METRO

Bike&Ride

ACCESS & IMPLEMENTATION PLAN

JANUARY 2014

COMMUNICATE • INTEGRATE • CONNECT • IMPLEMENT

Houston-Galveston Area Council

METRO Going Places

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Bike&Ride

ACCESS & IMPLEMENTATION PLAN

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METRO

Bike&Ride

ACCESS & IMPLEMENTATION PLAN

TABLE OF CONTENTS

CHAPTER 1
EXECUTIVE SUMMARY

Bicycle connections to transit service represent a small but growing component of the METRO transit system ridership. With the overall growth of cycling and expansion of bicycle infrastructure in the METRO Service Area, developing strategies and recommendations to improve the integration between cycling and transit is critical to continued growth and expanding ridership for METRO.

To support METRO in improving bicycle access to the transit system, this study has been undertaken to understand existing system users, key factors driving users to access transit by bicycle, current barriers to access, and to develop recommendations that capitalize on opportunities to improve access to the transit system by bicycle. Finally, this study seeks to lay out the strategies, funding sources, partnerships and priorities necessary to make these recommendations realities.

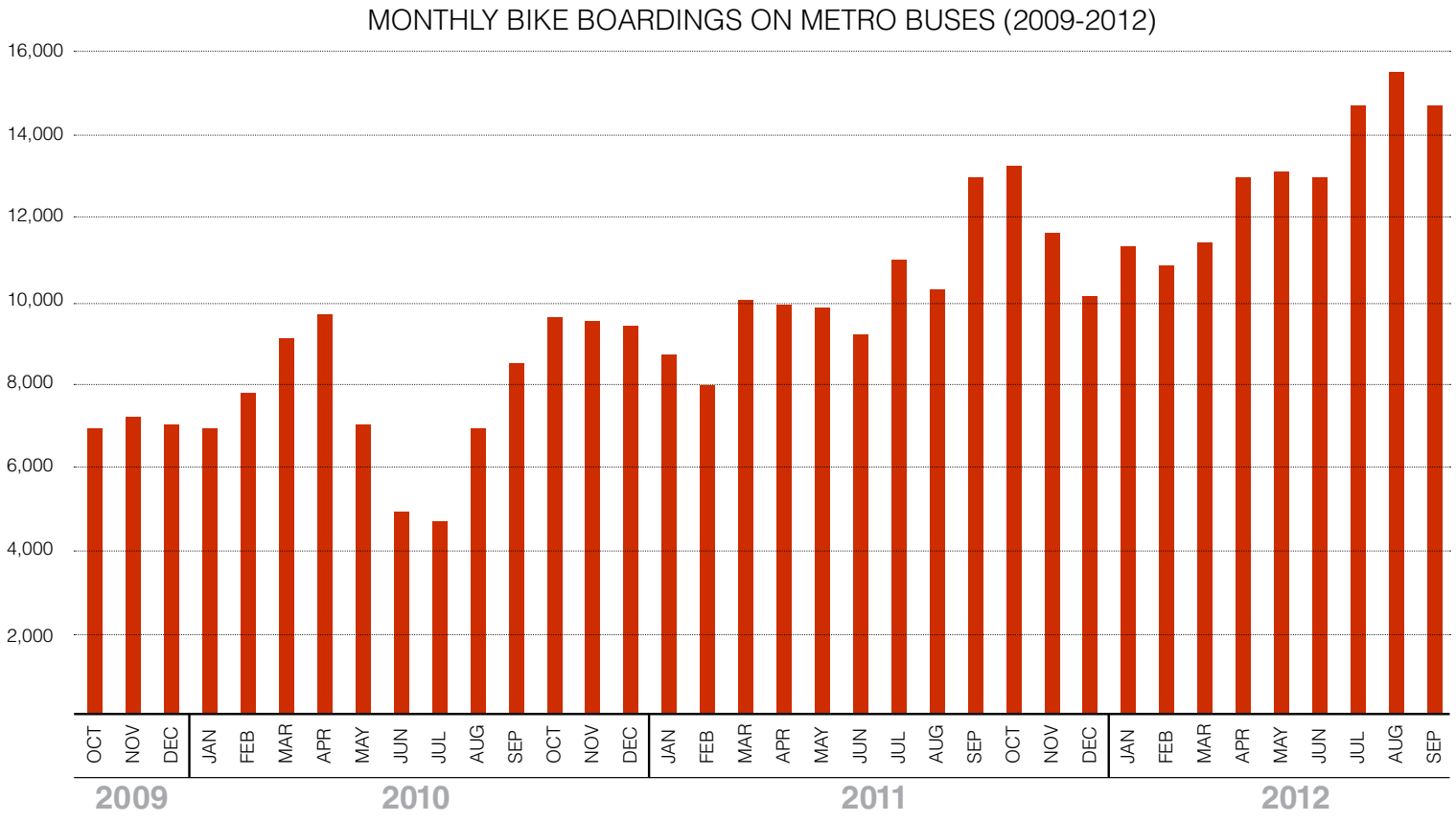
METRO introduced bicycle racks on its buses in 2007, and the system has experienced significant growth of cyclists using METRO services every year, despite declines in local bus ridership. For a growing number of riders, the use of bicycles in conjunction with transit is part of their everyday commute, and is essential for reaching regional destinations. In September 2012, approximately 15,000 bicycles were placed on board METRO buses, or roughly 500 per day. This represents only a portion of those using bicycles in conjunction with transit, as many users also park bicycles at transit facilities rather than carrying them on board.

In order to understand what factors contribute to combined trips by bicycle and transit, a statistical analysis was used to determine bicycle boarding activity by route. The results of this analysis were used in conjunction with METRO's 2011 Origin/Destination Survey, an online survey of bicycle and transit users and targeted focus groups in order to paint a clearer picture of the opportunities and barriers to bike-transit integration. Key factors, including proximity to major bicycle facilities, proximity to jobs and population and access to high quality transit services, were identified in order to target improvements to transit locations with the greatest opportunities for impact.

Once locations for improvements were identified, efforts were made to understand the decision making process from the rider perspective. Once an individual decides to make a trip, there are many additional choices that go into how they make that trip. They could choose to walk, drive a car (either alone or riding with a friend), ride a bike, use transit, or some combination of any of these modes. Cyclists ask certain questions to determine whether transit could help them make their trip:

- Why should I bike to transit for this trip?
- Where should I connect to the transit network?
- What will I do with my bike once I get to transit?
- Is there a safe and easy route to reach transit and my destination?

To answer the questions that cyclists have about using transit for their trip, a framework of four key principles has been developed. These principles for improving bicycle access to transit are Communicate, Integrate, Connect, and Implement.



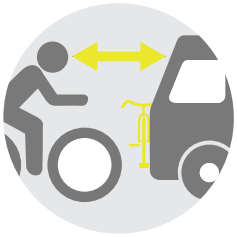
Executive Summary Figure 1.1: Monthly Bike Boarding on METRO Buses
Source: METRO Bike Boarding Report

COMMUNICATE…

- The value to cyclists of using the transit system.
- Where to access the transit system.

INTEGRATE...

- Bicycles into the transit system through parking, on-vehicle accommodations and a bike share.



CONNECT...

- Cyclists to high value transit nodes where they can access useful transit service.
- Transit nodes to nearby destinations.

IMPLEMENT...

- Projects that communicate, integrate, and connect the bicycle and transit networks.
- Partnerships with other organizations and agencies to execute projects outside of METRO's direct control.

COMMUNICATE

A critical theme of the analysis and feedback received through the study was the need to better communicate the value transit can bring to cyclists. This includes answering the question of why cyclists should consider making transit a part of their trip. There is also a need to communicate to cyclists where they can access the transit system and what destinations are readily accessible by bike, particularly those that that may be outside of easy walking distance. Nine recommendations were made to better communicate the value of transit to cyclists.

01 **Establish a team to assist METRO with bicycle issues, including a Bicycle Coordinator, Bicycle Working Group and Bicycle Advisory Committee.**

02 **Create a bicycle-oriented brand, logo, and consistent marketing material.**

03 **Develop a Bike & Ride Education Program.**

04 **Expand data collection and data sharing efforts.**

05 **Add wayfinding signage to trails, bicycle facilities, Transit Centers, Park & Ride lots and METRORail Stations.**

06 **Develop location-specific bicycle and transit network maps for transit activity centers, such as Transit Center and METRORail Stations.**

07 **Develop a system-wide map indicating transit routes and facilities with bicycle routes.**

08 **Create a multi-modal online trip planning tool.**

09 **Improve real-time information available through mobile apps and cell phone technology.**

INTEGRATE

Once a cyclist has decided to utilize the transit network for part of his or her trip, the next challenge to increasing access relates to the question "what do I do with my bike while I am using the transit system?" Without a clear answer to this question, the bicycle network and transit network will not be seamless and a barrier exists to increasing bicycle trips linking to transit. Solutions may include on-vehicle accommodations, bicycle parking and bicycle share. Eight additional recommendations have been made to integrate the bicycle and transit systems.

10 **Reevaluate peak hour restrictions on METRORail annually, or when major system changes occur that may alter light rail car capacity.**

11 **Install vertical racks on train cars as space allows.**

12 **Initiate a pilot project to test the feasibility of 3-bike racks on the front of buses.**

13 **Provide short-term bicycle parking accommodations at or adjacent to select bus stops and METRORail stations without obstructing the pedestrian walkway.**

14 **Explore potential design options to outfit future METRORail station platforms with space for short-term bicycle parking.**

15 **Provide long-term bicycle parking at Park & Ride lots and Transit Centers with options for free and fee-based accommodations.**

16 **Develop a framework for bike hubs on METRO property that can be managed by outside entities.**

17 **Work closely with B-Cycle to identify potential locations for Phase 4 expansion on or near METRO property.**

CONNECT

The third principle for creating stronger access between the bicycle network and METRO's transit system is providing safe connections for cyclists. Even once cyclists have identified useful transit service and understood how they can use their bicycle to get there, an additional deterrent to using transit is a lack of safe, well maintained routes that will connect them to and from transit. This section contains three additional recommendations.

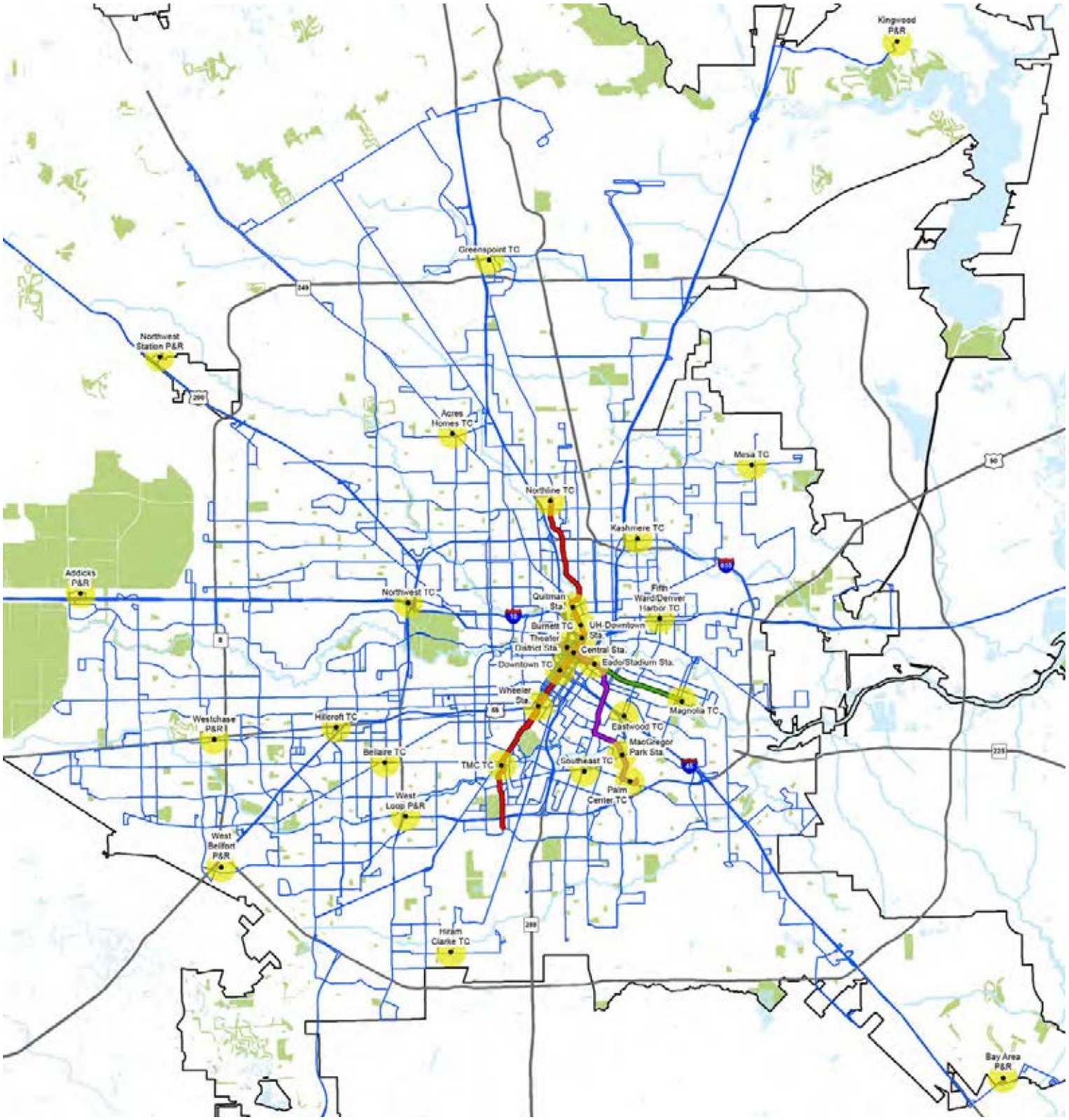
18 **Connect transit nodes to nearby bicycle facilities that expand the transit catchment area in a useful way.**

19 **Connect transit nodes to major destinations nearby (but outside walking distance) for which a bike connection would create a useful trip.**

20 **Connect neighborhoods to transit nodes that offer transit service most beneficial to cyclists (such as limited-stop, frequent, rail, and/or Park & Ride service)**

Together, these recommendations must be applied within and around major METRO transit nodes to identify where improved bicycle facilities can enhance a cyclist's ability to connect to the transit system. As most of these proposed bike facilities extend beyond METRO's property, they will require partnerships with other local agencies. There are also improvements that METRO can make regarding bicycle parking and wayfinding to make its facilities better access points for cyclists.

Within the METRO system, transit nodes such as Transit Centers, rail stations, and Park & Ride lots represent key points of access because they are typically locations with high levels of service to a variety of destinations. Thirty-one transit nodes were selected for further assessment to develop improvement recommendations. These locations were selected to provide a range of transit node types, both existing and planned. The nodes also provide a spectrum of geographic contexts for bicycle connections, as shown in Figure 1.2.



Executive Summary Figure 1.2: Transit Nodes Targeted for Improvements

IMPLEMENT

The fourth principle of the recommendations framework is to develop a clear approach for prioritization and implementation of the recommendations for the initial three principles: Communicate, Integrate and Connect.

Capital improvements to create connections will require many partnerships with outside entities. These may include management districts, member cities, TIRZs and MUDs, among others. Several recommendations from the *Communicate* section may require ongoing internal support from METRO, such as outreach and education to the public.

In this section, recommendations from Communicate, Integrate and Connect are further organized into three strategies for implementation, outlining a holistic approach to improving the access of bicyclists to transit in the METRO service area.

Policy

Recommendations for new or altered policies represent improvements that create and maintain the approach METRO takes toward enhancing bike-to-transit integration. These typically require input and engagement at the senior staff and board level. These recommendations do not require capital expenditures, but may set guidelines for how to approach prioritization.

Program

Program recommendations represent the most direct ways in which METRO staff will interact with cyclists and other members of the public, including a proposed Bicycle Advisory Committee that will play a major role in prompting future improvements and evaluating the success of existing ones. Programs include both ongoing promotion of bicycle-friendliness in the system as well as pilot projects to evaluate potential improvements. Though these programs are expected to be of lower cost than capital improvements, they will nevertheless require staff time and other outlays.

Capital Improvements

Capital Improvement recommendations are primarily focused on increased integration between the bicycle and transit systems through on-vehicle accommodations, bicycle parking, and bike share. Capital improvements are also required to create connections and support wayfinding recommendations, which are further specified within individual transit nodes. The associated costs and prioritization for those recommendations are included with the nodes.

Costs and Partnerships

The sum total of all infrastructure improvements proposed through this study is just under 5.7 million dollars, representing a relatively inexpensive list of improvements, especially given the wide geographic spread throughout the METRO service area. As many of these improvements, especially the most expensive of them, are not to take place entirely within METRO property, partnerships for funding, implementation and maintenance will need to be built with cities, Management Districts, TIRZs and other agencies. As such, bicycle improvements will continue to be a small portion of METRO expenditures, especially given the potential impact of improvements.

Looking to the Future

Finally, the study examines how METRO should approach bicycle access at future improvements, whether they are new transit centers or rail station, service changes due to the ongoing System Reimagining project or Long Range Plan, or changes in job or population density in the service area itself. Tools have been developed for METRO's planners to evaluate the desirability and effectiveness of potential future improvements.

CHAPTER 2
INTRODUCTION

By making efforts to become a more bicycle-friendly transit agency, METRO helps support a multi-modal transportation system within its service area. For many transit riders, the bicycle is crucial to making connections. By improving access, bicycle amenities, programs with targeted marketing and distribution of information to potential users, METRO services can appeal to a wider audience.

VISION

The METRO Bike and Ride Access and Implementation Plan will enhance METRO's ability to provide first class transit service by linking the region's expanding bicycle networks to transit infrastructure. This builds upon METRO's foundation as a trusted community partner to implement a prioritized set of projects that will provide attractive, safe, healthy, low-cost transportation choices for all users.

OBJECTIVE

The METRO Bike and Ride Access and Implementation Plan will define a prioritized set of high-quality links between the bicycle and transit networks in the METRO service area to maximize the ability to make bicycle-transit linked trips for all users, including commute and day trips, utilizing on-street facilities and trails that have been traditionally used primarily for recreation.

GOALS

1 Improve bicycle access to METRO facilities, prioritizing locations with the highest potential for increased bicycle traffic.

2 Create partnerships across jurisdictions to support recommendations and improvements outside METRO's properties.

3 Provide bicycle parking accommodations at METRO facilities that are appropriate for the projected bicycle trips, especially at Park & Rides, Transit Centers and METRORail stations.

4 Suggest recommendations for METRO to consider as it develops a comprehensive plan for bicyclists.

5 Implement programs and standards that make the METRO system easy for bicyclists to understand and use.

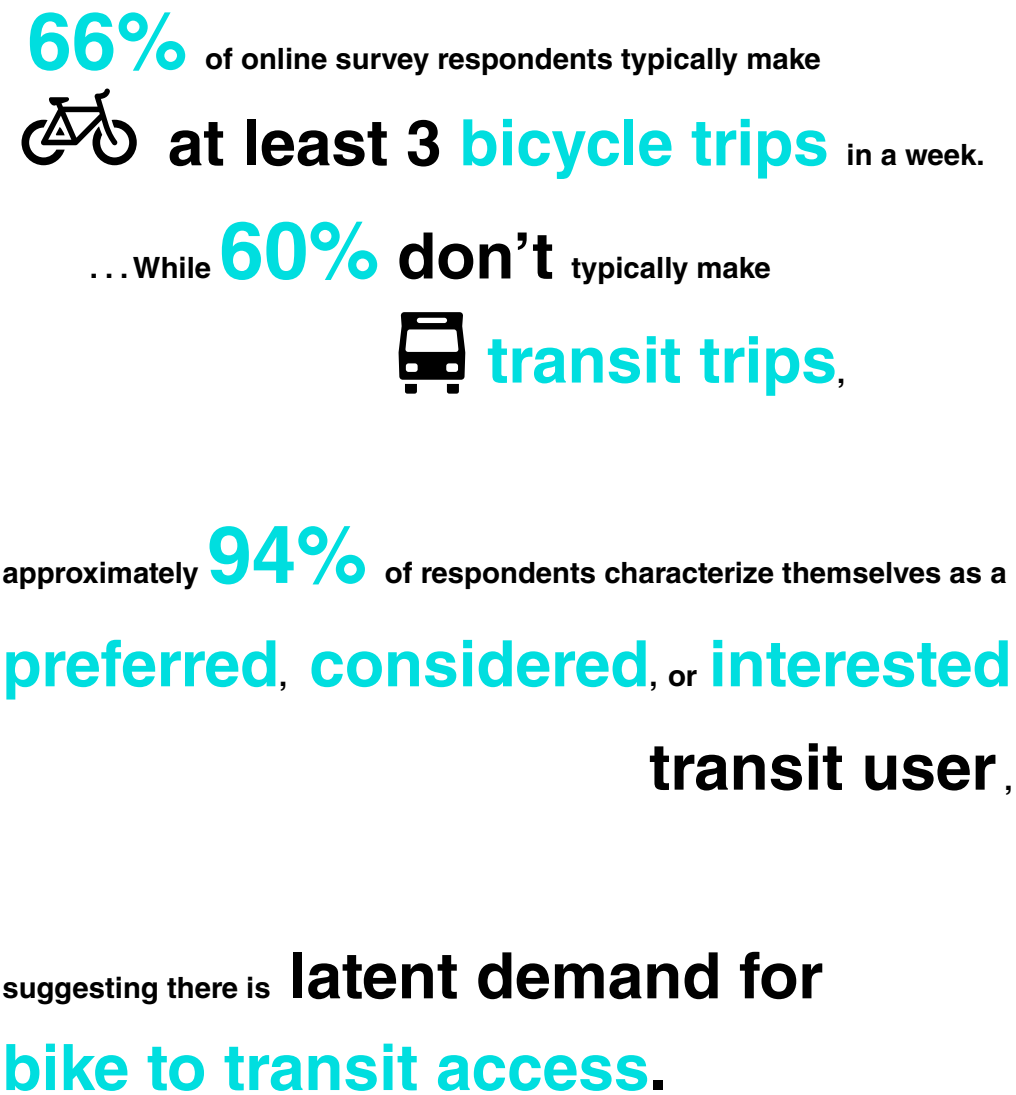
The City of Houston is expanding its network of bicycle infrastructure in the form of new bike trails, bike lanes, parking, and an expanding bike share program. Simultaneously, METRO's recent efforts to accommodate bicyclists using buses have been successful, as seen through the annual increase in bikes brought on board buses since the incorporation of racks in 2007. Linking these two trends, by supporting the integration of biking with riding transit, represents a significant opportunity to expand mobility and accessibility across the region. This plan serves as a guide for understanding trends in the existing system, best practices for integrating bikes and transit, and how public responses can shape a more bicycle-friendly transit system.

The methodology of the study employed multiple scales of analysis. The public input methods pursued - an online survey, five focus groups, on-board bus surveys, and two public meetings - aimed at engaging current transit users, bicyclists, and those considering using these modes. At a larger scale, Geographic Information System (GIS) data was analyzed to identify the factors influencing mode choice in the region. Statistical regression analysis served to identify METRO service routes that were under-performing in terms of bike boardings, and site visits and analysis were conducted at nearby Park & Rides, Transit Centers, and METRORail stations.

A broad set of recommendations support the integration of bike and transit, and could attract new riders to transit with improvements for bicycle accommodation. The study establishes recommendations that include on-vehicle accommodations, bike parking, wayfinding, and marketing and planning, as well as infrastructure enhancements at select Transit Centers, Park & Ride lots, and METRORail stations in the region.

The online survey conducted as part of the METRO Bike & Ride study, with over 1,000 respondents, indicates that there are bicyclists in the Houston region that ride regularly, and who characterize themselves as “strong & fearless” (20%) or “enthused & confident” (51%) bicyclists. While fifty-seven percent of respondents state that they do not currently make any transit trips on a typical week, the majority of all respondents described themselves as a “considered” (32%) or “interested” (51%) transit user. These results indicate that there is latent demand for bike to transit access among many of involved cyclists in the METRO service area.

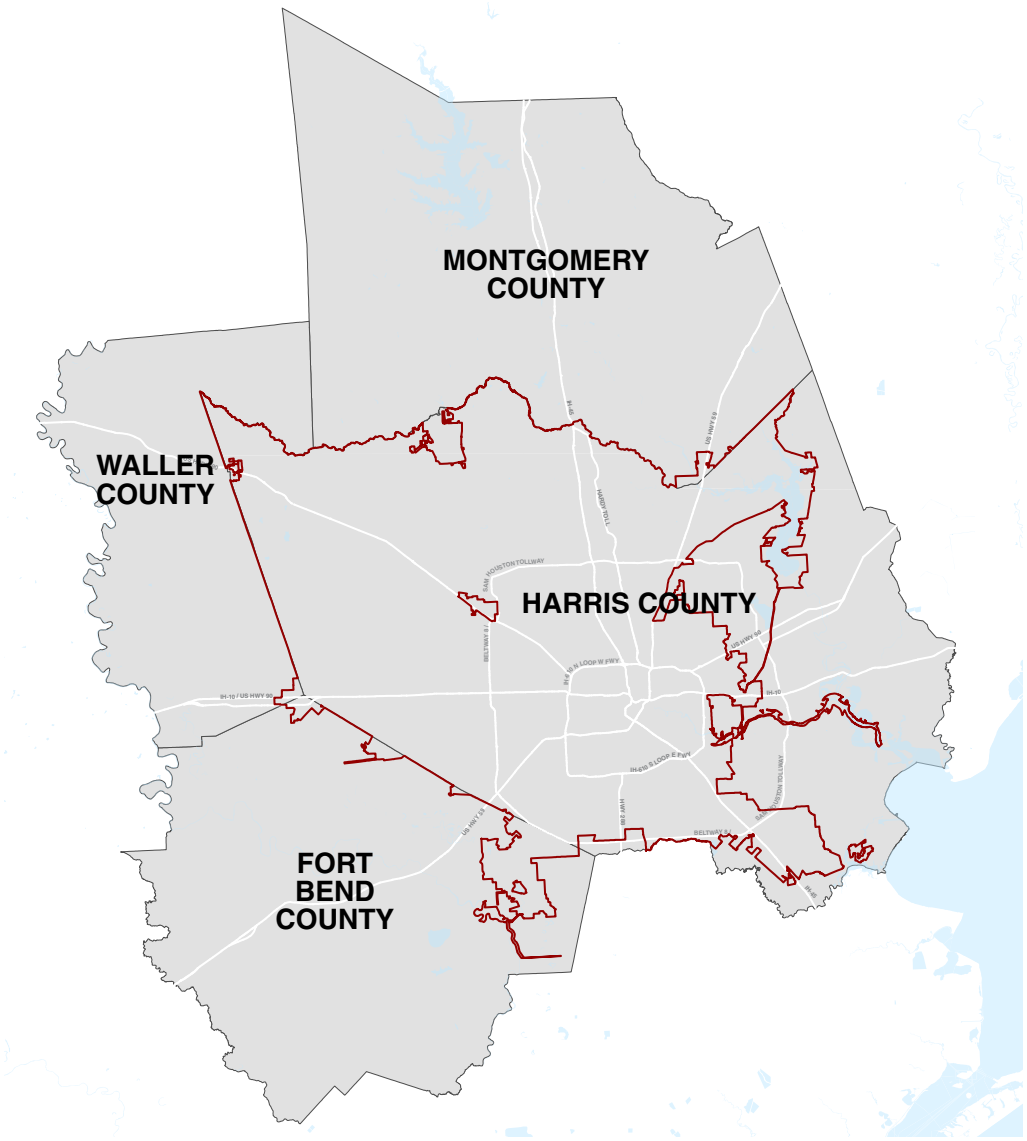
Figure 2.1: Latent Demand for Bike to Transit Access



CHAPTER 3
EXISTING & PLANNED CONDITIONS

Transit, Cycling, and the METRO Service Area

As the Houston region has grown, many of its cities have begun to make significant investments in infrastructure for walking, biking and transit. The City of Houston alone has more than 300 miles of on and off-street bike facilities, an expanding bike share program and improved sidewalks in many parts of the city.



METRO SERVICE AREA
Area: 1,285 sq. miles

HARRIS COUNTY
Area: 1,777 sq. miles
SERVICE AREA
Area: 1,240 sq. miles
96.1% of total service area

FORT BEND COUNTY
Area: 885 sq. miles
SERVICE AREA
Area: 44 sq. miles
3.4% of total service area

MONTGOMERY COUNTY
Area: 1,077 sq. miles
SERVICE AREA
Area: 4 sq. miles
0.3% of total service area

WALLER COUNTY
Area: 518 sq. miles
SERVICE AREA
Area: 3 sq. miles
0.2% of total service area

Figure 3.1: Service Area County context

BICYCLING & METRO

The past ten years have been a time of significant change for the METRO service area. The region contains a booming and diverse population that has grown by more than 600,000 people in a decade. As the Houston region has grown, many cities have begun to make significant investments in infrastructure for walking, biking and transit. This includes the City of Houston's investment in more than 300 miles of on and off-street bike facilities, a pilot bike share program and improved sidewalks in many parts of the city.

For METRO, the decade has seen numerous significant milestones, including the opening of the region's first light rail line and the commencement of construction of three additional lines, in addition to the introduction of additional HOV/HOT lanes and new local service types, such as the Bellaire Quickline.

The Texas State Legislature authorized the creation of local transit authorities in 1973, funded by a 1 cent sales tax throughout the METRO Service Area. METRO opened for business in January 1979, taking over local bus service from the City of Houston Transit Agency, HouTran. METRO set out to transform itself into a regional multimodal transportation system.

METRO provides service predominantly to Harris County, which accounts for 96 percent of the service area, while the boundary extends to three other adjacent counties: Montgomery to the north (0.3%), Waller to the northwest (0.2%) and Fort Bend to the southwest (3.4%).

METRO introduced bicycle racks on its buses in 2007, and the system has experienced significant growth of cyclists using METRO services every year, despite declines in local bus ridership. For a growing number of riders, the use of bicycles in conjunction with transit is part of their everyday commute, and essential for reaching regional destinations.

Indeed, the number of cyclists boarding transit with their bikes represents only a percentage of total multi-modal users, as many cyclists also park their bicycles at Park & Rides, Transit Centers, bus stop poles, and use Houston's expanding bike share system.

By the end of FY 2012, an average of approximately 15,000 bicycles were placed on board METRO buses monthly, or roughly 500 per day. On a typical weekday in the spring of 2013, an additional 67 bicycles were parked at METRO Transit Centers and Park & Ride lots. Most facilities had few bicycles (zero or one bike), but a few of METRO's Park & Ride lots draw much larger number of bicyclists. Park & Ride lots with a large number of parked bicycles include Kingswood (12), Kingsland (8), Bay Area (5), and Northwest Station (4).

The final component of bike to transit activity is bicycling to METRO's Red Line; bikes are allowed on the trains during off-peak periods. While METRO does not count the number of bicycles taken on trains, METRO's 2011 Origin Destination (O/D) Passenger Survey found that about 1% of rail riders access the system with bicycles. Taking these three bike to transit components together, about 0.3% of METRO's weekday riders access transit via bicycle. While the percentage is small, it is increasing and provides continued opportunity for growth.

Figure 3.2: Bicyclists accessing transit often lock their bikes to secure objects if racks are not provided; (left) bikes locked to pole adjacent to bus stop, (right) bikes locked to railing at METRORail station

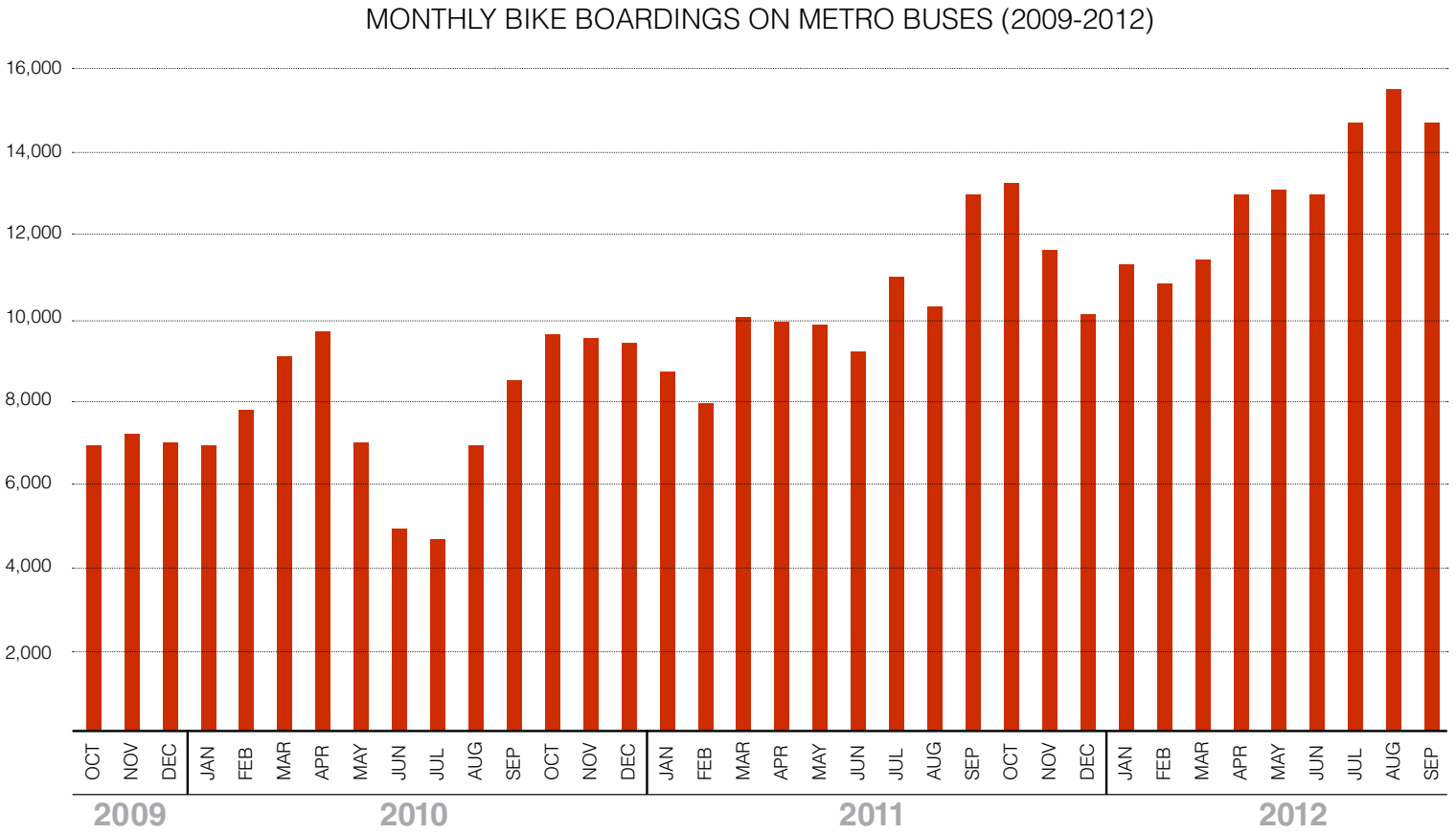


Figure 3.3: Monthly Bike Boarding on METRO Buses
Source: METRO Bike Boarding Report

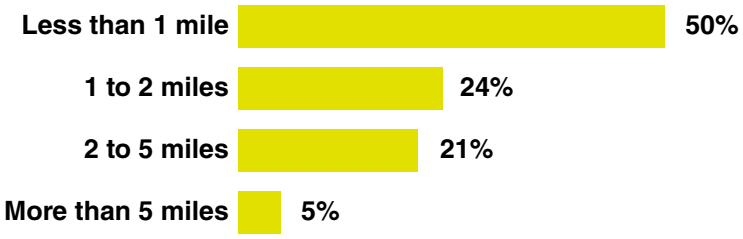
UNDERSTANDING THE SYSTEM USER

The bicycle serves as an important connector to transit, allowing transit riders to travel beyond a reasonable walking distance to reach their stop or final destination. METRO conducted a system-wide survey of its passengers in 2011, The Origin Destination (O/D) Passenger Survey, that gives some insight into bicycle and transit users in comparison with the average passenger. It must be remembered that the O/D Survey represents only a small percentage of METRO users, as such, all conclusions gained from the survey must be reinforced with other data. All percentages are stated as the percent of those answering a particular question rather than the percent of total surveys. System-wide, about 1% of METRO passengers traveled to or from their transit stops by bicycle, representing about 3,000 trips to transit and 3,000 trips from transit in a given weekday. Bicycle access and egress to transit on the local and METRORail systems are about the same (1%) but less for the METRO Park & Ride (P&R) system. Of those completing surveys, 69% rode local buses, 17% were on the METRO P&R routes, and 14% used the METRORail service.

The distance travelled to the transit stop by bicycle averaged 2.7 miles, while bicycle travel after alighting averaged 1.8 miles, both of which are beyond comfortable walking distance. As would be expected, these distances are significantly shorter than the average distance to and from transit by automobile. With almost 75% of these distances under two miles, bicycle infrastructure such as bike lanes and trails, and general connectivity of the street network in the area of METRO transit stations, is critical to connecting biking with transit.

Figure 3.4: Bike Distance Travelled

DISTANCE TRAVELLED:
Bike Access To & Egress From Transit



TRIP TIME PERIOD

Slightly more of the trips taken by bicycle are in the early morning and in the peak period than in the midday, as compared to METRO's overall ridership. This time period distribution is likely a function of the heavier use of bicycles to access and egress transit for work trips, as shown in Figure 3.5.

TRIP PURPOSE

Trip purpose for bicyclists using transit is similar to METRO's overall ridership. The only exception is that bicycles are used less frequently for school trips and more frequently for work trips, as shown in Figure 3.6.

GENDER

Gender is one of the few characteristics for which the bicyclist profile is substantially different from the typical METRO passenger. While the majority of passengers are female (56%), the majority of bicyclists are male (74%), as shown in Figure 3.7. This is in line with other surveys of cycle usage nationally.

AGE DISTRIBUTION

The average age of bicyclists is 41 years, similar to the age of the average transit passenger (41.5 years). The only real difference in the distribution by age between bicyclists and all METRO passengers is that fewer very young and older passengers use bicycles. No age range has larger than a 5% difference between bicyclists and all passengers, as shown in Figure 3.8.

