



Southeast Universities Hobby  
Planning Study

January 28, 2004

# Alternatives Analysis Executive Summary

Prepared for:

**Metropolitan Transit Authority of Harris County**

Prepared by:

**Parsons Brinckerhoff Quade & Douglas, Inc.**

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Southeast  
Universities  
Hobby  
Planning Study

**Southeast-Universities-Hobby  
Planning Study**

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EXECUTIVE SUMMARY**

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Houston, Texas**

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# EXECUTIVE SUMMARY

## 1. Introduction

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The Alternatives Analysis (AA) described briefly in this Executive Summary is a part of the Federal Transit Administration's (FTA's) process for transit corridor studies. The AA is a specific element of the Southeast-Universities-Hobby Planning Study being carried out by the Metropolitan Transit Authority of Harris County (METRO) and its consultants. The overall purpose of the Planning Study is to identify appropriate application of Advanced High Capacity Transit (AHCT) within the corridor. AHCT is defined as a corridor transit facility that provides high-capacity, high-speed, two-direction, near all-day transit service. The technology may be any of a variety of vehicle and guideway forms intended to attract greater use of public transportation, improve the level of service of the overall transportation system, contribute to better air quality, and provide ample capacity to meet growing travel demand.

The route(s) to be followed and technologies to be used will be decided through a process that considers alternatives, beginning with a wide variety of ideas and narrowing, through a process of progressively detailed analysis and continual public involvement, to the selection of a "Locally Preferred Investment Strategy" (LPIS). The LPIS, fully integrated with a system-wide plan for the METRO service area, then will be subject to refinement of design concepts and preparation of a Draft Environmental Impact Statement (DEIS).

**Study Area Context:** The Metropolitan Planning Organization for the greater Houston area is the Houston-Galveston Area Council (H-GAC). This organization maintains plans and policies for the area's transportation system, air and water resources, economic growth potential, and various social service and human resource needs. H-GAC's responsibilities extend across a 13-county area. Eight of those counties, Harris, Brazoria, Chambers, Fort Bend, Galveston, Liberty, Montgomery, and Waller comprise the primary area of metropolitan development.

Within that area, the dominant provider of public transportation services is METRO, formed in 1979. This agency, funded by a one-percent sales tax levied within its boundaries, encompasses 1,285 square miles, including most of Harris County and small parts of Fort Bend and Montgomery counties. METRO operates a fleet of 1,500 buses providing local and express, commuter, METROLift, METROVan, Special Events, Charter, and FasTrak services. These services carried approximately 97 million passengers in 2002. METRO has built and now operates more than 100 miles of High Occupancy Vehicle lanes, 14 Transit Centers, and 24 Park & Ride Lots with a total of over 26,000 parking spaces. METRO's 7.5-mile "Downtown to Reliant Park" light rail line began revenue passenger service early in January 2004. METRO is expanding the HOV system and building additional Transit Centers. Under a "General Mobility" program, METRO has funded extensive street improvements within its service area.

In May 2001 the METRO Board of Directors adopted a "mode-neutral 2025 Transit System Plan for Mobility" (the METRO Mobility Plan) and directed the staff to work with H-GAC to incorporate the 2025 Plan into the Metropolitan Transportation Plan (MTP). The Board also selected corridors for more detailed evaluation. Three of those corridors have been the subject of planning studies including AA and the preparation of a DEIS. These three studies address the North-Hardy, Uptown-West Loop, and Southeast-Universities-Hobby corridors. In addition, METRO is continuing to develop and refine plans for other corridors that will be the subject of major transit improvements as progress is made in implementing the long range plan.

The three AA corridors and other corridors as their plans develop must all fit logically together to form a functionally sound and integrated regional system. The choice of transit technology to be used and the specific routing at locations where interfaces with other parts of the

regional system occur are key aspects of the planning for AHCT. Equally, the system planning process must recognize and serve the specific needs of each corridor.

## 1.1 Purpose and Need

The rationale for consideration of AHCT is demonstrated by current and anticipated development and transportation conditions within the study area. Existing or projected future transportation deficiencies guide the formulation of potential transportation improvements.

*Purpose and Need* addresses the following main topics:

- Definition of the study area;
- Characteristics of the study area including land use, population, employment, and student enrollments at major educational facilities;
- Transportation infrastructure and services; transportation deficiencies and congestion levels;
- Travel characteristics of the study area including travel patterns for trips by all modes, and use of public transportation;
- Goals and objectives; and,
- Public transportation strengths, deficiencies, and opportunities.

### 1.1.1 Study Area or Corridor

The Southeast-Universities-Hobby study area, shown in Figure 1, includes downtown Houston, a near-downtown area to the east, and a broad wedge to the southeast, generally bounded by IH 45 on the east, SH 288 on the west, and Almeda Genoa Road on the south.

### 1.1.2 Metropolitan Area and Study Area Characteristics

According to recent forecasts by the Houston-Galveston Area Council, the population in the eight-county region is expected to grow from approximately 4.5 million in the year 2000 to 6.4 million by 2025. During the same period, regional employment will grow from 2.4 million to 3.1 million. The most rapid growth will be in suburban and master planned communities surrounding the city, but the city, Harris County as a whole, and the METRO service area will continue to gain population and employment through both redevelopment and new development of areas that are under-utilized or still vacant. The forecasts are summarized in Table 1.

In addition to the activity centers listed in the table, METRO recognizes the airports, the Museum District, Reliant Park and vicinity, and the UH and TSU campuses as a focal points of travel within the region. These university campuses are adjacent to one another within the Southeast-Universities-Hobby corridor. Two of the activity centers in the table and four in the additional places listed are within or adjacent to the Southeast-Universities-Hobby corridor. Altogether, activity centers contain nearly half of Harris County's current and future employment.

The population distribution in the Southeast-Universities-Hobby area is broadly similar to that found in much of the inner METRO service area, although there are higher concentrations of population seen in the near north side and in large portions of the southwest. Employment is mainly concentrated outside the Southeast-Universities-Hobby area corridor, but the

Figure 1. The Southeast-Universities-Hobby Study Area



Table 1. Employment and Population Forecasts

| Activity Center  | Employment |           | Growth Factor, 2025/2000 | Household Population |           | Growth Factor, 2025/2000 |
|--|------------|-----------|--------------------------|----------------------|-----------|--------------------------|
|  | 2000       | 2025      |                          | 2000                 | 2025      |                          |
| CBD  | 156,469    | 178,602   | 1.141                    | 1,290                | 8,227     | 6.378                    |
| Bay Area   | 44,419     | 49,664    | 1.118                    | 50,233               | 70,035    | 1.394                    |
| Energy Corridor  | 84,692     | 99,806    | 1.178                    | 124,685              | 152,699   | 1.225                    |
| Greenspoint  | 73,563     | 103,042   | 1.401                    | 94,484               | 133,034   | 1.408                    |
| Greenway Plaza   | 80,810     | 131,473   | 1.627                    | 14,968               | 14,612    | 0.976                    |
| Galleria   | 129,264    | 154,949   | 1.199                    | 62,930               | 59,831    | 0.951                    |
| TMC & Plaza del Oro  | 89,014     | 113,267   | 1.272                    | 34,778               | 40,607    | 1.168                    |
| Westchase  | 98,008     | 106,494   | 1.087                    | 138,306              | 163,315   | 1.181                    |
| Subtotal, Activity Centers   | 756,238    | 937,299   | 1.239                    | 521,674              | 642,360   | 1.231                    |
| Other Harris County  | 1,189,961  | 1,529,759 | 1.286                    | 2,759,426            | 3,659,350 | 1.326                    |
| Total Harris County  | 1,946,200  | 2,467,057 | 1.268                    | 3,281,100            | 4,301,710 | 1.311                    |
| <b>Southeast-Universities-Hobby</b>  |            |           |                          |                      |           |                          |
| Excluding CBD  | 105,848    | 124,918   | 1.180                    | 193,678              | 215,642   | 1.113                    |
| Other METRO Service Area   | 1,630,091  | 2,074,291 | 1.273                    | 2,572,859            | 3,415,352 | 1.327                    |
| Total METRO Service Area   | 1,735,939  | 2,199,209 | 1.267                    | 2,766,537            | 3,630,994 | 1.312                    |
| Outside METRO Service Area   | 627,354    | 909,279   | 1.449                    | 1,764,931            | 2,763,725 | 1.566                    |
| Total Region (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller) | 2,363,293  | 3,108,488 | 1.315                    | 4,531,468            | 6,394,719 | 1.411                    |

Source: METRO GPC April 12, 2002; H-GAC

corridor's labor force benefits from the proximity of downtown and the Texas Medical Center (TMC) and other nearby employment concentrations. Furthermore, the corridor itself is not far below the areawide average in its ratio of employees to population. Average household income within the Southeast-Universities-Hobby area is below the average for the eight-county H-GAC area as a whole, and average household size is above average.

Ethnicity of the population within the Southeast-Universities-Hobby area is described in Table 2 below, by Super Neighborhood. The Super Neighborhoods are shown in Figure 2. Overall, the population is predominately African-American, but three of the eleven areas in the table, especially the Gulfgate/Riverview Super Neighborhood, have more Hispanic residents than any other ethnic group.

The northern end of the corridor lies in the downtown area and land uses are dominated by retail and commercial establishments. Within downtown, southeast of the Central Business District, large public and public/private investments have been made in: Minute Maid Park, home of the Houston Astros; an expanded George R. Brown Convention Center; a 1,200-room Convention Center Hotel (Hilton Americas); a 20,000 seat multi-purpose arena; and the expanding retail and restaurant venues to support this complex.

Table 2. Ethnicity of the Population (percent of total in each area)

| Super Neighborhood              | African-American | White | Hispanic | Asian | Other |
|---------------------------------|------------------|-------|----------|-------|-------|
| Downtown                        | 42               | 26    | 23       | 1     | 9     |
| Greater Third Ward              | 76               | 13    | 7        | 4     | 1     |
| MacGregor                       | 73               | 15    | 8        | 4     | 1     |
| Old Spanish Trail / South Union | 86               | 3     | 10       | <1    | <1    |
| Sunnyside                       | 90               | 3     | 5        | 2     | <1    |
| South Park                      | 88               | 4     | 8        | 0     | 0     |
| Gulfgate / Pine Valley          | 8                | 8     | 82       | 2     | <1    |
| South Acres / Crestmont         | 90               | 4     | 5        | <1    | <1    |
| Golfcrest / Reveille            | 29               | 15    | 54       | 2     | <1    |
| Minnetex                        | 55               | 22    | 20       | 2     | <1    |
| Greater Hobby                   | 32               | 28    | 36       | 4     | <1    |

Source: 1997 data, US Department of Housing and Urban Development (from City of Houston)

The predominant land use within the Southeast-Universities-Hobby corridor is residential, with substantial areas containing pre-1950 housing, particularly in the Third Ward area, which extends about two miles south and east from the central business district (CBD) to Bray's Bayou. The UH and TSU campuses are within this area. Many of the major arterials throughout the corridor are sites of strip commercial development; there are few major shopping centers, an exception being Gulfgate, just inside the corridor at the intersection of IH 45 and IH 610.

IH 610 and the Union Pacific Railroad (UP) form a major east-west barrier south of Bray's Bayou, at a radius of four miles from the southeastern corner of the Houston CBD. Another active railroad, the Burlington Northern Santa Fe (BNSF), runs the length of the corridor, from the northwestern corner of the CBD southward and slightly eastward. Both railroads serve a variety of industrial sites located along their routes. Another two and a half miles south of IH 610 and the UP tracks is Sims Bayou, which, like Bray's Bayou, drains from west to east toward Galveston Bay. Another mile to the south is William P. Hobby Airport, occupying a site that is roughly 1.5 miles square.

According to existing and projected figures in Table 1, the area will not grow as rapidly in either population or employment as the overall METRO service area through 2025. It is,



however, relatively densely developed, with about four percent of the land area served by METRO, but 7.0 percent of the service area's year 2000 population, and 6.1 percent of its employment. These percentages will drop to 5.9 and 5.7 percent, respectively, by 2025.

Figure 2. City of Houston Super Neighborhoods in the Southeast-Universities-Hobby Corridor



Source: City of Houston

### 1.1.3 Travel Patterns and Transportation

As noted earlier, the major activity centers within the area, other than the CBD, are the university campuses and Hobby Airport. Lesser concentrations of trips are oriented to commercial locations. Other major regional activity centers, including office, medical services and hospitals, entertainment facilities, and sports venues are located outside the non-CBD portion of the Southeast-Universities-Hobby Corridor. Travel patterns reveal the prominence of outside-of-corridor trip origins and destinations as part of the picture of travel involving the Corridor. This is illustrated in Figure 3.

