Texas at Hamilton	6.5	A	16.7	B
Texas at Chartres	8.4	A	8.7	A

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

Table 4-4. No Build Alternative Level of Service Analysis for Signalized Intersections between St. Emanuel and Wheeler Street

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
McKinney at Sampson	10.1	B	12.1	B
McKinney at York	12.9	B	13.3	B
Scott at Polk	22.9	C	26.4	C
Scott at Leeland & Scott	10.8	B	11.3	B
Scott at Gulf Fwy NSR	22.8	C	21.2	C
Scott at Gulf Fwy SSR	41.3	D	22.8	C
Scott at McGowan	13.0	B	9.5	A
Scott at Elgin	33.2	C	29.4	C
Scott at Holman	19.3	B	16.8	B
Scott at Cleburne	12.1	B	8.5	A
Scott at Wheeler	8.3	A	14.3	B

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

Table 4-5. No Build Alternative Level of Service Analysis for Signalized Intersections on Wheeler Street and Martin Luther King Boulevard

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Wheeler at Cullen	35.4	D	46.9	D
Wheeler at Rockwood	N/A	N/A	N/A	N/A
Wheeler at University Oaks	N/A	N/A	N/A	N/A
Wheeler at Calhoun/MLK	36.1	D	41.3	D
MLK NB at Old Spanish Trail	19.8	B	24.5	C
MLK SB at Old Spanish Trail	26.5	C	26.8	C
MLK at Arvilla	N/A	N/A	N/A	N/A
MLK at Madalyn	N/A	N/A	N/A	N/A
MLK at Cortelyou	N/A	N/A	N/A	N/A
MLK at Griggs	32.5	C	36.7	D
Griggs at Palm Center P&R	N/A	N/A	N/A	N/A
Griggs at Beekman	N/A	N/A	N/A	N/A

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

4.2.5.2 Impacts under the Locally Preferred Alternative (LPA)

A level of service analysis was conducted for all signalized intersections in downtown and outside downtown along the fixed-guideway alignment under the LPA in 2025. The analysis was based on the revised traffic signalized operations needed to accommodate the transit vehicle movements through intersection crossings and modified intersection geometrics as shown on the plan drawings contained in Volume 2 of this SFEIS. The results of the analysis are discussed below.

Locally Preferred Alternative

LPA between IH 45 and Polk Street

Table 4-6 presents the results of the analysis of delay and LOS for signalized intersections in the downtown district on Capitol and Rusk between Bagby and Avenida de las Americas and on Texas between Hamilton and Nagle.

The analysis assumes that the LRT trains would operate in reserved lanes from which general vehicular traffic would be conditionally or totally excluded. On Capitol and Rusk there would be a reserved lane along the south curb on each street. During peak hours all through traffic would be excluded from each of these lanes, but they would be available to vehicles turning south into cross streets and driveways. During off-peak hours and at all times on weekends and holidays these lanes would be open to all traffic. Parking or loading in these lanes would be prohibited at all hours when the trains are operating. No separate signal phases would be needed to time-separate train and vehicular movements.

On Texas there would be a two-lane exclusive trackway along the south curb. It would comprise two tracks for bi-directional train operation and would be closed to vehicular traffic at all times Along this segment turning movements from Texas across the trackway would be executed from the adjacent traffic lane and would be time-separated from train movements by means of an exclusive, callable signal phase.

A similar bi-directional trackway would be constructed on the south side of Dallas Street between Roberts Street and Scott Street. It would occupy more than half of the current roadway width, which would necessitate making this street segment one-way westbound. Train movements would conflict with turning movements from Dallas across the trackway and would require time-separation with an exclusive, callable signal phase.

The results of the analysis indicate that all of the intersections are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from A to C for overall operations, with most intersections operating at LOS A or B during both the a.m. and p.m. peak hours. Average vehicle delays for all the intersections are expected to range from 3.2 seconds/vehicle to 20.2 seconds/vehicle at the signalized intersections during both peak hours.