RACE / ETHNICITY

According to the O/D survey, a higher proportion of bicyclists using METRO are white than for the system as a whole (35% versus 24%), and a slightly lower proportion are black or African-American (34% versus 46%). This shift from black or African-American to white is more notable when comparing local system passengers, of whom only 17% are white. The distributions of other races and ethnic groups are about the same for bicyclists and other passengers, as shown in Figure 3.9, although language barriers in the administration of the survey may lead to under reporting of Latino or Hispanic riders. It can also be noted that the racial breakdown of bicyclists is closer to the racial breakdown of the City of Houston then that of the average transit rider.

HOUSEHOLD LANGUAGE

The use of Spanish at home is more prevalent among bicycle riders on transit than for METRO's overall riders, as shown in Figure 3.10. The percentage of bicyclists who responded that their households were either Spanish-speaking or used both English and Spanish is even higher than for METRO's local system.

NUMBER OF VEHICLES

Many METRO passengers had no vehicle available for their trip, and the same is true of bicyclists. However, much more bicycle access and egress trips are made on the local and METRORail systems rather than the P&R system. METRO's 2011 Origin Destination (O/D) Passenger Survey indicates that 41% of bicyclists had a vehicle available for the trip, which is significantly higher than the general percentage

of local riders who had a vehicle available (26%), but lower than the percentage of METRORail riders who had a vehicle available (56%), as shown in Figure 3.11.

The number of vehicles per household for bicyclists is very similar to the METRO rider population as a whole as well, with only a slightly smaller percentage of bicycle households reporting zero vehicles.

HOUSEHOLD INCOME

The household income distribution for bicycle households is fairly similar to METRO's overall rider population, with a slightly lower percentage being very low income and slightly higher percentage being high income, as shown in Figure 3.12. Compared to local system riders (excluding Park & Ride users), bicyclists are more notably higher income.

COMPARISON OF BICYCLISTS TO ALL TRANSIT PASSENGERS

Figure 3.5. **Trip TIme Period**

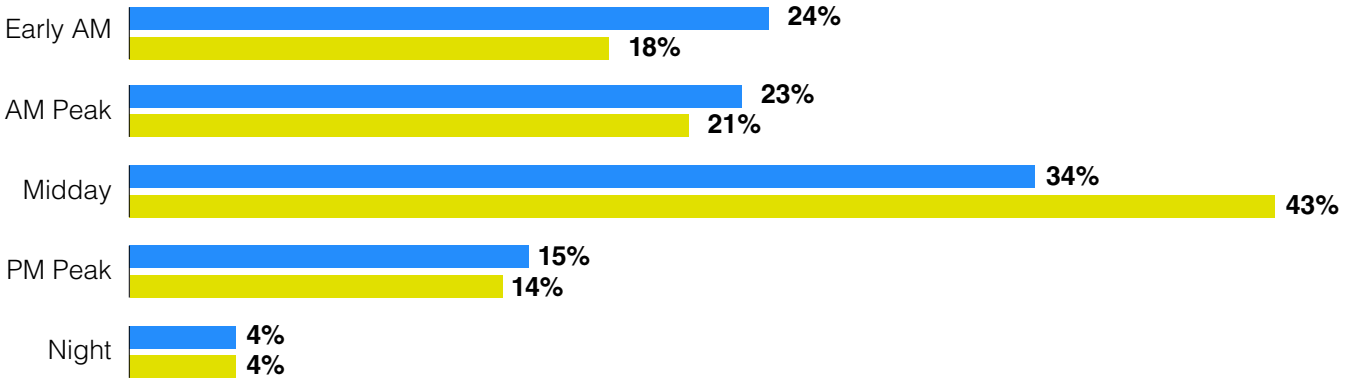


Figure 3.6. **Trip Purpose**

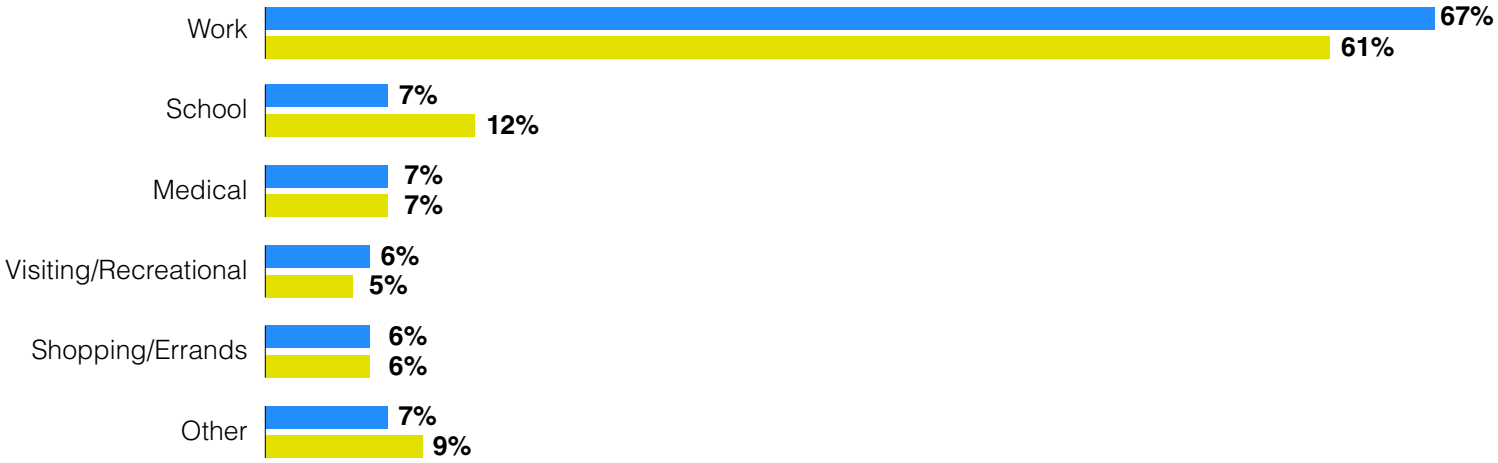


Figure 3.7. **Gender**

Source: METRO, 2011 Origin Destination Passenger Survey

COMPARISON OF BICYCLISTS TO ALL TRANSIT PASSENGERS

Figure 3.8. **Age Distribution**

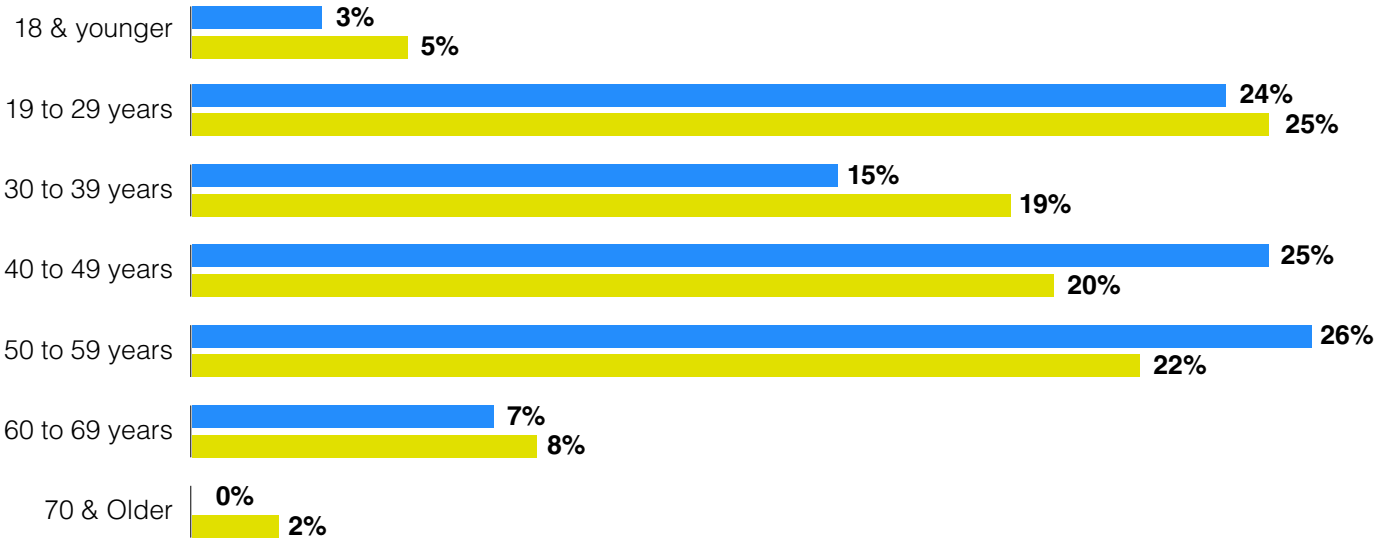


Figure 3.9. **Race / Ethnicity**

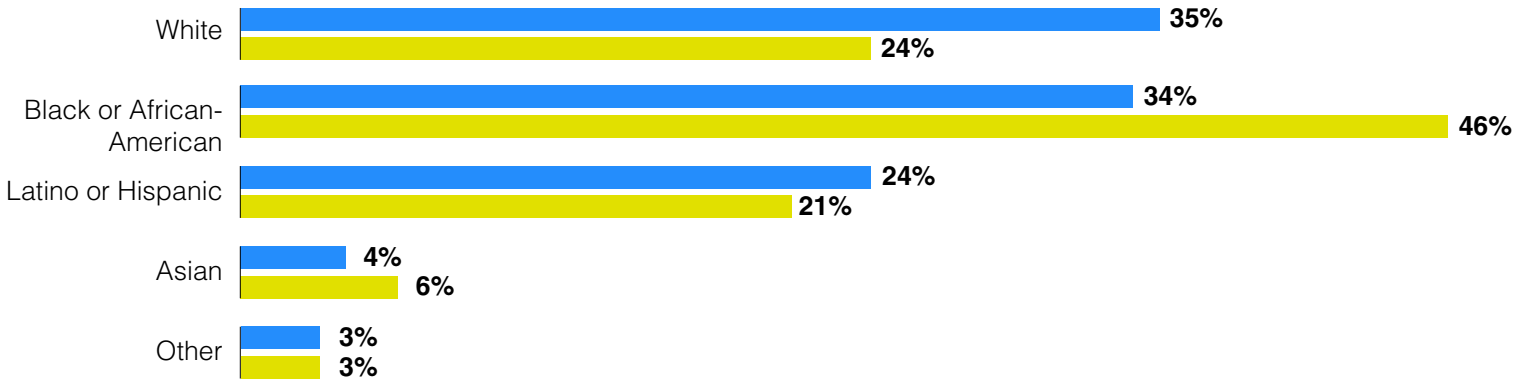
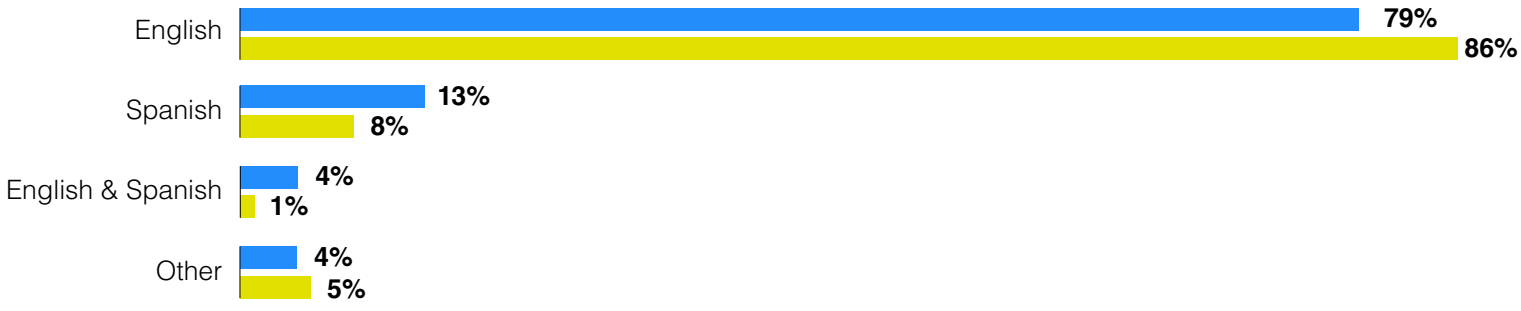


Figure 3.10. **Household Language**

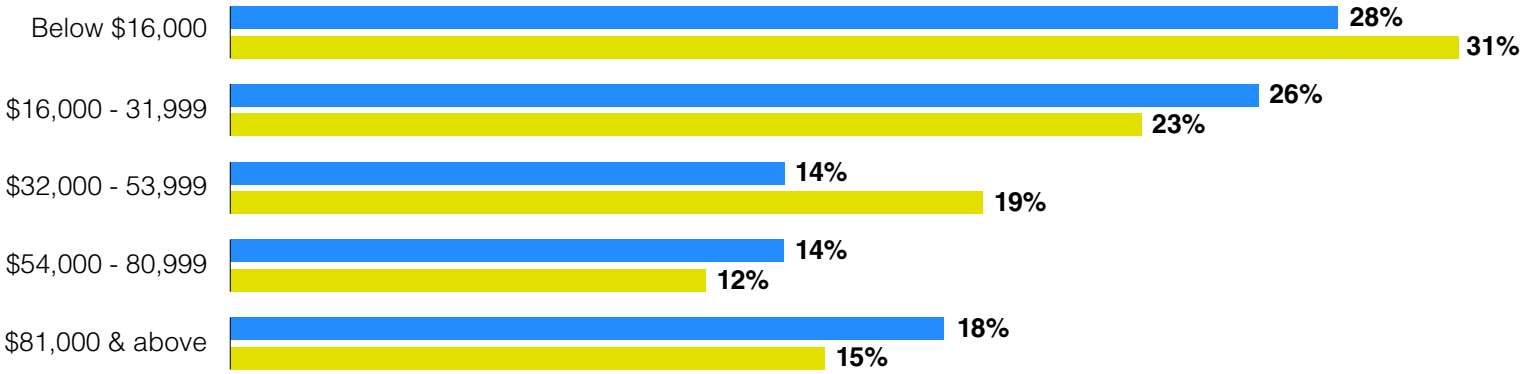


COMPARISON OF BICYCLISTS TO ALL TRANSIT PASSENGERS

Bicyclists All Passengers

Figure 3.11. **Number of Vehicles**

Figure 3.12. **Household Income**



Source: METRO, 2011 Origin Destination Passenger Survey

Houston's Bicyclists

According to Census commuting preference data, cycling accounts for a significant proportion of transportation within the southwestern part of the inner loop of Houston, especially in census tracts clustered around the Texas Medical Center, Rice University, the University of Houston and the residential neighborhoods surrounding Downtown. Maps detailing the significance of mode share for other transportation modes are available in Appendix II.

Attitude and culture are a crucial aspect of how many citizens commute by bicycle or public transportation. In order to describe attitudes towards cycling in Houston, a study from Portland, Oregon was used as a precedent.

Research conducted in Portland, Oregon has identified four primary "types" of people who might cycle for transportation, 1) The Strong and Fearless, 2) The Enthused and Confident, 3) The Interested but Concerned, and 4) No Way, No How. While Portland and Houston are very different cities with different weather, culture and infrastructure, these self-classifications of riders provide insight to how bicycle infrastructure can be targeted towards varying levels of comfort and skill, and help make bicycling a widespread means of transportation by addressing potential riders' concerns about personal safety. The full report, *Four Types of Cyclists*, is available at http://www.portlandoregon.gov/transportation/article/237507.

The study determined that it was a common perception that one must be "brave" to ride a bicycle, however, many cities in developed nations have managed to achieve significant levels of bicycle mode split through policies and programs, and created an urban environment where bicycling is considered the most logical and enjoyable choice within the transportation system, and even children can safely ride alongside other riders. Numerous studies have shown that the top reason people don't ride bicycles is because of concerns of safety, of riding in the roadway in fear of the risk of being injured by automobiles, which would explain why the majority of respondents fell within "The Interested but Concerned" and "No Way, Now How" categories.

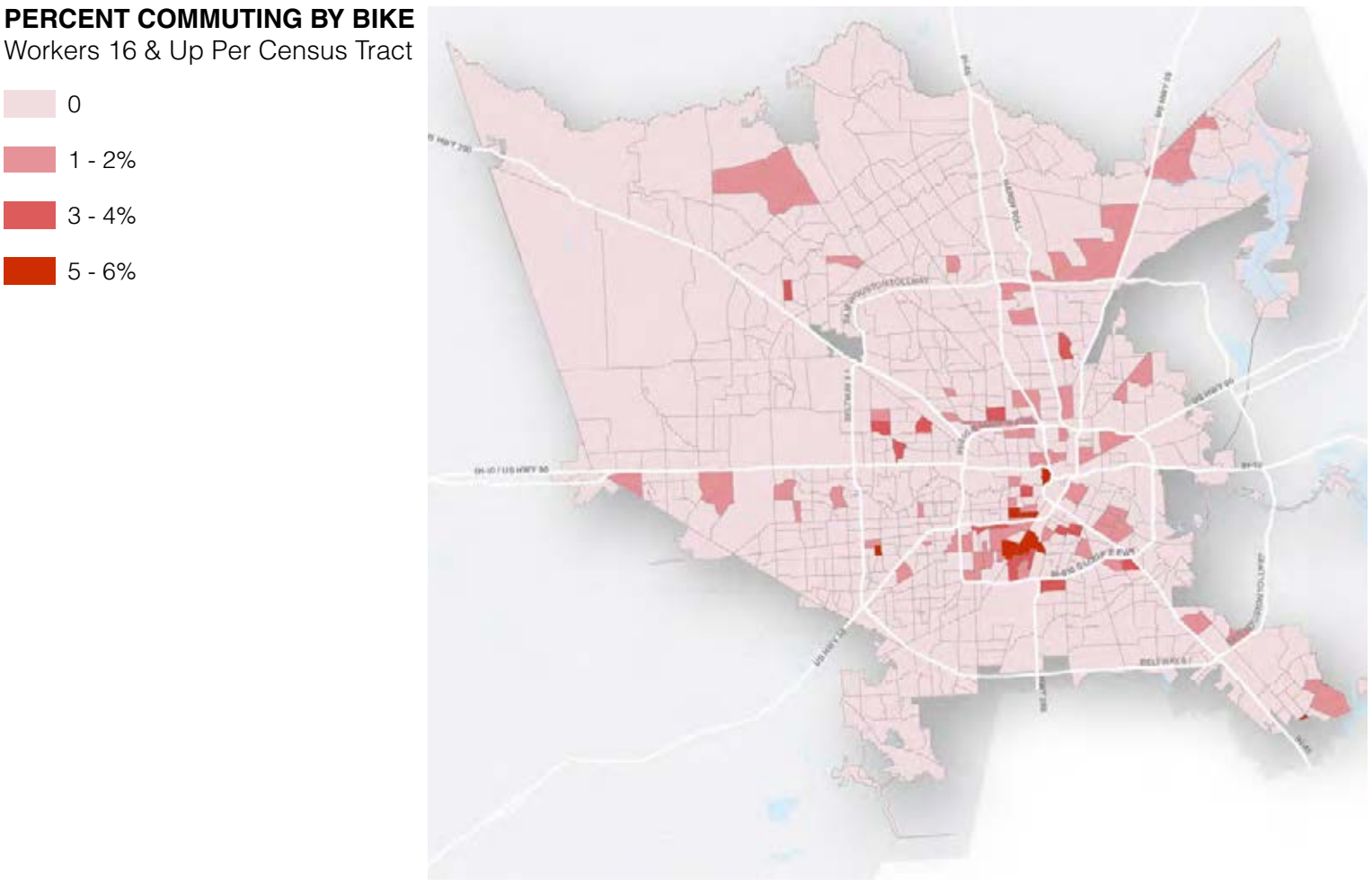


Figure 3.13: METRO Service Area - Percent Commute to Work
Source: 2010 American Community Survey 5-year Estimates

FOUR TYPES OF CYCLISTS

The "Strong and Fearless": People who will ride a bicycle regardless of the roadway conditions, and may be able to keep up with automobile traffic with little concern.

The "Enthused and Confident": People who are comfortable sharing the roadway with automobiles, but may prefer their own bicycle facilities.

The "Interested but Concerned": Residents that are curious, perhaps having learned about the resources being made available in the "bicycle friendly" city. While these individuals may associate the bicycle with their youth, they can now consider it as a tool to lead a more active lifestyle.

The "No Way, No How": Those who have no interest in bicycling, making up approximately one-third of Portland's population.

These descriptions illustrate that one of the primary differences between comfort levels for different cyclists has to do with the type of bicycle facility as well as the speed and width of roadways, traffic volumes, land uses and other, sometimes less tangible, factors. These same categories were used in the METRO Bike & Ride Online Survey conducted for this study. As may be expected, a higher percentage of respondents fell into the "strong and fearless" and "enthused and confident" categories than a random sample of areas residents would provide. Respondents were also asked about their preferences regarding different types of bicycle facilities.

Respondents to the METRO Bike & Ride Online Survey were largely individuals who currently bike in the region, and consequently the survey received disparate results compared to the study by the Portland Office of Transportation. In the METRO Bike & Ride Online Survey, the four categories of bicyclists were described as followed:

- Strong and Fearless: bicycle riding is a strong part of my identity and I am generally undeterred by roadway conditions. I will ride most anywhere.
- Enthused and Confident: I am attracted to cycling and the expanding options and facilities available. I am comfortable sharing the roadway with automotive traffic, but typically prefer to do so on a separate facilities.
- Interested but Concerned: I am curious about bicycling and have heard many things about the potential benefits to riding. I enjoy riding a bike and would like to ride more but frequently do not feel safe on the roadways.
- No Way, No How: I am currently not interested in bicycling at all, for reasons of topography, inability, or simply a complete and utter lack of interest.

Even with 22% of respondents classifying themselves as "Strong and Fearless" and 48% "Enthused and Confident," safety was identified as an important decision factor. When asked how safety affects their decision to ride transit, a bicycle or both together, 33% of respondents said it has a strong effect, another 33% said it is critical to their decision. Additionally, there is a 24% difference in male and female respondents that consider safety to be critical to their decision. Women are prioritizing safety in their transportation decisions, and may require bicycle facilities that establish a safe separation between bicycle and automobile infrastructure.

Respondents prefer facilities that physically separate them from automobile traffic, with 37% that prefer shared-use paths and 35% that prefer cycle tracks. In order to encourage bicyclists to board METRO vehicles at transit facilities, there must be appropriate bicycle infrastructure in place that safely connects users. While Houston is making investments in upgrading its biking infrastructure and transit systems, this has yet to be reflected in its mode split, especially in comparison to cities that are widely considered to have strong biking and/or transit cultures, such as Portland, Oregon and Austin, Texas.

Four Types of Cyclists:
METRO Bike & Ride Online Survey Respondents

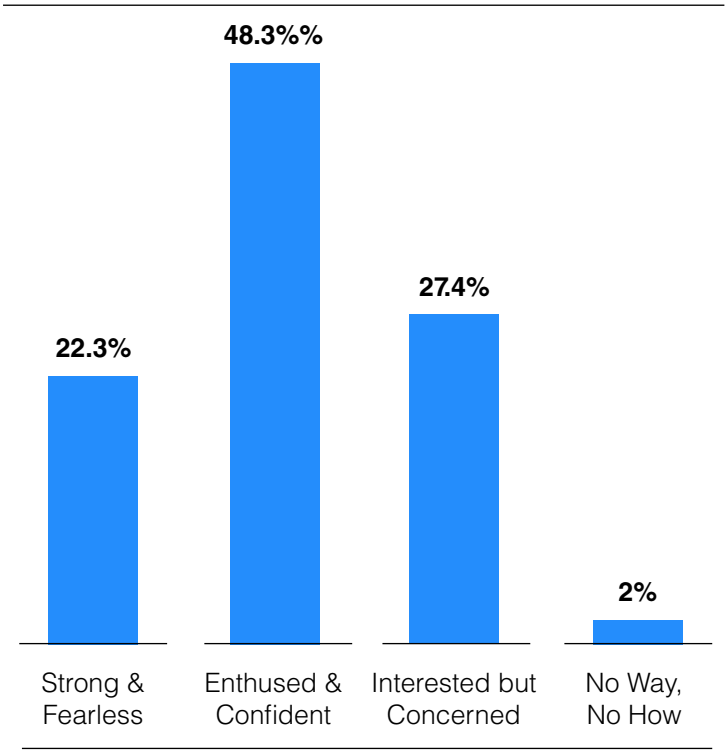


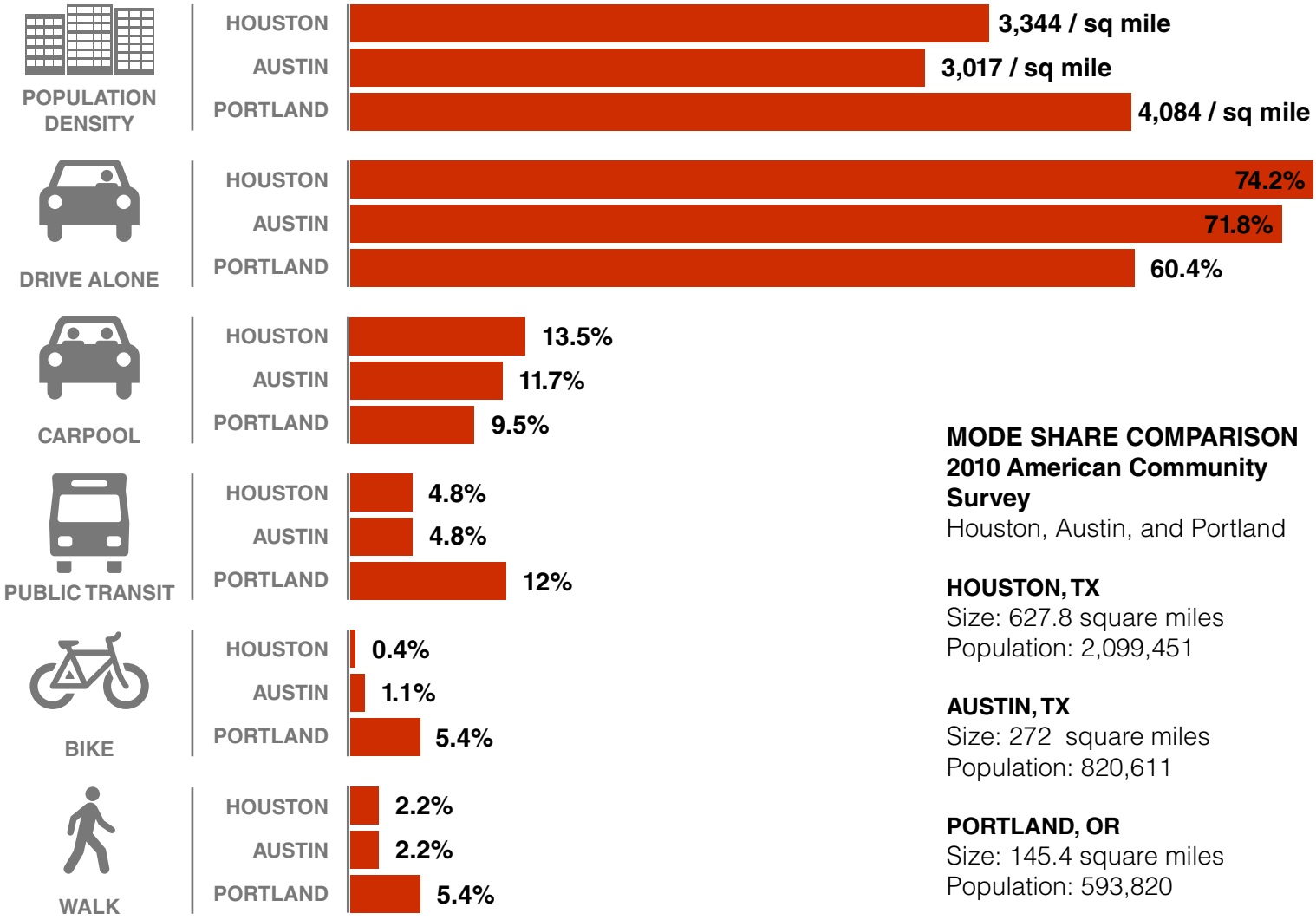
Figure 3.14: Four Types of Cyclists
Source: 2013 METRO Bike & Ride Online Survey

Ridership Goals and Strategies

The city of Portland, Oregon has one of the highest rates of bike ridership in the country as a percentage of its population at 5.4% of trips. Portland may not be the best comparison to Houston overall, as the city's population density is high; biking, walking, and transit ridership are all high; and driving alone is low. However, the framework it has used to prioritize bicycle infrastructure address different types of riders is exemplary. As a city witnessing consistent increases in biking and transit as commuter choices, Portland serves as a compelling example for Houston, where similar and infrastructure upgrades are now being invested in. Portland has effectively provided for the "Strong and Fearless" population, a majority of the "Enthused and Confident" population, and is poised to attract an increasing percent of the "Interested and Concerned." The City of Portland is widely known as a city promoting biking and riding, and the city simultaneously supports densification, as to make biking and riding more effective.

While Portland is an example for its strategies, Austin may be a better overall comparison as a city. With relatively similar population densities and similarly warm weather, Austin and Houston face some of the same issues in promoting biking and riding. However, Austin has seen steady gains in its biking, reaching a 2% mode split at the end of 2012 (source: 2013 City of Austin State of Bicycling Address), up from 1.1% stated in the 2010 American Community Survey, and thereby also moving towards supporting more of the "Enthused and Confident" biking population and their stated goal of 5% bicycle mode share by 2020. It should be additionally noted that the 2% goal was reached 3 years ahead of schedule, showing the

Figure 3.15: City Comparisons



Source: U.S. Census Bureau; American Community Survey, 2006-2010

potential for quick growth. The City of Austin has been explicit about their "If You Build It They Will Come" approach to attracting this segment of the biking population to commute, and has invested in a number of capital projects to build new bike lanes, widen existing ones, build cycle tracks, and install bike parking around the city. The case of Austin suggests that it is feasible for Houston to grow its biking mode share through infrastructure upgrades that attract more than just the "Strong and Fearless." Houston also has the added benefit of flat terrain when compared to Austin, a huge boost to its bikeability.

HOUSTON'S BICYCLE SYSTEM

The increasing density of Houston's inner loop, the completion of a number of new trails, the popularity of long-distance bike ride events such as MS150, and the pilot and expansion of a bicycle share system all serve to elevate the profile of biking in Houston. At the same time, bicycling is still a relatively small commute mode in Houston and lags behind other cities nationally and in Texas.

It is important to remember that our source for data on commuting mode, the American Community Survey, provides useful data about commuting preferences, but should not be read as a full count of the complete mode share for an area. Because the survey only asks participants for their primary mode of transportation for their commute, it forces people who may bike or walk to a bus or train line to choose one or the other to report. In many cases, it is likely that transit is mentioned, rather than bicycling or walking, because it covers a greater proportion of the trip. Additionally, this assessment of mode share does not include recreational use, shopping trips or social rides, which comprise a significant proportion of all trips, as well as many bicycling trips.

Bicycle facilities can be divided into five major categories, four of which currently exist in Houston. Facilities generally have a lesser degree of separation from vehicular traffic on lower volume, slower speed streets, and greater degrees of separation on higher volume, faster speed streets. Much of Houston's bikeway infrastructure consists of signed bike routes: low volume residential streets that often run parallel to larger streets. Houston also has a significant number of streets with traditional bike lanes, although in some cases, these lanes do not meet with current best practices for lane width and design. Signed shared roadways, also known as sharrows, have been recently added to Houston's bikeway infrastructure on Washington Avenue and West Dallas Street, with more planned. Shared use paths are both increasingly common and very popular, often following the region's waterways or abandoned rail lines. More of this type is planned through the Bayou Greenway Initiative. Cycle tracks have yet to make an appearance in Houston, but are increasingly considered a best practice nationally and abroad.

The majority of bikeway infrastructure in the region, especially signed bicycle routes, is concentrated within the 610 Loop, although significant infrastructure is now also available in west Houston. In general, on-street facilities are most likely in the urban core, while shared use paths are becoming more and more common in the outlying areas of the METRO Service Area, especially along the region's waterways.

EXISTING BICYCLE FACILITIES

- BIKE LANE
- SIGNED BIKE ROUTE
- SIGNED SHARED ROADWAY
- SHARED-USE PATH
- MAJOR ROADS
- METRO Service Area

Figure 3.16: Planned Bicycle Facilities

N

0 5 10 20 MILES

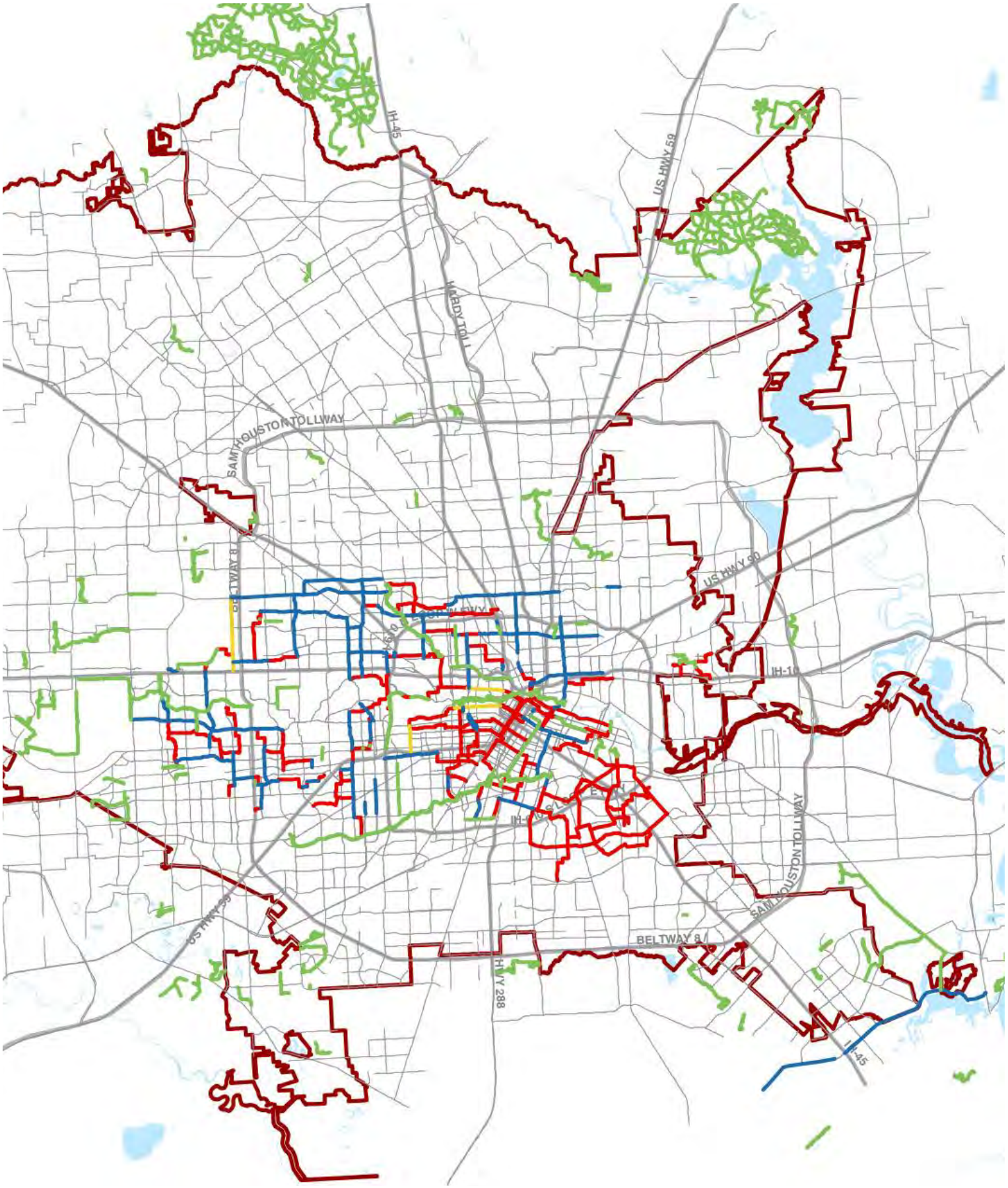


Figure 3.17: Existing Bicycle Facilities
Source: Houston Geographic Information Management System (GIMS)

POLITICAL JURISDICTIONS OF THE METRO SERVICE AREA

METRO provides service predominantly to Harris County, with small portions of Montgomery, Waller and Fort Bend counties making up the remainder. Within these counties lie numerous smaller cities and administrative entities like Management Districts, TIRZ, and MUDs. Because METRO consists of and connects to so many jurisdictions, efficient communication and strong partnerships are critical to METRO's success.

Communities that are part of the METRO service area include the cities of Houston, Bellaire, Bunker Hill Village, El Lago, Hedwig Village, Hilshire Village, Humble, Hunters Creek Village, Katy, Missouri City, Piney Point Village, Southside Place, Spring Valley, Taylor Lake Village and West University Place. Major portions of unincorporated Harris County are also included.