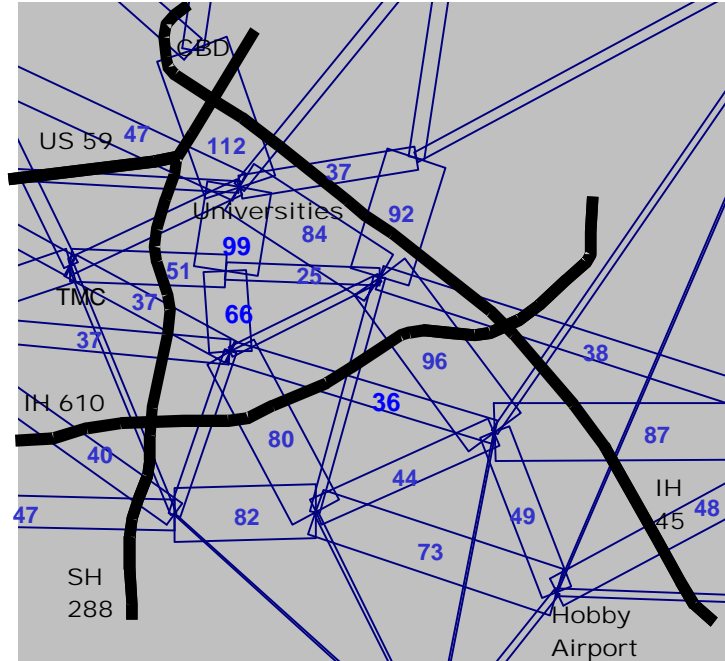
As shown, there are large north-south travel movements within the Corridor. Within the lower portion of the Corridor, there are large east-west movements as well. Travel volumes between the Corridor and other parts of the region to the west are significant but dispersed, while there are more concentrated movements to the CBD, to the northeast, and, in the lower part of the Corridor, to the east (South Houston and Pasadena, which lie outside the METRO service area). Also, many of the trips oriented toward the TMC continue to points farther west, while a large proportion of the trips oriented toward downtown (the Central Business District, or CBD) go no farther than downtown.

### 1.1.4 Roadways and Level-of-Service

The Study Area Map (Figure 1) shows that the Corridor is served by major arterials, supplemented by freeways (IH 45, IH 610, and SH 288). Together with the local and connector streets, they form an essentially complete road system; there are a few locations where natural and man-made barriers result in missing links that if built might usefully

augment the transportation system. Due to the age of the infrastructure and a general lack of maintenance, some facilities suffer from poor pavement conditions.

Figure 3. Major Person-Trip Flows, Year 2022  
Weekday Trips by All Modes, Thousands



Source: METRO and METRO GPC from H-GAC trip distribution model (compressed from METRO 786-zone system)

Parking is in short supply at the university campuses but otherwise ample in most locations within the Corridor.

Projected traffic assignments for the years 2007 and 2022 were examined, to gain an understanding of anticipated road capacity issues within the Corridor. Volume/capacity ratios were used to define the Level of Service (LOS) of roadways. Six LOS levels, A (best) through F (worst) are used in traffic engineering practice. Volume/capacity ratios below 0.75 (generally the threshold between Level of Service C and D) are desirable, and ratios above 0.90 (Level of Service E) are definitely problematic, resulting in unstable flow with frequent stoppages and a probability of failure to achieve the normal maximum capacity of a roadway. Volume/capacity ratios greater than 1.00 (Level of Service F) indicate failure to carry the projected demand, which will spill over into a broader peak period if no alternative routes are available.

The traffic assignment results show that the freeways and several arterials fall into these undesirable ranges during at least one peak period and direction. This indicates that traffic performance, especially for longer trips, is problematic and that more attractive public transportation service is clearly desirable to provide a viable alternative to progressive traffic congestion. On the positive side, the moderate volume/capacity ratios on most arterials indicate that it may be possible to re-allocate existing lanes from general traffic to AHCT without unacceptable effects on traffic levels of service, thus avoiding widening streets and taking additional right of way.

The 2022 demographic forecasts that underlie these forecasts have recently been shown to be well below the actual level of population anticipated to reside in the Houston metropolitan area during that decade. Consequently, the travel demand forecasts are at understated levels in these traffic forecasts as well.

1.1.5 Transit Services and Ridership

The Southeast-Universities-Hobby corridor is served by a comprehensive network of local bus routes including two crosstown routes (26/27 on Old Spanish Trail, and 73 on Bellfort), and several circulator routes. In addition there is one commuter express bus route, which connects downtown Houston to Hobby Airport and an area to the southeast including two Park & Ride facilities, Memorial Hospital East, and San Jacinto College South (outside the designated corridor). The bus routes provide roughly 19,060 weekday bus revenue miles of service within the corridor. This constitutes nearly 23 percent of all local bus service in the METRO service area. The weekday average revenue service speed is 12.5 miles per hour, which is also the METRO system-wide average speed for local bus service.

Table 3 presents approximate passenger volumes for the routes operating in the corridor, as determined during an on-board passenger survey conducted in 1995. The totals, 60,200 weekday boarding passengers or 49,800 linked passenger trips, are consistent with more recent “ride check” data. The corridor ridership equals 25 percent of METRO’s 1995 system-wide local-service boardings and 27 percent of local-service linked passenger trips.

Table 3. Approximate Bus Ridership in the Southeast-Universities-Hobby Corridor

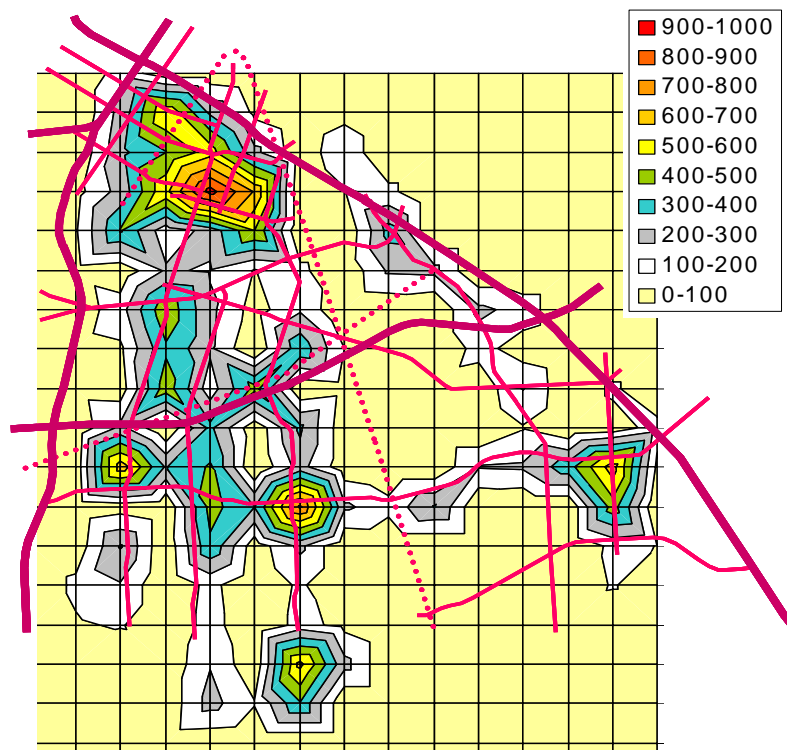
| Route  | Boardings | Linked Passenger Trips |
|--------|-----------|------------------------|
| 5      | 4,210     | 3,430                  |
| 26     | 6,344     | 5,054                  |
| 30     | 3,687     | 2,949                  |
| 35     | 762       | 645                    |
| 36     | 2,483     | 2,131                  |
| 40     | 4,543     | 3,694                  |
| 41     | 185       | 127                    |
| 42     | 1,782     | 1,378                  |
| 50     | 5,047     | 4,041                  |
| 52     | 6,621     | 5,599                  |
| 60     | 1,129     | 939                    |
| 68     | 4,881     | 4,169                  |
| 73     | 6,824     | 5,394                  |
| 77     | 5,163     | 4,468                  |
| 87     | 1,538     | 1,151                  |
| 88     | 411       | 340                    |
| 89     | 478       | 409                    |
| 321    | 2,860     | 2,849                  |
| Totals | 60,183    | 49,791                 |

Source: METRO on-board passenger survey, 1995

Available “ride check” data illustrate passenger flows as well as passenger boarding and alighting patterns within the Southeast-Universities-Hobby corridor. The boarding and alighting diagram (Figure 4) reveals major route-to-route passenger transfer points as well as areas that are important origins and destinations of the passengers. The most prominent transfer points are where the major north-south routes intersect the 73 Bellfort Crosstown route.

Non-transfer major sources of ridership are widely distributed but concentrations are seen at the universities, northwest of the universities, and to a lesser extent, along the north-south bus routes in the eastern portion of the corridor. Another cluster of activity occurs along Broadway between Bellfort and Hobby Airport.

Figure 4. Generalized Distribution of Weekday Passengers Boarding and Alighting from Buses in the Southeast-Universities-Hobby Corridor, 1999-2000



Source: METRO ride check data, 1999-2000

Another finding from the boarding and alighting data is that travel between the universities and locations to the south (including southwest and southeast) is more prominent than travel between the universities and downtown or other northerly areas. This does not negate the importance of movement between downtown and the corridor, but shows that good connectivity between the universities and the remainder of the corridor, including its connections to the west, is a vital part of any transit improvement program.

As the metropolitan area in general and Harris County and the METRO service area in particular address the transportation implications of an additional three million residents by 2025, transit will be called on to handle an ever increasing percentage of the work based and other trips. The two million new residents in the METRO service area will make it essential that AHCT be added to provide the spine of the system and the capacity required to offer an alternative to travel by automobile.

METRO's long range transportation improvement programs envision continued expansion of all the facilities, systems, and services currently provided. These route refinements and additions are shown in a "No Build" network that will be used as the basis against which AHCT alternatives will be evaluated. Preliminary No Build forecasts for the year 2025 indicate substantial growth in public transportation services and use, including approximately 85,100 weekday passenger boardings in the Southeast-Universities-Hobby Corridor. This is an increase of 41 percent over the corresponding figure for 1995, 60,200. The increase is attributable in part to growth in population and employment, but benefits also from continual improvements in transit service in context with intensifying mobility problems as the metropolitan area continues to grow in size, density, and amounts of travel. Further growth in the role of public transportation will accrue as major transit investments are made.

### 1.1.6 Transportation Goals and Objectives

The development of transportation goals and objectives for the Southeast-Universities-Hobby Planning Study has at its root the necessary considerations from federal, regional, and local perspectives. As a consequence, the general federal guidelines and criteria, the Houston-Galveston Area Council (H-GAC) goals, objectives and measures, the goals and objectives of the METRO Mobility Program, comments received from the public during previous studies, and the scoping process for the corridor have all been considered and reflected in the goals and objectives to which AHCT in this corridor must respond.

These goals and objectives, affirmed by public review and comment, are included in Table 4. The specific measures to assess the alternatives' responsiveness to the goals and objectives were developed based on public input as well as on federal (FTA) requirements.

Table 4. Southeast-Universities Hobby Corridor Study Goals and Objectives

| Goal No. | Goals  | Objectives   |
|----------|--|--|
| 1        | Develop a multimodal Transportation system   | <ul style="list-style-type: none"> <li>• Improve transportation system accessibility and connectivity.</li> <li>• Reduce the time necessary to travel to and between the primary job markets and activity centers (CBD, Texas Medical Center, universities, Hobby Airport, other major centers of employment and services).</li> <li>• Improve transportation options for socially, economically and physically disadvantaged groups.</li> <li>• Reduce dependency on automobiles.</li> <li>• Provide an alternative to highway travel delays and congestion by means of additional transit capacity and quality.</li> </ul> |
| 2        | Improve the efficiency, reliability, capacity and safety of existing transportation facilities | <ul style="list-style-type: none"> <li>• Provide direct transit connection to major activity centers.</li> <li>• Provide area residents with enhanced transit options for a variety of trips within the corridor and region.</li> <li>• Provide more direct connections between the corridors of residential and commercial activities.</li> <li>• Provide safe, reliable and secure transit services.</li> </ul>  |
| 3        | Preserve social integrity and support of urban communities                                     | <ul style="list-style-type: none"> <li>• Connect high volume pedestrian activity centers.</li> <li>• Serve existing and future high-density residential populations.</li> <li>• Provide transit investment supportive of redevelopment/development and land use plans.</li> <li>• Minimize traffic impacts on local streets within the study area.</li> <li>• Minimize impacts during construction.</li> <li>• Minimize right-of-way requirements.</li> </ul>  |
| 4        | Plan for transportation projects that enhance the quality of the environment                   | <ul style="list-style-type: none"> <li>• Improve air quality by reducing automobile emissions and pollutants.</li> <li>• Protect sensitive areas such as wildlife habitats, wetlands, and historic and cultural sites.</li> <li>• Provide a transit option to mitigate excessive parking demand and encourage a sense of place and neighborhood.</li> </ul>  |
| 5        | Define a sound funding base  | <ul style="list-style-type: none"> <li>• Provide equitable transportation services and benefits to all geographic areas and constituencies.</li> <li>• Provide for equitable sharing of the costs of transportation improvements among those who benefit from them.</li> <li>• Maximize the economic benefits gained from transit capital investments.</li> </ul>  |

### 1.1.7 Transit Improvement Needs to be Addressed

Travel in the corridor is generally focused on the few existing north-south and east-west arterials. The public transportation system is built on this same network of arterials, and serves large north-south travel movements within the corridor. The bus trips south of Bellfort tend to be long and dispersed in response to the scattered origins of the trips. From Bellfort north, the bus trips tend to be concentrated on a relatively small number of arterials within the west side of the corridor. Many of these trips begin and end within the corridor or have the CBD as their destination; smaller numbers continue farther north or transfer in other directions.