LPA between Polk Street and Wheeler Street

Table 4-7 presents the results of the analysis of delay and LOS for signalized intersections on Scott Street between Polk Street and Wheeler Street.

The analysis assumes that the LRT trains would operate in the median of Scott between Polk and the northbound IH-45 off-ramp and also between Hadley Street and Reeves Street. Train and through traffic movement on Scott would share a common signal phase. Left-turn movements from Scott would have an exclusive, protected-only phase. In the narrow segment of Scott Street between the northbound IH-45 off-ramp and Hadley Street the trains would operate mixed with

Table 4-6. LPA Alignment between IH 45 and Polk
Level of Service Analysis for Signalized Intersections

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Capital at Bagby	17.3	B	7.8	A
Capitol at Smith	14.1	B	9.9	A
Capitol at Louisiana	4.7	A	11.4	B
Capitol at Milam	16.7	B	10.8	B
Capitol at Travis	4.0	A	8.1	A
Capitol at Main	11.5	B	8.8	A
Capitol at Fannin	15.7	B	14.5	B
Capitol at San Jacinto	5.2	A	5.5	A
Capitol at Caroline	7.9	A	7.7	A
Capitol at Austin	6.8	A	12.8	B
Capitol at LaBranch	12.5	B	9.0	A
Capitol at Crawford	5.6	A	6.5	A
Capitol at Americas	19.2	B	20.2	C
Rusk at Bagby	9.4	A	11.2	B
Rusk at Smith	17.5	B	14.4	B
Rusk at Louisiana	17.3	B	14.6	B
Rusk at Milam	18.5	B	15.0	B
Rusk at Travis	10.5	B	16.2	B
Rusk at Main	18.3	B	17.0	B
Rusk at Fannin	15.0	B	13.5	B
Rusk at San Jacinto	11.8	B	12.0	B
Rusk at Caroline	10.7	B	10.0	A
Rusk at Austin	7.5	A	9.2	A
Rusk at LaBranch	5.6	A	10.0	A
Rusk at Crawford	8.3	A	9.1	A
Rusk at Americas	3.2	A	8.9	A
Texas at Americas	3.8	A	5.4	A
Texas at Hamilton	12.2	B	16.7	B
Texas at Chartes	8.8	A	9.2	A
Texas at St. Emanuel	10.7	B	17.7	B
Texas at Bastrop	16.0	B	15.8	B
Texas at Dowling	10.6	B	10.4	B
Texas at St. Charles	11.8	B	9.3	A
Texas at Live Oak	13.7	B	6.2	A
Texas at Nagle	8.7	A	9.9	A
Dallas at Roberts	7.8	A	8.2	A
Dallas at Sampson	19.9	B	19.9	B
McKinney at York	14.7	B	7.2	A

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

Table 4-7. LPA Alignment between Polk and Wheeler Street
Level of Service Analysis for Signalized Intersections

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Scott at Polk	20.6	C	26.0	C
Scott at Leeland & Scott	10.9	B	11.4	B
Scott at IH-45 NSR	20.1	C	25.0	C
Scott at IH-45 SSR	29.8	C	19.8	B
Scott at McGowan	13.0	B	13.9	B
Scott at Elgin	23.4	C	26.6	C
Scott at Holman	21.1	C	25.4	C
Scott at Cleburne	11.0	B	12.0	B
Scott at Wheeler	20.1	C	22.2	C

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

vehicular traffic in the inside through lanes. No special signal phasing would be needed to accommodate train movements at the intersections in this segment. South of Reeves the trackway would be located along the east side of Scott. At the two currently signalized intersections, Holman and Cleburne, an exclusive, callable phase would be needed to time-separate train movements from northbound right-turn and southbound left-turn movements. New signalization would be needed at Reeves which would include control of the northbound lanes of Scott at the point where the tracks would transition between the median and east side right-of way. Some type of active control would be needed where the trackway would cross the driveway approximately opposite Alabama Street. Signalization comparable to that envisioned for the Cleburne/driveway intersection would be appropriate, but control by flashing lights and automatic gates could be considered.