The vast majority of the METRO Service Area, both in terms of space and population, is made up of the City of Houston and unincorporated areas of Harris County. Missouri City, which is primarily within Fort Bend County, is both the largest service area member outside of Harris County and also the second largest city after Houston. Nine of the fifteen cities within the service area are surrounded completely by the City of Houston. Six make up a small area (around seven square miles total) in West Houston known as the villages, while three others (Bellaire, West University Place and Southside Place) are located in the southwest inside and straddling the 610 loop. The remaining cities within the service area are suburban or rural communities beyond

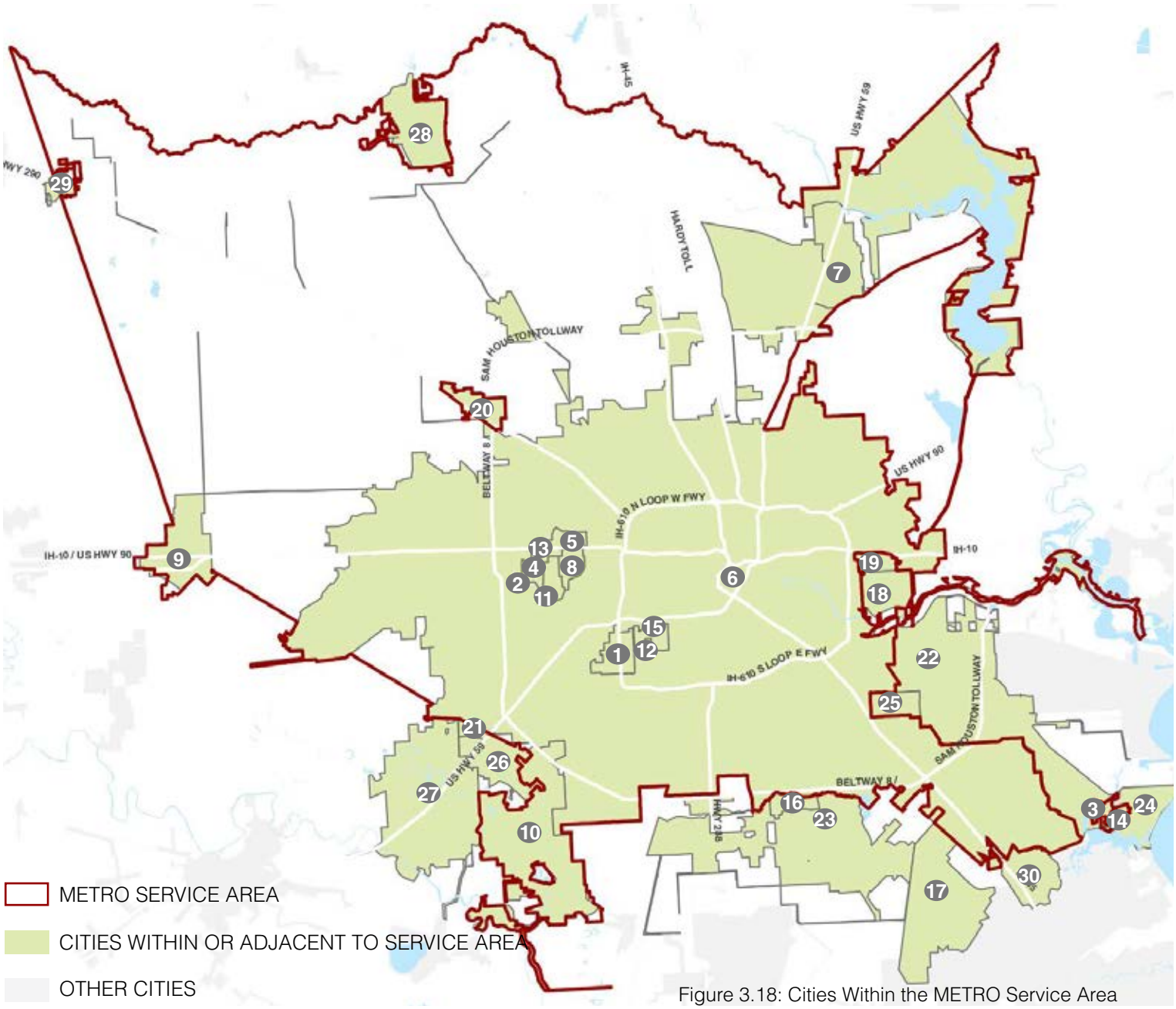


Figure 3.18: Cities Within the METRO Service Area

CITIES WITHIN & INTERSECTING THE METRO SERVICE AREA & UNINCORPORATED TERRITORY

		CITY	COUNTY	SIZE (sq. mi)	POPULATION (2010 Census)	BIKEWAY PROGRAM
CITIES WITHIN THE METRO SERVICE AREA	1	BELLAIRE	Harris	3.6	16,855	Yes
	2	BUNKER HILL VILLAGE	Harris	1.5	3,633	--
	3	EL LAGO	Harris	0.7	2,706	--
	4	HEDWIG VILLAGE	Harris	0.9	2,557	--
	5	HILSHIRE VILLAGE	Harris	0.3	746	--
	6	HOUSTON	Harris	627.8	2,099,451	Yes
	7	HUMBLE	Harris	9.9	15,133	--
	8	HUNTERS CREEK VILLAGE	Harris	1.9	4,367	--
	9	KATY	Harris / Fort Bend / Waller	10.7	14,102	--
	10	MISSOURI CITY	Fort Bend / Harris	29.8	67,358	Yes
	11	PINEY POINT VILLAGE	Harris	2.1	3,125	--
	12	SOUTHSIDE PLACE	Harris	0.2	1,715	--
	13	SPRING VALLEY VILLAGE	Harris	1.3	3,715	--
	14	TAYLOR LAKE VILLAGE	Harris	1.3	3,544	--
	15	WEST UNIVERSITY	Harris	2	14,787	--
	--	UNINCORPORATED	Harris	640	~1,200,000	--
CITIES ADJACENT TO THE METRO SERVICE AREA	16	BROOKSIDE VILLAGE	Brazoria	2.1	1,960	--
	17	FRIENDSWOOD	Galveston / Harris	20.9	35,805	--
	18	GALENA PARK	Harris	5	10.887	--
	19	JACINTO CITY	Harris	1.9	10.553	--
	20	JERSEY VILLAGE	Harris	3.5	7,620	Yes
	21	MEADOWS PLACE	Fort Bend	0.9	4.660	--
	22	PASADENA	Harris	44.5	149,043	Yes
	23	PEARLAND	Brazoria / Harris / Ft. Bend	47.5	91,252	Yes
	24	SEABROOK	Chambers / Harris	21.5	11,952	Yes
	25	SOUTH HOUSTON	Harris	3	16,983	--
	26	STAFFORD	Fort Bend / Harris	7	17,693	--
	27	SUGAR LAND	Fort Bend	24.9	78,817	Yes
	28	TOMBALL	Harris	11.9	2,326	Yes
	29	WALLER	Waller	2.07	10,400	--
	30	WEBSTER	Harris	6.6	10,400	--

Table 3.1: Cities Within & Intersecting the METRO Service Area & Unincorporated Territory
Source: 2010 Census TIGER

the Houston city line. Although only three cities within the service area have specific bikeway programs (a program housed within a city department dedicated to biking), these three cities make up almost half of the total service area.

A little under one-third of Harris County lies outside of the METRO Service Area, including Pasadena, the second largest city in Harris County. However, numerous residents from major population centers and rural commuters from outside of the METRO Service Area may also take advantage of service by driving to the nearest Park & Ride facility within the Service Area.

In addition to municipalities and the unincorporated areas of the METRO service area, significant additional portions of territory are also covered by Tax Increment Reinvestment Zones (Figure 3.20), Municipal Utility Districts (Appendix I) and Management Districts (Figure 3.21). All three types of districts may fall either within or outside of existing cities, though typically TIRZs and Management Districts are within and MUDs are outside. Both TIRZs and MUDs may overlap with Management Districts as well.

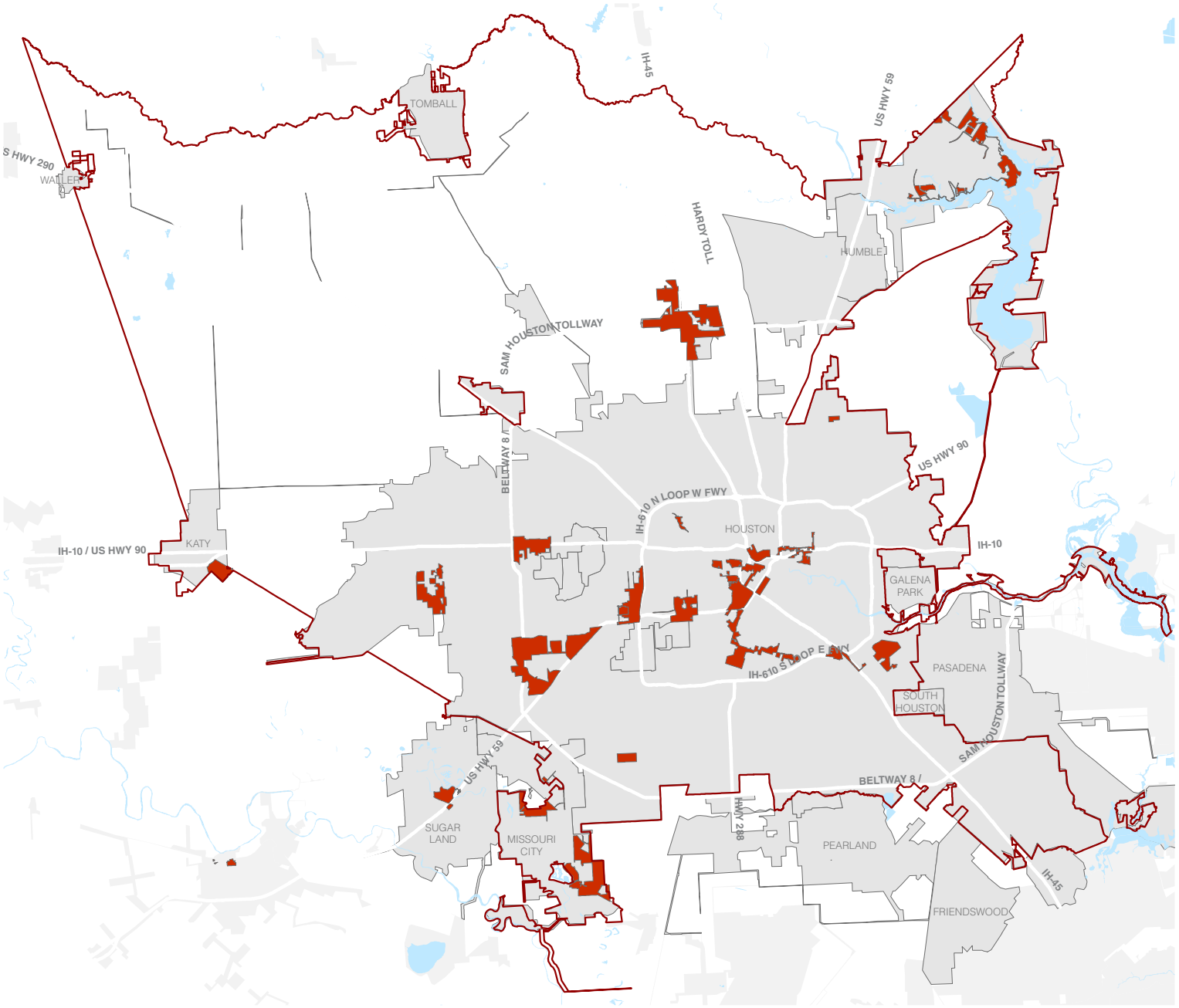
TIRZs, MUDs and Management Districts all have the ability to raise funds to be reinvested in their communities for economic development and quality of life improvements, including transit and bikeway related improvements. This funding may come from assessments levied on businesses or from tax increments forgone by the host municipality. Management Districts typically have the greatest institutional and planning capacity, though that is not universal.

All three types of districts have the ability to set their own agenda for infrastructure improvements. As such, interest in bikeways and transit improvements can vary greatly from district to district and from board member to board member. At the same time, the swift implementation timelines and unrestricted funding available to them makes them attractive potential implementation agents for many improvements.

Examples of TIRZ and Management District involvement in the development of bikeways includes the development of portions of the MKT and Buffalo Bayou Trails, as well as participation in a 2012 Federal Transportation Investment Generating Economic Recovery (TIGER) Grant that will complete a number of trails and on-street connections in Houston's Northside and East End neighborhoods.

Another example showing the importance of partnerships for regional bike connectivity is the role of CenterPoint Utility. While the city's bayous run almost entirely east to west, a plan to allow hike and bike trails to be built on CenterPoint utility easements was approved by Governor Rick Perry in May of 2013, thereby making 142 miles of right of way available for bikeways in Harris County. This offers the opportunity to make the critical north-south connections not offered by the bayou trails, and as such, offers a significant boost to the region's bikeability. Two of the initial bikeways under consideration include an over 11 mile trail running south from Memorial Park, passing through the Galleria area, to the Sam Houston Tollway; and the Wycliffe-Highline Spine Trail, a 9 mile trail running from Clay Road to just south of Bellaire.

Figure 3.19: Tax Increment Reinvestment Zones



TAX INCREMENT REINVESTMENT ZONES (TIRZ)

City of Missouri TIRZ No. 1
City of Missouri TIRZ No. 2
City Park
East Downtown
Eastside
Fifth Ward
Fourth Ward
Greenspoint
Gulfgate
Hardy/Near Northside
Katy TIRZ No. 1
Lake Houston
Leland Woods
Market Square
Memorial City
Memorial Heights
Midtown
O.S.T. / Almeda
Old Sixth Ward
South Post Oak
Southwest Houston
St. George Place
Upper Kirby
Uptown
Village Enclaves

TIRZ
METRO SERVICE AREA
CITIES

MANAGEMENT DISTRICTS

CITIES

METRO SERVICE AREA

BIKE LANE

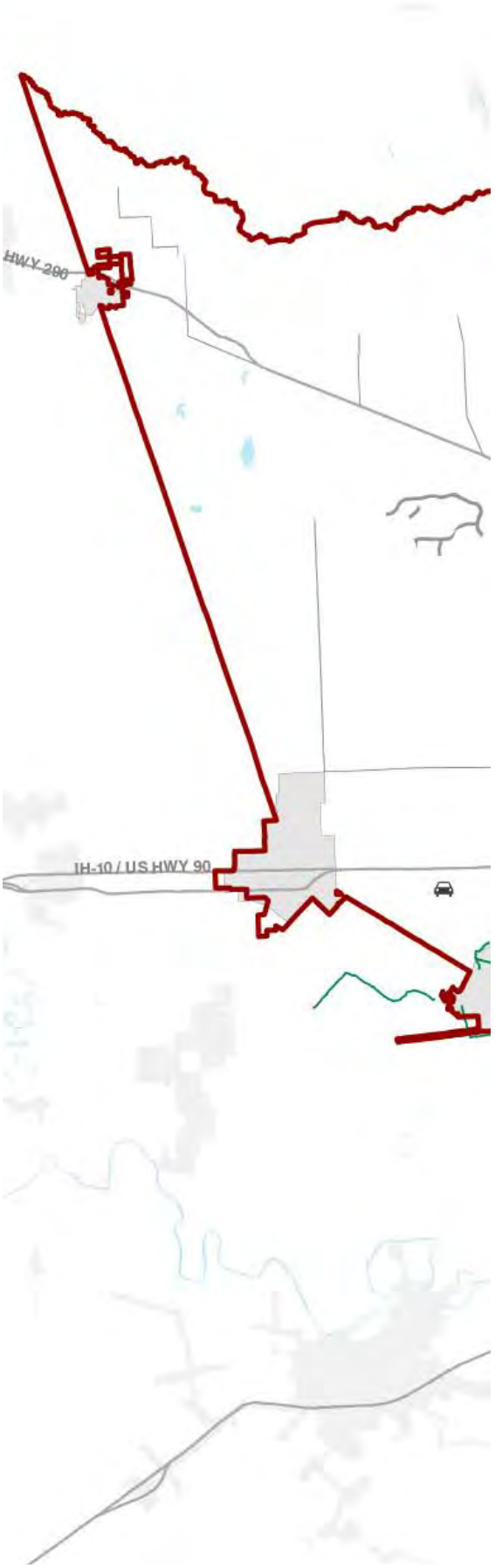
SIGNED BIKE ROUTE

SIGNED SHARED ROADWAY

SHARED-USE PATH

Table 3.2: Management Districts

	MANAGEMENT DISTRICT	SIZE (sq. mi)	POPULAT. ESTIMATE	TRANSIT CENTER	PARK & RIDE
1	GREATER NORTHSIDE	25.3	120,000	Northline Tidwell Heights	Kuykendahl
2	ALDINE PID	16.3	50,000		
3	AIRLINE PID	4.2	20,000		
4	GREATER GREENSPOINT	11.6	60,000	Greenspoint	
5	NEAR NORTHSIDE	14.1	70,000		
6	SPRING BRANCH	21.8	104,000		
7	ENERGY CORRIDOR	2.5	23,000		Addicks
8	MEMORIAL CITY	0.5	3,000		
9	UPTOWN HOUSTON	1.6	12,000		
10	UPPER KIRBY PID	1.3	13,000		
11	HCID #6	--	--		
12	MIDTOWN	1.2	7,500	Wheeler	
13	HOUSTON DOWNTOWN	1.8	14,000	Downtown	
14	EAST DOWNTOWN	1.2	7,000		
15	GREATER SOUTHEAST	8.3	39,000		
16	EAST END	15.8	80,000	Magnolia Eastwood	
17	WESTCHASE	4.4	30,000		Westchase
18	SHARPSTOWN	2.7	94,000	Hilcroft	Westwood
19	BRAYS OAKS	8.9	74,000		West Bellfort
20	INTERNATIONAL	--	--		Mission Bend
21	FIVE CORNERS	--	--	Hiram Clark	Missouri City
22	PROPOSED SUNNYSIDE / SOUTH ACRES	--	--		
23	HCID #9	--	--		
24	HCRID #1	--	--		
25	BAYBROOK	1.9	5,000		
26	SPRINGWOODS VILLAGE PID	--	--		



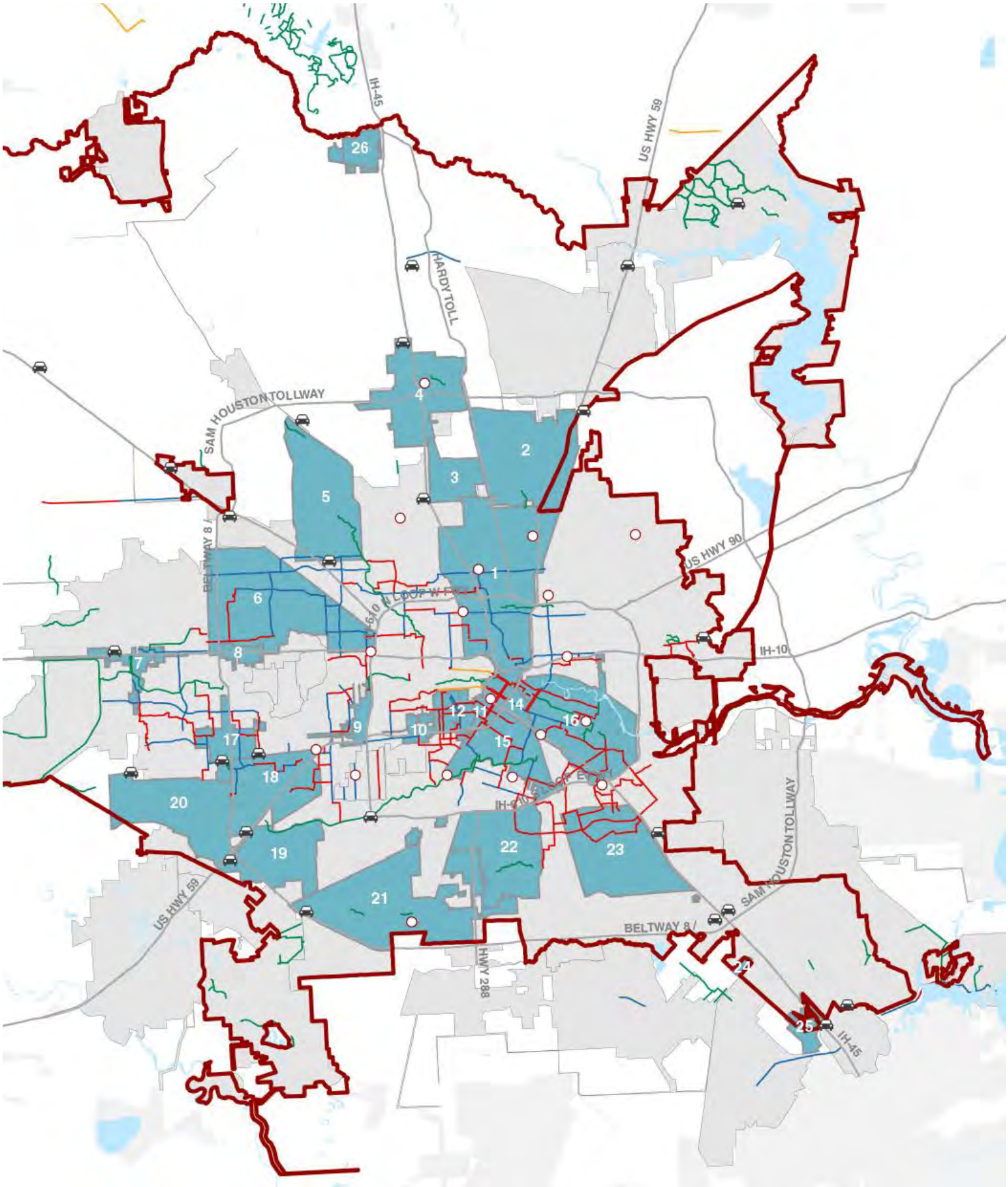
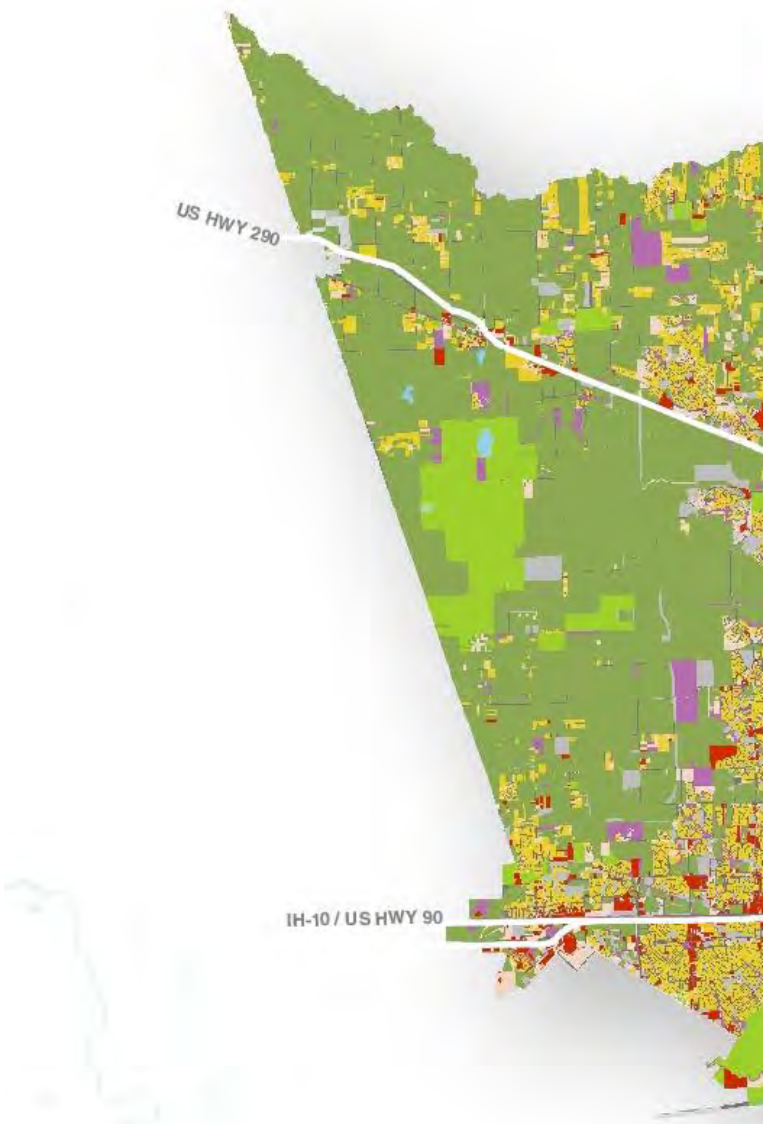


Figure 3.20: Management Districts
Source: 2010 Census

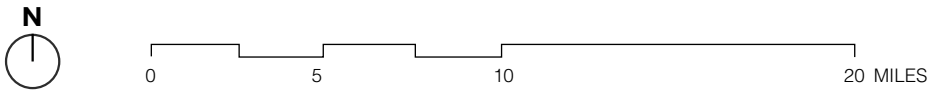
LAND USE

- RESIDENTIAL
- FARM RANCH
- UNDEVELOPABLE
- INSTITUTIONAL / OTHER
- COMMERCIAL
- PARKS
- VACANT
- INDUSTRIAL
- WATER



LAND USE PATTERNS AND BUSINESS CENTERS

Despite Houston's development without land use controls (i.e., zoning), the view of the METRO service area's overall land use map reveals fairly normal urban development patterns when viewed at city-wide and regional scales. In general, commercial development follows major corridors, while residential development predominates in between. The farthest reaches of the METRO Service Area still contain some undeveloped farm and ranch land. Large-scale industrial uses cluster on the east side of the city around the Port of Houston and along major freight rail corridors to the northeast, northwest, southeast and southwest.



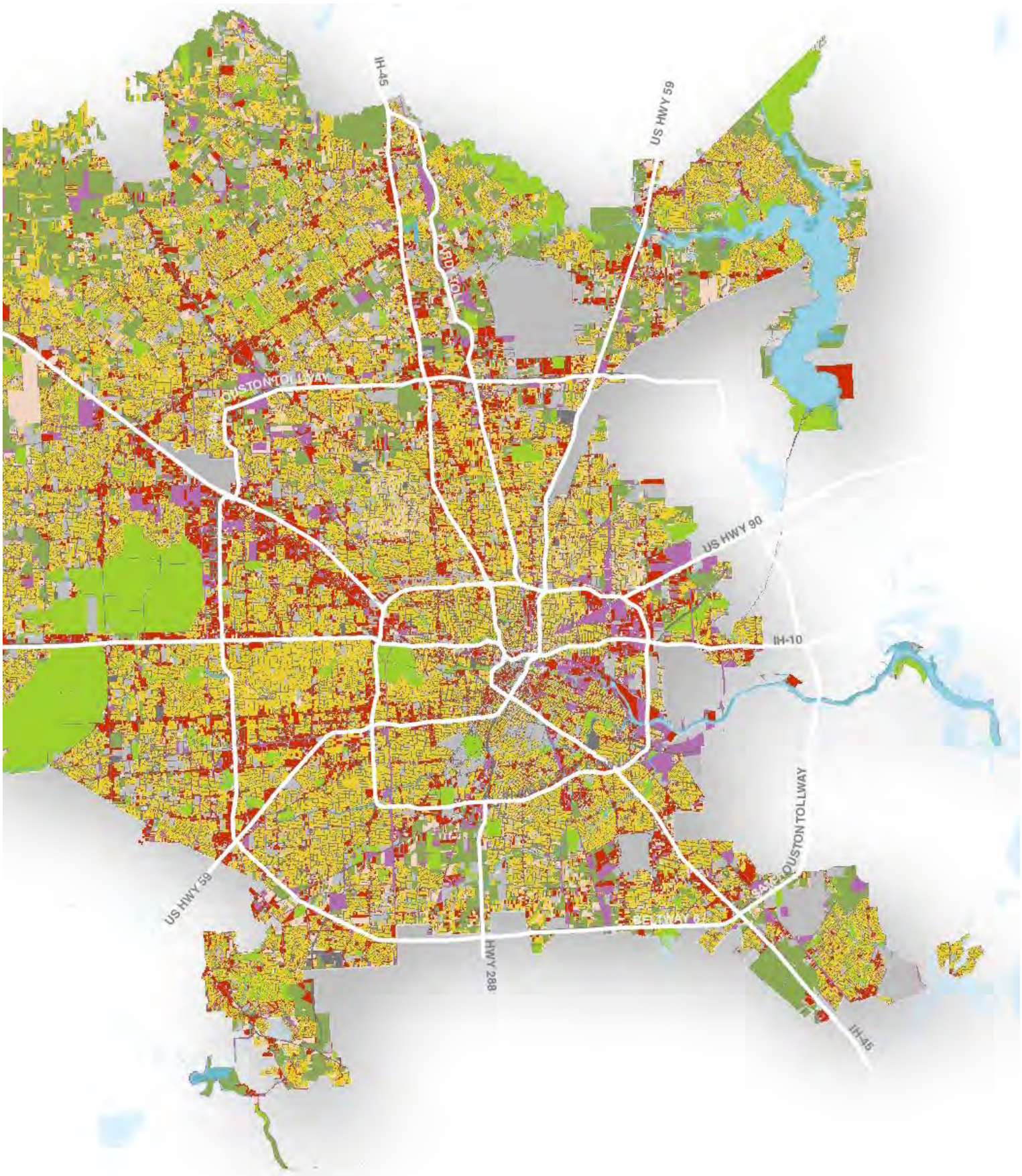


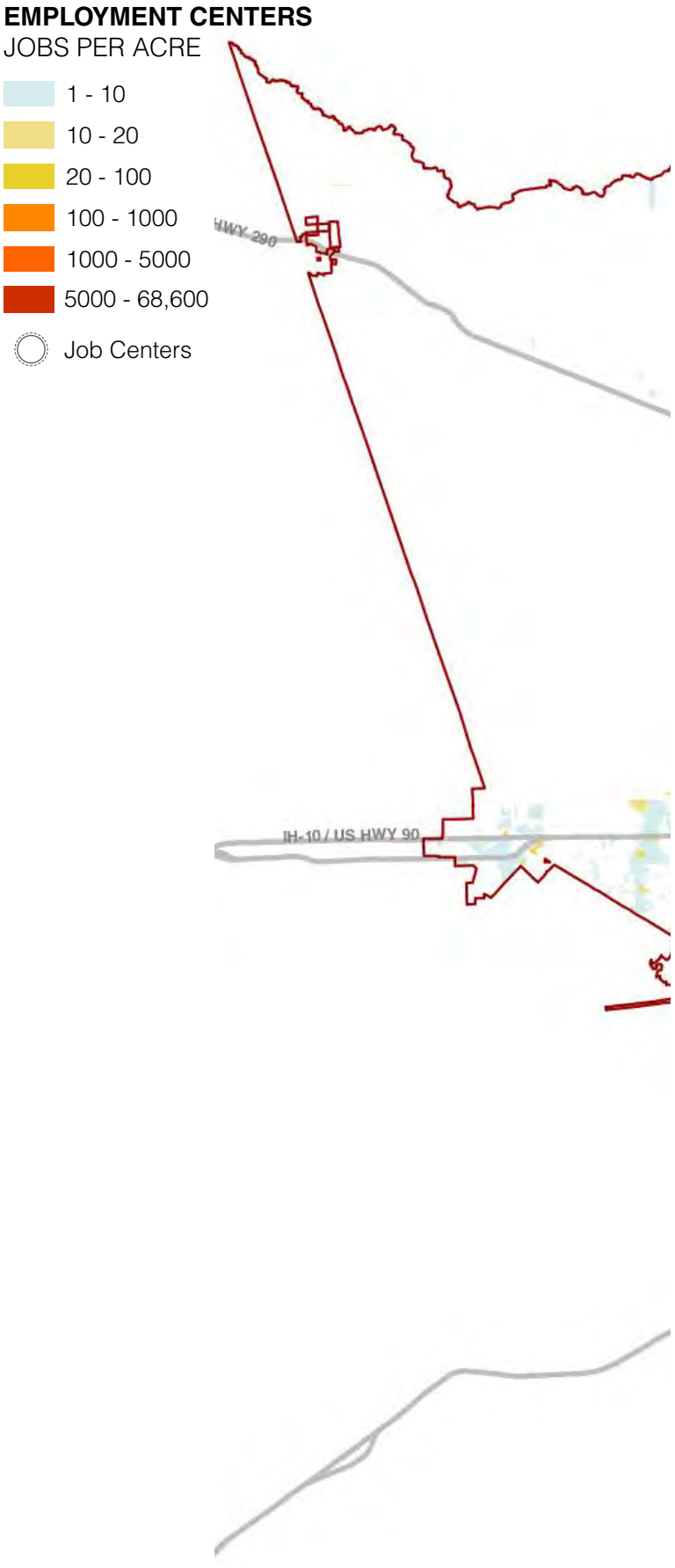
Figure 3.21: Land Use
Source: Houston-Galveston Area Council

Home-to-work trips make up a significant portion of trips on the METRO Transit System. The 2011 Origin Destination Passenger Survey shows that over 60% of trips have work as either the origin or destination. Figure 3.23 shows the employment density at a census block level and identifies major job centers within the METRO Service Area. As shown, employment in the METRO Service Area is more concentrated than population with a significant portion of jobs located within major job centers, though the job centers are relatively dispersed through the region. These major job centers serve as primary transit attractors for both the Park & Ride service and the local bus network.

METRO's current Park & Ride service provides connections to the four highest density job centers in the region, Downtown Houston, Texas Medical Center, Uptown and Greenway Plaza, with the majority of the service focused on Downtown Houston. These four centers account for over 25% of total jobs in the METRO Service Area. Currently all limited service connects to Downtown as well. These services represent attractive connections for cyclists who can access the Park & Rides and Transit Centers.

Several other large job centers, located further from the urban core of the service area, have major Park & Ride facilities or Transit Centers with direct limited bus service to Downtown. These represent opportunities for potential connections for what would traditionally be thought of as reverse commute trips, though most would require starting or connecting through Downtown. These centers include the Energy Corridor, Westchase, Memorial City, Greenspoint and Clear Lake/NASA, many of which continue to see significant development growth and increases in jobs. The development patterns in these centers tend to be more in line with traditional corporate campuses, so bicycle access can help bridge both longer walk distances and difficult to serve transit areas.

Major job centers are also well connected to the local bus and light rail network. High ridership routes like the 81/82 Westheimer, 2 Bellaire, 46 Gessner, 33 Post Oak and the 163 Fondren Limited all connect to one or several of the major employment centers. These routes also represent attractive options for cyclists due to factors like higher frequency, ability to travel long distances relatively quickly, and ability to cross barriers that may be challenging or indirect on a bicycle.



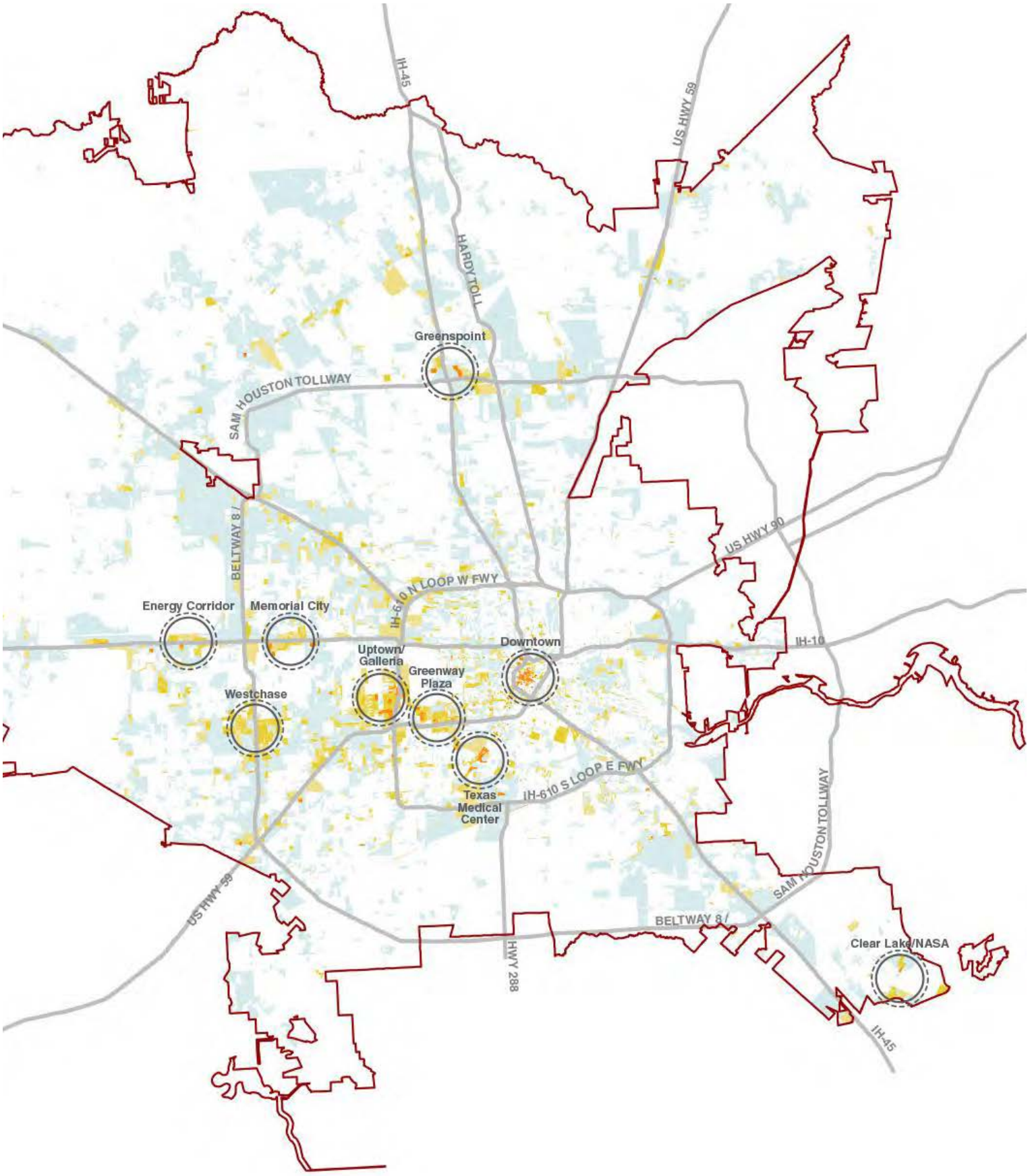


Figure 3.22: Employment Centers
Source: U.S. Bureau of Labor Statistics, 2010

POPULATION DENSITY
PEOPLE PER ACRE

- 0 - 5
- 5 - 10
- 10 - 20
- 20 - 40
- 40 - 90

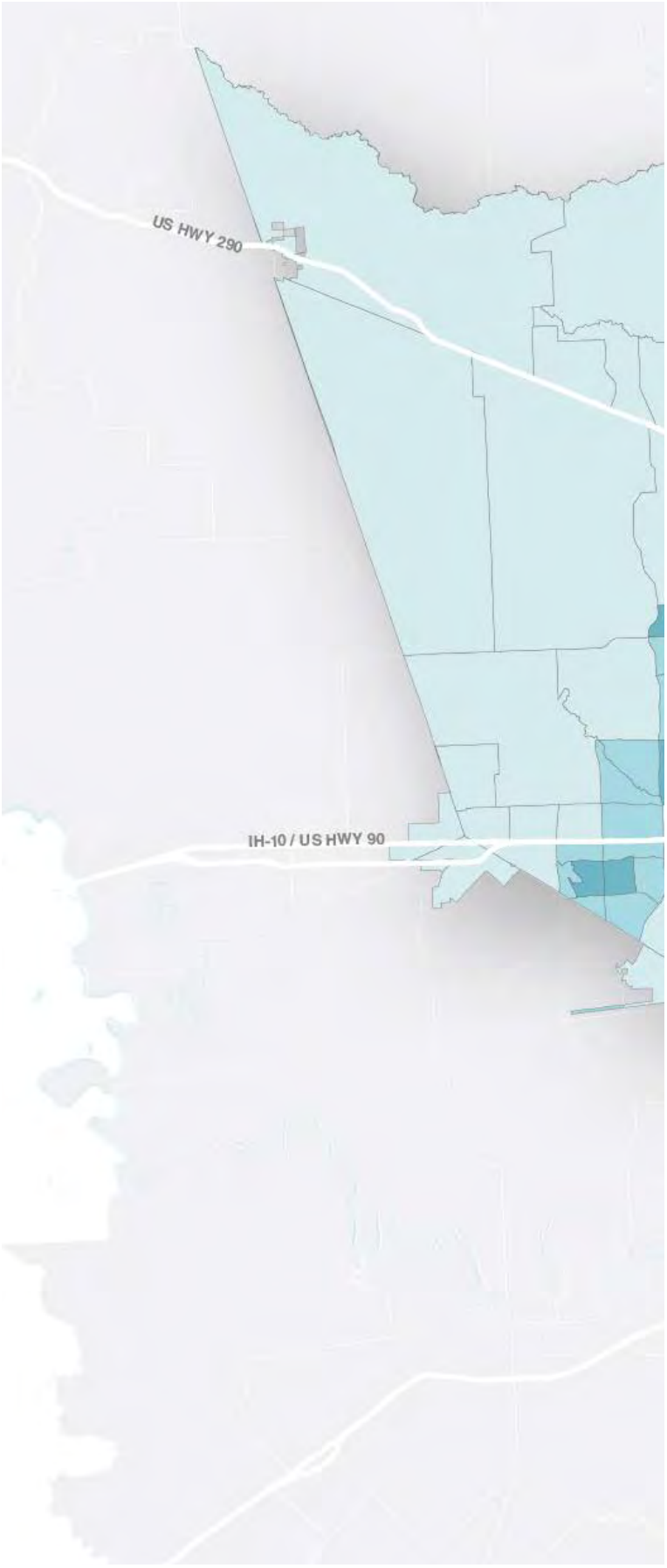


Table 3.3:
POPULATION AND DENSITY OF 5 LARGEST CITIES

CITY	RANK	POPULATION	DENSITY*
New York	1	8,175,133	27,012
Los Angeles	2	3,792,621	8,092
Chicago	3	2,695,598	11,342
Houston	4	2,099,451	3,501
Philadelphia	5	1,526,006	11,379

*persons per sq mile. source: 2010 census

POPULATION AND JOB DENSITY

Because most of the Houston area's growth occurred during the automotive age, the METRO service area has a much lower density than the other four largest American cities, though it is comparable to many of the large sun belt cities. At the same time, there is also significant variation in the population density throughout the region. The population density does not radiate out from the center, confounding, to some extent, the traditional city/suburb dichotomy. Indeed, many of the highest density census tracts lay west of the 610 loop, while there are numerous low-density census tracts, many with a high degree of industrial land use, within the east side of the inner loop. In other words, the population of the METRO study area, like that of its employment density, is significantly polycentric.