Throughout the corridor, there are very large east-west movements as well. While these travel volumes are significant, they are to and from widely dispersed locations both within and outside the corridor. Some are served directly by east-west bus routes, but there is a notable gap in linkage between the corridor and Midtown, limited bus routing to the TMC area, and no direct bus services to southwestern Houston beyond the Reliant Park area.

Given the nature of the bus travel patterns in the corridor and the inherent deficiencies enumerated above, the following specific issues must be addressed in identifying the appropriate AHCT investment for the corridor. Alternatives will be devised to address and strike the proper balance and compromise among the following main issues.

- Reduce in-vehicle travel times: accomplished by locating the AHCT investment along the spine of the system where most trips are concentrated. The AHCT stations and operating plan will be designed to maximize AHCT's speed advantages, as compared with the current local bus service in the corridor. Local buses replaced by this faster service can be reoriented to provide more effective transfers and feeder services to AHCT.
- Reduce waiting times and vehicle-to-vehicle transfer times: The introduction of AHCT will in some instances increase the number of transfers, but by providing improved frequency of service on both AHCT and the local and feeder bus routes, transfer times will be minimized. AHCT will operate with a high level of schedule adherence due to its extensive use of reserved right of way, and this predictability will also help to reduce passenger waiting times and inconvenience.
- Selectively relocate Transit Centers for optimal passenger transfer opportunities: If AHCT service is oriented north-south, for example, locating a Transit Center on Bellfort at an AHCT station will minimize passenger distance and time on local bus routes and maximize the opportunity to make use of AHCT, with its higher travel speed. There will be accompanying opportunities to upgrade the bus services that bring passengers to the AHCT route.
- Upgrade transit infrastructure and systems: AHCT will constitute an investment in premium transit, including fast, high-quality, reliable service accessed at well-designed stations at convenient locations. Additional investment also needs to be made to the existing and redesigned feeder services at bus stops, access to bus stops along sidewalks, Transit Centers, parking, paving of streets used as bus routes, lighting, and other safety and security measures, landscaping, and passenger information systems which may include the use of advanced information technologies.
- Encourage economic development and revitalization: AHCT station sites can spur economic development. The stations will provide an attractive, permanent investment and a ready market to encourage development. Carefully sited and planned stations can serve as the center for small urban villages of mixed development consisting of residential, office, commercial and institutional facilities. A fixed transit investment

can also improve access to existing businesses and public institutions, resulting in a revitalized community.

- Connect with the regional AHCT network: The AHCT investment in the Southeast-Universities-Hobby corridor must connect with the Downtown to Reliant Park light rail line and provide convenient access to the regional AHCT system at large. People from the corridor will be given direct access to all that the region has to offer, and people from outside the corridor will be linked conveniently to the public facilities, entertainment venues, universities, and Hobby Airport within the corridor.

#### 1.1.8 Agencies Involved in the Corridor Planning Process

A comprehensive list of agencies was prepared to invite participation in the Agency Scoping Meeting held on February 27, 2002 for the three corridor studies. In addition, an Interagency Coordinating Committee was established to monitor and guide the study. This Committee's membership includes the following:

- MPO Director, H-GAC
- Planning Manager, Harris County Public Infrastructure Department
- Transportation Planning and Development, Texas Department of Transportation
- Intermodal Team Leader, Federal Highway Administration
- Director, Planning and Development Department, City of Houston
- Mayor, City of Spring Valley
- Executive Director, Harris County Public Infrastructure Department
- Assistant Director, Harris County Toll Road Authority
- Community Planner, Federal Transit Administration, Region VI
- Director, Houston Airport System

#### 1.1.9 Public Involvement Process

The public involvement program was developed and implemented with specific attention to the National Environmental Policy Act, requirements of the Federal Transit Administration, and applicable laws, regulations and guidelines such as the Americans with Disabilities Act (ADA). Efforts were implemented to be in compliance with public involvement requirements as prescribed by Executive Order 12898, For Federal Actions to Address Environmental Justice on Minority Populations and Low-Income Populations (3 CFR, 1994 Comp., p. 859). As part of the public involvement process, the project team:

- Disseminated information about the Southeast-Universities-Hobby Planning Study to the general public and to directly affected communities;
- Identified stakeholder groups most affected by and interested in the Southeast-Universities-Hobby Planning Study corridor development and actively sought their input;
- Encouraged adequate community understanding and maximum input through tactically planned communication forums and mechanisms; and,

- Sought to produce results sensitive to and adequately addressing issues raised by the projects' multiple stakeholders.

The basic process consisted of employing successive sets of meetings at major study milestones. Initial Stakeholder meetings were used to identify representatives of the community who represented significant constituencies in the corridor, who became members of a Citizens Involvement Committee (CIC). The CIC met regularly and reviewed study progress, provided input to the development of study milestones, reviewed the products of the study and disseminated information to their respective groups. Stakeholder meetings were used continually, to update the public perception of the study and its products and adjust representation on the CIC.

Public meetings, formally advertised, were scheduled periodically to provide an additional opportunity to reach the public and verify that the stakeholder and CIC meetings were well focused and represented the public interest at large. Workshops were used to present materials reviewed and discussed with the CIC.

These efforts were supplemented by an aggressive mailing of fact sheets and newsletters and an informative corridor website. The following is a general summary of the number and types of meetings held:

|    |   |                      |
|----|---|----------------------|
| 3  | – | Scoping Meetings     |
| 10 | – | Public Meetings      |
| 48 | – | Stakeholder Meetings |
| 6  | – | Workshops            |
| 6  | – | CIC                  |

Additional efforts to maximize public involvement communications included the following:

- Informational Flyers and Handouts
- Project Fact Sheets
- Stakeholder Comment Sheets
- Stakeholder Questionnaires
- Brochures, Postcards, and Invitations
- Video Simulations
- Frequently Asked Questions Sheets
- Display Boards, Visuals, and Aerial Graphics
- Electronic Mail
- Website
- Telephone Contacts

Written and graphic materials were regularly distributed to local area residents, business owners, churches, schools, and project database participants to keep them apprised of project milestones and upcoming public involvement activities. Electronic mail and telephone contacts were executed when appropriate.



### 1.1.10 Role of the AA in the Project Development Process

The AA is the phase in project development during which a comprehensive and impartial process is carried out to identify the most promising approach to transit improvement within a corridor. The process involves the following main steps, as specifically planned for the three concurrent corridor AA studies:

- Initiation of a continual dialog with the public, stakeholders, and interested agencies, to gain an understanding of issues, problems, and opportunities that should be addressed;
- Assessment of initial public and agency comment and study of available planning data, to develop a Purpose and Need Report;
- Development of a “Long List” of transportation improvement alternatives addressing the corridor’s purpose and need, with emphasis on comprehensiveness and without prejudgment as to the merits of a particular idea. Alternatives may include both route alternatives and technology (transportation mode) alternatives;
- Screening of the Long List to eliminate alternatives that are clearly deficient compared with other alternatives, or that have “fatal flaws” such as insurmountable environmental effects, or physical problems that would be very costly to resolve;
- Detailed evaluation of the resulting short list of improvement alternatives, considering potential ridership, transportation user benefits, capital and operating costs, right of way and displacements requirements, effects on traffic, environmental issues, economic impact, and public acceptance; preparation of a report presenting the results of the evaluation;
- Conduct of a public hearing on the evaluation, and documentation of the public hearing and comments received; and,
- Selection (by the METRO Board of Directors) of the LPIS on the basis of the AA report, the system planning effort, and public comment.

The Southeast-Universities-Hobby Planning Study is being carried out in accordance with accepted practice and in full compliance with FTA guidelines and procedures. The project completed its Scoping Process, having prepared a Scoping Information Report, advertised and held open-house public meetings, and participated in a multi-corridor Agency Scoping Meeting. The Study scope, schedule and budget have been prepared to encompass data gathering, analysis, public involvement, and other steps appropriate to the identification of the major investment opportunities in the transit corridor, including advertising and holding a public hearing. In this case, a public hearing will be held at the conclusion of preparation of a Draft Environmental Impact Statement.

## 2. Alternatives Considered

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### 2.1 No-Build Alternative

The No Build Alternative includes the Metropolitan Transit Authority (METRO) transit services and facilities that were programmed to be in operation in FY 2007 and the regional roadway/highway system that was programmed to be in place in 2022. The definition of the No Build Alternative was discussed with the Federal Transit Administration (FTA) during its

development. A subsequent review concluded with a verbal approval of the concept from the FTA (conference calls held with FTA staff in the first quarter of 2002). It includes the implementation of the Downtown to Reliant Park light rail service, but incorporates no other new high capacity transit services. In addition to METRO service, the No Build Alternative includes bus service into Houston provided by the Brazos Transit District (Woodlands Service) and TREKEXPRESS (Fort Bend County/US 59 South). Roadway improvements included in the No Build Alternative, except for I-45 North where improvements were removed to test multiple I-45 highway options, are identified in the Houston-Galveston Area Council (H-GAC) 2022 Metropolitan Transportation Plan (adopted February 25, 2000).

The transit service and roadway improvements included in the No Build Alternative respond to the substantial increase in the region's population and employment. In twenty years, the Houston area will have two million more people and add over one million new jobs. The additional trips generated by the new residents and jobs and the three-fold increase in motor vehicles will aggravate regional roadway traffic congestion that will need to be mitigated by multiple types of transportation projects.

### 2.1.1 Existing METRO Service and Programmed Improvements

METRO provides approximately 6,700 route miles of service on fixed routes and special events service (such as sporting and community event shuttles). METRO operates bus service seven days a week, with weekday service operating from 3:47am (first bus in revenue service) to 2:27am (last bus in revenue service), weekdays. The span of service is less on weekends. In addition, METRO offers paratransit services for the senior and disabled communities utilizing 118 vans and 124 sedans. METRO, in conjunction with TxDOT, has funded and constructed over 100 miles of High Occupancy Vehicle (HOV) lanes on six freeways that METRO uses for many of its commuter routes.<sup>1</sup>

In FY2002, METRO carried over 97 million annual boardings on all fixed route and special bus services. In addition, over 20 million person trips in carpools and vanpools on METRO's HOV lanes contributed to system-wide annual boardings.<sup>2</sup>

In January 2004 METRO began operating the Downtown to Reliant Park light rail line with 16 stations, including one new Park & Ride lot, two transit centers and a new light rail maintenance and storage facility.

Concurrent with the operation of light rail, METRO has programmed bus service improvements that include route alignment and service frequency modifications. All of these improvements are included in the No Build Alternative for this study. The No Build bus routes are presented in Figure 5. Overall, the service improvements will change the existing system as indicated in Table 5.

As a result of No Build service improvements, METRO's total annual transit boardings are expected to increase from 97 million in 2003 to approximately 160 million by 2025.

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<sup>1</sup> HOV lanes operate between 5:00am and 11:00am and between 2:00pm and 8:00pm weekdays. The HOV lanes on the Katy Freeway are operational on Saturday and Sunday as well.

<sup>2</sup> METRO Office of Management & Budget Department, January 27, 2003.