The results of the analysis indicate that all of the intersections are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from B to C for overall operations, with most intersections operating at LOS B or C during both the a.m. and p.m. peak hours. Average vehicle delays for all the intersections are expected to range from 11.0 seconds/vehicle to 29.8 seconds/vehicle at the signalized intersections during both peak hours.

LPA between Wheeler Street and Sunrise Road

Table 4-8 presents the results of the analysis of delay and LOS for signalized intersections on Wheeler Street, Martin Luther King Boulevard and Griggs Road between Wheeler Street and Sunrise Road.

The analysis assumes that in the segment along Wheeler the LRT trains would operate in separate rights-of-way adjacent to the existing roadway, on the north side at the west end and on the south side at the east end with a track transition across the roadway at grade a short distance west of Rockwood Street. That crossing would be controlled by flashing lights and automatic gates. Train movements at the

Table 4-8. LPA Alignment between Wheeler Street and Sunrise Road Level of Service Analysis for Signalized Intersections

Intersection	AM Peak		PM Peak	
	Average Delay (sec/veh)	LOS	Average Delay (sec/veh)	LOS
Wheeler at Cullen	30.9	C	28.8	C
Wheeler at Rockwood	1.8	A	5.4	A
Wheeler at University Oaks	7.5	A	4.4	A
Wheeler at Calhoun/MLK	43.5	D	48.8	D
MLK at Old Spanish Trail	25.8	C	30.7	C
MLK at Arvilla	16.2	B	5.5	A
MLK at Madalyn	0.9	A	1.1	A
MLK at Cortelyou	2.6	A	2.4	A
MLK at Griggs	35.3	D	44.0	D
Griggs at Palm Center P&R	23.2	C	27.0	C
Griggs at Beekman	30.1	C	27.6	C
Griggs at Sunrise	30.9	C	28.8	C

Source: Parsons Brinckerhoff and Gunda Corporation, 2006 and 2008.

four cross streets would be time-separated from conflicting vehicular movements by means of traffic signalization that would also encompass the immediately adjacent intersections of these streets with Wheeler. This signalization would be programmed to provide an exclusive callable phase for the trains.

The analysis further assumes that the trains would operate in the median of Martin Luther King Boulevard between Calhoun Street and a point north of Griggs Road. Train and through traffic movements on Martin Luther King Boulevard would share a common signal phase. Left-turn movements from MLK would have an exclusive, protected-only phase. The transition between the alignment along the south side of Wheeler and the median of Martin Luther King Boulevard would be controlled by a customized signalization of the southbound lanes of Martin Luther King Boulevard and the south leg of Calhoun, which would include a callable exclusive phase for train movements. The analysis assumes that the roadway geometry at the Old Spanish Trail intersection would be reconfigured to allow implementation of this phasing.

The trackway would bypass the intersection of Martin Luther King Boulevard and Griggs Road as it curves from the median of one road to the other. In that curved segment the tracks would cross the northbound lanes of Martin Luther King Boulevard and the westbound lanes of Griggs, at grade, north and east of the intersection, respectively. These crossings would be controlled either by flashers and automatic gates or mid-block traffic signals. This control would be coordinated with the existing signalization at Martin Luther King Boulevard and Griggs.

The trackway would extend eastward in the Griggs Road median from the crossing of the westbound lanes east of Martin Luther King Boulevard to Sunrise Road where it would curve northeastward, again across the westbound lanes of Griggs, into the Storage and Inspection Facility. All existing median openings at driveways and side

streets in that segment would be closed, except those at Beekman Road and Sunrise Road. These two intersections would be signalized. Train and through traffic movement on Griggs at Beekman would share a common signal phase. Left-turn movements from Scott would have an exclusive, protected-only phase. This signalization at Sunrise would be programmed to provide an exclusive callable phase for the trains entering and leaving the Storage and Inspection Facility.