Bicycling helps facilitate the need to travel longer distances in cities with lower densities, whereas transit is easily accessible by walking in cities with higher densities.

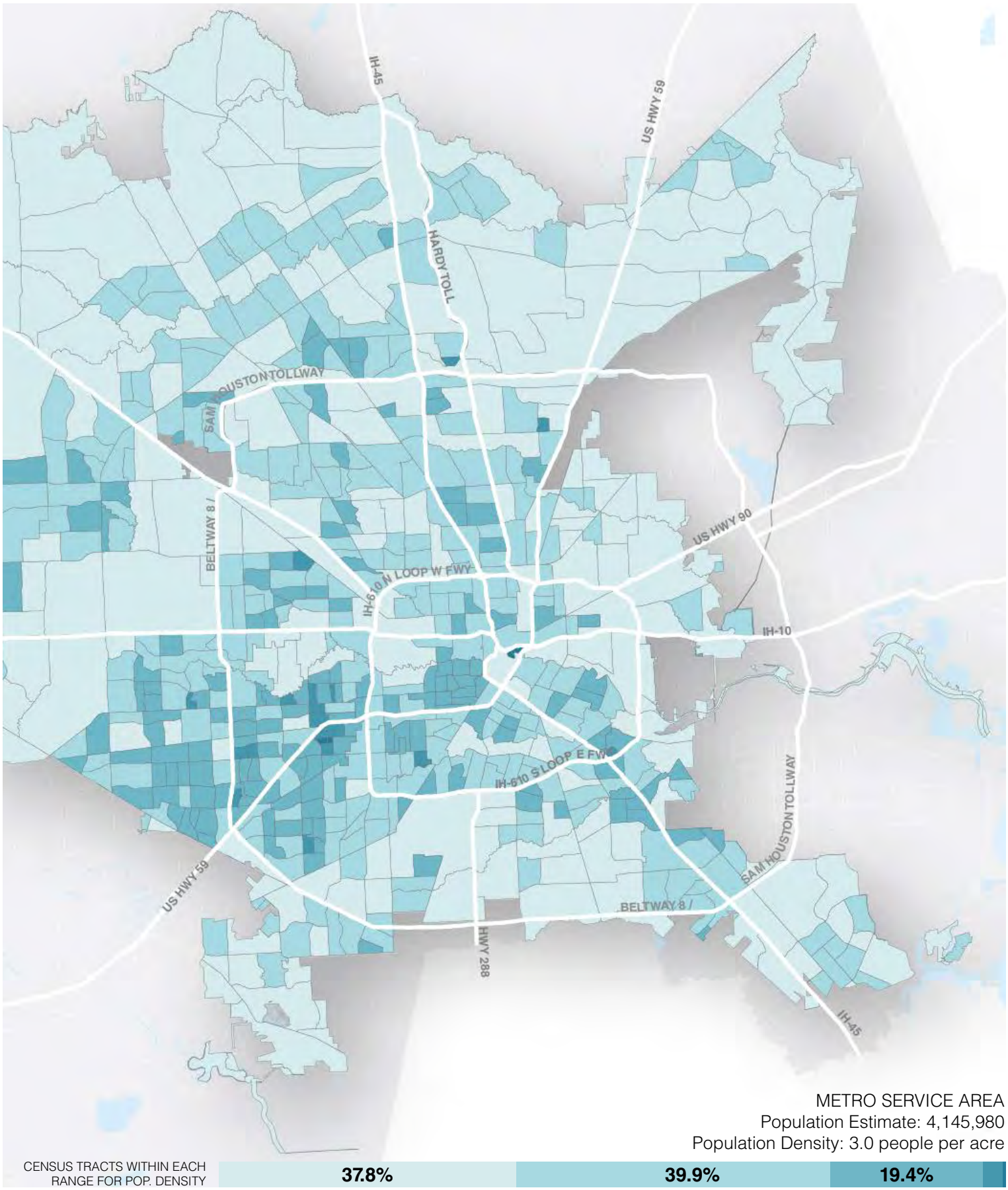


Figure 3.23: Population Density, METRO Service Area
Source: 2010 Census

RACIAL MAJORITIES
Per Census Tract

- MAJORITY WHITE
- MAJORITY BLACK / AFRICAN AMERICAN
- MAJORITY ASIAN
- NO MAJORITY

Despite its overall diversity, the METRO service area shows significant residential segregation. African-American census tracts are concentrated primarily on the east and southeast of the City of Houston, including traditionally African-American neighborhoods such as the Third and Fifth Wards. Outside of the 610 Loop, there are also several traditionally African-American cities long since annexed by the City of Houston, including Acres Homes and Independence Heights. Census tracts that are shown as having "no majority" are, in fact largely Hispanic, which is now shown in the US census as an ethnicity rather than a race.

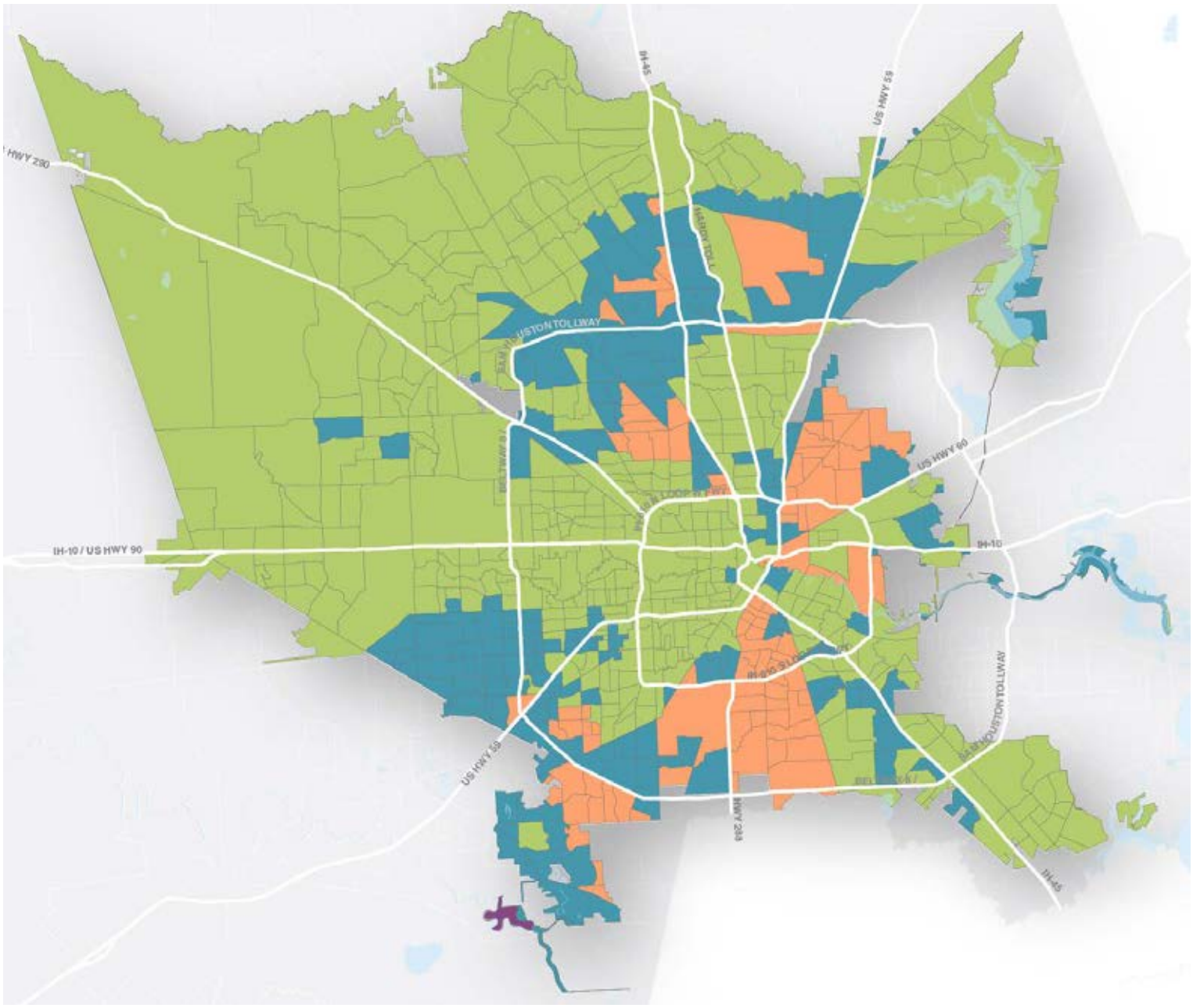


Figure 3.24: Racial Majorities, 2010 US Census

RACE & ETHNICITY

ETHNIC MAJORITIES
Per Census Tract

MAJORITY HISPANIC

Beginning with the 2010 Census, the US Census Bureau began listing Hispanic ancestry as an ethnic, rather than a racial, distinction. As such, residents of Hispanic origin would list both a race and ethnicity on the census. As people of Hispanic descent come from several racial categories, as well as a large group that does define their group as a racial category and as such selected “other,” it is necessary to show majority Hispanic tracts on a separate map. Hispanic population centers include traditional neighborhoods on the north and east of the city, as well as newer areas of settlement on the west.

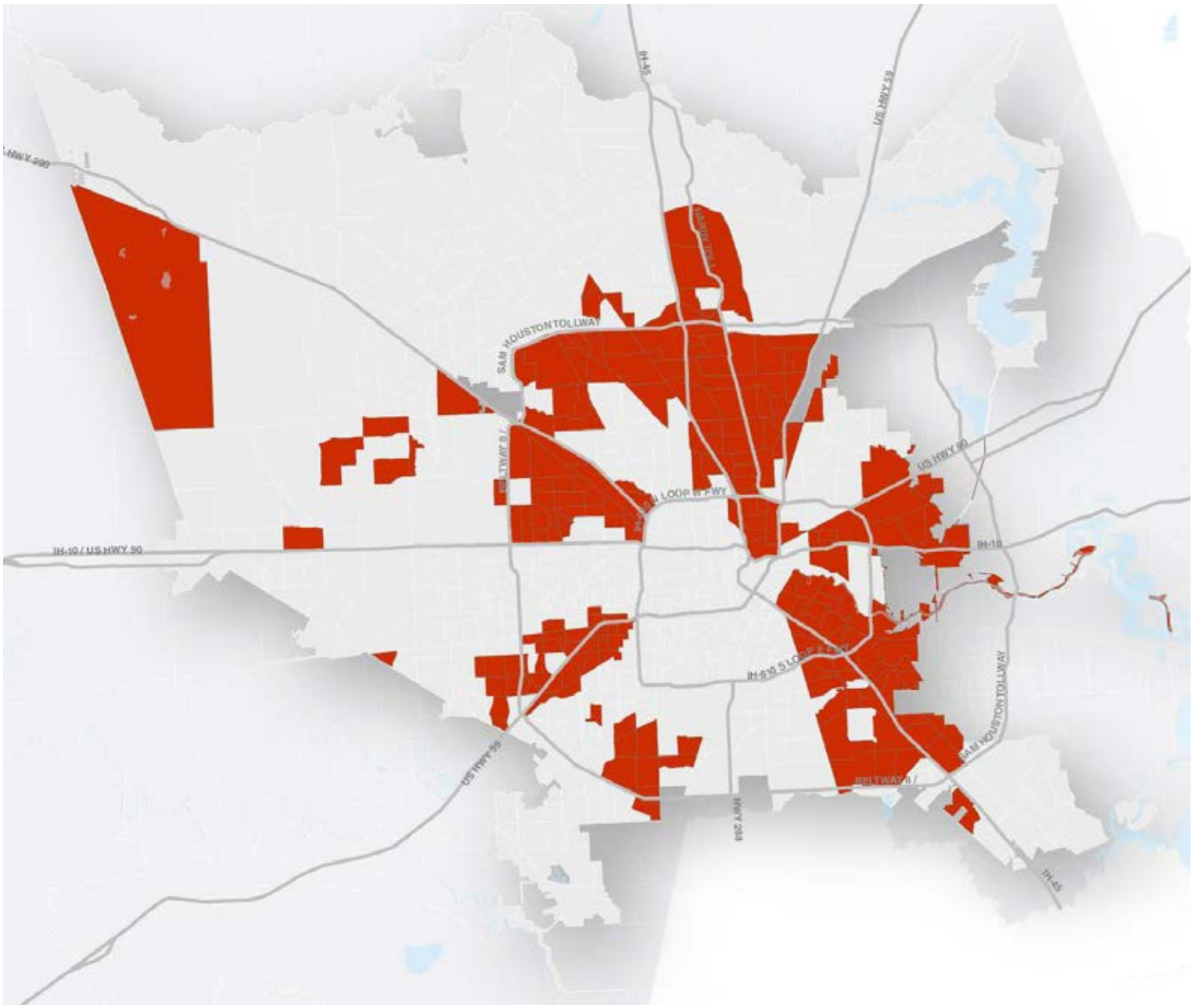
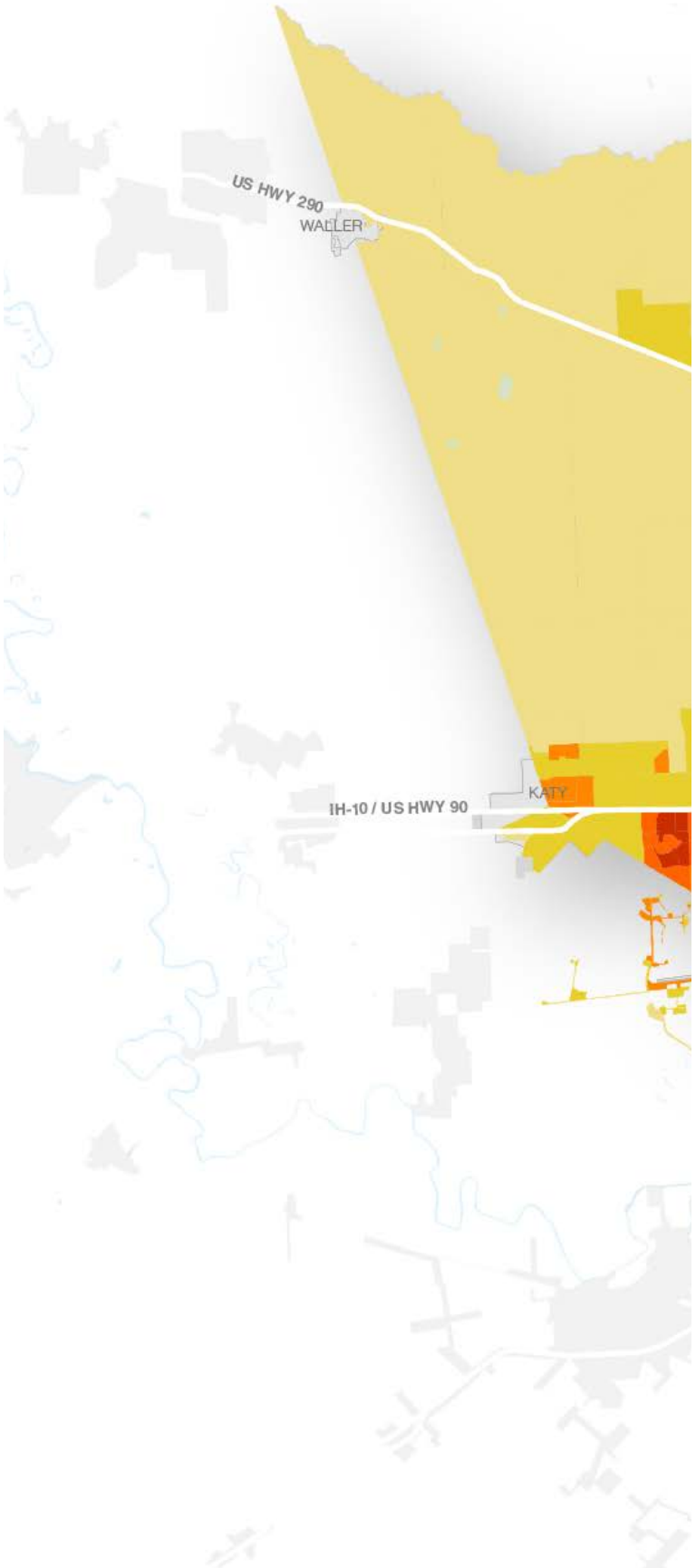


Figure 3.25: Ethnic Majorities, 2010 US Census

INTERSECTION DENSITY

Intersections per square mile

- 4.9 - 45
- 45.1 - 122.5
- 122.6 - 200
- 200.1 - 320
- 320 +



Intersection density is an increasingly common measure of the "connectedness" of a community. Generally speaking, a greater number of intersections indicates a grid pattern of streets and shorter block lengths, both of which are considered indicators of a general urbanity and can also signal greater ease for walking and biking trips (see Jane Jacobs, *The Death and Life of Great American Cities*, 1961). Medium densities of intersections are common in suburban areas with a greater number of cul-de-sacs and longer block lengths. The lowest density usually reflects rural road conditions with few roads and very long block lengths. Like the population density patterns for the study area, intersection density shows significant variation throughout the METRO Service Area with small patches of very good connection interspersed throughout.

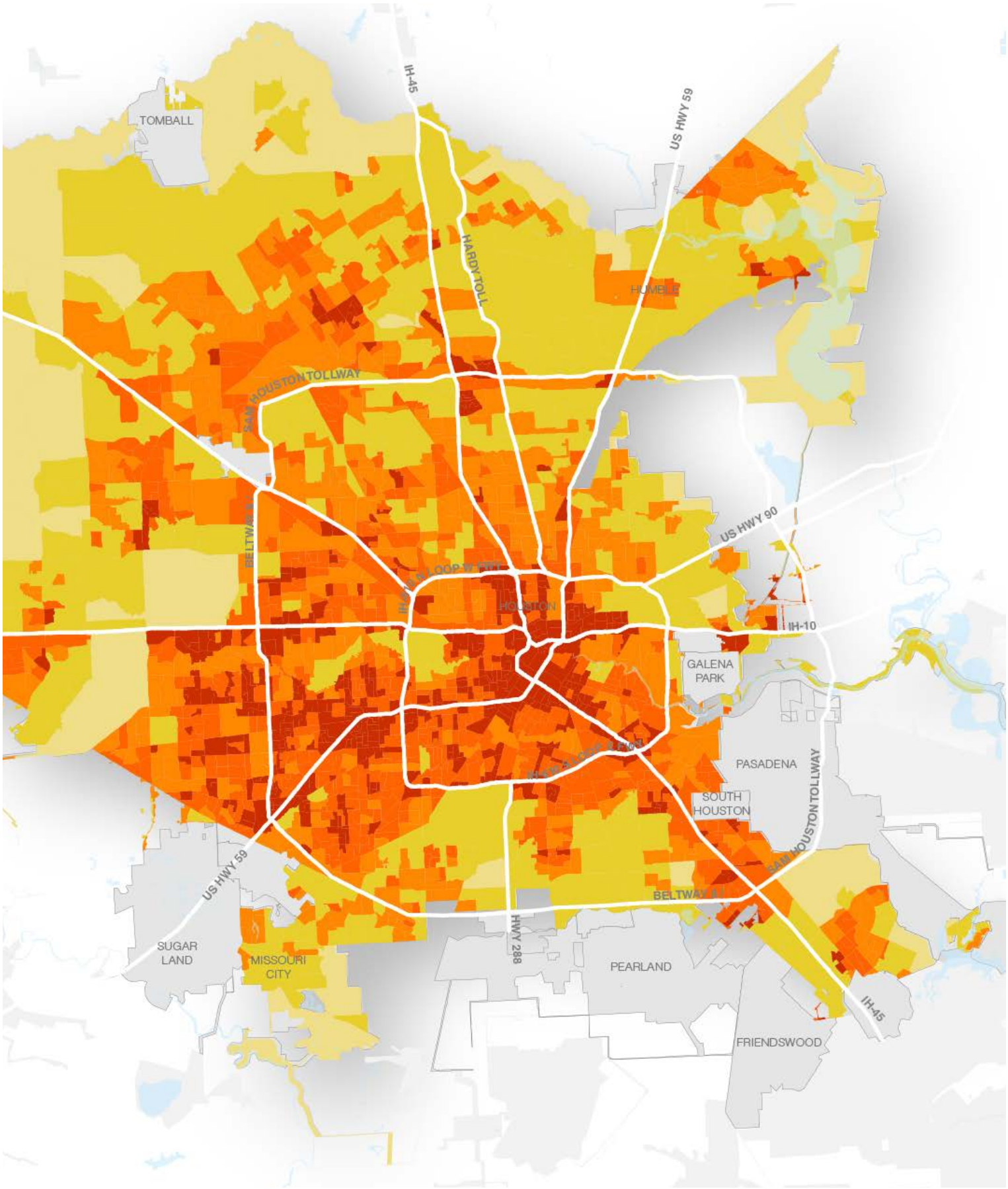
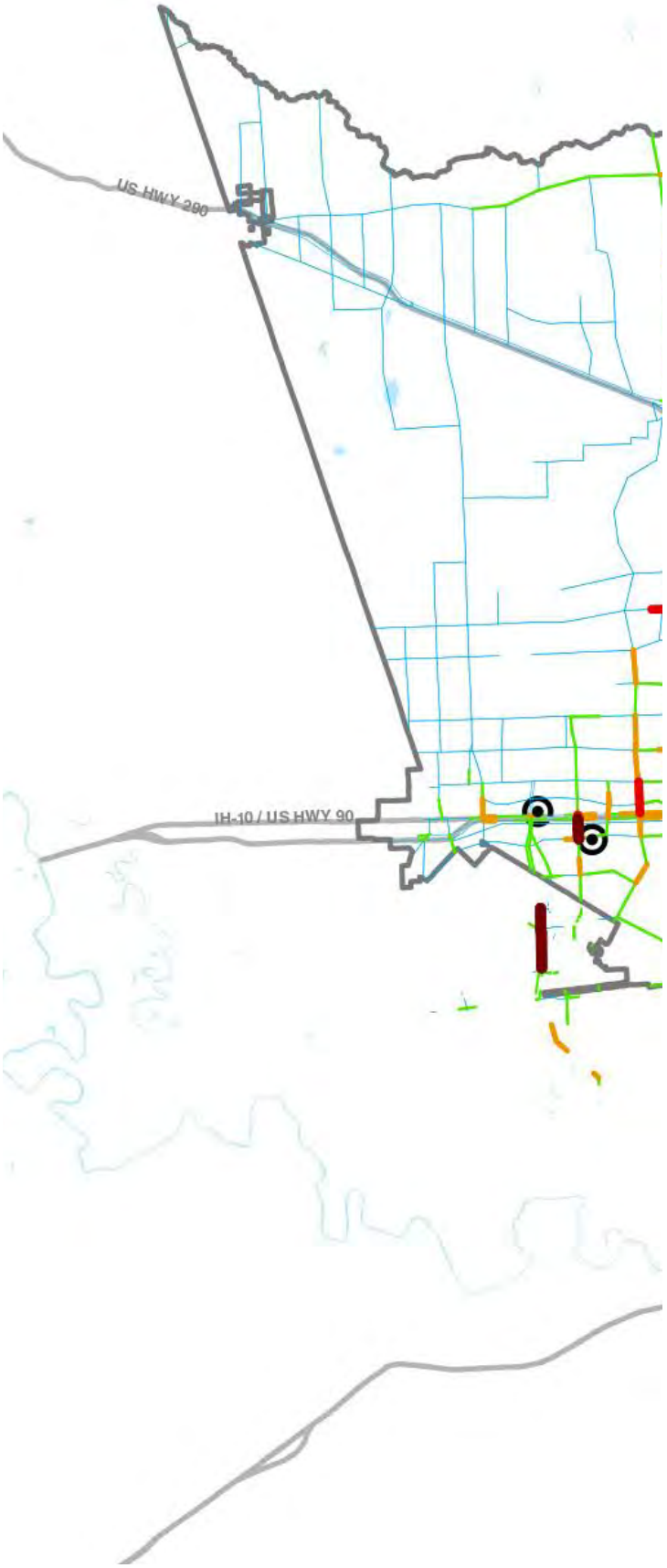


Figure 3.26: Intersection Density, Source: Houston-Galveston Area Council

H-GAC TRAVEL DEMAND MODEL

- 0 - 10,000
- 10,000 - 20,000
- 20,000 - 30,000
- 30,000 - 40,000
- 40,000+
- Transit Center
- Park & Ride



Traffic volumes are consistently highest in west and north Houston, corresponding to both higher population density and lower intersection density (which means that more cars will have to use fewer roads as a result of reduced connectivity). Inside the 610 Loop, roadways also carry more traffic on the west side because of high population density and high vehicular mode share. Focus group discussions and survey data both show a disinclination for bicycling on roadways with high traffic volumes.

To enable cycling throughout the region for cyclists with concerns for riding with vehicular traffic, the type and location of bicycle facilities must be sensitive to roadway volumes. On-street bicycle facilities such as bike lanes may be appropriate in neighborhoods with lower traffic volumes, such as Third Ward, the East End, Fifth Ward, and the Heights. In areas with roadways with higher traffic volumes, parallel routes along quieter neighborhood streets may be available for cyclists to use. Signage and wayfinding can help cyclists navigate these local streets to their final destination. Additional methods exist for emphasizing low-volume streets as “bicycle boulevards” such as restricting vehicular through-movements at major cross streets.

In many parts of the METRO service area, the local street network offers poor connectivity and few appropriate parallel routes to major roads. In some cases there may be opportunities to make connections in the local roadway network by filling minor gaps with bicycle-specific connectivity (such as a trail linking two adjacent cul-de-sacs). In other cases, major, high-volume roads may be the only public infrastructure that provides long-range connectivity suitable for bicycling. More extensive bicycle infrastructure such as sidepaths or cycle tracks may be necessary in these situations to provide a suitable level of comfort for the majority of prospective cyclists.

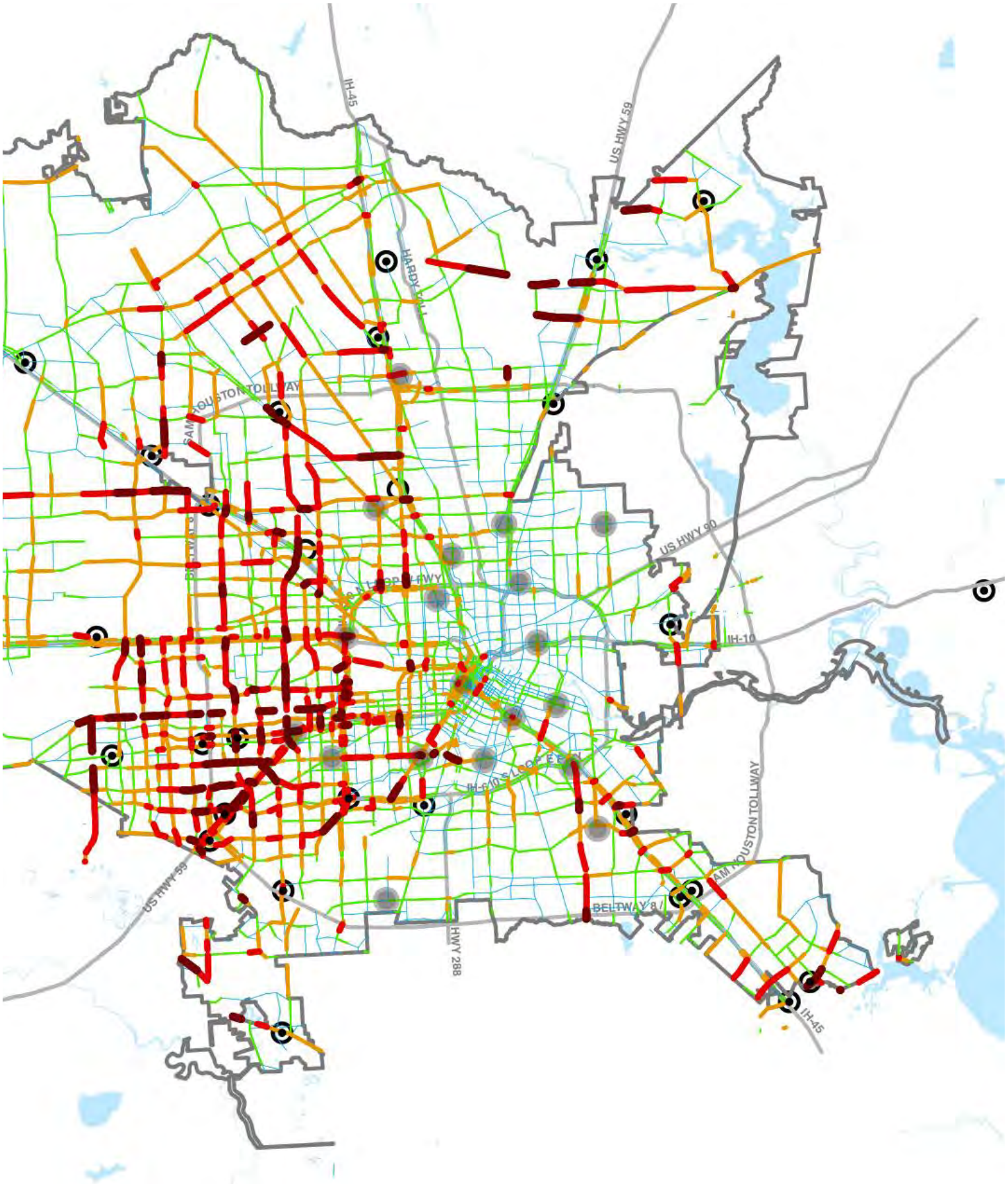


Figure 3.27: H-GAC Travel Demand Model
Source: Houston-Galveston Area Council Travel Demand Model

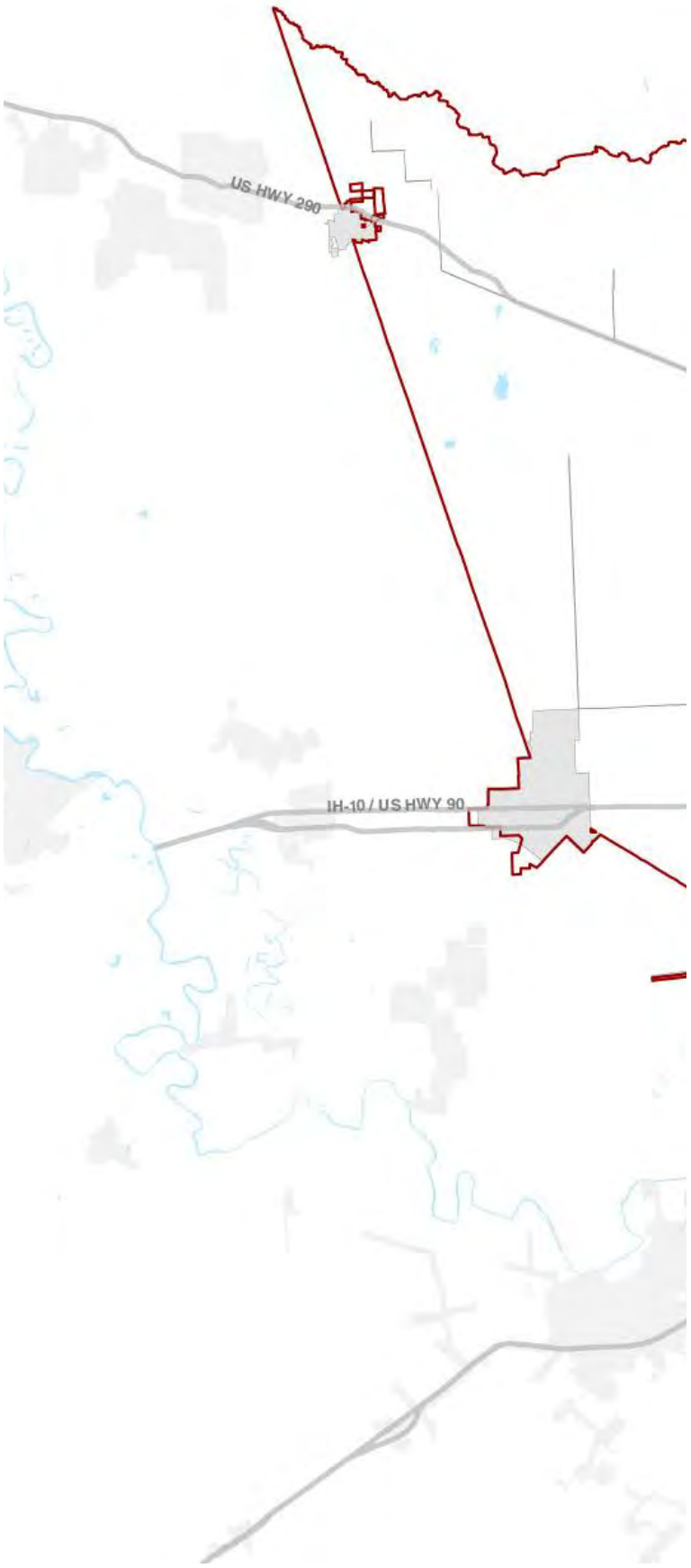
CRASHES INVOLVING PEDESTRIANS

JANUARY 2007 - JANUARY 2010

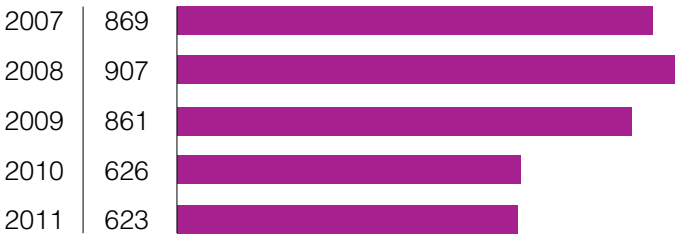
More Crashes

Fewer Crashes

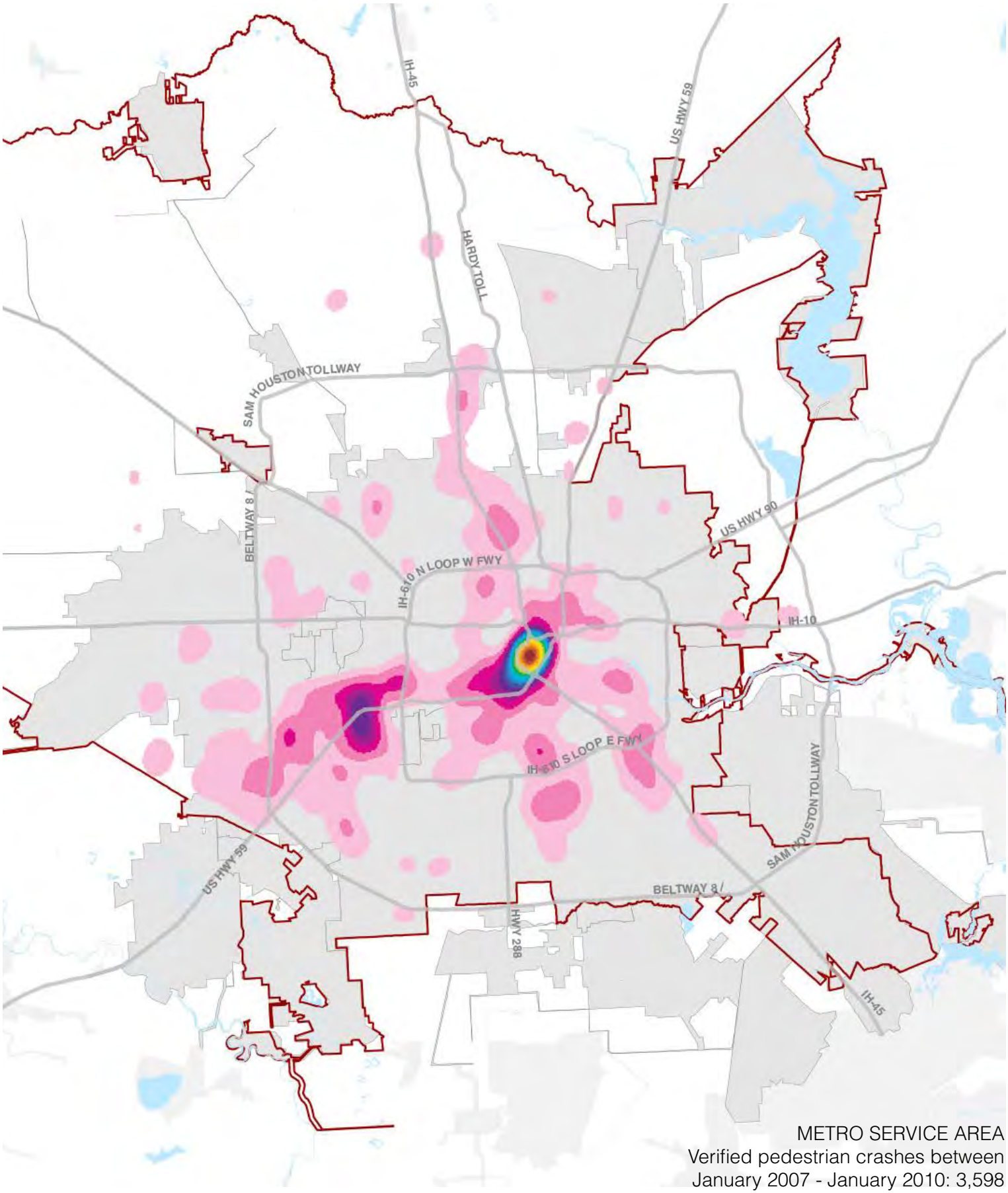
METRO Service Area



ANNUAL PEDESTRIAN CRASHES



Given the challenges in counting pedestrian activity within the METRO Service area, this heat map of pedestrian crash activity can stand in for areas of highest pedestrian activity (i.e. the more pedestrians that there are, the more likely there are to be conflicts). Downtown, Midtown, the Museum District have the highest concentrations of pedestrian incidents, as do the dense districts around Uptown and Southwest Houston (centered on Gulfton and Sharpstown neighborhoods), reflecting their high population densities and low degrees of connectivity and safe pedestrian amenities.