Table 5. Summary of No Build METRO Service Characteristics

| Element                                    | 2003                                    | 2025 No Build (estimate)                 |
|--|---|--|
| Fixed Routes by Service Type*              | 74 Local<br>8 Express<br>28 Park & Ride | 84 Local<br>10 Express<br>37 Park & Ride |
| Bus Fleet Size                             | 1,457 (including spares)                | 1,600 (including spares)                 |
| Annual Revenue Miles of Bus Service**      | 56.22 million                           | 87.21 million                            |
| Annual Revenue Hours of Bus Service**      | 3.82 million                            | 4.63 million                             |
| Light Rail Fleet Size                      | -                                       | 18                                       |
| Annual Revenue Miles of Light Rail Service | -                                       | 836,290                                  |
| Annual Revenue Hours of Light Rail Service | -                                       | 65,346                                   |

\*Does not include employee shuttles and transit services operated by other entities. Does not count route branches as separate routes. All numbers are based on Year-to-Date figures as of January 2003. No growth was assumed for 2007.

\*\*The 2025 estimates do not assume an increase in Special Bus Services from the 2003 levels and are annualized based on 300 operational days per year.

Source: METRO Scheduling Department, METRO Rail Operations Department, and METRO Capital Planning Department; December 2002; METRO Office of Management & Budget; January 2003.

**Existing METRO Capital Facilities and Programmed Improvements:** To accommodate the increase in service levels assumed to occur by 2025, METRO will expand or increase the number of transit facilities, including new locations for METRO's Park & Ride lots and transit centers, METRO's HOV system, and a planned sixth bus maintenance and storage facility (location to be determined). Details are provided in Table 6.

Table 6. Existing and No Build METRO Capital Facilities

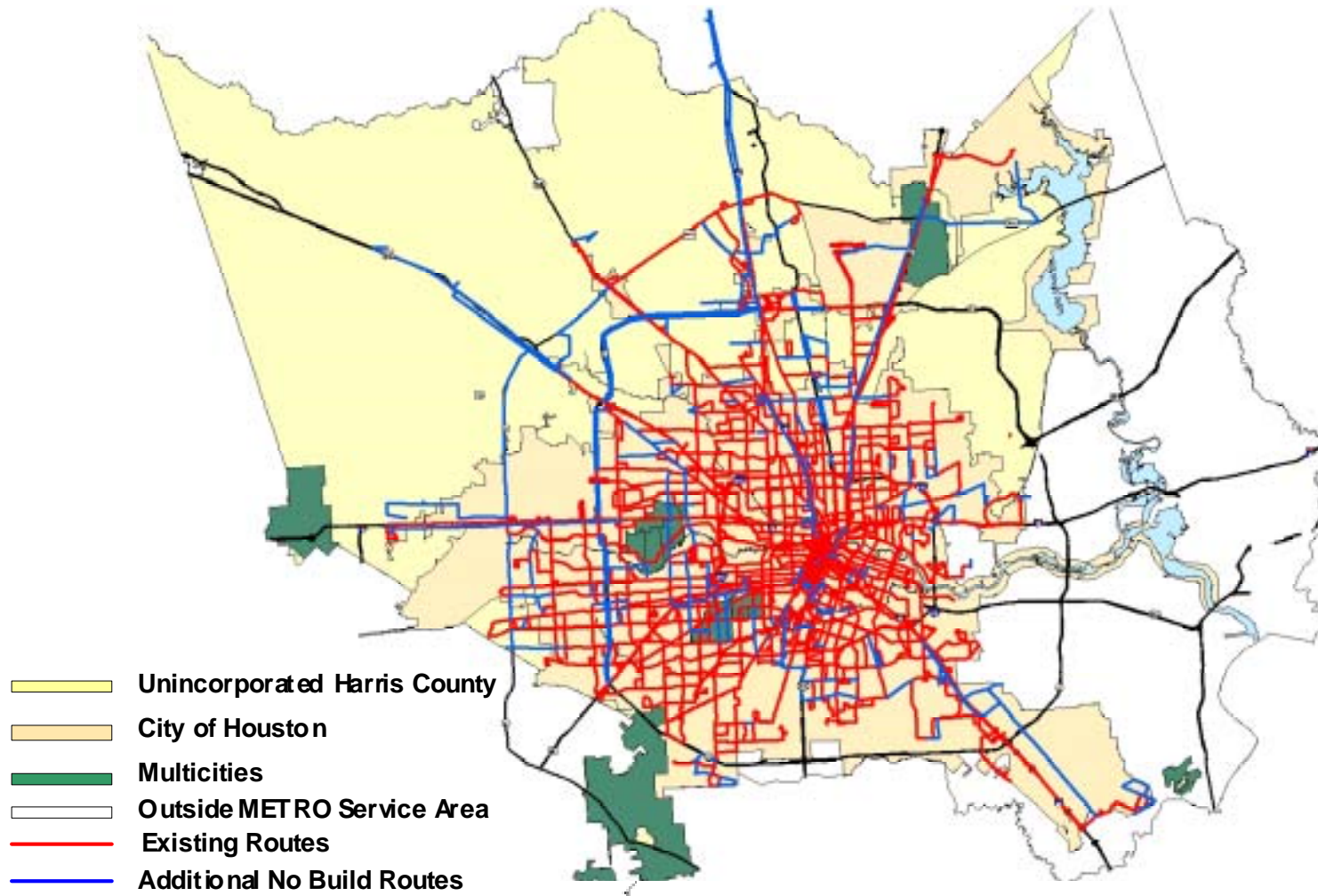
| Transit Facility                                      | 2003   | 2025 No Build                                      |
|---|--|--|
| Bus Park & Ride Lots                                  | 25   | 29   |
| Bus-only Transit Centers                              | 15   | 19   |
| HOV Lanes Used By METRO (centerline miles)            | 97.7 miles*  | 187 miles**  |
| Light Rail Park & Ride Lots                           | 0  | 1  |
| Light Rail-Bus Transit Centers                        | 0  | 2  |
| Bus and Light Rail Storage and Maintenance Facilities | 5 bus facilities                                   | 6 bus facilities<br>1 light rail facility          |
| Other METRO Storage and Maintenance Facilities        | 1 non-revenue vehicle facility<br>1 central supply | 1 non-revenue vehicle facility<br>1 central supply |

Source: METRO Service Planning, December 17, 2002; 2025 No Build Transit Facilities, METRO Capital Planning.

\*Source: METRO Planning, Engineering & Construction, HOV Lane Program Status Report, 04/09/03.

\*\*Generated from Houston METRO EMME/2 Travel Demand Model for No Build Scenario January 2003

Figure 5. No Build Transit Route Network



Source: METRO Transit System Analysis, 03/20/03  
Base Map, METRO GIS & Cartography

## 2.1.2 Highway and Roadway Improvements

The regional highway and roadway system is comprised of interstate and other federal highways, state highways, county roads, toll roads, and arterial roadways in the eight-county metropolitan area. In 2000, the regional roadway system totaled over 20,000 lane miles of major highways and roads. In addition, the regional highway network incorporates a system of freeway HOV lanes, most of which have been constructed and are used by METRO.

Regional roadway mobility levels will deteriorate unless planned transportation improvements are implemented. The planned roadway improvements include expansion of the regional roadway and HOV system. As indicated in Table 7, between 2000 and 2022, freeway lane miles will increase by 1,269 miles, but centerline miles (construction of new freeway segments) will increase by only 122 miles. The smaller growth in centerline miles is indicative of more freeway widening projects than construction of new freeways. The regional HOV system is also benefiting from the freeway widening projects. METRO will be operating 112 miles of HOV lanes in 2007, up from 89 miles available in 2000.

Table 7. No Build Regional Roadway Improvements Through 2022

| Roadway Facility   | 2002             |            | 2022             |            |
|--------------------|------------------|------------|------------------|------------|
|                    | Centerline Miles | Lane Miles | Centerline Miles | Lane Miles |
| Freeway            | 510              | 3,199      | 714              | 4,591      |
| Tollway            | 87               | 443        | 139              | 744        |
| Principal Arterial | 1,149            | 4,485      | 1,371            | 5,873      |
| Other Arterial     | 3,018            | 8,903      | 3,219            | 10,824     |
| Collector          | 1,502            | 3,227      | 1,577            | 3,791      |
| HOV Lanes          | 89*              | 90**       | 187              | 316        |

\* Miles of HOV facilities

\*\* Miles of HOV lanes, counting each lane separately, even if an HOV lane parallels another on the same roadway segment

Source: H-GAC 2022 Metropolitan Transportation Plan, 2000; H-GAC, 2/17/2003. (Includes 8 county region)

In addition, the arterial street system will undergo extensive improvements. Supplementing the regional roadway network are toll roads and new toll lanes being constructed by the Harris County Toll Road Authority (HCTRA). Currently, HCTRA operates 87 centerline miles of toll roads and is constructing or planning to construct approximately 139 centerline miles of toll facilities.

**Other Transportation Improvements:** Within the Houston-Galveston region, there are approximately 160 miles of bicycle and pedestrian facilities not including sidewalks. The Regional Bicycle and Pedestrian Plan identifies ways to implement and expand the planned 500+ mile network.

## 2.2 The Long List of Possible Build Alternatives

### 2.2.1 Route Alignment Alternatives

It is clear upon inspection of development patterns within and outside the corridor, and information regarding total and public transportation travel patterns, that a single AHCT alignment will not readily optimize all the travel market linkages being addressed. An optimal link between downtown and Hobby Airport, for example, would bypass most of the corridor, and would have few stops in order to achieve the best possible average speed between those two end points. Optimal service to the universities might include the airport as an end point, but would also link the universities to the population within the corridor, and to more than one connection with the regional network.

With respect to Hobby Airport, it was recognized that most AHCT-type routes to airports in major US cities are more productive as links between airport employment and employees' places of residence than as links between air travelers and their local origins or destinations. Recognizing such issues, it was concluded that service to residential areas within the corridor is an essential component of the linkages likely to produce a successful AHCT route.

With this in mind, initially almost all evident rights of way in which LRT or BRT might be introduced were mapped, including arterial streets and active or abandoned railroads. Upon creation of that map, a preliminary level of screening revealed sufficient reasons to discard some of these potential route segments; these conclusions were confirmed with the public.

Figure 6 provides the map of the long list route segments, including indication of segments that were discarded, and the reasons for dropping them.

Remaining route segments still were in excess of a practical number for consideration as parts of entire AHCT routes. For this reason, a screening process was applied to these route segments. This was structured within a "Sector" context as discussed later in this Executive Summary.

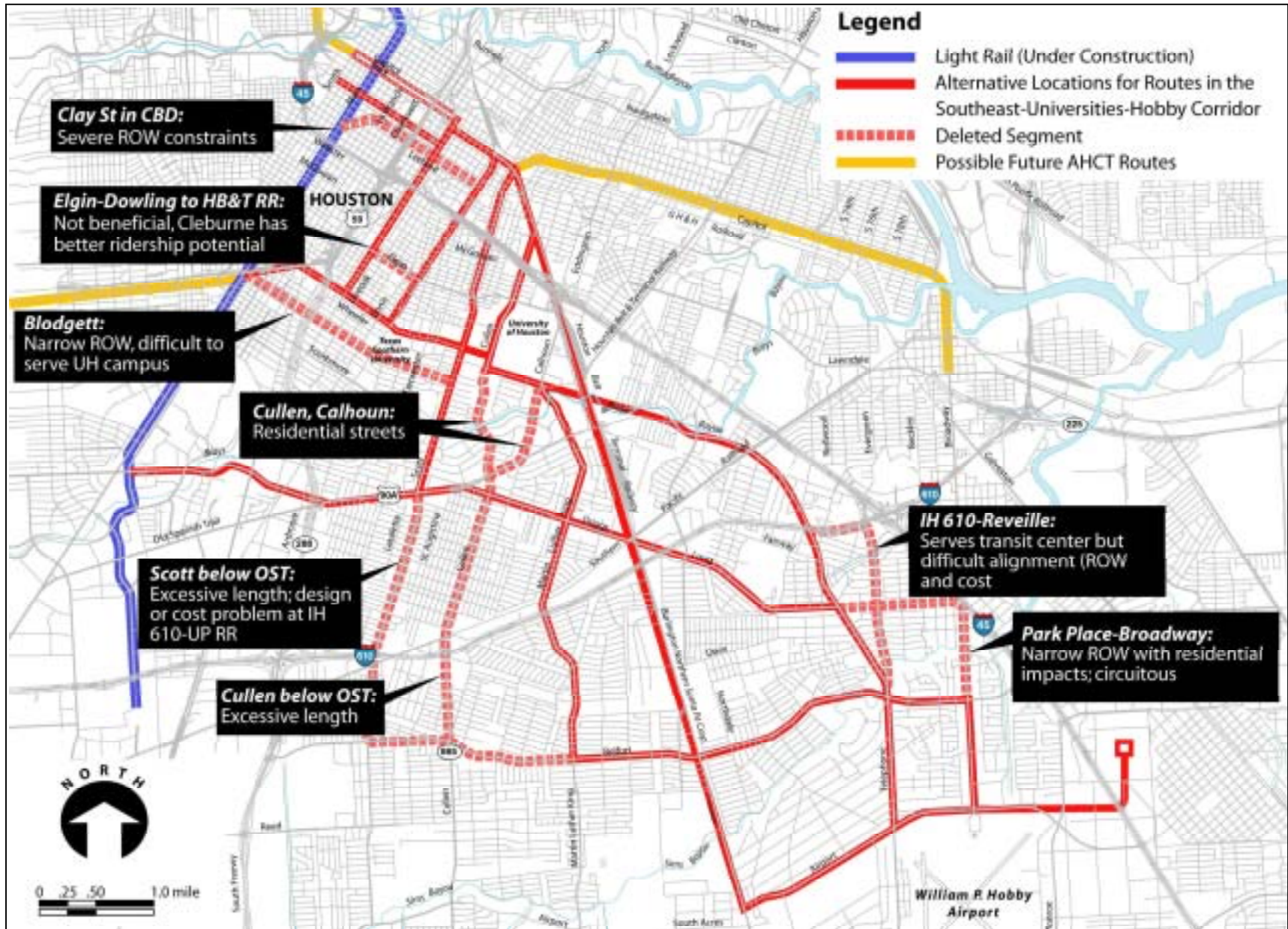
The Sectors included a "Regional Connectivity Sector" (Sector R), to encompass segments that provide alternative connections to the regional AHCT network (all connecting with the Downtown to Reliant Park light rail line). These segments extend into the downtown area, to Midtown at the Wheeler Light Rail Station, and to the Texas Medical Center at the TMC Transit Center Station. Possible downtown routings were not resolved at this stage, being subject to issues such as future connection to the Inner Katy corridor to the northeast, resolution of adequate solutions for passenger interchange with other downtown AHCT route(s), service to activity centers in the southeastern portion of downtown, and limitations posed by streets closed off by US 59, the Convention Center, Minute Maid Park, and the new Multi-Purpose Arena.