The results of the analysis indicate that all of the intersections are expected to operate with acceptable overall levels of service during both the a.m. and p.m. peak hours. Levels of service range from A to C for overall operations, with most intersections operating at LOS A during both the a.m. and p.m. peak hours. Average vehicle delays for all the intersections are expected to range from 0.9 seconds/vehicle to 48.8 seconds/vehicle at the signalized intersections during both peak hours.

4.2.6 Station Traffic Impacts

A total of 10 stations are proposed under the LPA. Localized increases in traffic volumes would result from passengers arriving by automobile at stations with parking facilities.

There is only one station under the LPA that would include parking for passengers, which is the proposed Palm Center Station on Griggs Road at Beekman Road. This station is proposed as a surface lot with 624 parking spaces and would generate approximately 450 vehicular trips in the a.m. peak period and 590 trips in the p.m. peak period.

The facility would be located on the east side of Beekman Road south of Griggs Road. It would be accessible via both directions on Beekman Road, which intersects both Griggs Road and Martin Luther King (MLK) Boulevard. Each of these through streets has an interchange with IH-610 and it is anticipated that a major portion of the auto traffic to and from the Palm Center Station would use this freeway and then either Griggs Road or MLK Boulevard to reach Beekman Road and the entrance to the parking facility.

The addition of the station traffic is expected to have only minor impacts on the IH-610 frontage road intersections with Griggs Road and MLK Boulevard. With appropriate modifications of the street geometry and signalization it would not cause an undesirable LOS at the intersections of Beekman Road with either Martin Luther King Boulevard or Griggs Road.

4.2.7 Mitigation Measures

Mitigation measures for impacts on signalized intersections have been identified and included in the traffic design and signal operations for the LPA. The measures to be implemented at signalized intersections include the following:

- A corridor-wide 90-second cycle length;
- Optimized signal timing splits at each intersection;

- A corridor-wide interconnected coordinated traffic signal system;
- New traffic signal controllers, pedestrian controls, and signage at signalized intersections;
- Traffic signal phasing operations with a special fixed guideway vehicle phase;
- Protected left turn phases for traffic turning across the fixed guideway from parallel lanes.
- METRO Police would continue to coordinate with state and local authorities on public safety and traffic within the corridor. Educational programs to alert the traveling public of the presence of new transit vehicles will be conducted in the corridor.

4.3 Impacts on Railroads

The LPA would end on Griggs Road at or west of Sunrise Road and would not have any impact to the existing at-grade railroad crossing of the Union Pacific and BNSF railroads near the intersection of Griggs Road and Long Drive. No mitigation would be required.

4.4 Parking Impacts

Construction of the LPA would require the removal of both on- and off-street parking. This section identifies the location of parking to be eliminated, anticipated impacts of the elimination of this parking, and mitigation to be implemented, where feasible, for replacement of parking. The No Build Alternative would have no impact to parking.

4.4.1 Removal of Off-Street Parking

Off-street parking consists of designated parking spaces on property adjacent to the LPA. Off-street parking may be provided for customer usage to support businesses or for residences. No for-fee parking facilities would be affected.

Under the LPA property in the form of right-of-way would be acquired in order to provide for the appropriate cross-section of the fixed guideway and adjacent roadways. The spaces would be eliminated from facilities supporting specific commercial properties that would be acquired for the project in the segment between Elgin Street and Wheeler Street. The capacity of the parking lot at the UH Robertson Stadium would be reduced by an estimated 270 spaces. Off-street spaces would also be removed from the Palm and nearby properties to accommodate roadway relocations and a parking facility for the proposed station at this location. The impact at Palm Center is expected to be minimal because of the excess parking at this site.