METRO SERVICE AREA
Verified pedestrian crashes between January 2007 - January 2010: 3,598

Figure 3.28: Crashes Involving Pedestrians
Source: TxDOT CRIS (Crash Records Information System), provided by H-GAC on 10/17/2012

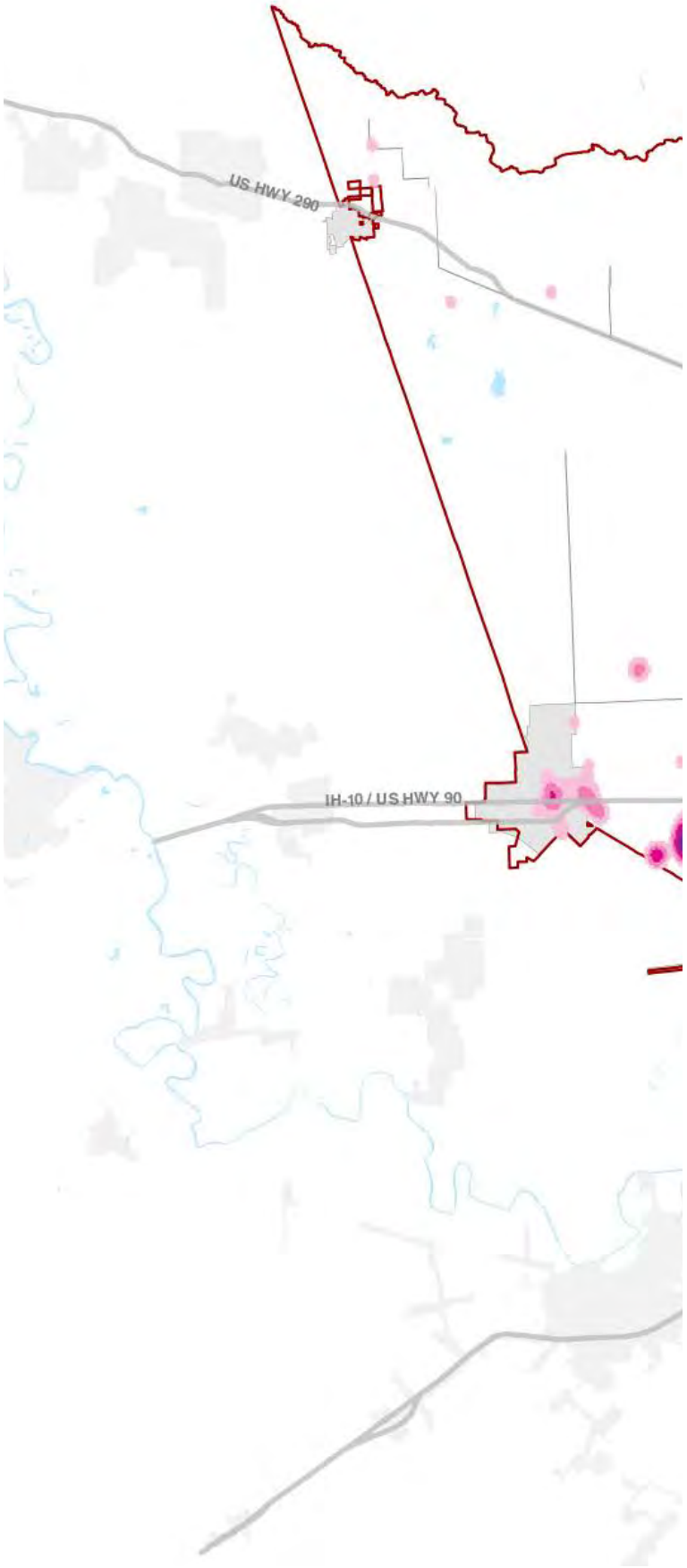
CRASHES INVOLVING BICYCLES

JANUARY 2007 - JANUARY 2010

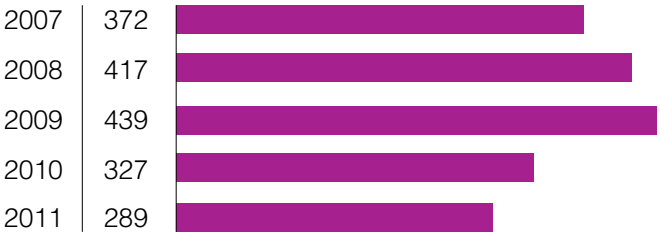
More Crashes

Fewer Crashes

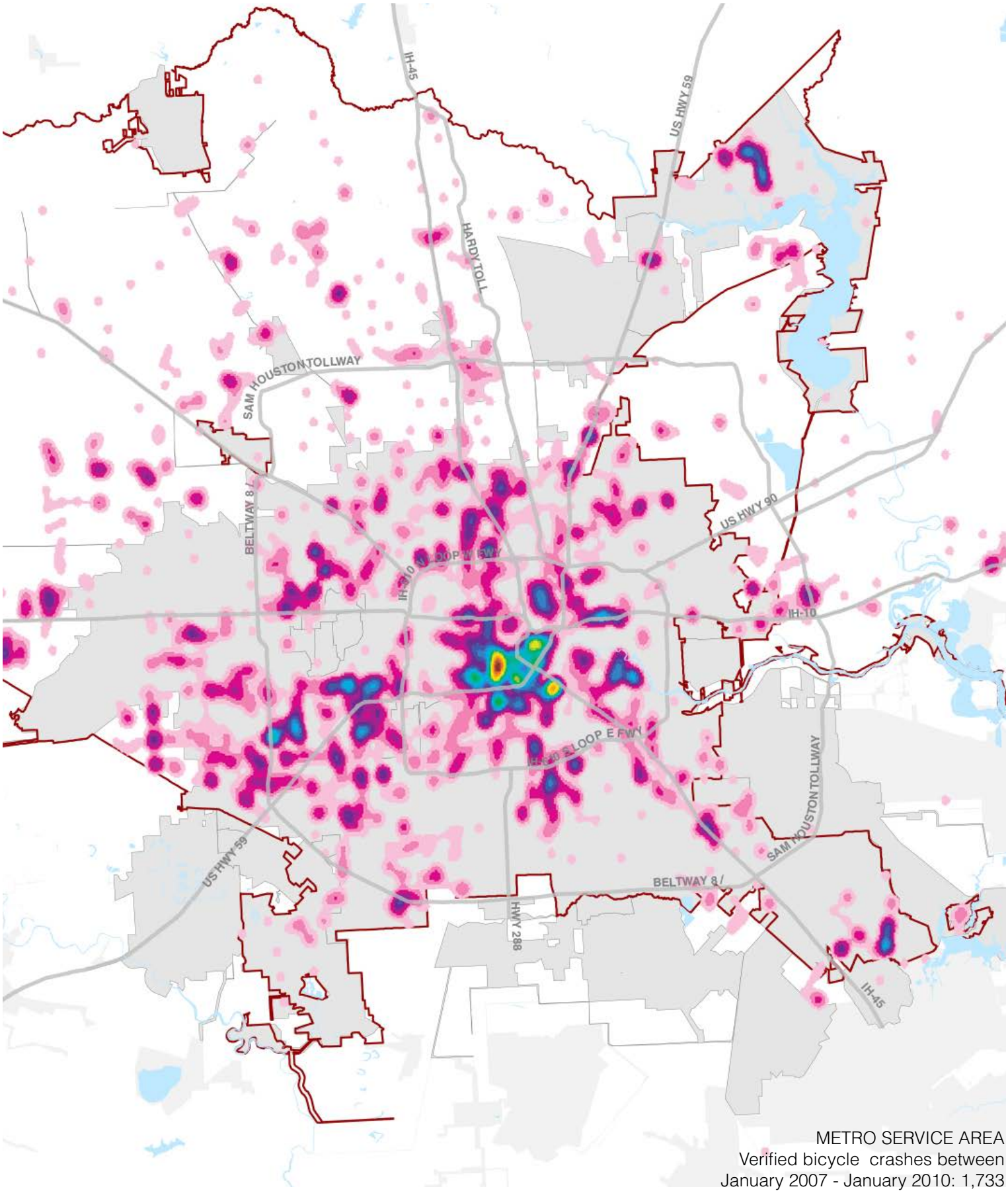
METRO Service Area



ANNUAL BICYCLE CRASHES



Likewise, this heat map of cycling incidents can stand in for areas of highest bicyclist activity. In this map, Montrose and Downtown stand out (corresponding well to the mode share map), but bicyclist incidents can be seen throughout the METRO Service Area. It is important to note that this does not mean that Montrose and Downtown are actually the most dangerous for cyclists, but could reflect a greater volume of cyclists in those areas.



METRO SERVICE AREA
Verified bicycle crashes between
January 2007 - January 2010: 1,733

Figure 3.29: Crashes Involving Bicyclists
Source: TxDOT CRIS (Crash Records Information System), provided by H-GAC on 10/17/2012

CHAPTER 4
ANALYSIS

The month-over-month increases of bicycles on buses suggests a latent demand for additional transit and cycling linkages.

However, because data regarding bike boardings are aggregated by line, conclusions regarding specific locations can be difficult to draw.

ANALYSIS METHODS

In order to understand what factors contribute to joint trips by bicycle and transit, a statistical analysis was used to determine how to predict bicycle boarding activity by route. While the availability of bike boarding data per transit stop would provide greater insight to ridership patterns, boarding data are collected by route. Therefore, it is difficult to ascertain whether specific streets or neighborhoods experience a higher concentration of bike boardings. However, by comparing route characteristics to the demographics and densities they pass through (see Regression Analysis on page 56), correlations become evident, such as the prevalence of greater numbers of bike boardings in low income areas or along frequent bus service.

A buffer was drawn at a mile radius of each local route in order to analyze the data per census tract within a mile of each route. Then a regression analysis was performed to determine if the number of bike boardings per route are correlated with commute mode, population density, race, age, income, job density, or route frequency. The following data were used in the analysis:

1. Bike boardings by bus route for FY 2012
2. Demographic characteristics for each of the variables explored in the existing conditions section of this report for a one-mile buffer along each local and express bus route from the 2010 Census
3. Bus revenue miles and headways from the August 2012 Summaries of Schedules

An index was created with the following data sets to ensure consistent figures when representing the data. These data sets were calculated for one-mile buffers of both local and express bus routes, and "transit nodes" (Transit Centers, Park & Rides, and METRORail stations). The data ranges are shown on the opposite page, and larger maps can be referenced in Appendix II.

1. Commute By Driving
   Areas of the METRO service area with a high proportion of residents that commute by driving alone may have land uses and roadway configurations that prioritize the convenience of driving for trips to work because of characteristics such as low density housing developments, distance to job centers or lack of access to transit or safe bicycle infrastructure. Census tracts with a low percentage of commuters that drive alone (5.3 - 55%) are given a five on the Commute Index, meaning that a larger proportion of people choose other modes of commuting to work (such as transit, bicycling, carpooling, or walking) and potentially other trips.

2. Population Density
   Census tracts with higher population densities are often easier to serve by transit, because walking and biking distances for connecting to transit are inherently shorter. The analysis results confirm this with a positive relationship between population density and bike boarding productivity. Census tracts with a high population density (40-90 people/acre) are given a five on the Population Index.

3. Percent White (Race)
   There are correlations between concentrations of people of varying race or ethnicity and use of transit or bicycling to connect to transit, as evident in METRO's 2011 Origin Destination Passenger Survey. For example, while the greatest proportion of overall transit riders are black (46%, compared to 24% white), the percentages of ridership connecting by bicycle are very similar for each race (35% white and 34% black). Census tracts with a high percentage of white population (75-100%) are given a one on the Race Index.

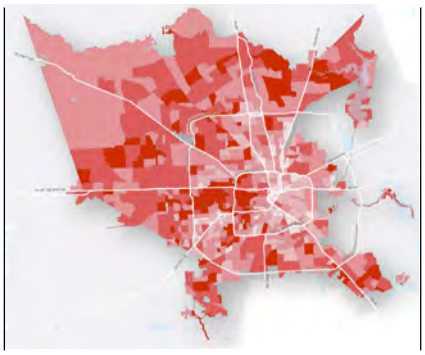
4. Median Age
   Bicyclists connecting to transit are well distributed across age groups, as seen in the results from the 2011 Origin Destination Passenger Survey. Age groups with the highest percentage of bicyclist passengers are ages 19-29 (24%), 40-49 (25%), and 50-59 (26%). Census tracts with a high median age (43+ years) are given a one on the Age Index.

5. Median Annual Income
   Bicycling and transit serve as an affordable transportation option for people earning lower incomes, either as a primary mode or to provide flexibility for families with multiple workers in the household. The analysis results confirm this with a positive relationship between numbers of low income households and bike boarding productivity. Census tracts with a low median annual income (under $40,000) are given a five on the Income Index.

6. Job Density
   Areas with high job densities must provide transportation accommodations for a large number of employees traveling into the area on weekdays. Efficient transit can reduce traffic congestion, reduce the need for parking, and create more efficiency in those job centers. Because job centers are concentrated, rather than spread along corridors, most routes have a low index reference overall. Census tracts with a high concentration of jobs (75+ jobs/acre) are given a five on the Job Density Index. Downtown Houston is the most prominent job center, while other concentrations can be seen in Figure 4.1.

INDEX REFERENCES

1. COMMUTE BY DRIVING



Index Reference

1	85 - 100%
2	80 - 85%
3	70 - 80%
4	55 - 70%
5	5.3 - 55%

Census tracts that have a lower percentage of individuals that commute by driving alone have a greater percentage of those who commute by other modes, including carpooling, transit, walking and bicycling.

See Appendix II for a larger map.

2. POPULATION DENSITY

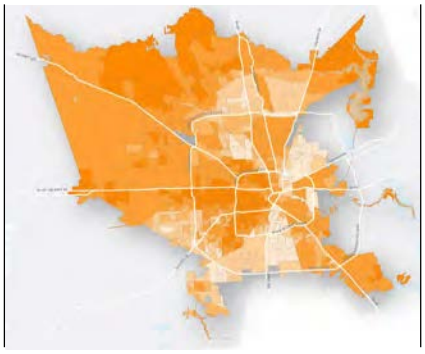
Index Reference

1	0-5 people/acre
2	5-10
3	10-20
4	20-40
5	40-90

Census tracts with higher population densities are often easier to serve by transit, where walking and biking distances are reduced for connecting to transit.

See Appendix II for a larger map.

3. PERCENT WHITE (RACE)



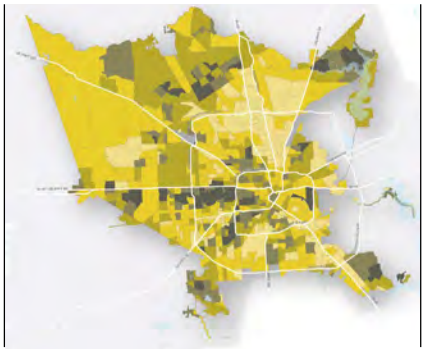
Index Reference

1	75 - 100%
2	50 - 75%
3	40 - 50%
4	20 - 40%
5	0 - 20%

Based on O/D Survey data, bicyclists accessing transit are in rough proportion to service area population. It is important to ensure that all communities are receiving adequate service and infrastructure to accommodate bicycle connections.

See Appendix II for a larger map.

4. MEDIAN AGE



Index Reference

1	43+ years
2	38 - 43
3	33 - 38
4	29 - 33
5	20.6 - 29

According to METRO's 2011 Origin Destination Passenger Survey, the age groups with the highest percentage of bicyclist passengers are ages 19-29 (24%), 40-49 (25%), and 50-59 (26%).

See Appendix II for a larger map.

5. MEDIAN ANNUAL INCOME

Index Reference

1	$145,000-215,000
2	$100,000-145,000
3	$65,000-100,000
4	$40,000-65,000
5	Under $40,000

Low-income areas produce a high proportion of bicyclists connecting to transit. According to METRO's 2011 Origin Destination Passenger Survey, 54% of bicyclist passengers have an annual income of less than $32,000.

See Appendix II for a larger map.

6. JOB DENSITY

Index Reference

1	0-5 jobs/acre
2	2-15
3	15-45
4	43-75
5	75+

Because job centers are highly concentrated rather than distributed along transit lines, most routes have a low index reference. However, the node index in the Recommendations section presents opportunities where Transit Centers, Park & Rides, and METRORail stations are within the catchment area for bicyclists.

See Appendix II for a larger map with job densities per block group.

Figure 4.1: Index References

Descriptive Statistics

In an analysis of local bus routes, an average of 4.43 bike boardings per 1,000 revenue miles, and 5.62 bike boardings per 100 revenue hours was calculated. The descriptive statistics for the sample are in Table 4.1. Local Bus Route Bike Boarding Performance. Some routes have better bike boarding performance then others, as seen in the comparison between the minimum and maximum values. This range becomes telling in the regression analysis to determine why some perform better than others.

Table 4.1. Local Bus Route Bike Boarding Performance

	Annual Bike Boardings	Bike Boardings / 1,000 Revenue Miles	Bike Boardings / 100 Revenue Hours
Average	2,355	4.43	5.62
Minimum Value	86	0.75	1.00
Maximum Value	7,607	10.50	12.93
Standard Deviation	1,878	2.09	2.85

Regression Analysis

A series of combinations of independent variables were tested against two different dependent variables: bike boardings per 1,000 revenue miles and bike boardings per 100 revenue hours. The results are stronger in predictive power using revenue miles than revenue hours, therefore those are the results presented here.

For bike boardings per 1,000 revenue miles, a productivity factor was used rather than gross bike boardings per route, so that pure volume of service did not dominate the analysis. The total boardings per route are mostly a function of the amount of service on a route; the boardings per 1,000 revenue miles shows instead how many bike boardings are generated **per unit of service.** As such, the factors other than total volume (if any) that contribute to differing bike productivity per route can be explored. The full regression analysis results may be referenced in Appendix III.

FINDINGS

The following variables are statistically significant in predicting bike boardings per 1,000 revenue miles. They are NOT listed in order of impact or significance. All are highly statistically significant, and each is discussed in more detail below.

1. PM peak hour headways
2. Population density
3. Percentage of residents who are white
4. Median household income
5. Use of alternative mode for commuting

Median population age and job density were also tested, but neither showed statistically significant predictive power.

PM Peak Hour Headways

The relationship here is negative—i.e., the shorter the headway (or the more frequent the service), the higher the number of bike boardings per revenue mile. In other words, more frequent service generates even more bike boardings than would be proportionate to the number of miles of service. This effect may be due to a number of reasons, including:

- More frequent service is more attractive to all riders, bicyclists included.
- The more frequent the service, the less of a penalty accrues to a bicyclist who encounters a bus with a full bike rack.
- With less frequent service, bicyclists may find it quicker to simply complete the trip on bike rather than wait for a bus.

BIKE BOARDINGS ON LOCAL BUS ROUTES
October 2011 - September 2012

- 0 - 1,000 Bike Boardings
- 1,001 - 2,000 Bike Boardings
- 2,001 - 4,000 Bike Boardings
- 4,001 - 7,607 Bike Boardings
- METRO Service Area
- Transit Centers

1. Acres Homes
2. Bellaire
3. Downtown
4. Eastwood
5. Fifth Ward / Denver Harbor
6. Greenspoint
7. Gulfate
8. Heights
9. Hillcroft
10. Hiram Clarke
11. Hobby
12. Kashmere
13. Magnolia
14. Mesa
15. Northline
16. Northwest
17. Southeast
18. Tidwell
19. TMC
20. Wheeler

Figure 4.2: Bike Boardings on Local Bus Routes (FY 2012)
Source: METRO

N

0 5 10 20 MILES

Population Density

The relationship between population density and bike boardings productivity is positive. The higher the density along a bus route, the higher the bike boardings per 1000 revenue miles. Higher population densities around a transit route provide a larger number of people to draw from. Within the local bus service, bicycles are not as heavily used for connecting to transit in low density areas. Typically low density residential developments do not receive high levels of local service, but residents may be connecting to Park & Ride lots to access METRO services. However, Park & Ride services are not included in the regression analysis.

Racial Demographic

The relationship between the percentage of white residents and bike boardings productivity is positive, i.e., the more white residents, the higher the bike boardings/1000 revenue miles. The 2011 Origin Destination Passenger Survey conducted by METRO supports this conclusion, reporting that 35% of bicyclists passengers were white, 34% black or African-American, and 24% Latino or Hispanic, while the black or African-American population has the greatest number of overall passengers, making up 46% compared to 24% white and 21% Latino or Hispanic. Although this is a higher percentage of white riders, it is in proportion to percentages in the overall population. As noted above, the O/D survey data may undercount non-english speaking riders. It is likely that the racial disproportion of bicyclists connecting to transit as compared to the general ridership is a consequence of culture, infrastructure, and service. However, it is advised that METRO be proactive in building long-term partnerships throughout the service area, including multi-cultural communities and organizations that promote bicycling, active and sustainable transportation. This would give METRO the opportunity to educate the public on the services provided, including the expansion of bicycle facilities, and the benefits of using transit.

Median Household Income

The relationship between average household income and bike boardings productivity is negative. The higher the median household incomes along a bus route, the lower the bike boardings per 1000 revenue miles. If people with lower incomes are relying on the use of bicycles and transit for transportation, proper connections must be made in communities with a concentration of low-income households.

Median Population Age

Median age was not a significant independent variable, perhaps because the median ages of populations across the various bus routes are not varied enough to allow a pattern to emerge. However, the household income variable might be capturing part of this effect, as younger residents are generally less affluent than middle aged residents.

Alternative Mode for Commuting

The relationship is negative. The higher the percentage of commuters using an alternative mode, the lower the bike boarding/1000 revenue miles. The relationship between the average percentage of residents along a route that used an alternative mode of transportation for commuting (walk, bike, transit, carpool, or vanpool) and bike boardings productivity is opposite what might be expected. However, this result may be due to the aggregation of data by line, as discussed previously. The representation of this data in the Commute Index in the Recommendations Section may still provide insight to the transportation patterns immediately adjacent to the Transit Nodes.

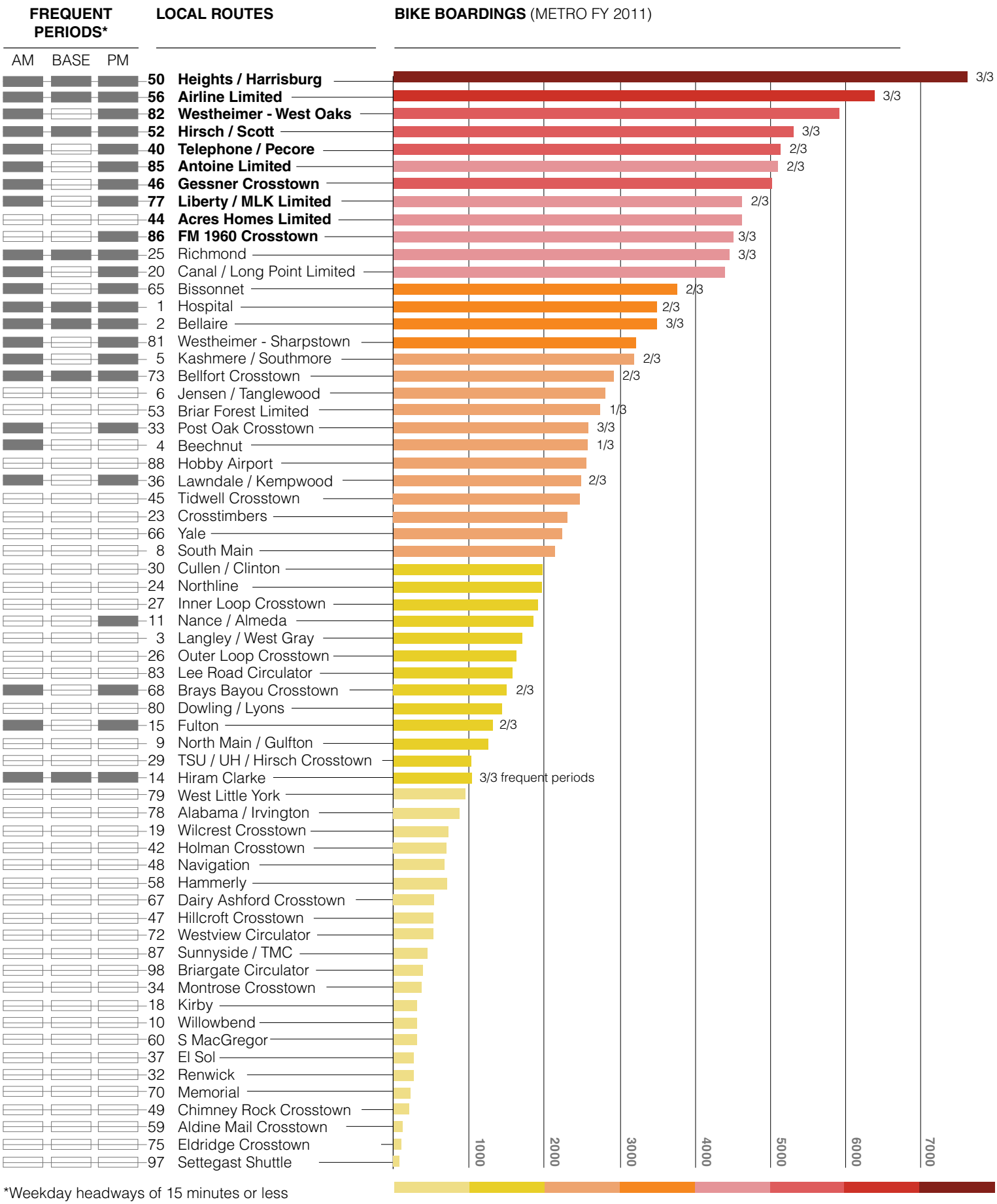
Frequency of Service and Bike Boardings

As shown in the Figure 4.3, top routes for bike boarding have some common characteristics. Most high boarding routes have high frequency of bus arrivals (15 minutes or less) for most or all of the day. From a bike rider's point of view, this is beneficial as high frequency reduces the average wait time at a stop for the next bus. If the bus arrivals are low frequency, the likelihood that a cyclist could bike to their destination becomes greater. If they can arrive more quickly by bike, it reduces the benefit of the bus portion of the trip.

Another characteristic of high bike boarding routes is that many of the stronger performers have some segment of express service. The 56 Airline Limited, the 20 Long Point Limited, and the 85 Antoine Limited all provide some local service and then travel express on the freeway to Downtown. This service can be attractive to a cyclist who would like to cycle part of their trip or have their bike to complete their trip from Downtown, but do not want to ride the entire length of the trip. This can also be a useful way for a cyclist to overcome barriers like freeway or rail crossings, a common point of feedback from stakeholders and focus group members.

Most of the top performing routes are also long routes (15 to 20 miles), a distance that may not be comfortable or time-efficient to bike. Many of the low performing routes are among the shortest routes in the system. These routes do not cover a sufficient distance or come frequently enough that they provide an effective value proposition to cyclists.

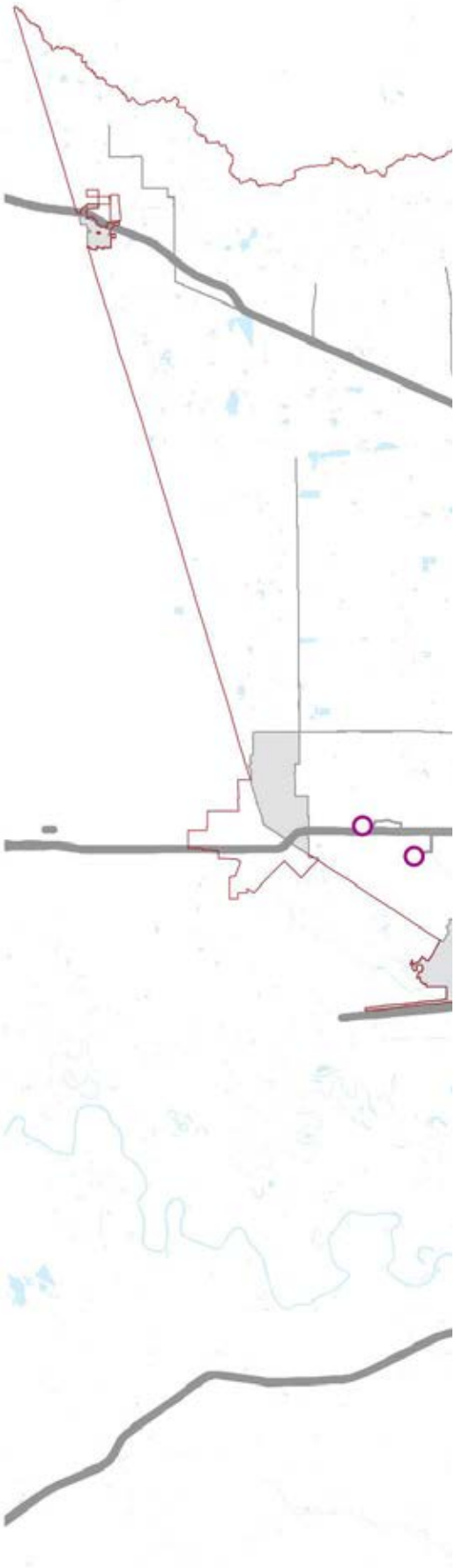
Figure 4.3. Local Bus Frequency and Bike Boardings



*Weekday headways of 15 minutes or less

TRANSIT FREQUENCY

- Frequent transit routes: Every 15 minutes or less
- Peak-hour frequent routes: Every 15 minutes or less
- Red Line and North Extension (2013)
- Green Line (2014)
- Purple Line (2014)
- Park & Ride
- Transit Center
- Incorporated Cities
- METRO Service Area



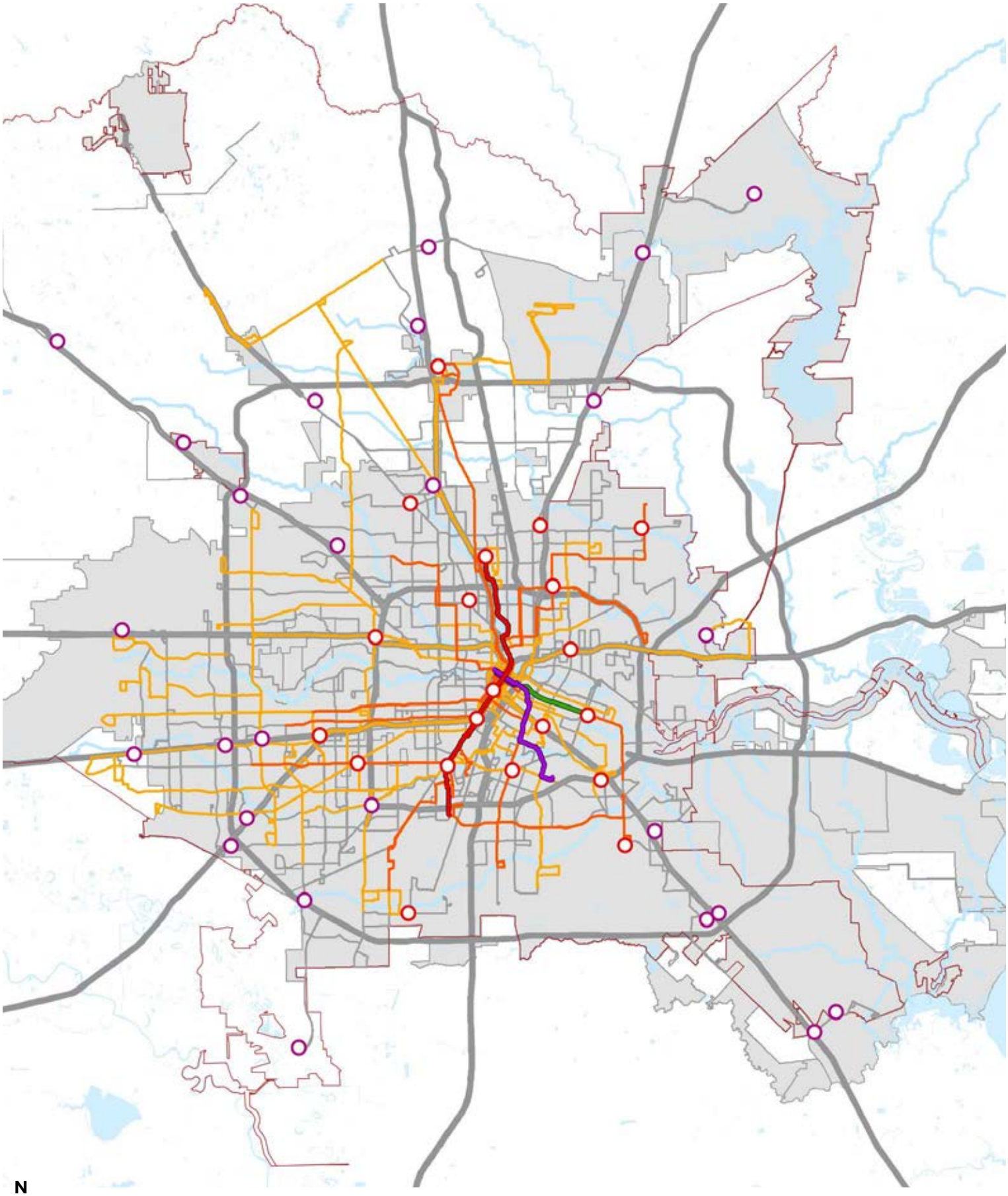


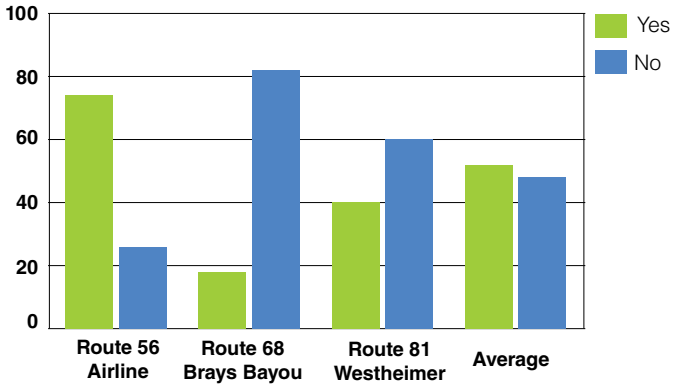
Figure 4.4: METRO Frequent Transit Map
Source: METRO, Houston-Galveston Area Council

METRO BIKE AND RIDE ON-BOARD BUS SURVEY

In the Spring of 2013, METRO surveyed passengers boarding the 56 Airline Limited, 68 Brays Bayou Crosstown, and 81 Westheimer routes. Responses were received from 417 passengers—193 from the 56 Airline, 67 for the 68 Brays Bayou Crosstown, and 163 from the 81 Westheimer.

In terms of bike boardings per revenue hour of service, the 56 Airline has very high bike ridership (more than twice the systemwide average), the 81 Westheimer is an average route, and the 68 Brays Bayou Crosstown is a low bike ridership route (about half the systemwide average). Slightly more than half of the respondents were male, and about 12% of the surveys were completed in Spanish.

Figure 4.5: Biking with METRO to Complete Trip

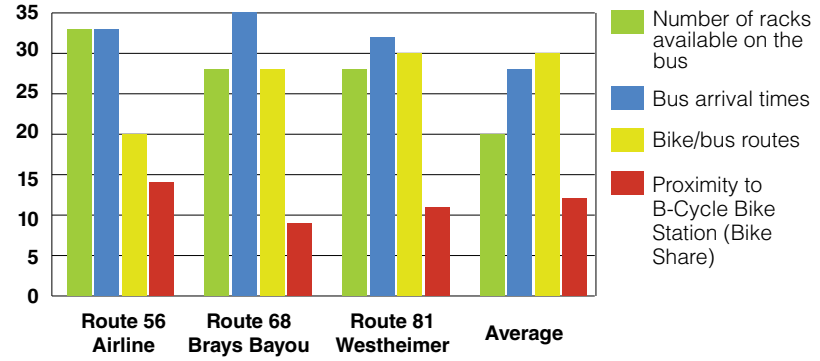


Combine Biking with METRO to Complete Trip

Responses to this question varied significantly across routes, reflecting the different rates of bike boardings across these three routes.