### 2.2.2 Screening the Long List of Build Alternatives

For purposes of screening, preliminary information was gathered in support of each of the technical evaluation areas, these being Demand, Design, Development, and Environment, which were identified from the AHCT goals and objectives.

**Demand:** The implications of known travel characteristics in screening AHCT route alternatives include the following main points:

- Connection between the corridor and the CBD is likely to be better than connection to the regional network elsewhere, but improved east-west connections (e.g., to Midtown and to the Texas Medical Center) could be productive as well.
- Connection of the universities area to the residential area to the south is very important.
- Major transit improvement will be needed to achieve substantial use of transit for travel to and from Hobby Airport.
- It may be logical to link Hobby Airport with residences of airport employees; this may be a larger market than the air traveler market.
- Along with an AHCT connection to the CBD, the transit service connections to the TMC Transit Center and Wheeler light rail station will need to be improved, including consideration of AHCT links to these locations.



Source: Parsons Brinckerhoff

**Design:** The potential route segments were visually inspected to assess the adequacy of existing right of way and to note significant alignment problems. A generalized review of traffic conditions was made, to identify locations where the introduction of AHCT might result in significant degradation of traffic conditions. The quality of the alignment possible within each alternative route segment was considered, recognizing the potential effects on trip times and the cost of operating and maintaining AHCT.

**Development:** An investigation of economic development potential at 31 alternative AHCT station sites was made. Eleven were found to have fair, good, or excellent development potential, as shown in Figure 7. In the figure, these sites are shown in context with the reduced set of potential AHCT route segments that resulted from completion of the screening-level evaluation, as explained in Section 2.2.3 below.

**Environment:** Protection and enhancement of the natural and built environment is a vital aspect of the improvement of public transportation within the corridor, and especially important in the identification and design of an AHCT route. Environmental screening was accomplished at the sector level for each route segment.

### 2.2.3 Screening-Level Evaluation Results

The screening evaluations within each of the technical areas considered were compiled, with numeric values attributed to the “+”, “o”, and “-” ratings: +1 for “+”, 0 for “o”, and -1 for “-”. These values were added together to obtain a composite score for each route segment. These screening results were taken to the Community Involvement Committee (CIC) and reviewed in detail. Working interactively with the CIC, the consultant team made adjustments to the evaluation scoring and conclusions based on views of Committee members.

The screening process concluded that seven additional route segments should be dropped. These screening results were subsequently presented at two public meetings, which were in “open house” format and included a presentation with a question and answer period.

Specific comment was received expressing the view that an alternative achieving optimal travel time between Hobby Airport and downtown Houston should be included, and suggested use of the BNSF alignment for that purpose. This resulted in restoring one of the route segments otherwise dropped.

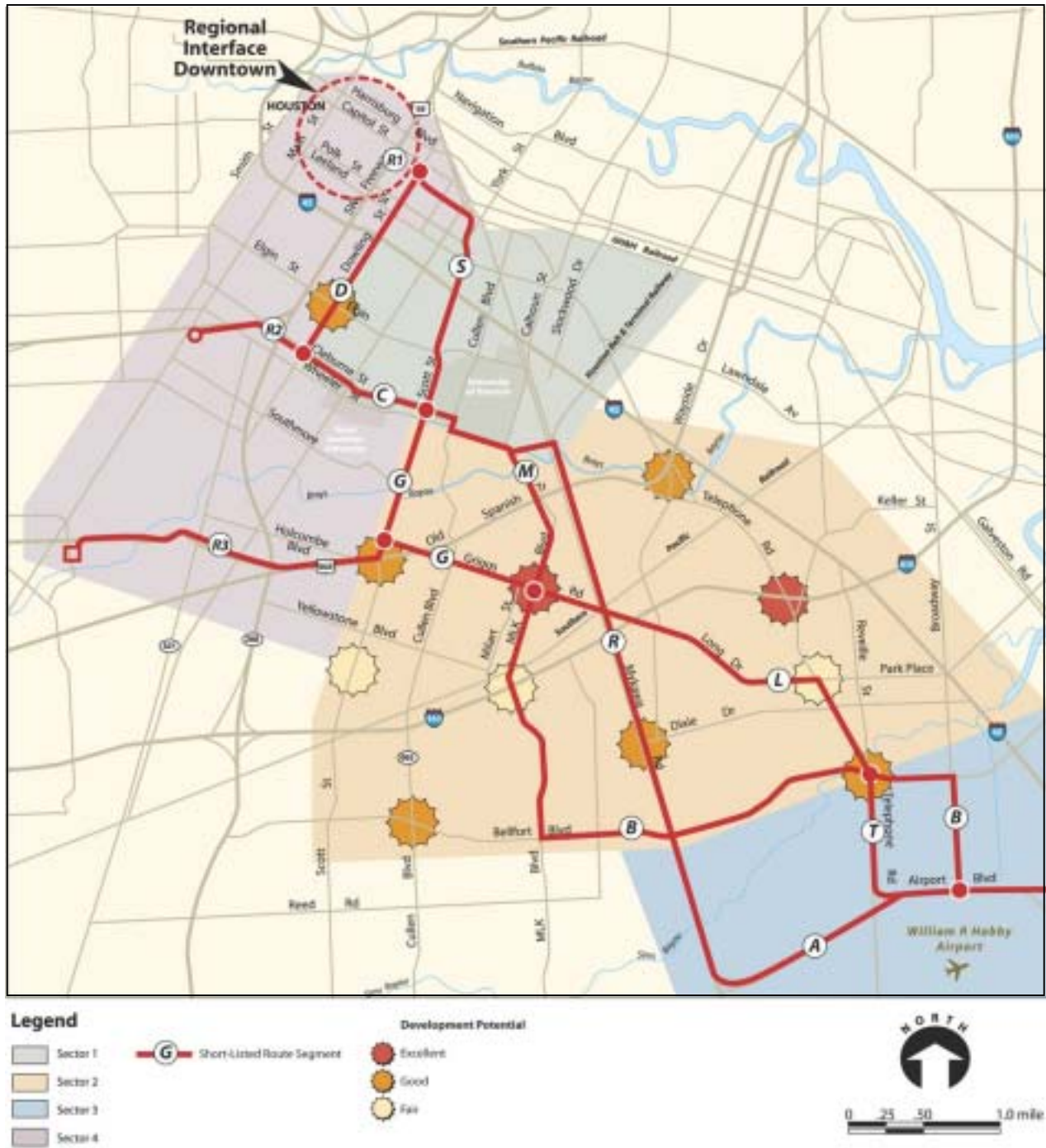
### 2.2.4 Resulting Alignments

The surviving route segments were compiled on a single map provided as Figure 8. These remaining route segments still provide a number of potential alignment options in each sector.

Four alternatives, using all the surviving segments, were defined for purposes of detailed evaluation. The evaluation was constructed to provide Sector-level detail as well as overall route results, to support final choices between “either – or” route segments, which were somewhat arbitrarily pieced together to form three of the four route alternatives. The fourth alternative is designed to test a route that primarily connects downtown, the universities, and Hobby Airport while seeking to minimize downtown to Hobby travel time. These route alternatives are shown in Figure 9 through Figure , below. Alternative SL-2 was analyzed both with and without the segment connecting to the TMC Transit Center.

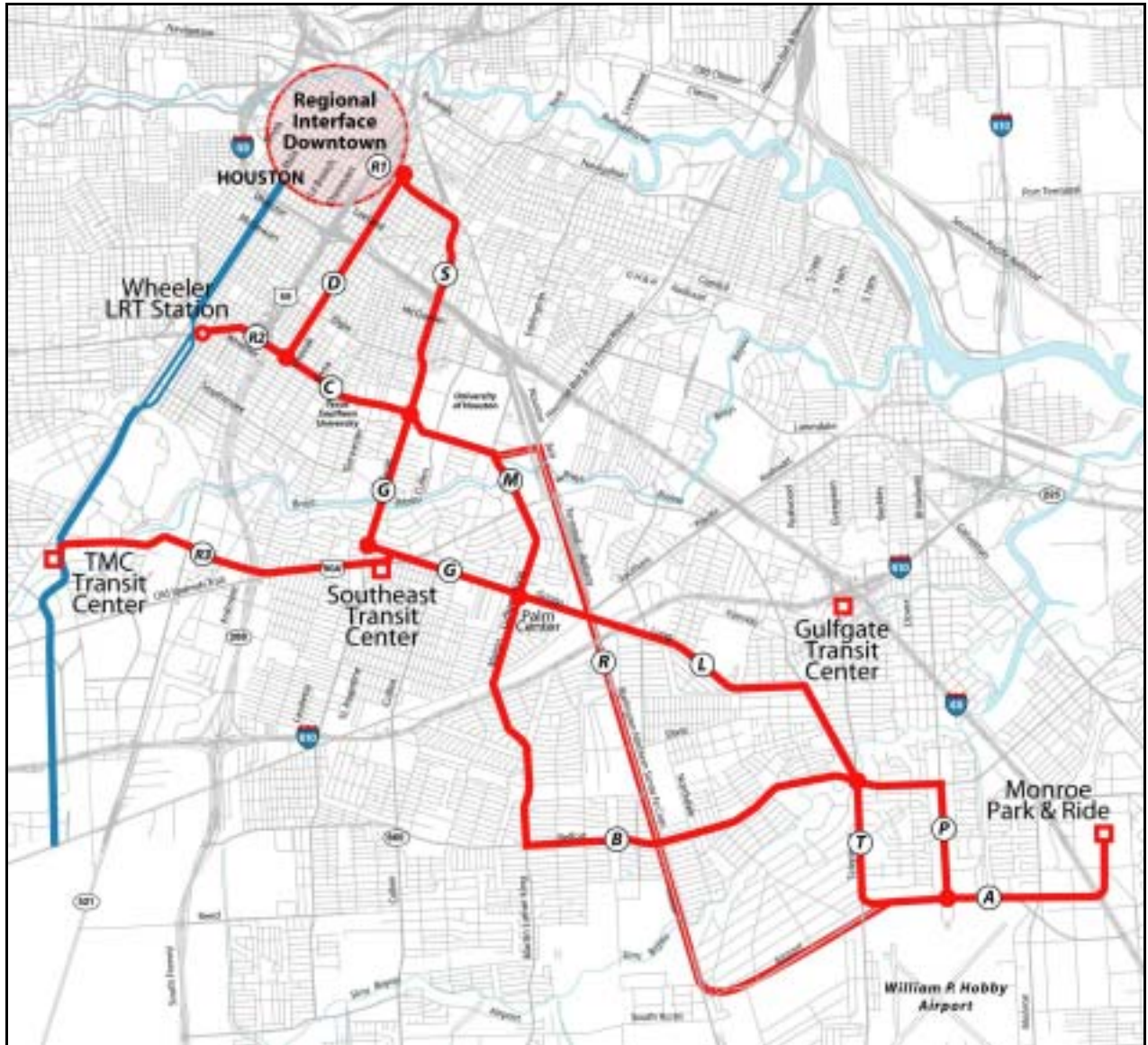


Figure 7. Preliminary Assessment of AHCT Related Economic Development Potential



Source: Parsons Brinckerhoff/CDS Market Research

Figure 8. Short-Listed AHCT Route Segments



Source: Parsons Brinckerhoff

### 2.2.5 Technology Options

Considering the route location options available in this corridor, and the trip lengths to be served within the corridor, only two technologies were selected for evaluation of AHCT in the Southeast-Universities-Hobby corridor. These are BRT and LRT. The two modes can be very similar in their physical and functional characteristics, with the result that they can be regarded as interchangeable at this point in the study, in terms of route and station locations, service frequency, and running times. Differences in capital cost and in operating and maintenance cost were estimated once physical and service parameters for the AHCT route alternatives in the corridor had been determined.