4.4.2 Removal of On-Street Parking

The parking impacts under the LPA are summarized below by segment:

- Downtown LPA – All on-street parking would be prohibited along the south curb lanes of Capitol and Rusk between Bagby and Avenida de las Americas. They

would be designated as restricted lanes for LRT trains. Signing would permit use of these lanes by general traffic during off-peak times on weekdays and at all times on weekends and holidays for travel, but not for any parking, loading or even brief stopping. During weekday peak hours vehicles turning onto southbound or two-way streets or into mid-block driveways (including off-street parking facilities) would be permitted to travel in these lanes on the immediate approach to the turn, but again not to park, load or stop. The east curb of Hamilton from Rusk to Texas would be converted into an exclusive LRT northbound trackway and closed to all other use. Two lanes on the south side of Texas between Hamilton and the BNSF tracks east of Nagle would be converted into a bi-directional trackway for exclusive use by LRT trains. Two traffic lanes would remain on the north side of the trackway. The installation of the trackway would necessitate the elimination of all parking and loading on the south side. Traffic volumes may require prohibiting parking along the north curb during one peak period, or both.

- LPA between Nagle Street and Polk Street – The installation of the trackway along the edge of the BNSF tracks would require a physical reconfiguration of two intersections: Capitol at Paige and Rusk at Ennis. As a result a small number of parking spaces in the immediate vicinity of each intersection would be eliminated, but this would have almost no actual impact. The parking demand in this area is very low any vehicles currently parking in these spaces could be accommodated within a short distance on the same street. The south side of Dallas Street between Roberts Street and Scott Street would be occupied by a bi-directional trackway for exclusive use by LRT trains. The surviving roadway between the trackway and the north curb would appear to be too narrow to accommodate both moving traffic and parking. However, on-street parking demand is very low in this area and there would be ample space available on the cross streets, Roberts and Sampson, to accommodate any parking displaced from Dallas.

- LPA between Polk Street and Wheeler Street – Along the segment of Scott Street that would host the trackway, parking is prohibited on both sides during the peak periods. In off-peak times parking is permitted in the outside travel lanes between the IH-45 interchange and Rosalie Street. When parked vehicles are present only the inside lanes are available for travel. With the installation of the trackway the Scott Street roadway would be reconstructed as necessary to maintain the current number of lanes. Consequently, while the lateral position of some lanes would change, that relocation would not affect parking availability.

- LPA between Scott Street and Beekman Road – Along Wheeler Street between Scott Street and Martin Luther King Boulevard the trackway would be situated largely in a separate right-of-way with a configuration that would leave the roadway undisturbed. The only physical interface with the roadway would occur a short distance west of Rockwood where the tracks would cross Wheeler at grade, creating a condition that would be incompatible with on-street parking. Since parking is already prohibited at this location the presence of this crossing would have no effect on parking availability. Along the segments of MLK and Griggs Road, where the trackway would be constructed in the median, there would be no consequential loss of on-street parking since it is currently prohibited.

4.4.3 Mitigation Measures

The impact of the removal of parking under the LPA would be primarily limited to the downtown area. The impact would be partially mitigation through the enhancements made in the blocks along the alignment. The restriping and reconfiguration of on-street parking could result in some new spaces.

Removal of off-street parking from commercial properties acquired by the project would be mitigated through compensation to property owners. The parking spaces removed at the UH and Palm Center would be partially mitigated through restriping and reconfiguration of existing parking.

4.5 Impacts on Bicycle and Pedestrian Facilities

Impacts to bicycle and pedestrian facilities would be minor and limited to perpendicular crossings at existing roadway intersections. The LPA would not introduce any new barriers along the proposed alignment. The LPA alignment would cross the Columbia Tap Trail, located east of Downtown between Ennis and Roberts. In coordination with the City of Houston, the City has agreed to relocate the trail. There would be no impact resulting from the LPA. There would be no impact to the signed, shared-lane bicycle routes on Wheeler Street, between Scott and Cullen Road, and on Griggs Road, from Scott Street to Mykawa Road, because in both locations sufficient right-of-way would be available or obtained to preserve the existing number of traffic lanes, while the fixed guideway would be added as exclusive transit lanes. No mitigation would be required.