While all passengers were offered surveys, the percentage of respondents who combine bikes and transit for some trips was very high, indicating that this group was more likely to respond.

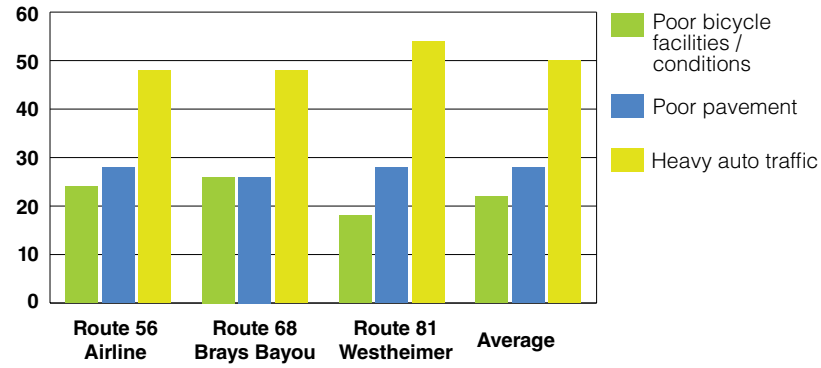
Figure 4.6: Desired Information on Bike-to-METRO



Desired Information on Bike-to-METRO

Bus arrival times were cited most frequently as desired information to help the respondents connect their bike and transit trips, information that is helpful to all transit riders. The respondents on the 56 Airline route cited knowledge of bike space availability on the next bus as just as important as bus arrival times, while this information was cited slightly less often on the other routes. As riders on the route with the highest bike boarding productivity of the surveyed routes, the 56 Airline respondents may be more likely to have encountered full racks than riders on the other routes and, therefore, understand the importance of this information. Respondents would also find combined bike/bus route information helpful.

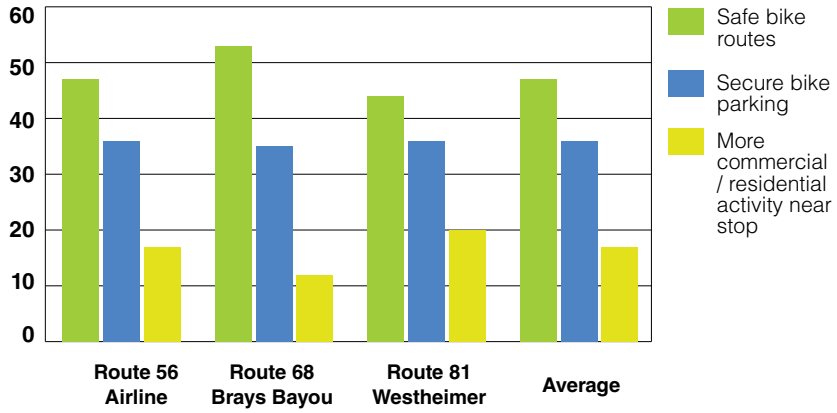
Figure 4.7: Barriers to Combining Biking with METRO



Barriers to Combining Biking with METRO

Responses indicate that about three-quarters of the respondents indicated that the main barriers to biking to transit are not in METRO's control (pavement condition and auto traffic). These concerns appear almost equally across all three bus routes surveyed, even though the use of bike to METRO across the routes does vary significantly. This suggests that METRO will need to be pro-active in building partnerships with cities and other agencies in order to achieve desired improvements.

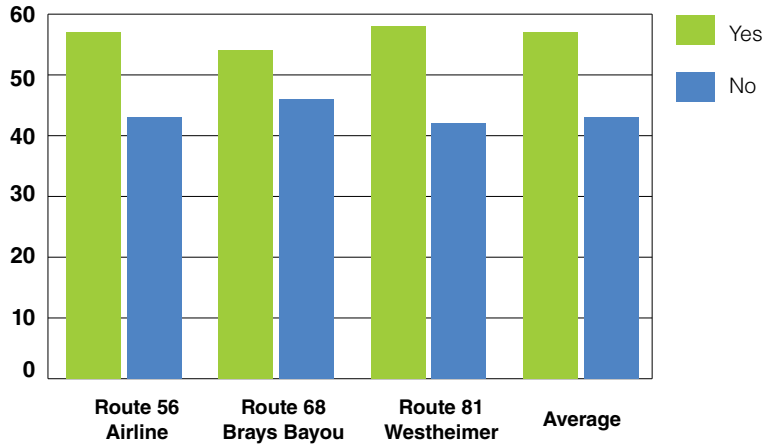
Figure 4.8: Desired Conditions for Combining Bike with METRO



Desired Conditions for Combining Bike With METRO

Land use conditions around a bus stop have some influence on the decision to bike to METRO, but safe bike routes and secure bike parking are more important. METRO can provide bike parking and may be able to influence bike routes and bike safety conditions around the transit system. Again, the variability of responses across routes is fairly low, indicating similar concerns are present across the system and region.

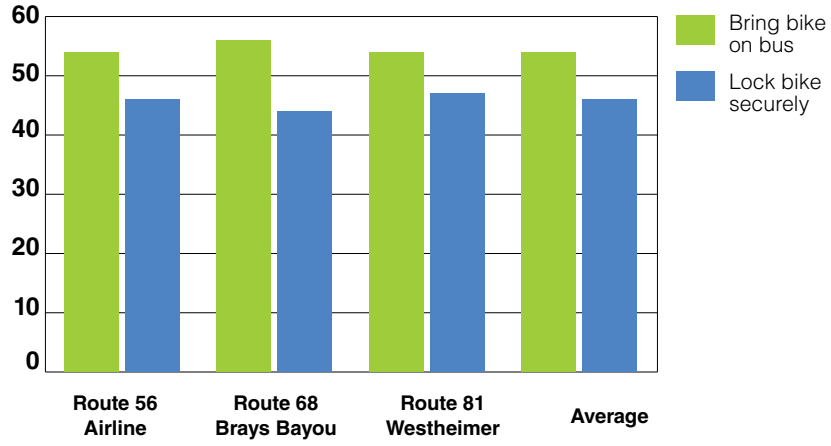
Figure 4.9: Willingness to Pay Fees for Bike Facilities



Willingness to Pay Fees for Bike Facilities

When asked if they were willing to pay a one-time fee or membership fee for use of secure bike parking facilities at a Transit Center or Park & Ride lot, a majority of the respondents said yes. As with most of the other questions, there was little difference in willingness to pay across the three routes.

Figure 4.10: Preference to Bring Bike on Bus to Lock Bike



Preference to Bring Bike on Bus or Lock Bike

Across all three routes, respondents show a slight preference for bringing their bicycles with them on the bus versus locking them at a secure location. This preference could be because the respondents need the bicycles on the other end of the trip or because parking security is not at a level they feel comfortable with.

METRO BIKE AND RIDE ONLINE SURVEY

The METRO Bike and Ride Online Survey was active for two and a half months, from February to mid-April 2013. The survey link was available from the Houston-Galveston Area Council (H-GAC) website, and advertised through social media postings that received attention from bicycle advocacy groups and other organizations. The survey was started by almost 1,400 people and completed by 1,050 people (75%).

Because the survey was designed to gain insight from bicyclists and transit riders, Question 1 asked:

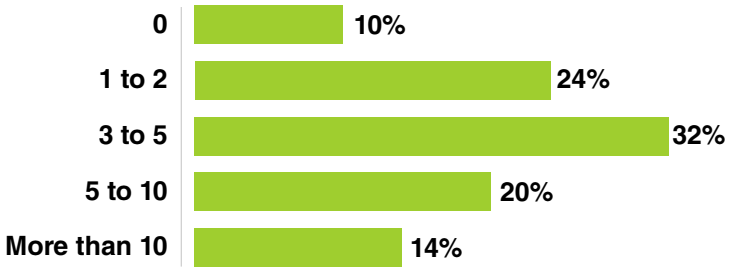
1. Do you travel by bicycle, use transit, or have an interest in using and better connecting these travel modes?

Ninety-seven percent answered "Yes," and continued to the following survey questions. The three percent that answered "No" were redirected to a page that encouraged them to stay informed on the project through the H-GAC project site.

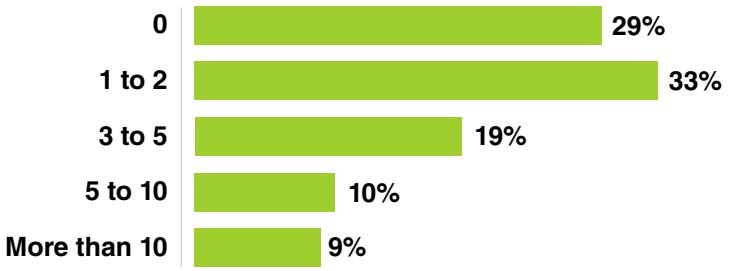
2. In what ZIP code is your home located? Please enter 5-digit ZIP code; for example, 77002.

Those continuing with the survey were asked for location. Respondents per zip code, as collected from Question 2, are displayed in a map and may be referenced in Appendix IV.

3. How many times per week do you typically ride a bicycle, including all bicycle trips?

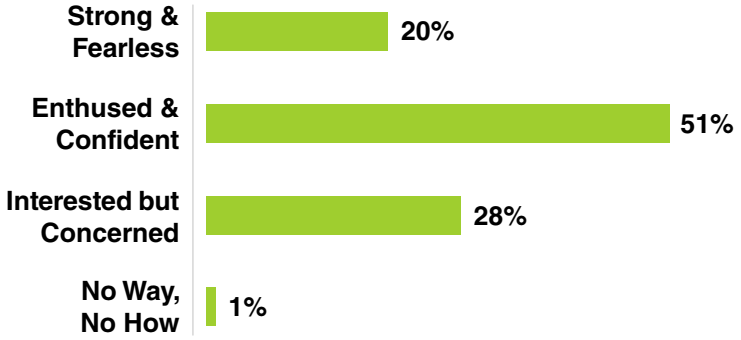


4. How many times per week do you typically ride a bicycle for non-recreational and non-exercise trips, for example, to ride to work or to the store?



Survey respondents were largely active bike riders; sixty-five percent typically make more than three bicycle trips per week. Of those respondents taking any number of bicycle trips in a typical week (90%), most are for recreational rides rather than trips to work or the store. As discussed in the Existing & Planned Conditions (pages 18 - 20) a person's comfort level riding a bicycle can reflect the type of bicycle infrastructure they prefer riding on. Due to the nature of this study, the survey attracted many bicyclists, of which fifty-one percent considered themselves "Enthused and Confident," and twenty percent "Strong and Fearless."

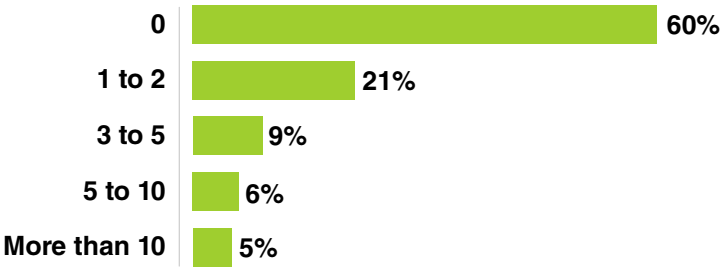
5. Which description below best characterizes you as a bicyclist?



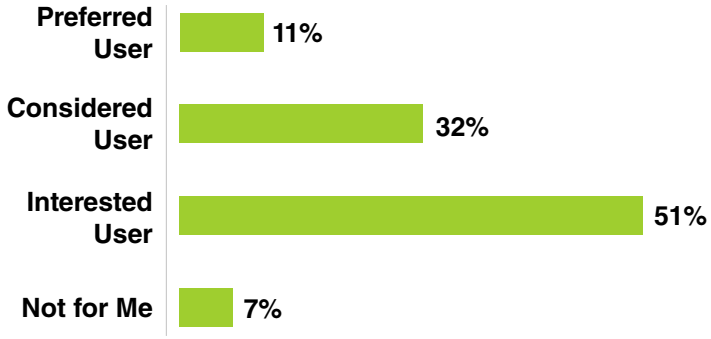
The four response choices and provided definitions for Question 5 are:

- **Strong and Fearless:** bicycle riding is a strong part of my identity and I am generally undeterred by roadway conditions. I will ride most anywhere.
- **Enthused and Confident:** I am attracted to cycling and the expanding options and facilities available. I am comfortable sharing the roadway with automotive traffic, but typically prefer to do so on a separate facilities.
- **Interested but Concerned:** I am curious about bicycling and have heard many things about the potential benefits to riding. I enjoy riding a bike and would like to ride more but frequently do not feel safe on the roadways.
- **No Way, No How:** I am currently not interested in bicycling at all, for reasons of topography, inability, or simply a complete and utter lack of interest.

6. How many times per week do you typically ride transit, for example, a one-way trip on a bus or a train?



7. Which description below best characterizes you as a transit user?



Despite the high number of bicyclist respondents, most aren't using or connecting to transit. According to the responses from Question 6, sixty percent never ride transit. However, fifty-one consider themselves an Interested User, and thirty-two percent a Considered User. The four response choices and provided definitions for Question 7 are:

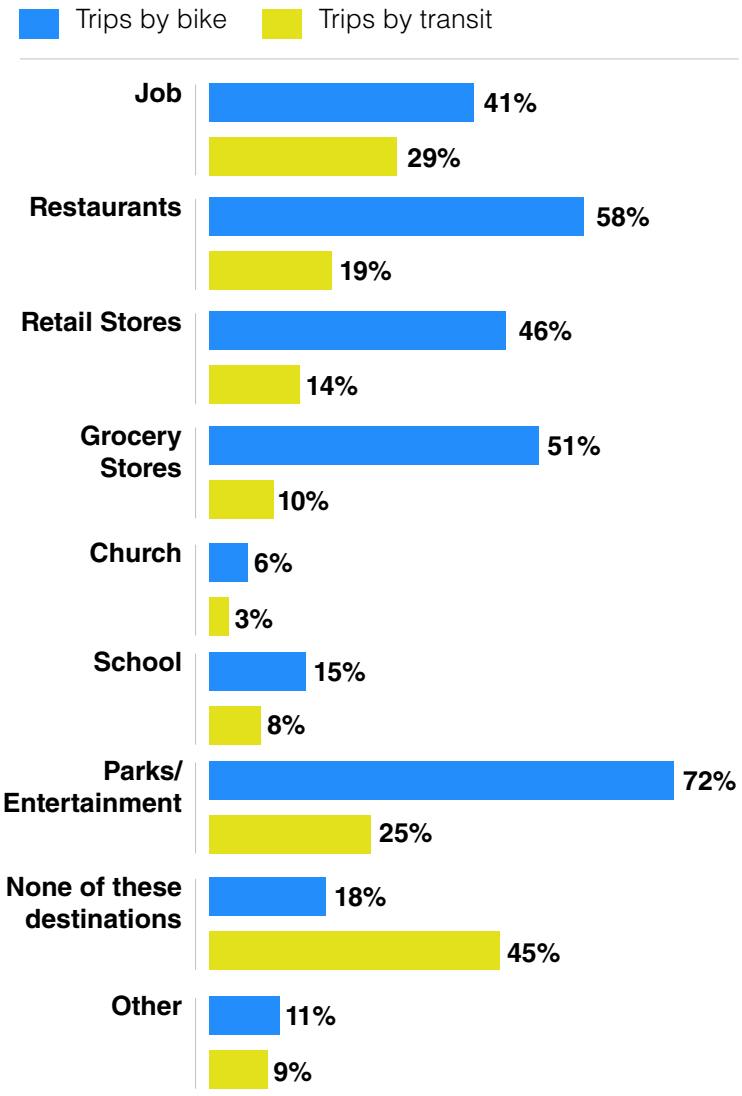
- **Preferred User:** Transit use is one of my primary modes of travel and I seek opportunities and routes to use transit on most trips.
- **Considered User:** I consider using transit for some of my trips. I use transit particularly where it provides me a clear travel benefit over my car or other travel mode.
- **Interested User:** I am interested in using transit and find some appeal in incorporating transit into more of my trips. Currently, I rarely use transit or I am unaware of good transit options for me to use.
- **Not for Me:** I am currently not interested in using transit at all. It is unlikely to become even a small percentage of my trips.

8. Have you biked to any of the following destinations within the last month? Select all that apply.

9. Have you taken transit to any of the following destinations within the last month? Select all that apply.

Responses to Question 8 and 9 offer insight to what trips may have the greatest potential for bike and transit connections, such as jobs, parks/entertainment, restaurants and retail stores. It should be noted that these bicycle trips are not shown in the City's mode share, as the American Community Survey asks about commute mode, not other trips. Respondents use bicycles most often to connect to parks and entertainment (72%), restaurants (58%), grocery stores (51%), retail stores (46%) and jobs (41%). The top three transit trip destinations were jobs (29%), parks and entertainment (25%), restaurants (19%), which offer opportunities for joint bicycle-transit trips for existing bicyclists.

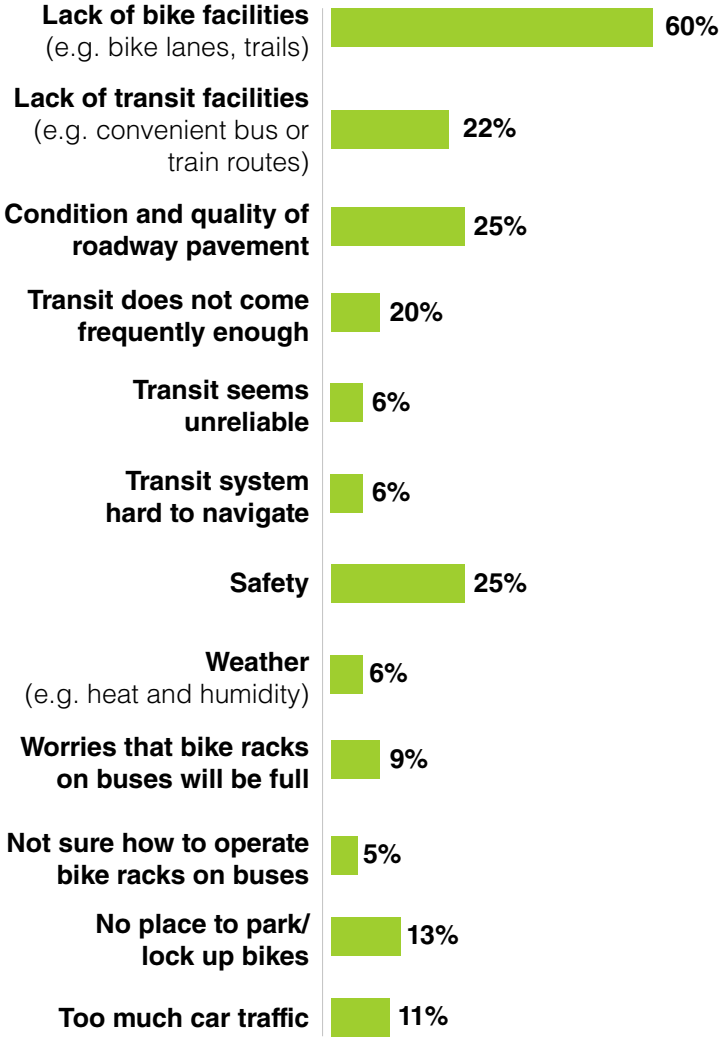
Destinations Reached by Bike and Transit in a Month



11. From the choices below, what do you believe are the two most important barriers to address to increase combined bicycling and transit trips in Houston? Please select only TWO choices:

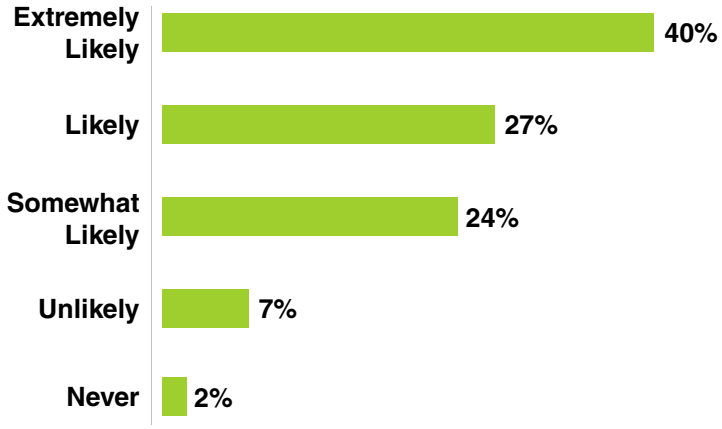
In order to increase the number of connecting bike and transit trips, there are a number of prevailing factors that can be addressed, such as roadway pavement, infrastructure, and transit service. When asked to specify the barriers to address for making these combined trips (see Question 11 below), a lack of bicycle facilities (60%), condition and quality of roadway pavement (25%), safety (25%), and a lack of transit facilities (22%) were identified as the top choices.

Additionally, considering nine percent are worried that bike racks on buses will be full, and thirteen percent say there is no place to lock up bikes, a total of twenty-four percent are concerned about how to manage their bicycles when making connections.



Opportunities for wayfinding for bike parking accommodations and the development of real-time information on the availability of bus bike racks are expanded upon in the Recommendations Section. Sixty-seven percent of survey respondents stated that if the identified connections and amenities are improved, they are likely or extremely likely to connect bike and transit trips (see Question 12 below):

12. How likely are you to connect a bike trip to transit if connections and/or amenities are improved?



Considering the majority of survey respondents don't currently connect to transit, they aren't accustomed to using the METRO website (30% "haven't used") or METRO Trip Planner Phone Assistance (66% "haven't used"). They primarily rely on Google Maps for trip planning, which thirty percent said they "can't live without." When assisting bicyclists, who are largely unfamiliar with the METRO system, it is crucial to provide trip planning information that combines the two modes as it pertains to routes, facilities, and amenities. The graphs on page 65 show what other trip planning tools are useful to survey respondents.

In an attempt to predict how people are making transportation decisions, specifically bicycling and transit, respondents rated a series of decision factors as being "Critical to My Decision," having a "Strong Effect," "Some Effect," "Minimal Effect," or "No Effect". The following factors were identified by a majority of respondents as either critical to their decision or having a strong effect:

- Convenience - 76%
- Easy Access to Destinations - 73%
- Safety - 67%
- Weather - 66%
- Travel Time - 61%
- Trip Distance - 59%

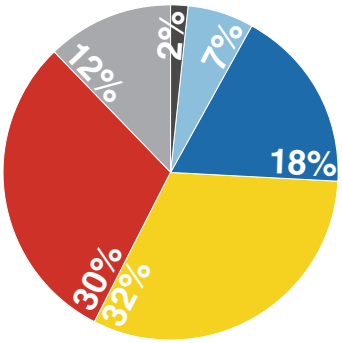
For a bicyclist, the incentives to incorporate transit as part of a trip would include more convenient connections, improved access to destinations, and reduced travel times.

13. When planning a trip by bicycle or transit, how useful do you find the following?

- Can't Live Without
- Very Useful
- Useful
- Somewhat Useful
- Not Useful
- Haven't Used

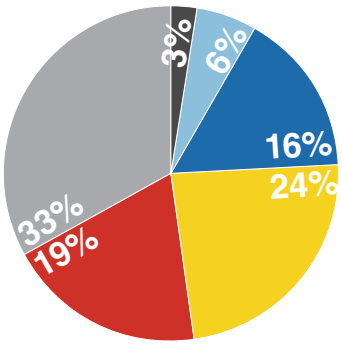
GOOGLE MAPS TRIP PLANNER

30% CAN'T LIVE WITHOUT
32% VERY USEFUL
18% USEFUL
12% HAVEN'T USED
7% SOMEWHAT USEFUL
2% NOT USEFUL



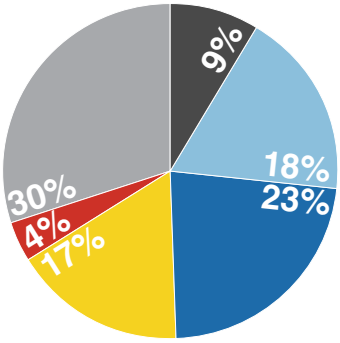
SMART PHONE APPS

33% HAVEN'T USED
24% VERY USEFUL
19% CAN'T LIVE WITHOUT
16% USEFUL
6% SOMEWHAT USEFUL
3% NOT USEFUL



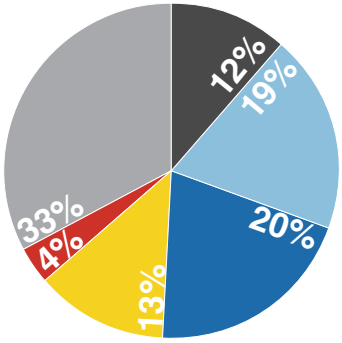
METRO WEBSITE

30% HAVEN'T USED
23% USEFUL
18% SOMEWHAT USEFUL
17% VERY USEFUL
9% NOT USEFUL
4% CAN'T LIVE WITHOUT



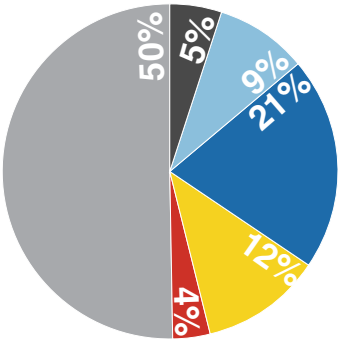
PRINTED MAPS

33% HAVEN'T USED
20% USEFUL
19% SOMEWHAT USEFUL
13% VERY USEFUL
12% NOT USEFUL
4% CAN'T LIVE WITHOUT



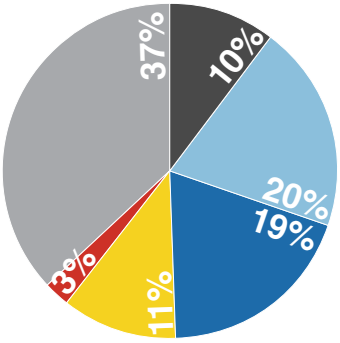
OTHER WEBSITES

50% HAVEN'T USED
21% USEFUL
12% VERY USEFUL
9% SOMEWHAT USEFUL
5% NOT USEFUL
4% CAN'T LIVE WITHOUT



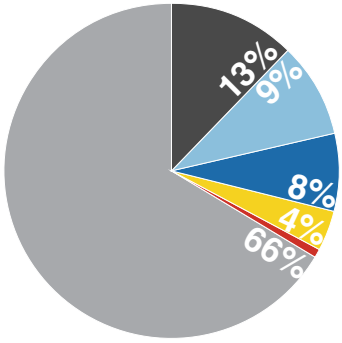
PRINTED INFORMATION AT TRANSIT STOPS AND STATIONS

37% HAVEN'T USED
20% SOMEWHAT USEFUL
19% USEFUL
11% VERY USEFUL
10% NOT USEFUL
3% CAN'T LIVE WITHOUT



METRO TRIP PLANNER PHONE ASSISTANCE

66% HAVEN'T USED
13% NOT USEFUL
9% SOMEWHAT USEFUL
8% USEFUL
4% VERY USEFUL
1% CAN'T LIVE WITHOUT



Online survey respondents overwhelmingly prefer Google Maps Trip Planner, which may be a biased outcome for two reasons, [1] respondents are likely to be familiar with using the internet for information over the use of printed material, and [2] respondents are primarily bicyclists that don't typically use transit, and are unlikely to be using the METRO website at all. However, lessons can be learned to increase information available on Google Maps to promote a multi-modal transportation system, while appealing to bicyclists.

Note: Totals may add up to more than 100% due to rounding.

15. Rate the above Images 1-6 based on how comfortable you would be riding a bicycle on the following types of trails or roads. (Scale from 1: Not Comfortable to 5: Very Comfortable)

16. Of the bicycle facility types shown in Images 1-6 below, on which two would you most prefer riding?


1. Path or Trail, such as Buffalo Bayou

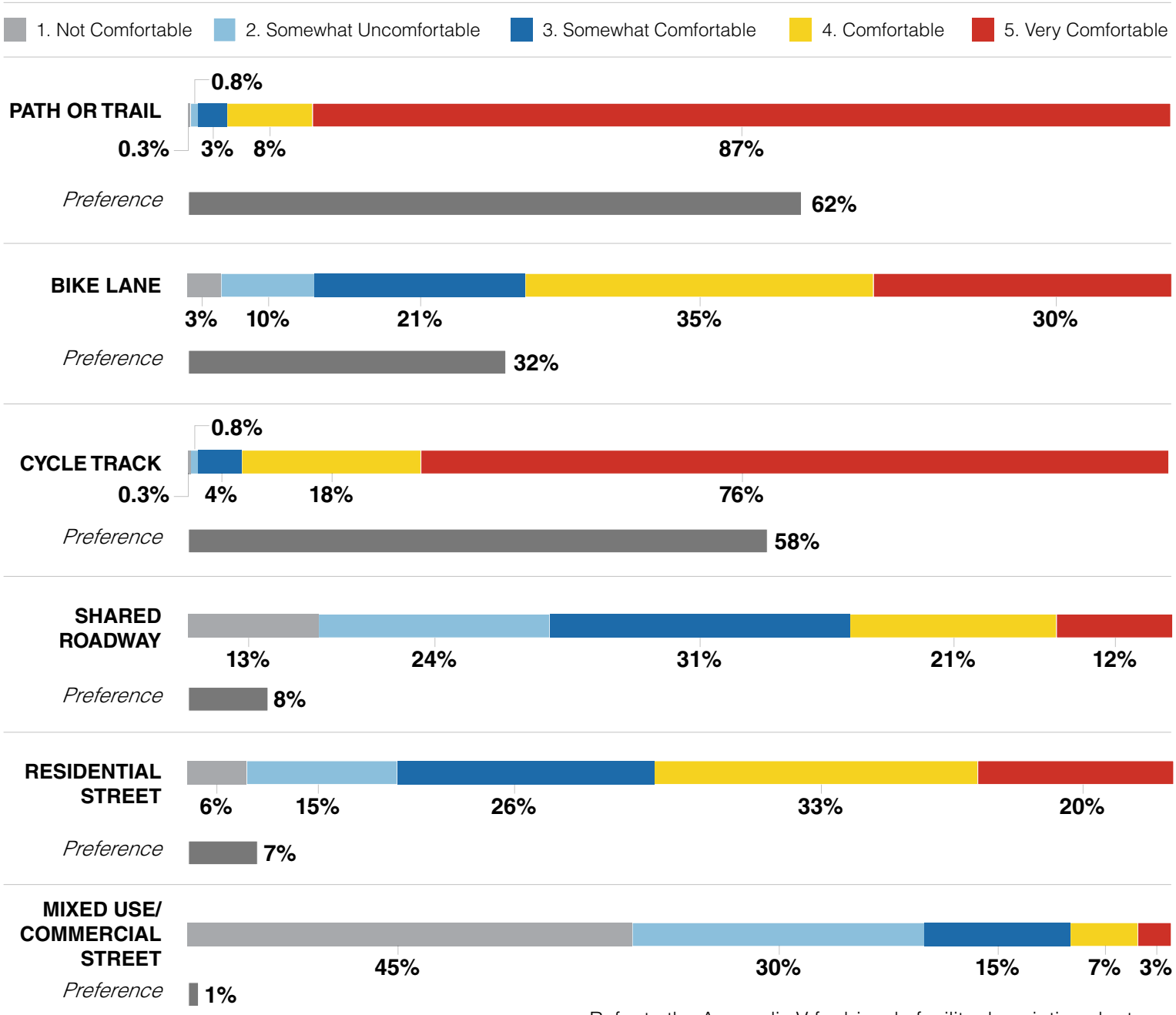

2. Bike Lane


3. Cycle Track


4. Shared Roadway / Sharrow


5. Residential Street with no bicycle facility


6. Mixed Use / Commercial street with no bicycle facility



Refer to the Appendix V for bicycle facility descriptions by type.

17. Rate the above Images 1-5 based on how comfortable you would be parking your bicycle. (Scale from 1: Not Comfortable to 5: Very Comfortable)

18. Of the bike parking facilities shown in Images 1-5 below, which two would you most prefer using to park your bike?

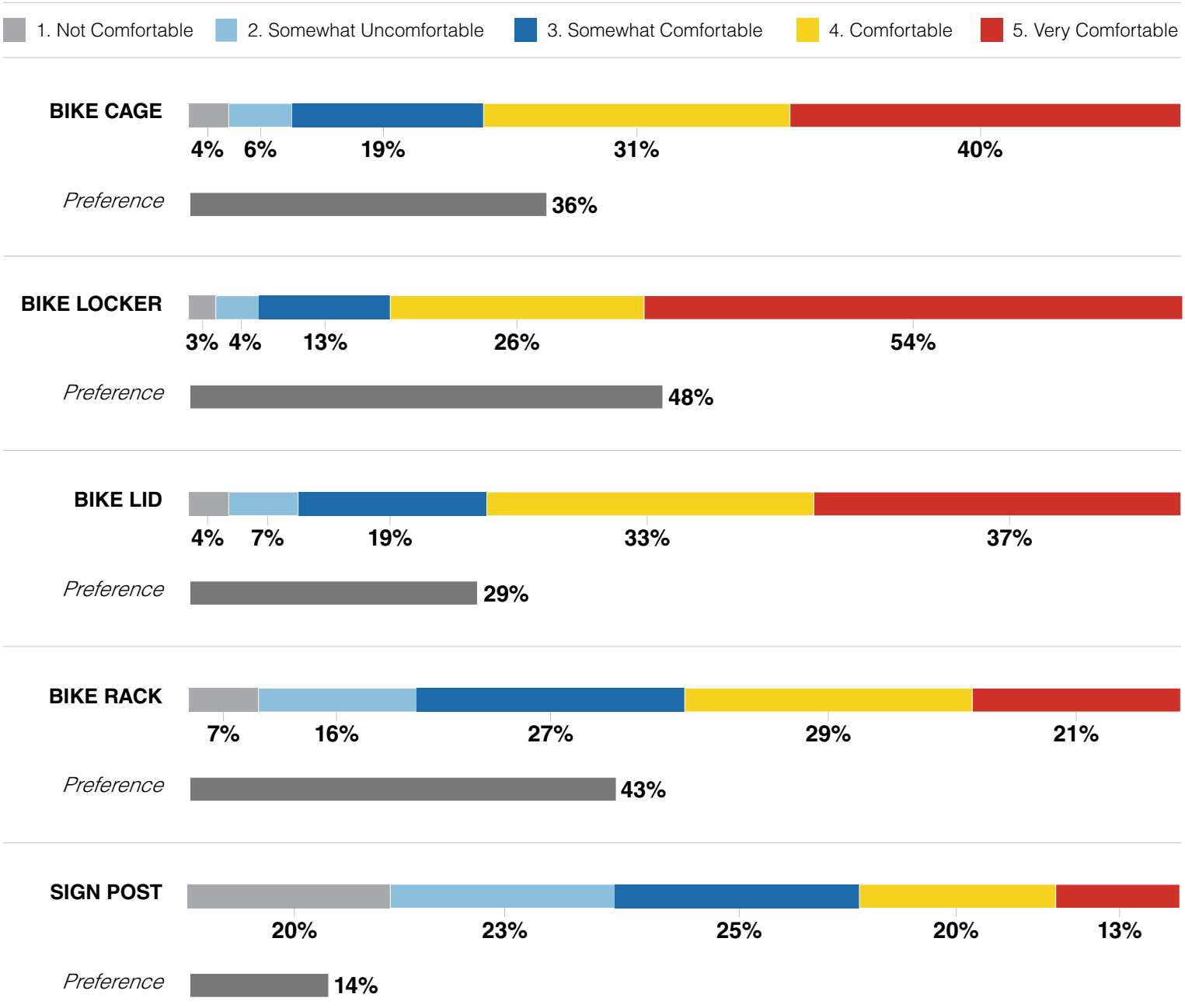
Bike Cage

Bike Locker

Bike Lid (Turtle Shell)

Regular Bike Rack

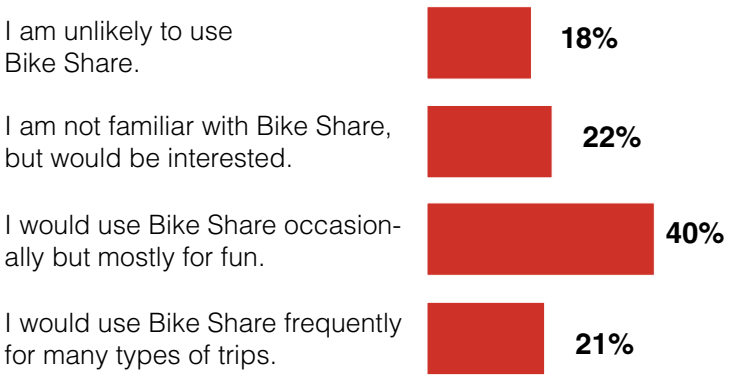
Signpost



For long trip distances, cyclists may choose other modes such as driving or transit. Factors such as limited parking availability or cost of parking could influence people to choose transit over driving. With existing parking minimum ordinances in the City of Houston, there are rarely circumstances where parking is scarce. However, newly adopted parking requirements by the City of Houston allow for 20% parking reductions adjacent to light rail train stations for developments that have opted into the Transit Corridor Ordinance for non-residential uses (Section 26-503) and a reduction in parking for additional bicycle parking (Section 26-497). These ordinances, and COH design standards for bicycle spaces and racks (Section 26-583) can be found in Appendix VI.

Eighty-three percent of respondents indicated that they would use B-Cycle, Houston's Bike Share program, to some extent. This indicates that there are significant opportunities to connect to transit by communicating the freedoms and destinations potential users could connect to through B-Cycle and METRO.