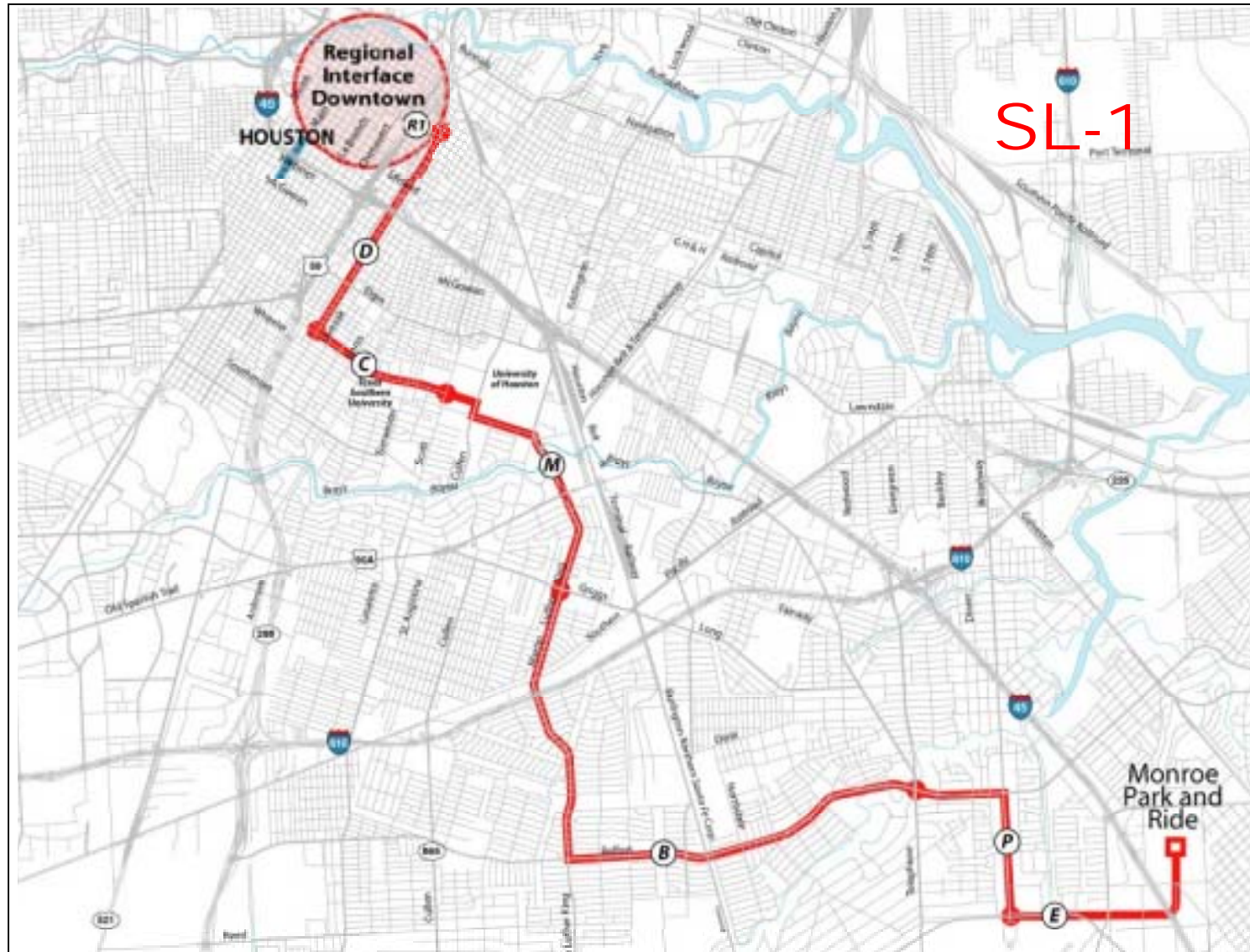
## 2.3 Refinement of the Short List

In this stage of the Alternatives Analysis, the four alternatives of the Short List were the subject of more detailed conceptual-level study and evaluation. The process was conducted in accordance with the alternatives evaluation methodology and in close coordination with the CIC and public, and included:

- Functional Design Criteria and Conceptual design of the four alternative routes including horizontal alignment, typical cross sections, requirements for water crossings, grade separations, and any other major structures, location of stations, and siting of a maintenance and storage facility. The design criteria, standards, and typical cross sections used in the development of the AHCT alternatives were based upon light rail criteria adopted by METRO for its METRORail project, with appropriate augmentation to include BRT;
- Preparation of comparative conceptual-level capital cost estimates for each alternative as LRT and as BRT, based on a cost estimation methodology being applied to the various corridor studies;
- Bus and AHCT conceptual-level operations planning for each alternative, to define the transit network within the corridor and its relationship to the adjoining regional network;
- Preparation of demand potential and accompanying indicators such as user travel times and transit operational actors;
- Preparation of estimates of operating and maintenance cost for each alternative as LRT and as BRT, based on a cost estimation methodology being applied to all the various corridor studies; and,
- Preliminary environmental analysis of the route alternatives as LRT and as BRT, considering effects on traffic, visual effects, noise and vibration, effects on the natural environment, and historic and archeological sites.

To the extent possible, evaluation data have been assembled at the route segment level, to facilitate making the best choice between route alternatives at that level of detail. In this way, the concluding route recommendation can be a combination of the best segments and features of each of the four Short List route alternatives.

Figure 9.



Source: Parsons Brinckerhoff



Figure 10.



Source: Parsons Brinckerhoff



Figure 11.



Source: Parsons Brinckerhoff



Figure 12.



Source: Parsons Brinckerhoff



### 2.3.1 Alignments

The AHCT alternative alignments in the Southeast-Universities-Hobby Corridor would provide a dual guideway their full length and be constructed primarily at-grade in the median or adjacent to existing surface streets, and in some cases, within new rights-of-way. Alignments along surface streets would generally have at-grade intersections with cross streets. All streets crossing the alignments at-grade would be controlled by traffic signals, which may be preempted by, or give priority to, the AHCT system. Aerial structures would be provided at locations where it is necessary for the alignment to cross main line freight railroad tracks, major freeways, or waterways. Since the BRT alignments have generally been conceptually designed to be readily convertible to LRT in the future, a single alignment description is provided for both technology modes. The number, configuration, and location of stations are the same for the BRT and LRT technology options, but vary by alignment alternative.

Stations were located primarily at activity centers and optimal locations for bus-AHCT passenger transfers, resulting in average station spacing ranging from 0.8 to 1.2 miles. The longest station spacing would be in Alternative SL-4, because of its emphasis on short travel time between Hobby Airport and downtown Houston. There would be 21 stations in Alternative SL-1, 17 in SL-2 excluding the TMC connector, 15 in SL-3, and 13 in SL-4.

**Hobby Airport:** At the time of conducting the study, a new Hobby Airport Master Plan was in preparation. METRO was coordinating with the Houston Airport System in planning for a Hobby Airport Transit Center as well as a location for a Hobby Airport AHCT station. These two sites may ultimately be combined. For the present purposes, however, reference is made only to the Hobby Airport AHCT station.

**An alternative terminal station:** The alternatives extend beyond Hobby Airport to the Monroe Park & Ride, as a test of the value of tying the corridor's AHCT service into the regional service that extends farther to the south. This link is an expensive one, however, due to its length and particularly to the fact that it must include an elevated segment of guideway long enough to cross the Gulf Freeway. Anticipating the possibility that the Monroe Park & Ride link will prove too expensive in comparison with its transportation value, an alternative terminal station was identified. The selected location is just north of Airport Boulevard to the east of Hinman. At this location there is vacant land that could be used to provide surface parking and space for bus-AHCT passenger interchange. Adoption of the Hinman Station as the terminal station instead of Monroe Park & Ride would reduce the route length by 1.13 miles and would reduce one-way running time by 1.45 minutes (preliminary estimates).

**Transit Centers:** Because of the importance of passenger transfers in achieving effective use of AHCT in the corridor, the introduction of additional transit centers was considered. Also, the alignment of one of the alternatives (SL-2) was based on relocation of the existing Southeast Transit Center, although this will be reconsidered in later stages of design development. If relocated, this Center would be at a site on the north side of Old Spanish Trail, between Old Spanish Trail and Griggs Road a short distance to the west of the intersection of these two streets. There are plans to build Transit Centers at the University of Houston and at Hobby Airport. Sites for these Transit Centers are still under discussion, but it is anticipated that their locations can be contiguous with AHCT stations. Finally, the potential is seen for a Transit Center at the intersection of MLK and Belfort, which will be a major transfer point for Alternative SL-1.

### 2.3.2 Capital Cost

Capital cost estimates for each corridor study and in the assembled plan were developed using a standardized spreadsheet method. The capital cost estimates were based on METRO experience and supplemented with national cost when applicable. Summary estimates of capital cost are provided in tables containing the overall evaluation results, later in this Executive Summary.



### 2.3.3 Operating and Maintenance Costs

The METRO Solutions plan was developed through a phased approach in which operating and maintenance (O&M) cost was treated as appropriate in each phase of the study.

**Phase One – Corridor Level Sketch Planning:** In Phase One, various high capacity transit alignments and modal technologies were formulated and evaluated along ten corridors within the METRO service area. The purpose of the Phase One evaluation was to screen high capacity transit alternatives using criteria that could differentiate among alternatives at a gross level of comparison. A differential assessment of O&M costs was not conducted as part of the Phase One evaluation because the major characteristics of the initial list of alternatives, such as route alignments and transit operating plans, were similar and would not, at this gross level, identify major cost trade-offs among the alternatives within each corridor. Other criteria, such as access to population and employment, connectivity to the regional system, and improved travel time or quality of travel were used to screen the alternatives.

**Phase Two – Corridor Refinement:** In Phase Two, indicators of capital and O&M costs were developed to narrow the range of alignment and technology alternatives carried forward into system planning. During this phase, ridership forecasts were generated from a sketch planning tool that was not designed to provide alternative-specific vehicle hours and vehicle miles, which are equilibrated to ridership; thus, detailed O&M cost estimates were not calculated. Instead, O&M cost estimates were indexed on the estimated number of passengers as proposed for the CBD to Reliant Park light rail line.

A cost index was developed for each high capacity transit technology under consideration: light rail transit (LRT) and bus rapid transit (BRT). The four operating scenarios were:

- Exclusive one-car LRT operation (LRT-1);
- Mixed operation using a balance of one and two-car trains (LRT-1.5);
- Exclusive two-car LRT operation (LRT-2); and
- BRT operation.

At the end of Phase Two, BRT was not carried forward into system planning. While other factors established BRT as a non-viable option for this system, the reduced capacity provided by BRT vehicles compared with light rail on a system-wide basis of high ridership corridors and the strong community preference for LRT as the high capacity mode of choice were noted in this element of the study.

**Phase Three – System Refinement:** In Phase Three, capital and O&M cost estimates were developed for four system plan scenarios (No Build, Minimum Build, Mid-Range Build, and Maximum Build) and used as evaluation criteria. In this phase, METRO's EMME/2-based Long Range regional travel demand model replaced the sketch planning tool to forecast ridership. O&M costs were estimated system-wide using the cost factors shown in Table 8, as well as cost factors for bus service from METRO's bus cost allocation model. Peak vehicle, revenue mile, and revenue hour outputs were also used from the travel demand model. Each of the cost factors shown in the table are multiplied by the respective quantity of revenue train hours, revenue car miles, peak vehicles, number of stations, and guideway miles. The results are summed to produce the total annual cost.

Table 8. Estimated Service Costs by Scenario  
(in constant FY 2002 dollars)

|                     | METRO Rail | LRT-1     | LRT-1.5   | LRT-2     |
|---------------------|------------|-----------|-----------|-----------|
| Cost/Rev Train Hour | \$69.40    | \$53.15   | \$54.36   | \$56.79   |
| Cost/Rev Car Mile   | \$6.23     | \$5.71    | \$5.71    | \$5.71    |
| Cost/Peak Vehicle   | \$42,976   | \$18,222  | \$18,222  | \$18,222  |
| Cost/Station        | \$138,702  | \$109,455 | \$109,455 | \$109,455 |
| Cost/Guideway Mile  | \$341,404  | \$292,265 | \$292,265 | \$292,265 |

**Source:** METRO Rail Operations and Maintenance Plan, Revision: 0, Date: 11/07/01; Calculations of LRT scenarios prepared by General Planning Consultant, March 2003.

The scenario-specific cost indicators and service inputs generated the annual LRT O&M costs for the three Alternatives Analysis corridors including the Southeast-Universities-Hobby Corridor, as shown in Table 9. The METRO travel demand model produces daily service inputs that were annualized by multiplying them by 300, a generally accepted practice by the transit industry. The O&M costs were calculated assuming all one-car trains or all two-car trains to provide a range of costs.

Table 9. Estimated Annual LRT Operating Costs

| Alternative | One-Car Trains | Two-Car Trains |
|-------------|----------------|----------------|
| SL-1        | \$15,809       | \$14,079       |
| SL-2        | \$13,764       | \$12,271       |
| SL-3        | \$11,849       | \$10,499       |
| SL-4        | \$12,258       | \$11,091       |

Note: in thousands, constant FY2002 dollars

**Source:** General Planning Consultant Calculations of March 2003

#### 2.3.4 Ridership

During the evaluation of the short-listed alternatives, potential ridership was examined primarily by means of a "Service Estimator" sketch planning tool developed for the purpose and used in lieu of full-scale travel demand modeling, due to the necessity to study multiple corridors simultaneously. The Service Estimator provided a ridership index by which the performance of a corridor's alternatives in relation to one another could be compared. It was also possible to establish a similar index for the relative potential of alternatives to attract new riders, which also tends to indicate the potential of generating transportation user benefits.

From the preliminary analyses available for the Southeast-Universities-Hobby corridor AHCT alternatives, and using Alternative SL-1 as the base for comparison (SL-1 = 100), the results are as follows:

| Alternative | AHCT Demand Potential |
|-------------|-----------------------|
| SL-1        | 100                   |
| SL-2        | 100                   |
| SL-3        | 90                    |
| SL-4        | 75                    |

The second measure, new transit riders, evaluates the ability of an alternative to attract passengers from private transportation. In general, alternatives that offer the largest time savings, especially to/from suitable park and ride stations, are likely to perform best. Again based on preliminary analysis, the results are as tabulated here:

| Alternative | New Transit Rider Potential |
|-------------|-----------------------------|
| SL-1        | 100                         |
| SL-2        | 115                         |
| SL-3        | 80                          |
| SL-4        | 95                          |

## 2.4 EVALUATION OF ALTERNATIVES

### 2.4.1 Goals Attainment

The goals for transit improvement, including the introduction of AHCT in the Southeast-Universities-Hobby corridor, are documented in Chapter 1 of this report.

The evaluation material presented in this chapter demonstrates the capability of an optimal AHCT project, together with related bus service and facility improvements, to address and attain these goals. Ways in which this can be accomplished include the following:

- Goal 1: Studies completed thus far clearly demonstrate the capability of AHCT and related improvements to improve accessibility and connectivity by providing direct linkage and notably reduced travel times between major activity centers. AHCT will be an accessible mode providing a higher level of service than presently available in the corridor. It is also clear that AHCT will be capable of attracting riders who currently use private transportation. By providing a higher level of schedule adherence than is currently possible, and a frequent, all-day bi-directional service, it will offer an attractive alternative to the congestion and uncertainties facing travel by automobile.
- Goal 2: AHCT as planned for the corridor will operate at almost twice the average speed of the existing local bus services. By operating within a reserved right of way and with traffic signal prioritization, it will encounter minimal delay and irregularity of service. Strategic location of stations will avoid too-frequent stops and provide for efficient movement between activity centers and nodes of convenient interchange with local bus services; well-located park and ride stations will meet the needs of passengers whose best option is to drive to an AHCT station. Operating efficiencies will be gained for the transit system as a whole by introducing this faster, high-capacity mode.
- Goal 3: The goal of maintaining social integrity and community support can be met through adoption of a route that balances accessibility to the corridor's population with design that respects the communities and the existing street network. Routes will be located mainly in arterial streets that can accommodate AHCT without excessive widening or adverse traffic impacts.
- Goal 4: The AHCT plan can enhance the quality of the environment by introducing a physical facility of high quality and attractive appearance in appropriate settings, and by providing an environmentally friendly service that also provides and encourages less use of transportation vehicles that are noisier or that contribute more to air pollution.
- Goal 5: AHCT will constitute a significant capital investment that contributes to the equitable supply of transportation facilities and services within the region. An appropriate project within this corridor will be part of an affordable program put forward by METRO for areawide system improvement.

## 2.4.2 Findings for the Four Short-Listed Alternatives

The assembled findings are summarized in Table 10 and Table 11 below, and indicate no “fatal flaws” that would prevent adoption and implementation of any of the four alternatives, although some are not as free of adverse effects as others. Examples include a few locations where existing mature landscaping and trees would be affected, places where street widening may affect adjacent properties, alignment segments that traverse relatively large areas of flood plain, and locations where relatively large numbers of properties may be subjected to adverse noise and vibration (although further study will be required to determine whether there would in fact be any such effect).

Accepting this conclusion, it appears reasonable to focus on the best solution with regard to factors other than environmental, such as transportation effects and capital cost. On that basis, the following indications emerge:

- Alternatives SL-3 and SL-4 need not be further considered
- Alternative SL-2, excluding the TMC branch, appears to be somewhat better than Alternative SL-1.

One must recognize also, however, that some other combination of the route segments comprising the alternatives might prove to be better than Alternative SL-2. That possibility was considered in the next section of this report.

## 2.4.3 Sector-Level Findings

A total of six Sectors, not including the previously-mentioned Regional Connectivity sectors, were defined, as shown in Figure 11. Evaluation findings were compiled at the Sector level in order to consider whether some different combination of route segments might function better than any of the four short-list alternatives. The six Sector-level investigations addressed:

- Sector 1 – the area from just east of Downtown to the Universities;
- Sector 2a – the area from the Universities to Palm Center (the Griggs-Martin Luther King intersection);
- Sector 2b – Palm Center to the Bellfort-Telephone intersection;
- Sector 3 – the Bellfort-Telephone intersection to Hobby Airport;
- Sector 2-3 – (for evaluation of a major section of Alternative SL-4) – from the Universities to Hobby Airport; and
- Sector H-M – to consider terminating the line near the northeast corner of the Hobby Airport site at a new park and ride station called Hinman Station rather than continuing to the Monroe Park & Ride.

These Sector-level studies concluded that a selection of the best-performing alternative alignment in each Sector could be assembled, but would not result in an alternative that would be better than any of the four alternatives.

Table 10. Findings Comparing the Four Short-Listed Route Alternatives

|   | No Build | SL-1        | SL-2                                   | SL-3                        | SL-4          |
|---|----------|-------------|--|-----------------------------|---------------|
| Current Population, Households, and Employment within a half-mile of AHCT stations (thousands, H-GAC)   |          |             |  |                             |               |
| Total Population  | NA       | 92.1        | 86.3 (76.0 without TMC)                | 57.0                        | 54.6          |
| Total Households  | NA       | 32.0        | 29.9 (26.4 without TMC)                | 19.8                        | 18.9          |
| Low Income Households   | NA       | 9.3         | 7.8 (7.1 without TMC)                  | 6.6                         | 4.8           |
| Employment (includes Downtown and TMC employees as applicable)  | NA       | 204.3       | 262.3<br>(201.3 without TMC)           | 36.3                        | 195.2         |
| Travel Time – Selected Examples (minutes)   |          |             |  |                             |               |
| Main (Downtown) to Hobby Airport  | 40       | 38          | 31                                     | 29 (at Wheeler LRT Station) | 25            |
| Main (Downtown) to Scott & Cleburne   | 20       | 12          | 10                                     | 7 (at Wheeler LRT Station)  | 10            |
| Scott & Cleburne to Hobby Airport   | 35       | 25          | 22                                     | 22                          | 15            |
| Scott & Cleburne to Belfort (major crosstown route)   | 20       | 12 (at MLK) | 16 (at Telephone)                      | 16 (at Telephone)           | 9 (at Mykawa) |
| Preliminary Mobility Performance  |          |             |  |                             |               |
| Potential Passenger Demand and User Benefit Index: SL-1 = 100   | NA       | 100         | 105                                    | 80                          | 80            |
| Preliminary Transit Operations Statistics   |          |             |  |                             |               |
| One-way route miles   | NA       | 15.7        | CBD-Hobby: 13.4,<br>(TMC Branch: 3.1)  | 11.6                        | 14.0          |
| Number of stations  | NA       | 21          | CBD-Hobby: 17,<br>(TMC Branch: 6)      | 15                          | 13            |
| Average revenue speed (miles per hour)  | NA       | 22.4        | CBD-Hobby: 23.0,<br>(TMC Branch: 18.8) | 21.9                        | 28.5          |
| Preliminary Capital Cost (\$millions)   |          |             |  |                             |               |
| Light Rail  | NA       | 682         | 796<br>(664 without TMC Branch)        | 506                         | 629           |
| Bus Rapid Transit   | NA       | 454         | 540<br>(455 without TMC Branch)        | 326                         | 426           |
| Deduct \$43 million from Light Rail cost for terminal at new Hinman Station Park & Ride instead of Monroe Park & Ride<br>Deduct \$31 million from Bus Rapid Transit cost for terminal at new Hinman Station Park & Ride instead of Monroe Park & Ride |          |             |  |                             |               |

|  | No Build | SL-1                      | SL-2                             | SL-3                      | SL-4      |
|--|----------|---------------------------|----------------------------------|---------------------------|-----------|
| <b>Environmental Issues</b>  |          |                           |                                  |                           |           |
| Non-Public Right of Way Required (Acres)   | NA       | 33.0                      | CBD-Hobby 34.6, TMC Branch 0.4   | 32.9                      | 50.0      |
| Economic Revitalization Potential (Qualitative Score, 7 = best)  | NA       | 7                         | 7                                | 5                         | 2         |
| Neighborhood Impacts   | NA       | Cleburne, Broadway        | Scott                            | Cleburne                  | None      |
| Noise and Vibration Sites (pre-analysis – may have no adverse effect)  | NA       | 656                       | 302 (including 3 on TMC Branch)  | 410                       | 328       |
| Potential Historic and Cultural Resources  | NA       | Dowling and Cleburne      | Riverside Terrace (Scott Street) | Cleburne                  | None      |
| Important tree plantings   | NA       | Low to significant impact | Low to significant impact        | Low to significant impact | No impact |
| Land Use Issues, Opportunities, Constraints  | NA       | Good                      | Good                             | Good                      | Fair      |
| <p>Note: Some evaluation categories have been omitted due to having the same and not significant effects for all alternatives, e.g., wildlife habitat, hazardous materials, and environmental justice. Other categories are omitted because they are subject to overall METRO System Plan analysis not yet performed, e.g., transportation user benefit.</p> |          |                           |                                  |                           |           |

Source: Parsons Brinckerhoff

Table 11. Summary Comparison of the Four Short-Listed Alternatives

| Item                           | SL-1   | SL-2  | SL-3  | SL-4   |
|--------------------------------|--|---|---|--|
| Mobility Improvement           | Close second-best; directly serves largest population                                      | Best overall because of travel time performance   | Third-ranked due to necessity to transfer to go downtown  | Faster than SL-3 and connects to Downtown but misses much of the population in the corridor                |
| Cost                           | Moderately high cost   | Highest cost for entire alternative, but cost is similar to SL-1 and SL-4 cost if TMC branch is omitted | Lowest cost (shortest route)  | Cost is similar to that of SL-1  |
| Regional Connectivity          | Downtown is the optimal connecting point   | Downtown is the optimal connecting point; some added value if TMC branch is included                    | Midtown (Wheeler LRT) is useful for access to Uptown and WestPark corridors but less useful than Downtown | Connects to Downtown but does not connect as many areas of the Southeast-Universities-Hobby corridor       |
| Ease of Implementation         | Some difficulties in connection with Dowling, Cleburne, and Broadway portions of the route | Portions of Scott likely to be most difficult   | Some difficulties in connection with Cleburne and Broadway portions of the route                          | Significant difficulties likely in working out acceptable alignment proximate to the BNSF and future SR 35 |
| Economic Development Potential | Tied with SL-2 for highest potential   | Tied with SL-1 for highest potential  | About half the recognized potential of SL-1 or SL-2   | Lowest potential   |
| Community Impact               | Generally favorable; some displacements or neighborhood effects                            | Generally favorable, fewer adverse effects than SL-1  | Generally favorable, fewer adverse effects than SL-1  | Fewer favorable and fewer unfavorable effects than SL-1  |
| Environmental Impacts          | Fair   | Good  | Better  | Best   |

Note: Shaded cells are those that are judged to be best.