19. How likely are you to utilize Houston's expanding Bike Share program?

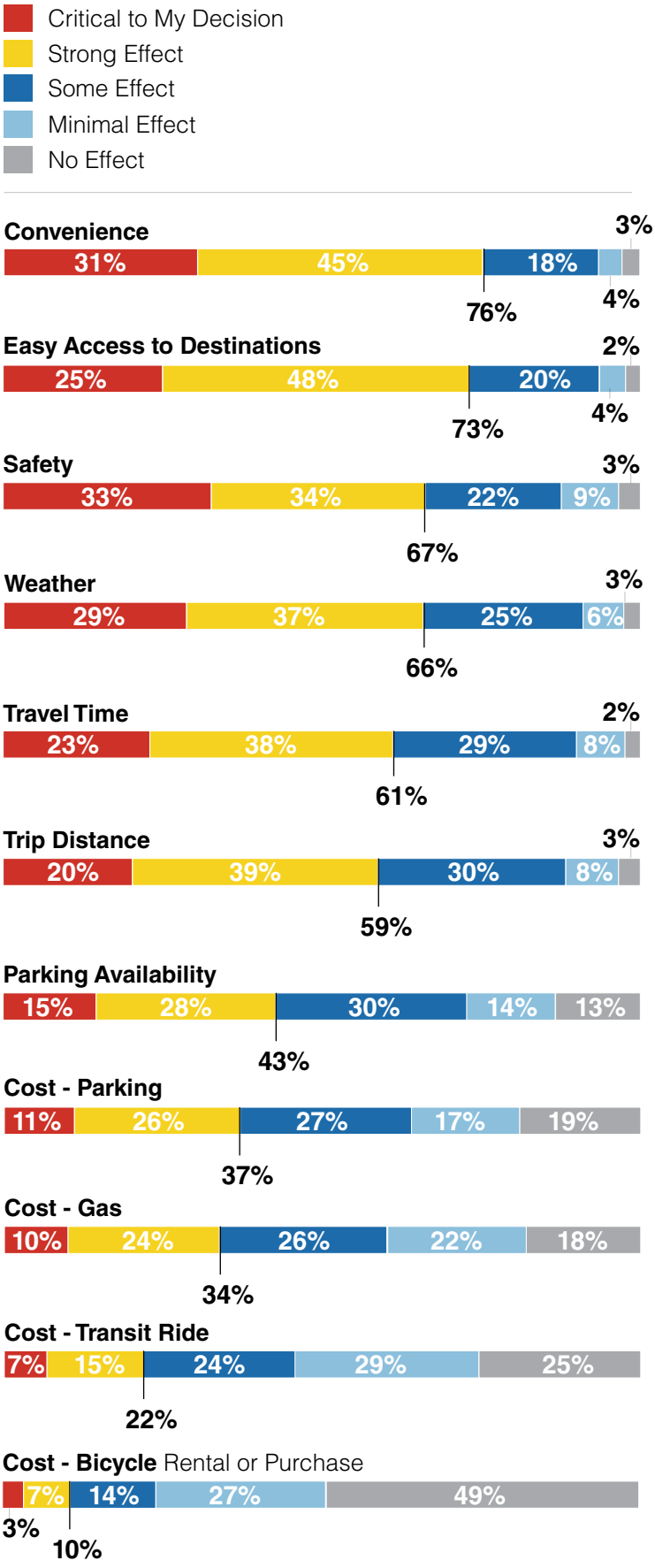


Safety is a serious concern for many people, especially women, as twenty-two percent more female respondents than male respondents identified it as a critical decision factor. This difference might be a due to respondents interpreting "safety" to include a risk of crime in addition to the risk of injury

The risk of injury, at least, can be addressed by providing safe, protected bicycle infrastructure leading to transit connections. Sixty-two percent of respondents chose paths and trails as one of their top two bicycle infrastructure preferences, followed by cycle tracks (58%), which both provide a physical separation between bicyclists and automobiles (see Question 15 on the previous page).

Online survey respondents' top two bike parking preferences were bike lockers and bike racks, options that indicate the desire for both long and short term parking.

14. How do the following factors affect your decision to ride transit, a bicycle or both together?



Conclusions from All Surveys

This report includes survey data related to bike to transit from three sources: METRO's 2011 Origin Destination (O/D) Passenger Survey, the on-board survey conducted for this study, and the online survey conducted for this study. The results extracted from the O/D survey profiles those that are already biking to transit, the on-board survey gives some indication about the challenges of biking to transit from current transit riders' perspectives, and the online survey drew respondents mostly from current bicyclists, who may or may not yet combine biking with transit.

It may not be appropriate to use these various survey results to estimate latent demand for bike to transit, because the respondents were self-selected. Those interested in the topic were far more likely to be aware of the survey (in the case of the online survey) or to complete the survey (in the case of the on-board survey). However, the results are very useful in looking at barriers to bike-to-transit and for desired programs and facilities to increase usage among those who are inclined to do use the system. While the questions were not the same across all surveys, some comparisons across the surveys and hence the target consumers across the groups can still be made.

One notable difference that emerges across the surveys is gender. Most METRO riders are female (56%), while males comprise a strong majority of current bike-to-transit riders (74%), as well as those that appear to be interested in biking to transit. Most of the on-board survey respondents (54%) and on-line survey respondents (60%) are male.

Current transit users (about half of whom have combined biking and transit), and current bike users (about 30% of whom have combined biking and transit) cite many of the same issues and barriers to biking to transit. Safety—due to heavy traffic, poor pavement, or lack of bike routes—is the top listed concern for both groups. Secure bike parking is noted as a larger issue for transit users than for potential transit users, but both groups identify secure bike parking as a concern. Bus rack capacity is cited as an issue with a small percentage of both groups, perhaps reflecting those who have actually encountered a full rack at some point in the past.

Respondents of the METRO Bike & Ride Online Survey indicate bicycle infrastructure preferences as well. Results indicate a strong preference for facilities that protect the biker from automobile traffic, as 72% selected bikeways that are removed from the roadway, in the form of either a cycle track or a shared-use path. Cycle tracks incorporate a physical barrier, such as a curb or planter, between the bike and motorist lanes. Shared use paths are becoming more common and widely used along the bayous, rails-to-trails corridors, and may also be incorporated along the

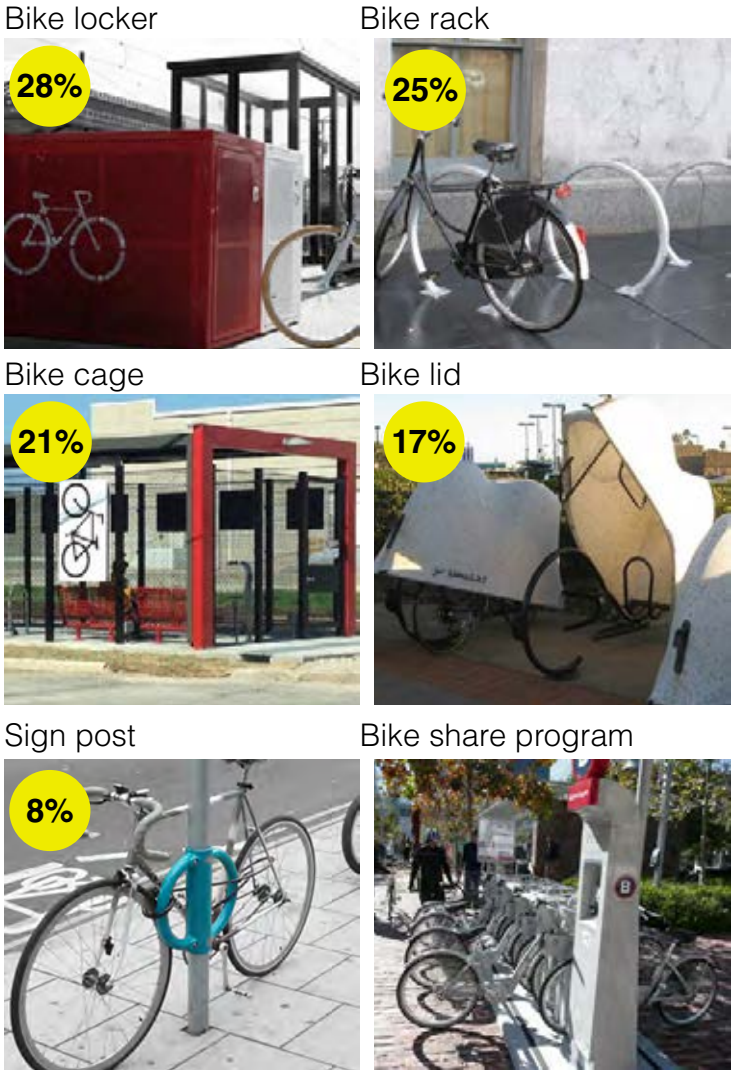


Figure 4.11: Online survey respondents did not have an obvious preference regarding bicycle storage facilities, but the top three choices were bike lockers (28%), bike racks (25%) and bike cages (21%).

CenterPoint easements. While cycle tracks and shared-use paths offer safety to the region's bikers by virtue of being removed from the roadway, wayfinding and connections to destinations must be thoughtfully considered. In addition, these facilities are generally outside of METRO control.

Bike lanes received the next highest share of preferences among survey respondents, at 19%. Bike lines still provide a delineated space, like the cycle tracks and shared-use paths; however, this space is within the roadway. As such, some interaction with vehicular traffic is still required.

Signed bike routes and sharrows received the lowest amount of votes from survey respondents at 4% and 5% respectively. It is likely that they appeal to only the most experienced cyclists, or those willing to take risks, as they require significant negotiating of roadway space with vehicular traffic.

CASE STUDY:
Austin - Capital Metro

Capital Metro (www.capmetro.org) was formed in 1985. It covers a service area of 522 square miles and services a population of 936,363.

Bikes on Trains

Bikes are allowed on MetroRail, with no restrictions as to times of day. Rail cars have two racks each, but cyclists may stand with their bikes if there is room. The website encourages cyclists to be courteous, waiting for other passengers to clear doorways before boarding or disembarking and not blocking aisles. The website also indicates that the number of bikes "may be limited" to four per compartment or eight per train, but in practice this does not happen. Capital Metro does not currently police the numbers of bicycles per train and are trying to get more options in place for cyclists before enforcing this limitation.

Bikes on Buses

All buses have two-bike racks on the front of the buses. Currently, only folding bikes may be brought onto the bus. Capital Metro is considering revising this policy to allow bikes inside buses for certain crosstown routes for last runs only. In addition, a three-bike rack pilot project was conducted in the fall of 2012.

The response was positive. Almost unanimously, the operators had no problems with the 3 bike racks, and bicyclists requested these be installed on all buses. Capital Metro will begin adding 3-bike racks to fixed route buses.

Bike Parking Facilities

Bike racks are provided at most bus stops, at MetroRail stations, and at all park and rides. Capital Metro has just opened its first MetroBike Shelter and has seven more planned to open in 2013. The shelters are card key accessible 20 ½ hours per day, seven days a week and provide enclosed, secure parking with camera surveillance. The spaces also offer sitting areas for changing shoes and a work bench for minor repairs. The fee for the shelters is $30 per year and is the only bike service for which there is a fee charged.

Marketing

Capital Metro has extensive information on its web site for bike riders. Complete information for how to use bikes in conjunction with transit is offered as well as information on how to park bikes at transit stops. Information on safety is included on several pages of the site. Website maps of routes and stations do not provide bike parking or bike

Figure 4.12: Capital Metro bike shelter

trail information, but links are provided to numerous other organizations which do provide good maps. Specifically, the City of Austin offers a map of all city bike trails and the regional planning organization CAMPO provides regional maps of all bike trails, both of which include the location of transit stops.

Other cooperative efforts with the City include developing more trails connecting cyclists and pedestrians to transit and working on a bike sharing program. The City of Austin has a Bike Buddy program which connects "people who want to try bicycle commuting with experienced commuters who want to help." Capital Metro also partners with local bicycle advocacy groups, neighborhood groups, and local festivals and events. Capital Metro relies on these groups for the organization of promotions and events.

Planning and Evaluation

In FY 2012, Capital Metro recorded about 74,500 bike boardings on its bus system, with an additional 8,700 counted as being passed-by due to full racks. This demand represents about 0.3% of Capital Metro's fixed-route bus ridership, compared to bike boardings as a percentage of total fixed-route bus ridership in Houston in the same year at about 0.2%.

Capital Metro has focused its planning for new bike parking facilities primarily on its MetroRail Red Line; however, the new shelters will be included at two major bus facilities. Locations for new facilities are chosen based on demand. Additionally, feedback collected from surveys of bus drivers, cyclists and riders during the three-bike rack pilot program will be taken into account.

In 2011-2012, an informal First Mile/Last Mile survey was done via the Capital Metro website. The survey was patterned after the 2010 Parsons Brinckerhoff study conducted for Washington, D.C.'s WMATA for their Metrorail Bicycle and Pedestrian Access Improvements Study. Capital Metro's study provided very helpful information in their effort to define what their riders saw as barriers to using bikes to access transit.

CASE STUDY:
Dallas - DART
Fort Worth - The T

DART (www.dart.org) was initially created in 1983 and currently covers a service area of 700 square miles with a population of 2.3 million. It serves the City of Dallas and 12 surrounding cities with bus and light rail. The T (www.the-t.com) was also formed in 1983. It serves Fort Worth and 3 surrounding cities with bus transit and is currently in the initial stages of development of a commuter rail line to be called Tex Rail. DART and The T share the operation of a commuter line, the Trinity Railway Express (TRE), which connects the two cities and points in between.

Bikes on Vehicles

Bicycles are allowed on all trains, including the TRE, with no restrictions as to times of day or number of bikes. The only limiting factor is capacity. Cyclists must place their bikes in the area designated for disabled customers and are asked to consider how crowded the train is when boarding. Currently, DART is considering removing a few seats in the center segments of their light rail trains to increase capacity. The center of each of these trains has been retrofitted with a low floor insert so that the center door provides level boarding. Denton County Transportation Authority (DCTA) allows bikes on board the A-train. There aren't bike hooks, and passengers should hold their bikes securely.

Figure 4.13: Instructions for hooking bicycle in DART's Super Light Rail Vehicle (SLRV)
Image credit: dart.org

Two-bike racks are available on all buses. If the bike rack is full, bikes may be brought onboard buses, provided the bicycle is clean and there is space on the bus (cyclists must move to the rear of the bus). The T, as well as nearby DCTA, allows bikes inside buses if there is space, and the bike rack is full or there is no rack.

Bike Parking Facilities

DART provides bike racks at "most rail stations and transit centers." There is no list of bike rack locations nor are they indicated on any of the maps, but they are included as a customer feature in the descriptions of each transit center and rail station. Additionally, DART provides bike lids at 48 of its rail stations and transit centers. Cyclists must provide their own padlock for the exterior and are encouraged to also secure their bike inside the lid with a chain or cable lock. The number of bike lids per location ranges from one to 12. There is a list of the locations with bike lids on the website. There are no fees for racks or bike lids. The T has no mention of bike parking on its website.

Marketing

The information on combining biking and transit on the DART website is occasionally incomplete. There are no thorough maps and, although there are brief references to the importance of safety, it is not emphasized. The links to other resources are primarily those of the parks departments of the cities within the service area.

BikeDFW, a biking advocacy group, has a very helpful website and a link listed on the DART website, but the link is broken. According to DART, they do sponsor bicycle oriented events; however, these are not highlighted on their website. The only mention of events is buried in their list of press releases.

The T's website has one brief page devoted to bicycles and transit which describes the process of riding a bus with your bike. It also mentions that bikes are allowed on the TRE. There is no safety information and no mention of events. There is one link to Fort Worth Bike Sharing which was launched April 22, 2013, but there is no listing of bike stations.

Planning and Evaluation

DART has conducted sample surveys of bike parking usage but has not completed any comprehensive surveys as of this time. Their staff say that locations for new facilities would be based on demand from passengers, but it is not clear how that demand is determined.

CASE STUDY:
Phoenix - Valley Metro

Valley Metro (www.valleymetro.org) is the result of the 2012 merger of Valley Metro Regional Public Transportation Authority, which provided bus service to Phoenix, Maricopa County and numerous surrounding cities, and Valley Metro Rail, which was formed to construct and operate the area's light rail system in 2002.

Bikes on Trains

Bicycles are allowed on all trains, with no restrictions as to times of day or number of bikes. Bike racks are provided inside the trains, and bicycle symbols on train windows show riders which doors are closest to the racks. If the racks are full, riders are allowed to stand and hold their bikes, as long as they don't block the aisle. If a train is crowded, bikers are encouraged to wait for a less crowded train. The website states that if the train is crowded "you may be required to wait for a less-crowded train." However, this is not officially enforced and the expectation is that cyclists will regulate themselves.

Bikes on Buses

All buses have bike racks. Bikes may not be brought onto a bus if the racks are full. Most buses have two-bike racks, but some have three-bike racks and large racks will be added whenever possible.

Bike Parking Facilities

Racks are provided for bike parking at all nine park and ride lots, four Metro station platforms, and 13 bus stops. Bikes attached to anything besides a rack are tagged, and the owner has 24 hours before the bike will be removed and taken to the Lost and Found. If this occurs, notification is left at the site to inform the owner of the bike.

A bicycle commuting support station, the Bicycle Cellar, is located in the Tempe Transportation Center building at a light rail stop (Tempe is home to Arizona State University and a member of Valley Metro). The Bicycle Cellar was begun by two individuals as a membership organization. It provides secure parking with 24 hour video surveillance and security guards, bike repair, bike related retail, and bike rental. It also provides showers, towel service, and lockers. Riders have key card access to the facility 20 hours per day, seven days a week. Membership is offered annually ($168) or monthly ($35) and covers parking and showers. Towel service and lockers are available for additional fees. There is also a "10 pack" available for $10 that provides limited access to the facilities when staff are present. The Bicycle Cellar is the only facility which requires a fee; there are no fees for any of the Valley Metro-provided bike facilities.

Marketing

Valley Metro has extensive information on its website for bike riders. In addition to comprehensive information on how to use bikes in conjunction with transit, the site offers information on safety, maps of bike trails, links to other bike resources, and a list of events. Safety education is a major component of all promotional events. Major events include Bike to Work and School Days, Share the Ride contests, and Valley Bike Month.

Figure 4.14: Valley Bike Month marketing graphics

April is Valley Bike Month and features promotions such as the Phoenix Bike to the Ballpark & Game, a program co-sponsored by the Arizona Diamondbacks. The program consists of a family bike ride with special parking provided for bikes at the ballpark. It also serves as a fundraiser for Valley Metro. For each ticket sold, Valley Metro receives $5, which is used to fund city-wide bike rack purchases. Businesses can participate by providing bike racks at their locations and receive grants from Valley Metro to help pay for the racks. Valley Metro partners with the Arizona Department of Corrections for the manufacture and installation of the bike racks.

Share the Ride contests are offered on a regular basis. The goal of the contests is to decrease automobile trips, so bicycling along with transit use and carpooling are counted as participating rides. Riders create an account, log daily ridesharing activities, receive rideshare points, and then redeem their points for chances to win prizes.

Planning and Evaluation

Valley Metro conducted a survey of bike parking usage two years ago, which gathered information about which facilities are used the most. The results of this survey are incorporated in Valley Metro's planning activities to help determine what and where bike facilities will be expanded. Biking is extremely popular in the Valley Metro service area, to the point that all bike facilities are used to the maximum and Valley Metro cannot keep up with demand. The area's member cities are adding bike lanes, and a bike sharing program is in the works. The member cities, the county, and Valley Metro are working together to meet this exploding demand for bike services.

CASE STUDY:
San Francisco Bay Area

BART - Bay Area Rapid Transit
SFMTA (MUNI) - San Francisco Municipal Transportation Agency

BART (www.bart.gov) began providing heavy rail and subway service to the San Francisco Bay area, including Alameda, Contra Costa, San Francisco and San Mateo Counties in 1972. SFMTA (www.sfmta.com) was formed in 1999 to serve the city and county of San Francisco. It provides bus, light rail, cable car, trolley, and streetcar service.

Bikes on Trains

BART conducted a trial period, allowing bikes on trains during commute periods from July 1 to December 1, 2013 to test the necessity of existing restrictions. During this trial, bikes were allowed on all trains and in all stations at all times, except for the first three cars during peak commute hours. Refer to Figure 5.8 to see the announcement that was posted on the BART website.

In October 2013, the BART Board unanimously voted to modify the Bike Rules (effective December 1, 2013) to allow bikes on all trains at all times, with the exception of commute hours (7am - 9am and 4:30pm - 6:30pm) when bikes are not allowed to board on the first three cars of any train. The following bike safety rules must be followed:

- No bikes are allowed in the first train car at any time;
- Bikes are never allowed on crowded trains;
- Bicyclists must yield priority seating to seniors and those with disabilities;
- Bikes must not block doorways or aisles; and
- Bike are not allowed on escalators.

Only foldable bikes are allowed on Muni's streetcars and light rail, and no bikes of any kind are allowed on their cable cars.

Bikes on Buses

All Muni buses have two-bike racks on the front of the buses. Bikes may not be brought into the buses themselves.

Bike Parking Facilities

Muni provides very little parking for bus riders. They have 52 bike lockers, most of which are downtown. Muni recommends other parking options for their riders, including parking meters, bike racks provided by stores and offices, and private or public parking garages. Any garage with more than ten parking spaces must provide bike parking. Some garages charge a minimal fee, but many offer free parking.

BART itself provides more extensive parking facilities. Almost all BART stations have bike racks and over half have bike lockers. Private lockers can be rented for $15 for 3 months, or $30-$40 per year (depending on location), and a $25 key deposit. Thirty-six stations have electronic lockers. These are shared use and require a BikeLink card. These lockers are metered, so the cyclist parks the bike and sets the meter for the time the bike will be left. The charge is 3¢ per hour. Unused value is returned to the card.

BART has four Bike Stations, some self-serve and some attended, all of which also require the BikeLink card. Self-serve bike stations are accessible 24 hours per day; attended bike stations have valet parking during the hours they are staffed. Other services offered include bike rentals, bike repair, classes, and events.

Both BART and Muni offer theft prevention tips. In addition to suggestions on the most secure way to lock bikes, they both suggest recording the bike's serial number for easier retrieval if a bike is stolen.

Marketing

The Muni website provides only very basic information. The BART website is more extensive. Maps and schedules include information specifically to help cyclists. Safety is emphasized, and links to other resources are included. BART has a Bicycle Task Force which meets every other month. They review policies, discuss problems and present recommendations to the Board. They act as a liaison between BART and the cycling community, and facilitate marketing and educational programming.

Planning and Evaluation

BART's goal is to double the 4% of passengers who currently access BART by bike to 8% by 2022. To achieve this target, for focus areas are emphasized: cyclist circulation, plentiful parking, reaching beyond BART's boundaries, and persuasive programs.

The BART Bicycle Task Force, comprised of six appointed members, meets bi-monthly to address issues that improve bicycle access to and on BART by reviewing bicycle policies, discussing problems and complaints, presenting recommendations to the BART Board of Directors, and acting as a liason between BART and bicyclists.

CASE STUDY:
Los Angeles - LA County Metro

LA Metro (www.metro.net) covers a service area of 1,433 square miles and 9.6 million people. They have experienced a significant increase in interest toward bicycling and transit and believe that, although economic pressures like gas prices may be a factor, the primary reason for the shift is generational. Therefore this move away from dependence on cars will continue to grow in the long term.

Bikes on Trains

Bicycles are allowed on all trains, with no restrictions as to times of day or number of bikes. There are no bike racks on trains, but certain areas inside cars are designated by signs for passengers with bikes. The website reminds cyclists to check if there is room before boarding and to wait for the next train if the designated area is full. There is some concern about riders with bikes conflicting with riders in wheelchairs as the space designated for each of them is in the same area. This issue is being studied and may lead to a change in the way the trains are designed.

Bikes on Buses

All buses have bike racks. Bikes may not be brought inside the bus if the racks are full. Although LA Metro would like to switch to three-bikes racks on its buses, it is constrained by a state law which dictates the length of buses; three-bike rack buses are too long to comply with the law. One exception is the Orange Line, which runs in an exclusive bus lane, and therefore providing three-bike racks do not violate the state law.

Bike Parking Facilities

Out of 104 rail stations, 82 have bike parking equipped with racks and/or lockers. There is no charge for using bike racks, but bike lockers cost $24 for six months and require a $50 refundable security deposit for the key. LA Metro has a contract with LA County Bicycle Coalition, a biking advocacy group, to oversee their lockers.

In addition, LA Metro plans to open its first Bike Hub in 2014, with four additional Bike Hubs to follow soon and a long-term goal of 30. Bike Hubs are stand-alone bicycle parking facilities with 24 hour surveillance cameras. They will be available to registered users and will require a “small fee” to use. In addition to parking, the hubs will offer repair stands and air pumps. There are already five of these types of facilities in the surrounding county. Burbank, Claremont, Covina, Long Beach, and Santa Monica offer what they call Bike Stations. Fees and services vary, but the basic concept is a stand-alone, secure parking facility. LA Metro would like to ultimately partner with one or more bicycle retailers, who would manage the hubs and provide goods and services for sale.

Figure 4.15: Los Angeles Metro bike lockers Image credit: thesource.metro.net

Marketing

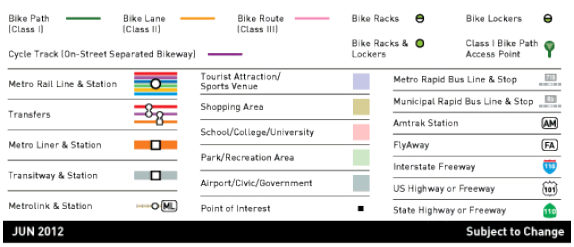
The LA Metro website has extensive resources for cyclists. In addition to information on how to combine bicycling and transit, there are excellent maps, links to many biking resources, and a considerable emphasis on safety. After receiving a California Office of Traffic Safety grant for safety training, LA Metro developed four safety training programs: A three-hour “need to know” road safety skills class – with a separate class available in Spanish, an eight hour vehicular cycling class, and a “multicultural community for mobility” class.

LA Metro is also working with a nonprofit called Cycle to organize family weekend bike rides. These are intended to be easily managed and child friendly. Each ride incorporates landmarks and unique features around the county. Twenty rides will be developed over the next two years, and a map will be compiled illustrating all the rides.

Planning and Evaluation

LA Metro has conducted surveys of bike to transit usage. Bike locker users average 2.8 miles per trip and 3 trips per week, and demand for facilities currently outstrips supply. The decision as to where to locate the Bike Hubs was based more on experiential knowledge of the system as a whole than on surveys and counts.

Figure 4.16: Los Angeles Metro bike and transit maps. Image credit: metro.net



CASE STUDY: Denver - RTD

RTD Denver (www.rtd-denver.com) was first organized in 1969. It encompasses eight counties in the Denver/Boulder area with a 2,337 square mile service area. Currently, it is in the midst of the nation's largest transit expansion program, called FasTracks. FasTracks will ultimately add 122 miles of rail, 18 miles of bus rapid transit, 57 new stations, 31 new Park-n-Rides, and 21,000 new parking spaces, with the intention of turning Denver Union Station into an urban center and multimodal transportation hub.

Bikes on Trains

Bikes are allowed on all trains with no restrictions as to time of day. However, the number of bicycles per train is restricted. Only two bikes are allowed at each bike boarding area, front and rear, for a total of four bikes per car. There are loading symbols on the platforms indicating where the cyclists should wait for boarding. There are no racks on the trains, so cyclists must stand with their bikes in the designated areas and are asked to allow other passengers to board or exit first. Bicycles that are excessively muddy, dirty or greasy are not permitted on board.

Bikes on Buses

All buses have two-bike racks on the front. Bikes are allowed inside buses at the discretion of the operator. Folding bikes are also allowed inside buses.

Bike Parking Facilities

Bike racks are provided at many Park-n-Rides and stations. Although there is no listing or map showing bus and rail stations with racks and lockers, there is a list of Park-n-Rides which includes whether or not they have bicycle parking. Approximately 60% of these Park-n-Ride lots have racks and/or lockers.

RTD-Denver has over 700 bike lockers which rent for $30 for six months with a one-time padlock fee of $20. However, RTD-Denver is questioning whether bike lockers are the best bicycle parking choice for the future. In some locations, many of their lockers go unused. Another issue regarding lockers which has very recently arisen is a question of security. RTD-Denver is now looking at whether TSA regulations would include bike lockers as potential bomb sites, and if so, would bike lockers then be subject to the regulation requiring a 300 foot radius of space surrounding potential bomb sites. They are concerned this would mean that their bike lockers should not be within 300 feet of train and bus loading areas.

RTD-Denver and Boulder County are cooperating on a trial program to construct Bus Bike Shelters. The Bus Bike Shelters are bike cages with a protective roof, key-card access and space to accommodate 30 bikes. They are designed to be built in parking lots. The Boulder shelters are "3-bay" sized shelters, meaning they can be built in the space of three car parking spaces. The shelters are part of Boulder County's BusThenBike program which seeks to improve the first and final mile links of transit trips and decrease travel time delays from loading and unloading bikes. Use of these shelters is free but a one-time donation of $25 is encouraged. Two of these shelters are now in place with more planned. The 300 foot security question could potentially also be an issue with the Bus Bike Shelters.

Marketing

The RTD-Denver website is moderately helpful. The site provides information necessary for combining biking and transit, but little else. Maps are not helpful to cyclists and there are few links to other resources. However, the Park-n-Ride website offers information on the number of automobile parking, bike racks and bike lockers available at each facility. An webpage example can be seen in the Appendix VII.

No bicycle oriented events are identified and there is minimal safety information available. There is a link to B-cycle which operates the Denver bike sharing program and RTD-Denver does partner with B-cycle in locating bike share stations at transit stations. Denver's bike sharing program was begun in 2007, is the oldest bike sharing program in the country, and operates from March to December. Other than its website, RTD-Denver does no marketing of their bike programs. Because their programs are heavily used, and in numerous cases over used, they have felt no need to advertise them.

Planning and Evaluation

RTD-Denver counts bikes on buses every three years. They do not count bikes on trains, because staff feels that it is not cost-effective. RTD-Denver just released an RFP for a bike parking and accessibility study which it hopes will help with planning new facilities. In the past, staff has relied on feedback from customers to determine which locations have the greatest demand.

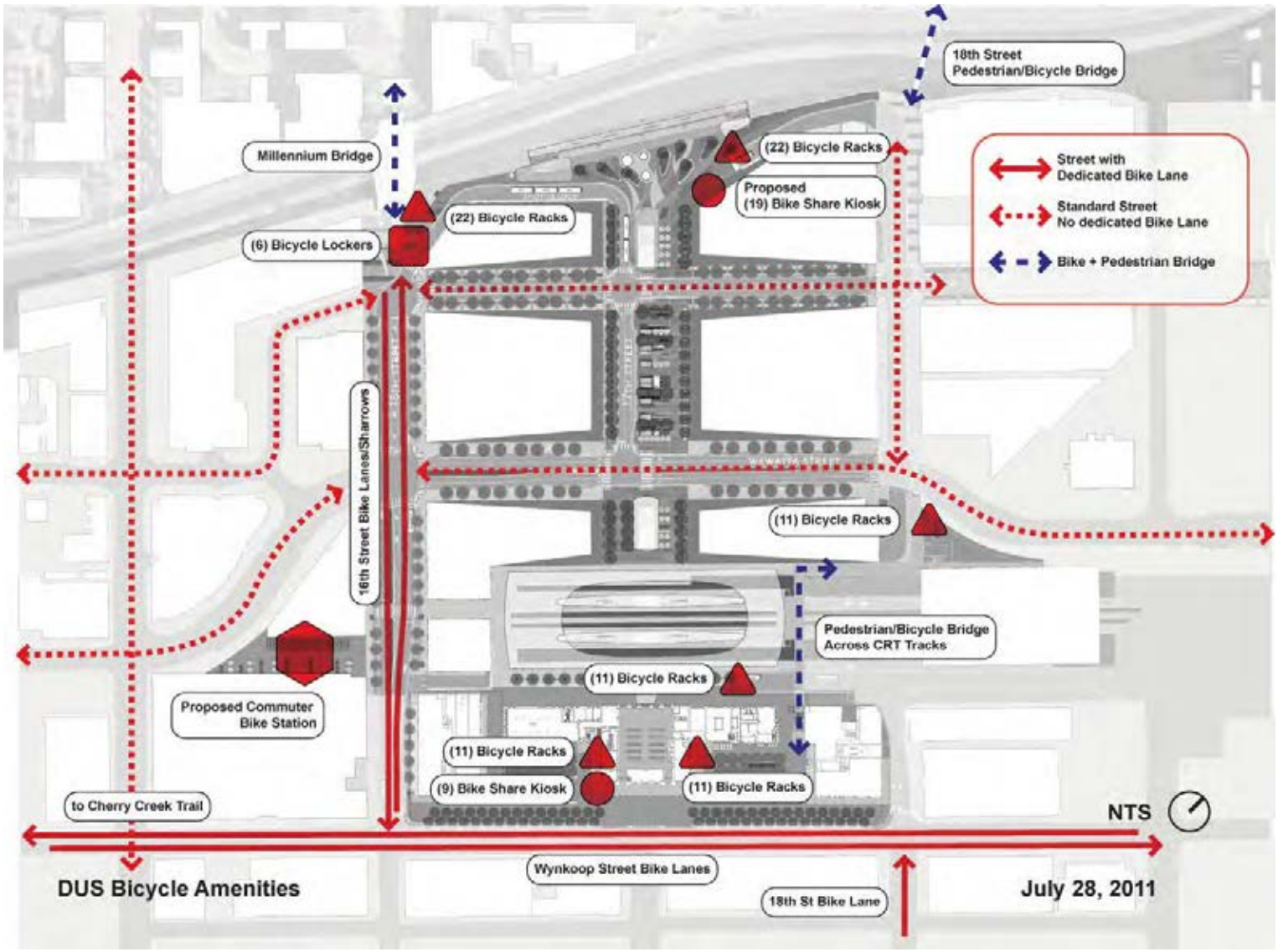


Figure 4.17: Denver Union Station Bicycle Facilities

CASE STUDY:
PORTLAND - TriMet

TriMet (www.trimet.org) was created in 1969 and serves the metropolitan Portland, Oregon area. Its service area covers 575 square miles and includes portions of three counties.

Bikes on Trains

Bikes are allowed on all trains with no restriction as to times of day. Cyclists board through doors marked with a bike symbol and place bikes in a designated area, which they share with riders in wheelchairs, with strollers, and with luggage. The light rail trains (MAX) are a mixture of low floor cars and high floor cars. On low floor cars, hooks are provided for hanging bikes. On high floor cars, the bikes are held standing in a designated area. The commuter rail trains (WES) can accommodate six bikes on each car, with two bike racks and room for four in the priority seating area, if available. There are straps provided to stabilize bikes in the priority seating area.

Bikes on Buses

All buses have two-bike racks on the front. Only foldable bikes are allowed inside the bus. TriMet has a demonstration bus bike rack available at their transportation information center so that riders can practice placing their bikes in the rack. The demo rack is also taken to community events by their outreach team to give more people the opportunity to practice.

Bike Parking Facilities

Parking bikes is encouraged, because bikes on buses and trains are causing congestion issues. TriMet has free bike racks at most rail and bus stations. They offer reserved lockers at most train stations and some Park & Ride lots and transit centers. The lockers cost $25 for six months with a one-time refundable key deposit. Their website provides a list of stations with lockers and whether or not those lockers are currently available to rent.

One light rail station and one commuter station have Elockers. These lockers are available on a first come first served basis and are key card accessible, 24 hours a day. Payment is through a BikeLink card, which is initially loaded with $20. The cyclist parks the bike and sets a meter for the time the bike will be parked. The charge for parking is 5¢ per hour; however, if the bike is left longer than the metered time, extra time costs 12¢ per hour. TriMet says Elockers are a more efficient use of resources than rented assigned lockers, because assigned lockers are empty most of the time. They say Elockers serve five to seven times more cyclists per year than assigned systems.

Finally, TriMet has secure parking buildings with key card access at three of their transit centers. These are called Bike & Rides and their hope is to build a regional system of these parking facilities. A BikeLink card is initially loaded with $20 and the user is charged a one-time fee of $5 to activate the card. The cost to park is 3¢ per hour, 8AM to 8PM weekdays, and 1¢ per hour all other times. The BikeLink card can be used at any BikeLink facility nationwide.

Marketing

TriMet has extensive information on its website for bicyclists. In addition to information thoroughly explaining the bike to transit process, the site emphasizes safety. Safety is mentioned on every page containing bike information, and a link is always included to more complete safety information. There are numerous safety tips and safety videos. Beyond their website, they recently ran a nationally recognized campaign called “Be Seen. Be Safe.”

The maps on the website are excellent. The TriMet Trip Planner allows a cyclist to plan a trip by bike or a combination of modes. It allows the users to specify whether they want the quickest route, the flattest route, or the most bike friendly. The resulting trip plan includes distance, an elevation profile, and printable turn by turn directions.

The links to other resources are also very helpful. A link to the Portland Bureau of Transportation Bicycling Information Page lists classes, events, maps, and many other aids. TriMet is cooperating with the City of Portland in the development of a bike share program scheduled to begin in Spring 2014. In addition to Portland, TriMet works with the other municipalities in their service area. TriMet also frequently partners with BTA (Bicycle Transportation Alliance) and Oregon Walks, both advocacy groups.

TriMet prepares brochures and handout sheets covering rules and policies which operators can give to cyclists. It advertises the Bike & Rides in the area’s weekly newspaper and has contests on their Facebook page with BikeLink cards as prizes.

Planning and Evaluation

The latest survey done for bikes on light rail was in 2007-2008. They have not done any surveys of bikes on bus usage. Locations for new facilities are determined using “a variety of tools for demand analysis.”

CHAPTER 5
RECOMMENDATIONS

"Bicycling supports public transport by extending the reach of transit stops far beyond walking range and at much lower cost than neighborhood feeder buses and Park & Ride facilities for cars. Access to public transport helps cyclists make longer trips than possible by bike. Transit services also can provide convenient alternatives when cyclists encounter bad weather, difficult topography, gaps in the bikeway network, and mechanical failures."

Pucher and Buehler, "Integrating Bicycling and Public Transport in North America," *Public Transportation*, Vol. 12, No. 3, 2009.

The assessments of the METRO transit network, regional cycling conditions, as well as socioeconomic and demographic characteristics of the service area outline many of the factors that impact a cyclist's decision to use transit for part of their trip. Community stakeholders and the public have identified challenges and priorities through focus groups, survey responses and public meetings. Case studies from other transit systems show that other agencies are wrestling with these issues as well and describe how they have taken steps to address these challenges.

Cyclists who use bikes in conjunction with transit represent a small but growing component of the METRO transit system ridership. With the overall growth of cycling and expansion of bicycle infrastructure in the METRO Service Area, developing strategies and recommendations to improve the integration between cycling and transit is critical to continued growth and expanding ridership for METRO.