Source: Parsons Brinckerhoff

#### 2.4.3.1 Sector H-M

The basic alignment planning provided for extension of the line from Hobby Airport to the Monroe Park and Ride, thus integrating the AHCT route with METRO bus routes as well as parking. As an option to this feature, a park and ride station site was found adjacent to Airport Boulevard near Hinman (just east of the Hilton Hobby Hotel). This alternative terminal station location was found to be preferable, having no adverse effect on ridership, while lowering capital cost and O&M cost.

#### 2.4.4 Summary of Findings

From the conceptual analysis performed to obtain these initial findings some general conclusions can be reached. Alternatives SL-3 and SL-4 clearly provide a service inferior to that provided by SL-1 or SL-2. SL-3 was designed to test an alignment that did not penetrate the downtown area and the results clearly indicate the importance of a direct connection to the CBD.

The SL-4 Alternative tested a more direct and faster connection to Hobby Airport. While the alternative is faster, it also clearly demonstrates that the market it would serve is considerably smaller than that reached by alternatives SL-1 and SL-2.

In comparing alternatives SL-1 and SL-2 (without the TMC, AHCT connection), SL-2 is stronger due to its shorter length, faster run time and lower cost. The TMC connection as an

enhanced bus route can easily, and should be, included with whichever of these two alternatives is ultimately selected. Based on public input, there would be resistance to the SL-1 alignment and the potential impact on a historic neighborhood along Dowling and Cleburne. Also, it was verified that both TSU and UH preferred the SL-2 alignment, which could adequately serve the campuses from stations on Scott Street, supplemented by shuttle buses. Other Scott Street stakeholders also favored Alternative SL-2. Given these findings, SL-2 was determined to be the most promising alternative, and was carried forward into METRO system planning.

The precise location of the downtown route will be an outcome of the connectivity study currently engaged in by METRO and its GPC.

While there was not an overwhelming public preference for BRT or LRT in the corridor, there is probably a slight edge to the LRT technology. The choice of technology is also influenced by the regional connections in or near the CBD, which affect system capacity capabilities and needs for consistent technology among corridors that may be "through-routed".

### 3. SYSTEM PLAN ISSUES

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Subsequent to completion of an "Initial Findings" version of this report, the material described above was used in the development of an updated regional System Plan. The System Plan, known as METRO Solutions, identified a regional transit network that includes a wide array of service improvements including Advanced High Capacity Transit (AHCT) routes to be implemented through 2025. The development of the System Plan built on the framework established in the 2025 Plan, approved by the METRO Board in 2001, which called for an integrated regional transit system that combines bus service and facility improvements, with the need for AHCT in high travel demand corridors. It also incorporated the results of the AA and corridor feasibility studies carried out during 2002-2003 including this Southeast-Universities-Hobby Planning Study.

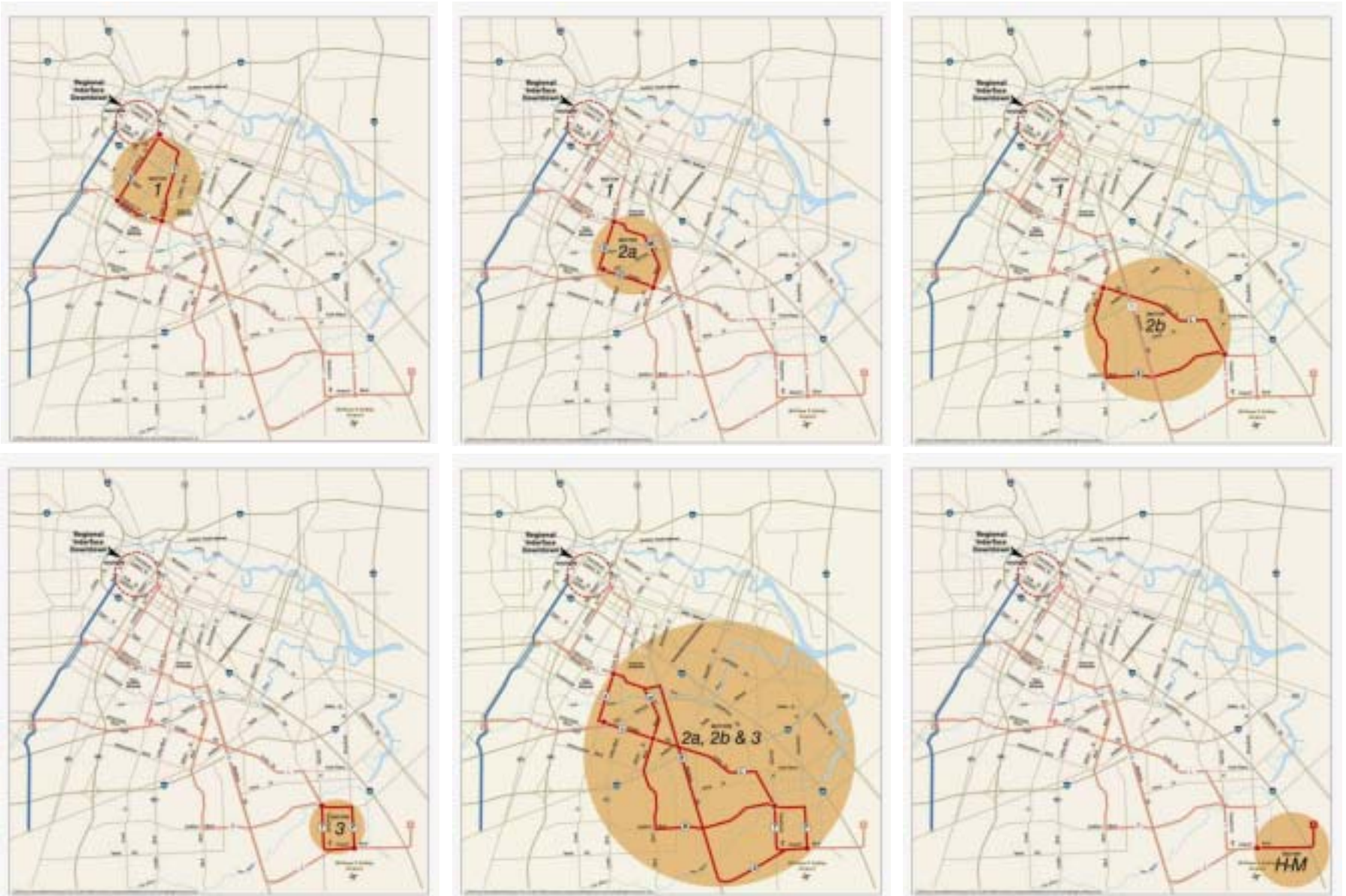
In the course of the plan development process, METRO adopted Alternative SL-2, with its TMC branch as a "Signature Service" (enhanced limited-stop bus route) as the Locally-Preferred Investment Strategy (LPIS) for this corridor, and identified three stations that could be omitted from the SL-2 route, due to low ridership potential. METRO also selected light rail as the preferred transit technology for the planned AHCT routes. Figure 12 illustrates the Southeast-Universities-Hobby LPIS, including a line added during system planning that will extend southward from the Southeast Transit Center to serve the Sunnyside area of the corridor.

METRO Solutions includes an implementation plan, calling for completion of 22.1 miles of light rail by 2012, and 64.8 miles by 2025, together with eight miles of commuter rail. The two highest-priority lines are Minimum Operable Segments (MOSs) of the North-Hardy Corridor and the Southeast-Universities-Hobby Corridor lines. The selected MOS for this corridor extends from Downtown Houston to the vicinity of IH 610, and is to be in service by 2009.

The METRO Solutions plan was approved by voters on November 4, 2003. An initial action of METRO following this approval is to proceed with the DEIS for the MOS in this corridor.



Figure 11. Route Evaluation Sectors



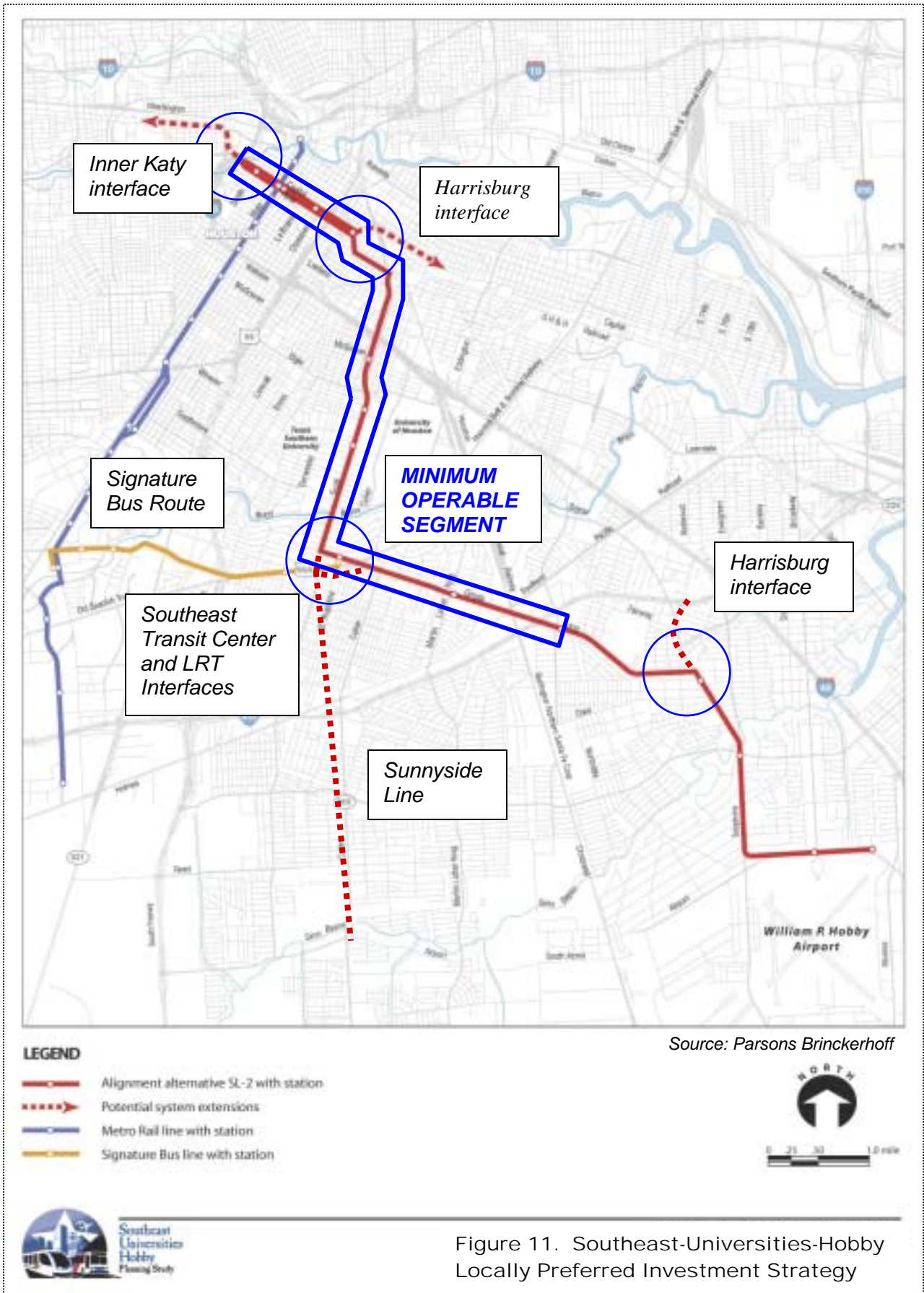


Figure 11. Southeast-Universities-Hobby Locally Preferred Investment Strategy



**Parsons Brinckerhoff Quade & Douglas, Inc.**

11757 Katy Freeway  
Suites 600  
Houston, TX 77079  
281.496.5590



**METROMOBILITY**