Once an individual decides to make a trip, there are many additional choices that go into how they make that trip. They could choose to walk, drive a car (either alone or riding with a friend), ride a bike, use transit, or some combination of any of these modes. Cyclists ask certain questions to determine whether transit could help them make their trip:

- Why should I bike to transit for this trip?
- Where should I connect to the transit network?
- What will I do with my bike once I get to transit?
- Is there a safe and easy route to reach transit and my destination?

To support METRO in improving bicycle access to the transit system, this chapter puts forth recommendations that will enable the transit and bicycling networks to operate in tandem when individuals are making decisions about their trips. The recommendations outlined in this chapter have been developed to help METRO encourage cyclists to choose transit as a part of their trip. While some of these trips would already have been made using the METRO system, these recommendations support making such trips faster, safer, more comfortable and more efficient, furthering METRO's goal to be a transit agency that supports multimodal transportation. Importantly, the recommendations will also support an increase in ridership on the METRO system by attracting new riders. This includes people who currently complete their entire trip by bicycle as well as people who might otherwise drive.

A framework of four key principles has been developed: Communicate, Integrate, Connect, and Implement. These four principles begin by letting people know why they should bike to transit and support the decision process all the way to suggesting where and how they should make the connection. The principles also inform the approach that METRO can take to prioritize and implement these recommendations, as well as partner most effectively with other jurisdictions and other implementing agencies.

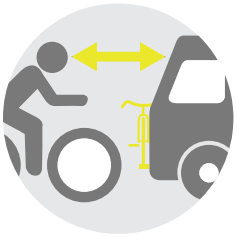
The first three principles - Communicate, Integrate, and Connect - directly address what METRO and its partners can do to answer the questions about improving bicycle access to transit. The fourth principle, Implement, discusses how METRO and regional partners can accomplish these recommendations, with a focus on how to prioritize projects to maximize the positive impact they can have.

COMMUNICATE…

- The value of using the transit system to cyclists.
- Where to access the transit system.

INTEGRATE...

- Bicycles into the transit system through parking, on-vehicle accommodations and bike share.



CONNECT...

- Cyclists to high value transit nodes where they can access useful transit service.
- Transit nodes to nearby destinations.

IMPLEMENT...

- Projects that communicate, integrate, and connect the bicycle and transit networks.
- Partnerships with other organizations and agencies to implement projects outside of METRO's direct control.

COMMUNICATE

A critical theme of the analysis and feedback received through the study was the need to better communicate the value transit can bring to cyclists. This includes answering the question of why cyclists should consider making transit a part of their trip. There is also a need to communicate to cyclists where they can access the transit system and what destinations are readily accessible by bike, particularly those outside of easy walking distance.

The recommendations here outline an approach to communicate these benefits, the processes and organization strategies that would most effectively develop and maintain communication, and the tools that would support communication most effectively.

01 Establish a team to assist METRO with bicycle issues, including a Bicycle Coordinator, Bicycle Working Group and Bicycle Advisory Committee.

By building a dynamic team for internal and external coordination, marketing, advocacy, outreach and planning efforts can reflect and address bicyclist concerns, and ensure that initiatives reach target audiences.

A full-time Bicycle Coordinator on METRO staff would lead bicycle initiatives, such as the implementation of recommendations presented in this report, that require coordination with internal departments and external collaborators. The Bicycle Coordinator would be responsible for organizing the monitoring of capacity and condition of METRO's bicycle facilities, leading planning efforts to improve integration of bikes and transit, collecting and responding to user feedback, organizing promotional events, seeking funding opportunities, and building partnerships with potential collaborators, such as Houston-Galveston Area Council (H-GAC), City of Houston, Harris County Flood Control District, community groups, management entities, Houston B-Cycle, and the proposed Bicycle Working Group and Bicycle Advisory Committee (discussed below).

The organization of a Bicycle Working Group (BWG) would be established internally under the leadership of the Bicycle Coordinator, with a structure that is modeled after METRO's Bus Shelter Committee. The purpose of the BWG is to assist with collaborative decision-making for bicycle access to facilities, on-vehicle facilities and parking accommodations. The group should meet monthly to ensure that bicycle service is being considered for existing projects and initiatives. Potential representation may include Communications and Marketing, Facilities and Maintenance, Inter-governmental Affairs, Capital Projects, Service Delivery, Service Design and Development, Safety, METRO Police Department (MPD), and vehicle drivers.

The Bicycle Advisory Committee (BAC) would consist of external collaborators, similar to METRO's Customer Advisory Committee. With approximately fifteen members, a diverse group that is familiar with bicycling in conjunction with the transit system, the committee could provide feedback on issues of access, service, marketing, and outreach. Members should include community members across the service area, representatives from community bicycle groups, city or management district staff, and representatives from BikeHouston, Houston Parks and Recreation Department (HPARD), and the H-GAC Pedestrian and Bicycle Subcommittee.

In 2007, METRO engaged representatives from BikeHouston and internal departments (Rail Operations Center, Service Delivery, Safety and Security, Communications and Marketing, Planning) for input on how new rail cars could impact the cycling community. This type of inclusive collaboration would ensure that multiple perspectives are taken into consideration. By establishing the BAC, this group could be engaged easily with the necessary METRO departments.

02 Create a bicycle-oriented brand, logo, and consistent marketing material.

Building on METRO's existing marketing material, a brand that is specific to bicyclists can help direct these passengers to information that is useful for them, as their trip needs vary from others. These marketing efforts would broadcast key messages that METRO wants to send to existing and potential bicyclist riders, i.e. the value of using transit, and how they can connect the two modes. The brand and logo should be consistent across all materials, such as pamphlets, brochures, online resources, advertisements, and outreach and education materials.

Currently, bicycle information available online is listed separately under Bus or METRORail Services. Building a database of information that is specific to bicycle services could show riders how all modes best accommodate their needs. The current message stated on the online METRORail Bike Guide says, "Whether you're an avid cyclist or a recreational rider, METRO helps you go the distance for commuting, running errands or exercising along the rail line." Similarly, other transit agencies stress the economic, health, and social benefits of using bikes with transit. The key message could be further developed to help highlight specific services that METRO offers to bicyclists; for example, building flexibility into the transportation system, and the diversity of riders' daily travel needs.

The "Chain Reaction" marketing program is an existing initiative that informs people of some general bicycle accommodations that are provided by METRO. Posters inform passengers that there are front bike racks on all local buses, bike and baggage compartments are located under commuter buses, and that bikes may be brought onto METRORail during approved hours. Once bicycle guidelines and services are compiled in a common location, posters and other marketing initiatives can direct people the website to learn more. A bike-oriented page on METRO's website may include the following information:

- Types of bicycles allowed on METRORail*
- Bicycle rules at METRORail stations/platforms*
- Bicycle rules on board trains*
- Photo and video instructions on how to use the front bus bike rack*
- Photo and video instructions on how to use the racks on trains
- Photo and video instructions on how to access storage areas under commuter buses
- General bicycle safety information, including rules of the road
- Bicycle safety around METRORail*
- Ability to purchase bike parking credit
- Links to trip planning resources (METRO, Google, etc.)
- Useful links for additional information, such as partner organizations' websites
- News related to bikes and transit, such as pilot projects and new initiatives
- Advertisements and instructions for promotional events, such as "Ride to the Rodeo"
- Polls, surveys, comment section
- Frequently Asked Questions
- Interactive map with the following layered features:
  - Bike parking; locations by type, and availability when applicable
  - Transit routes
  - Frequent transit routes
  - Bike routes
  - Transit Centers
  - Park & Ride lots
  - METRORail Stations
  - Bike access points to METRO facilities
  - B-Cycle stations
  - Bike shops

* Information already available on ridemetro.org.

03 Develop a Bike & Ride Education Program.

Developing a Bike & Ride Education Program would actively communicate the information available online to the target audience: existing and potential bicyclist transit riders. It would direct outreach to schools, universities, employment centers, community organizations, special events, and bicycle repair shops. The Bicycle Coordinator and Bicycle Advisory Committee may work together to develop the material (to be reviewed by the Bicycle Working Group), identify potential groups or locations for outreach, and connect with the right individuals. Additionally, engaging the Communications and Marketing Department within METRO ensures that these outreach efforts are being advertised through other marketing initiatives, and streamlined with METRO's overall message to bicyclists.

A Bike & Ride Education Program would not only showcase the services that METRO offers, but also provide practical education about safe, efficient options for trip planning and accessing transit with bicycles. This may include the following:

- Bike safety training (bicycle laws, reducing conflict between modes)
- Organized bike rides with schools or community groups, with routes that integrate bike and transit
- Demonstrations of train and bus bike racks
- Distribution of information about train and bus rules, bike parking payment options, etc.

METRO has brought portable front bus bike racks to special events in the past, allowing people to test out the device. Loading the rack can be intimidating when there is a bus full of passengers waiting, and providing the opportunity to practice can help alleviate people's concerns. These demonstration racks may also be rotated among partner locations, such as bicycle repair shops or schools, so that people have greater opportunities to become comfortable with them.

There are also opportunities for METRO to coordinate with existing groups and build upon their efforts, which may provide fun options for familiarizing people with the connecting bike and transit trips. For example, the Bike Buddy program, organized through the City of Austin, connects experienced and inexperienced bicycle commuters. An example of a more technical education program is that of the road safety skill classes (in English and Spanish) provided by LA Metro through a California Office of Traffic Safety grant.

04 Expand data collection and data sharing efforts.

Data collection and sharing efforts should be expanded to improve agencies' understanding of transportation needs, such as bike counts on roadways and bike boardings onto transit, with collaboration between COH Public Works and Engineering, Planning and Development, HPARD, H-GAC, and other agency departments. Areas for improvement in data collection within METRO include the following:

- Parked bike counts at METRO facilities
- Bike locker usage (duration, time of day, day of week, month)
- Bus bike boardings by location
- Train bus boardings
- Number of "bicyclists passed by" due to full bus bike racks

Bus bike boardings are currently recorded manually by drivers and collected per route, rather than per stop, making it difficult to identify specific points of high boardings, and consequently the potential for improved bike parking. METRO is coordinating with the School of Engineering at Rice University to develop solutions for improved data collection and reduce the need for manual data collection of bike boardings. For example, bikes may be counting using sensors that are triggered by light or weight and could geocode the bike boarding location. METRO may consider sharing data through an open source method, making it accessible to academia, design and technology professionals, which in turn may push innovation, such as trip planning through mobile app development. For example, in Boston, the Metropolitan Area Planning Council and Hubway (bike share program) organized the Hubway Data Visualization Challenge, an open competition that provided access to system usage data and asked individuals to develop visualization tools for users and for system planning.

05 Add wayfinding signage to trails, Transit Centers, Park & Ride lots and METRORail Stations where the bike and transit connections are not visibly apparent.

Directional signage is helpful on bike routes, which may deviate from the street grid or people's typical routes by other modes. Wayfinding should indicate the direction and distance to area destinations, such as transit facilities, parks, districts, public facilities and attractions (as shown in Figure 5.1); located prior to intersections. Multiple entities could coordinate on developing wayfinding signage to better create a consistent language across a wide variety of destination types. METRO may work with the City of Houston and management entities to develop signage or ensure that facilities are included for proposed signs.

Wayfinding signage is recommended for routes leading to the following transit facilities:
Addicks Park & Ride (Terry Hershey North Trail)
Bay Area Park & Ride (Route to NASA)
Bellaire Transit Center
Burnett Transit Center (White Oak Bayou Trail)
EaDo/Stadium Station (Columbia Tap Trail)
Eastwood Transit Center (Route to University of Houston)
Fifth Ward/Denver Harbor Transit Center (Shotwell Street connection)
Greenspoint Transit Center (Greens Bayou Trail)
Hillcroft Transit Center (Proposed connections)
Hiram Clarke Transit Center (Sims Bayou Trail)
Kashmere Transit Center (Proposed connections, including Hunting Bayou Trails)
Kingwood Park & Ride (Greenway Trails)
Mesa Transit Center (Halls Bayou upon completion of trails)
Northline Transit Center (Proposed connections)
Northwest Station Park & Ride (Proposed connections)
Palm Center Transit Center (Proposed connections)
Quitman Station (White Oak Bayou Trails)
Southeast Transit Center (Proposed connections)
TMC Transit Center (Proposed connections, including Brays Bayou Trails)
Theater District Station (Buffalo Bayou Trails)
UH Downtown Station (White Oak Bayou Trails)
West Bellfort Park & Ride (Keegans Bayou Trails)
Westchase Park & Ride (Westchase Hike & Bike Trail)
Wheeler Transit Center (Proposed Connection)

Signage from the loading area should direct bicyclists towards bike routes (see Figure 5.2), which may be located near bike racks or at facility walkway ramps.

Figure 5.1: Directional signage, located prior to intersections of bike routes and paths indicate direction and distance to transit facilities, as well as other area destinations.

Figure 5.2: Directional signage from transit facilities help direct bicyclists to safe bike routes.

06 Develop location-specific bicycle and transit network maps for transit activity centers, such as Transit Centers and METRORail Stations.

METRO should market itself as a premiere transportation option by communicating transit routes/facilities, bike routes and pathways in relation to area destinations, and assist people with their multi-modal trips by creating and providing wayfinding maps at transit facilities. These maps may include the following information within walking distance (approximately a quarter-mile radius):

- Transit routes
- Bike routes and trails
- Bike parking facilities
- B-cycle bike share stations
- Area destinations (employment, campuses, shopping, recreation, etc.)

Figures 5.3 and 5.4 show examples of wayfinding maps in New York City, which are attractive and easy to read.

Figure 5.3

Figure 5.4: Area maps indicate neighborhoods, major destinations, transit stops, bike share stations and other bicycle facilities. Photo: fastcodesign.com

07 Develop a system-wide map indicating transit routes and facilities with bicycle routes.

Through improved data collection and data sharing efforts (see Recommendation 4), METRO maps can be updated to include information that is useful for multi-modal trips, specifically bike and transit. These maps could be made available online or in print and should be produced in coordination with the City of Houston to ensure consistent categories, icons and graphic conventions. The current City of Houston Bikeway Network map shows locations of existing METRORail stations, but lacks Transit Centers and Park & Ride facilities. METRO and the City of Houston should work together to ensure that these facilities are shown when map is updated.

LA Metro provides a clear and helpful map for connecting the two modes, as seen in Figure 5.5, which includes the following information:

- Bike Path (Class I)
- Bike Lane (Class II)
- Bike Route (Class III)
- Bike Racks
- Bike Lockers
- Bike Racks and Lockers
- Class I Bike Path Access Point
- Rail Line and Station
- Transfers
- Tourist Attraction / Sports Venue
- Shopping Area
- School /College / University
- Park / Recreation Area
- Airport / Civic / Government
- Point of Interest
- Metro Rapid Bus Line & Stop
- Municipal Rapid Bus Line & Stop
- Amtrak Station
- Freeways and Highways

METRO may also include other items such as B-Cycle stations, all-day frequent routes, peak-frequent routes, Park & Ride lots, and Transit Centers. A simplified map by LA Metro is shown in Figure 5.5, which shows only the rail lines, stations, transfer points, and bike parking accommodations.

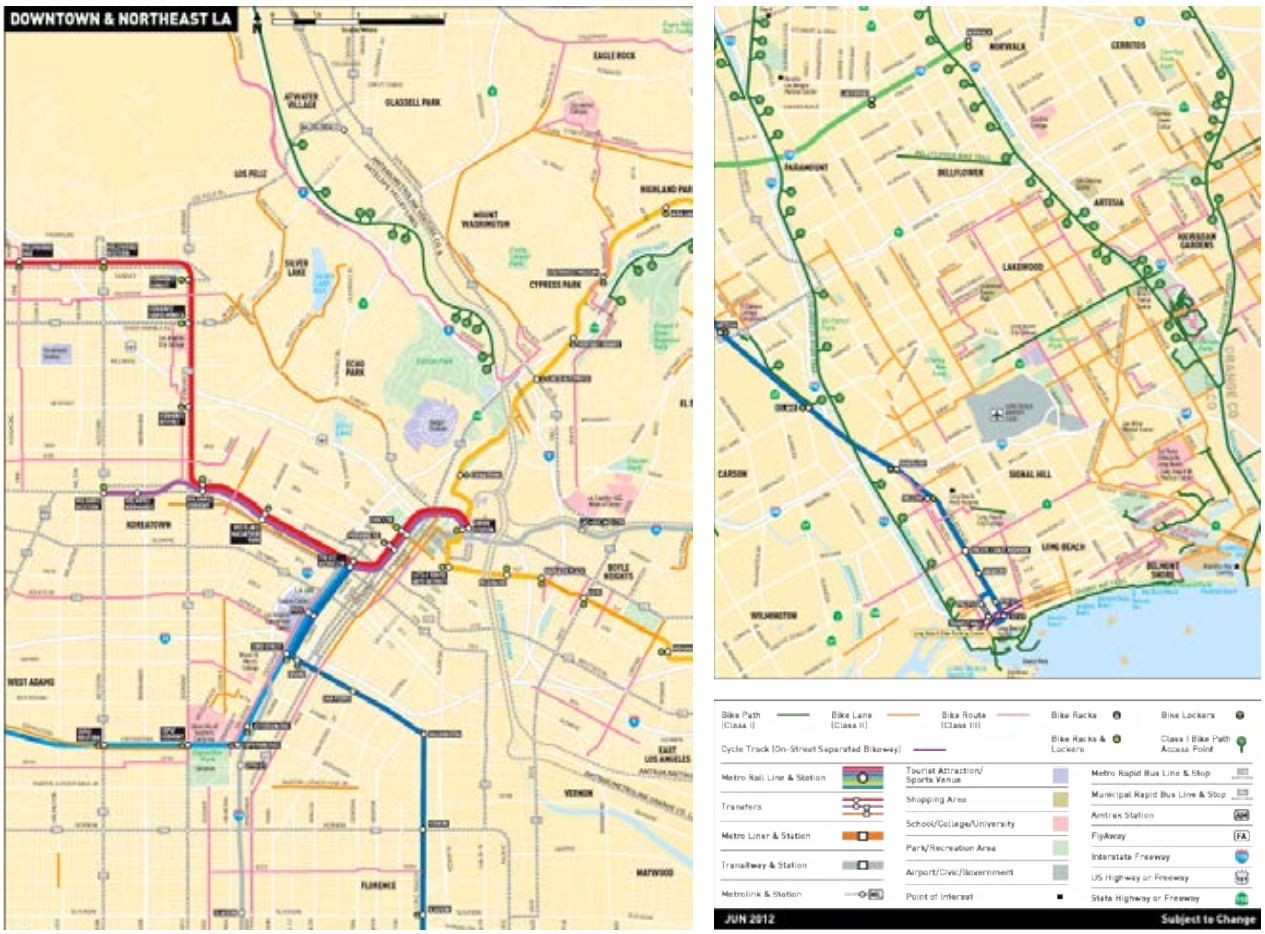


Figure 5.5: Los Angeles Metro bike and transit maps. Image credit: metro.net

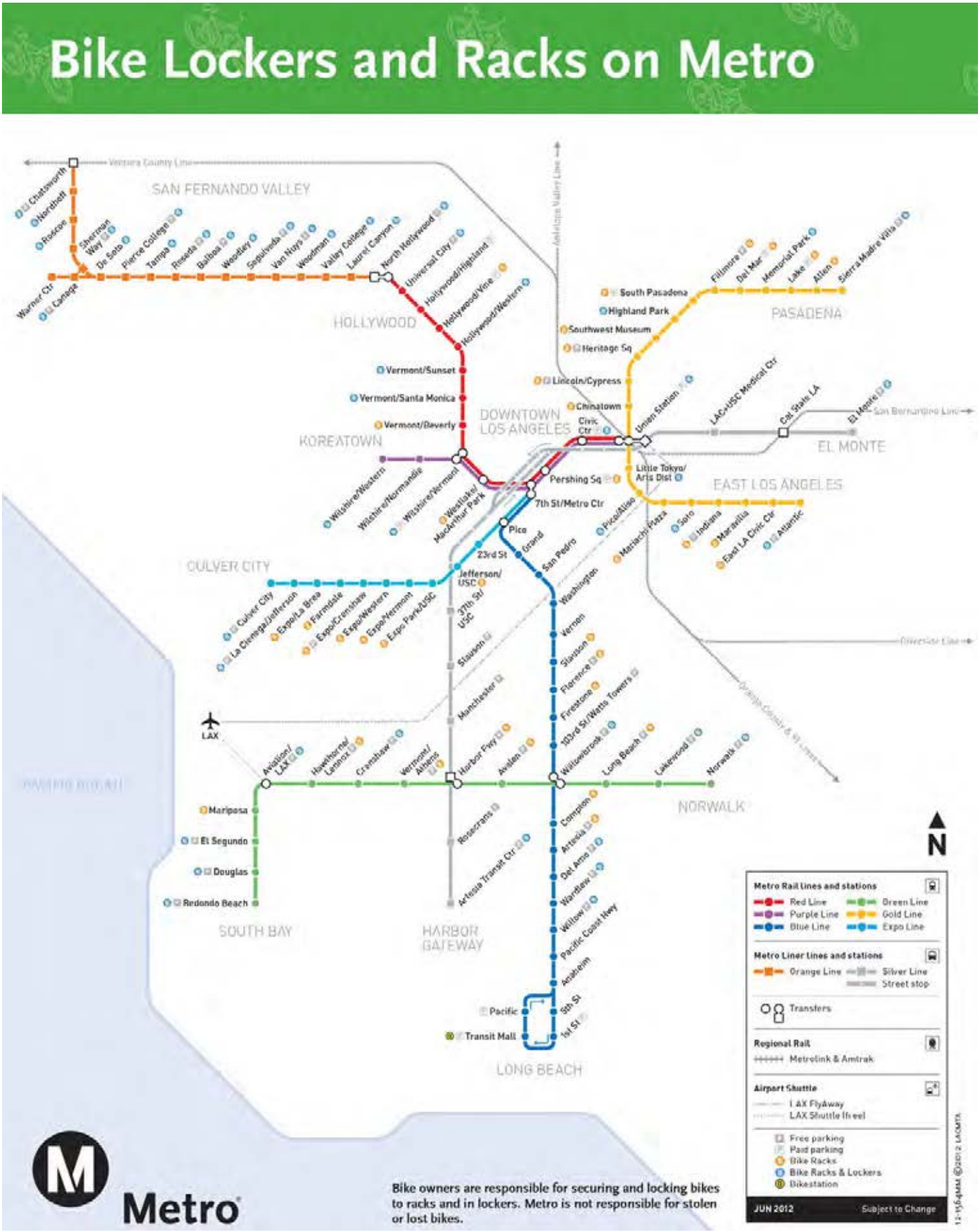


Figure 5.6: This Los Angeles County Metro Transit Authority map shows useful transit and bicycle information to better assist with trip planning: light rail lines and stations, transfers, regional rail, airport shuttles, free and paid parking, bike racks, bike lockers and bike stations.

08 Create a multi-modal online trip planning tool.

METRO's online trip planning tool, METRO T.R.I.P., allows users to indicate the following information:

- Date / time of departure
- Starting point (address or landmark)
- Destination (address or landmark)
- Sort results by (1) Trip Time, (2) Walking Distance, (3) Number of Transfers

This trip planning tool can be improved, with some technical development, to include the following preferences and build flexibility for bicyclists who ride transit:

- Maximum Connecting Distance (Walk or Bike)
- Bicycle Parking at Starting Point
- Bicycle Parking at Destination

Adding the functionality to incorporate biking would allow tool to generate different route options according to a larger catchment area (instead of a standard 1/4 mile or 1/2 mile walking radius) and available bicycle parking, and eliminate the need for transfers in some cases. METRO Bike & Ride Online Survey respondents indicated Google Maps as a resourceful tool for trip planning, which could work as a framework for METRO's trip planning interface.

09 Improve real-time information available through mobile apps and cell phone technology.

Improved methods of data collection could generate a more comprehensive database and provide better real-time information through mobile apps. For example, the use of sensors to count bikes on bus racks (discussed in Recommendation 4) could provide information to a mobile app to inform bicyclists of rack availability on approaching buses. If a rack is full, they may choose to find the closest parking facilities or choose an alternative route. This type of information would ensure that riders experience fewer instances of disappointment and inconvenience, and promote transit as reliable option for their travel needs.

Online maps may integrate trip planning tools and support other bicycle infrastructure by combining real-time information with bike parking icons. For example, clicking on a Transit Center icon might show that "2 of 10 bike lockers are available," and provide a link for adding credit to their Q cards for transit trips and bike locker fees.

Capital Metro of Austin posts information on bus stop poles that instruct riders how to use their cell phones or smart phones to receive real-time information allowing people to use a text message code or scan a QR code linked to their location. By sending the code via text message, the user receives a response with the routes' arrival times. By scanning the QR code, users are directed to a website with the following options to choose from:

- Next Departure
- Show on a Map
- Plan a Trip
- Capmetro.org website

See Figure 5.7 for an example of the Capital Metro signs with Bus Stop ID. Once METRO improves its data collection, expanding the availability of digital information, users can include the following:

- Routes with arrival time
- Number of spaces available on the bus bike rack
- List of nearby parking facilities
- Link to map with transit routes, bike routes, bike parking

Figure 5.7: Capital Metro of Austin posts trip planning tools at bus stop that allow riders to use their phones to receive information on arrival times.

INTEGRATE

Once a cyclist has decided to use the transit network for part of his or her trip, their next question will be: “what do I do with my bike while I am using the transit system?” Without a clear answer to this question, the interface between the bicycle and transit networks will remain a barrier to increasing bicycle trips on transit. These recommendations, which cover the tools developed or needed to better integrate bicycles into the transit system, fall into three main categories of improvements:

- Bicycle Parking – leaving the bike at or near the transit stop. This can be very effective where cycling is most useful at only one end of the transit trip. Key issues for bike parking include security and protection from weather including rain and sun.
- On-Vehicle Accommodations – bringing the bike along on the transit vehicle. This is most useful where cycling is necessary at both ends of the transit trip. Key issues include on-vehicle capacity (both for bike storage and riders) and other operational impacts on trip times.
- Bike Share – utilizing the growing system of rental bikes available for “last mile” connections. This reduces the demand for on-vehicle accommodation and provides bike parking as part of the rental bike stations. A key issue involves ensuring growth of the bike share network in coordination with areas of high transit demand.

The recommendations here outline the approach to integrate bicycles into the transit system to allow user to make seamless trips.

10 Reevaluate peak hour restrictions on METRORail annually, or with major system changes that may alter light rail car capacity.

Up to two bicycles are allowed on board light rail vehicles, except during weekday peak hours (6:30 – 9:30 a.m. and 3:00 – 6:00 p.m.) to help alleviate congestion on the Red Line, which is heavily used by commuters. The proposed METRO Bicycle Coordinator could initiate the evaluation of light rail train capacity annually, or as changes are made in the transit system; for example, the addition of vehicles or the opening of the Green and Purple Lines. Bicycle rules on each light rail line could vary according to the passenger capacity, and should be adjusted according to demand. The demand to bring bicycles on board may be higher through certain communities, such as along the Green Line, where neighborhood bicycle infrastructure is being expanded. For example, regulations listed online by the Massachusetts Bay Transportation Authority vary by line and direction, as seen in Table 5.1.

Bikes are allowed on the:	WEEKDAYS	WEEKENDS
Blue Line	Inbound: YES, except 7 - 9 AM Outbound: YES, except 4 - 6 PM	YES
Orange Line	YES, except 7 - 10 AM and 4 - 7 PM	YES
Red Line	YES, except 7 - 10 AM and 4 - 7 PM	YES
Mattapan Trolley	NO	NO
Green Line	NO	NO
Commuter Rail	YES, except peak period / direction Look for bike symbol on schedules	YES
Ferry	YES	YES
Bus/Silver Line	YES, if a bike rack is available	

Table 5.1. Bicycles on Trains, Time Table, Massachusetts Bay Transportation Authority, Source: Massachusetts Bay Transportation Authority, Bikes on the T, Available at: www.mbta.com/riding_the_t/bikes

Additionally, by initiating a test period for unrestricted bicycle access, METRO could collect feedback for both current and new ridership through a brief online survey and identify which time periods generate negative feedback from riders. Bay Area Rapid Transit conducted three “Bikes on Board” pilots, reducing bicycle restrictions. The following announcement for the final trial period was posted on the BART website:

Commute Period Bike Restrictions Modified for Extended Trial

From July 1, 2013 to December 1, 2013 commute period restrictions will be modified and bikes will be allowed on all trains and in all stations at all times. During commute hours, bikes are not allowed in the first three cars of any train.

Please observe these updated bike rules during the trial:

- Bikes are welcome on all trains but never in the first car or any crowded car.
- During commute hours (7:00 to 9:00 am and 4:30 to 6:30 pm) bikes are not allowed in the first three cars of any train.
- Regardless of any other rule, bikes are never allowed on crowded cars. Use your good judgment and only board cars that can comfortably accommodate you and your bicycle.
- Folded bikes are allowed on the trains at all times.
- Hold your bike while on the trains.
- Bicyclists must use elevator or stairs, not escalators, and must always walk bikes.
- Bicyclists must yield priority seating to seniors and people with disabilities, yield to other passengers, and not block aisles or doors or soil seats.
- In case of an evacuation, leave your bike on the train, and do not let it block aisles or doors.
- Bicyclists under 14 years old must be accompanied by an adult.
- Gas powered vehicles are never permitted.
- Bikes must be parked in racks and lockers. Bikes parked against poles, fences or railings will be removed.

Comments Welcome

Comments and observations* from BART riders are an important part of how the trial will be evaluated. The BART Board will ultimately decide if onboard bike restrictions are modified permanently. The Board requested an extended trial after reviewing the results of two five-day pilot programs conducted in August 2012 and March 2013. Similar to the extended trial, which is now in progress, these pilot programs modified commute period onboard restrictions. Rider input is an important component of the Board’s decision making process and comments are encouraged. Click on the link at the beginning of this paragraph to complete a comment form or call (888) 743-9921 to submit comments.

* Linked to a 3-question survey, asking whether passengers have ridden during commute hours, whether they are most in favor of the existing bike restrictions or the trial bike restrictions, and welcoming other comments

Figure 5.8: Bay Area Rapid Transit, Commute Period Restrictions Modified for Extended Trial, Available at www.bart.gov/guide/bikes/index.aspx

During this trial period, 1,774 people responded (36% response rate) to the survey distributed by BART. According to Steve Beroldo, BART Bicycle Access Manager, the level of bike acceptance grew with each pilot period. As of October 2013, 79% were in favor of revising the bike rules.[1] Refer to page 73 for more information on the revised BART Bike Rules.

[1] Bay Area Rapid Transit, “BART Board votes to permanently lift bike ban,” 24 October 2013, Accessed at http://www.bart.gov/news/articles/2013/news20131024

Transit agencies in comparable cities have no restricted times for bikes on trains, including Capital Metro (Austin), DART (Dallas), Valley Metro (Phoenix), LA Metro (Los Angeles), RTD (Denver), and TriMet (Portland). In order to manage this, other restrictions, guidelines, or accommodations were established; for example:

- Two racks per rail car (Capital Metro, DART)
- Symbols on train doors where bicyclists should enter (Valley Metro, RTD)
- Encouraging cyclists to be courteous, and wait for other passengers to clear doorways before boarding (Capital Metro)
- Encouraging bicyclists to wait for the next train if one is full (LA Metro, Valley Metro)
- Bicyclists must place their bikes in the area designated for wheelchairs (DART, LA Metro)

11 Install vertical racks on train cars as space allows.

The on-board location for cyclists and their bicycles on METRORail is currently in the mobility-impaired/senior seating area, where seats fold back in order to set bicycles out of the aisle. This location should remain an option for cyclists, but an additional space should be created. By removing a couple seats from the rail vehicle, accommodations can be expanded with the installation of vertical racks. Vertical racks or hooks on rail vehicles reduce the space taken up by bicycles, where bicyclists can stand beside them. Bike hooks build flexibility for passengers, as this space can be designated for bicyclists, individuals with strollers, luggage, or in wheelchairs. An example from TriMet trains is shown in Figure 5.9. Because this design may seem inconspicuous to riders, a bicycle symbol with supporting guidelines and instructions ensures that the racks are used. This effort would require coordination between the Bicycle Working Group, and its representative departments including Capital Projects, Service Design and Maintenance, and Communications and Marketing.

Figure 5.9: Bike hooks allow passengers to store bikes vertically on the train to maintain walking space. Photo: Trimet.org

12 Initiate a pilot project to test the feasibility of 3-bike racks on the front of buses.

To date, there is no tracking system for the number of bicyclists that are discouraged from using the transit system due to the limited capacity of front bus bike racks. However, since the incorporation of two-bike racks of the front of METRO buses in 2007, there has been a fairly steady annual increase in the number of bike boardings. When the two spaces are full, transit riders with bikes can be denied access to the transit system. The expansion of bus bike racks isn't the sole solution to this issue, but can accommodate many more riders' travel needs when bikes are necessary at both ends of the trip.

King County Metro of Seattle has converted to three-bike racks, and Capital Metro of Austin is testing their feasibility on select routes. Capital Metro received mostly positive feedback from its three-bike rack pilot project and will eventually retrofit all their local bus racks. Capital Metro's success should be encouraging to METRO if it chooses to respond to the public's request for greater on-bus accommodations. There are issues to consider for the conversion or testing of three-bike racks on METRO buses, for example, choosing a design that doesn't compromise vehicle and service efficiency, and can remain user-friendly. Other safety and evaluation criteria may be considered for future rack purchases, such as a light for night use and data collection technology.

If a 3-bike rack pilot project is initiated, METRO should test out various routes and types of buses, and collect data to inform future capital purchases. These evaluations should be a collaborative effort between the Bicycle Working Group and Bicycle Advisory Committee to review feedback from bus drivers and passengers (bicyclists and others) on wait time, ease of use, demonstrated demand/capacity, and operation and maintenance constraints. If determined that the overall response is positive, METRO should begin replacing the 2-bike racks with 3-bike racks on future purchases.

13 Provide short-term bicycle parking accommodations at or adjacent to select bus stops and METRORail stations without obstructing the pedestrian walkway.

Short-term bicycle parking options are meant to accommodate quick trips, lasting two hours or less, and may be less secure than some long term parking options. These short-term bicycle parking provisions, as described in Figures 5.10 and 5.11, are best located in areas with high pedestrian traffic and frequent transit within walking distance (a quarter-mile or less). All bicyclists could benefit from the availability of short-term parking at commercial developments, a standard that should be supported to across the region to promote a multi-modal transportation options. METRO may coordinate with the City of Houston, Management Entities, and property owners at destinations along light rail and bus stops with frequent bus routes to provide bike parking for their visitors and patrons; these are partnerships that should be developed by METRO's Bicycle Coordinator. Bike parking within the public right-of-way will be a policy issue for the City, and will require coordination between METRO and the City of Houston Public Works and Engineering Department City Engineer's Office.

In situations where short-term bike parking can be installed on METRO property, on or adjacent to light rail stations or bus stops, the design team must ensure the pedestrian walkways aren't obstructed when bicycles are locked up. This may require METRO's Inter-governmental Affairs Department to consider policies for handling bicycles that are left overnight or for multiple days. The Communications and Marketing Department can assist with the creation and distribution of marketing material to educate users on newly established rules.

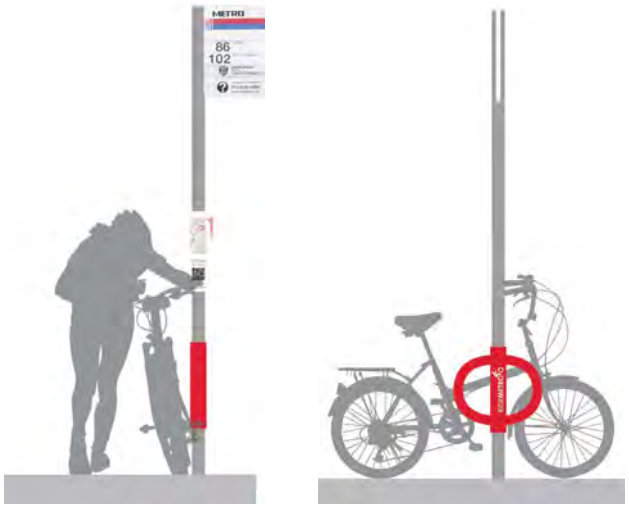


Figure 5.10: Signpost bike rack allows bikes to be locked up parallel to the curb line. Left: view as seen walking along sidewalk, right: view as seen when facing curb.

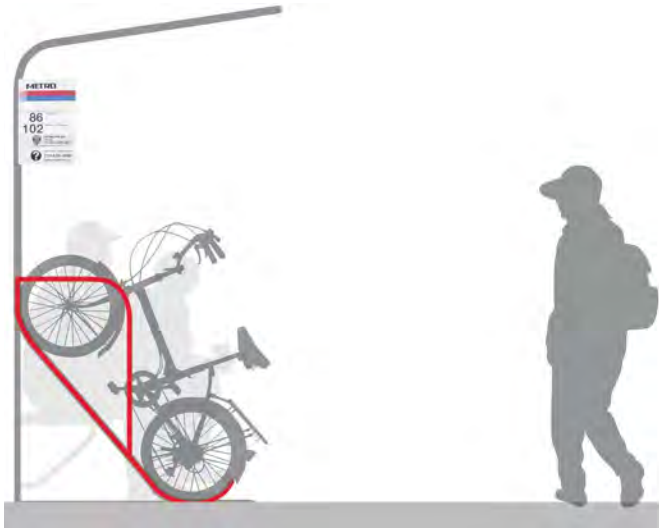


Figure 5.11: Bus shelter designed with an angled bike rack provides a secure location for bike parking.

14 Explore potential design options to outfit future METRORail station platforms with space for short-term bicycle parking.

METRO should consider how bicycle facilities could be included in the development of future METRORail stations, with configurations similar to those shown in Figure 5.12. As part of a comprehensive parking plan for METRO's Service Area, these racks should be emphasized as a short-term option indicating locations for long-term parking on an adjacent map, and establishing time limits to locking bikes. A sign may warn bicyclists, "This rack is for short-term bike parking. Bicycles left overnight are subject to removal," or other variations depending on policies adopted by METRO for short-term bike parking. These racks will not be appropriate for all METRORail stops, but should be examined where wider platforms, a high demand for cyclists and/or no appropriate adjacent parking area can be identified.

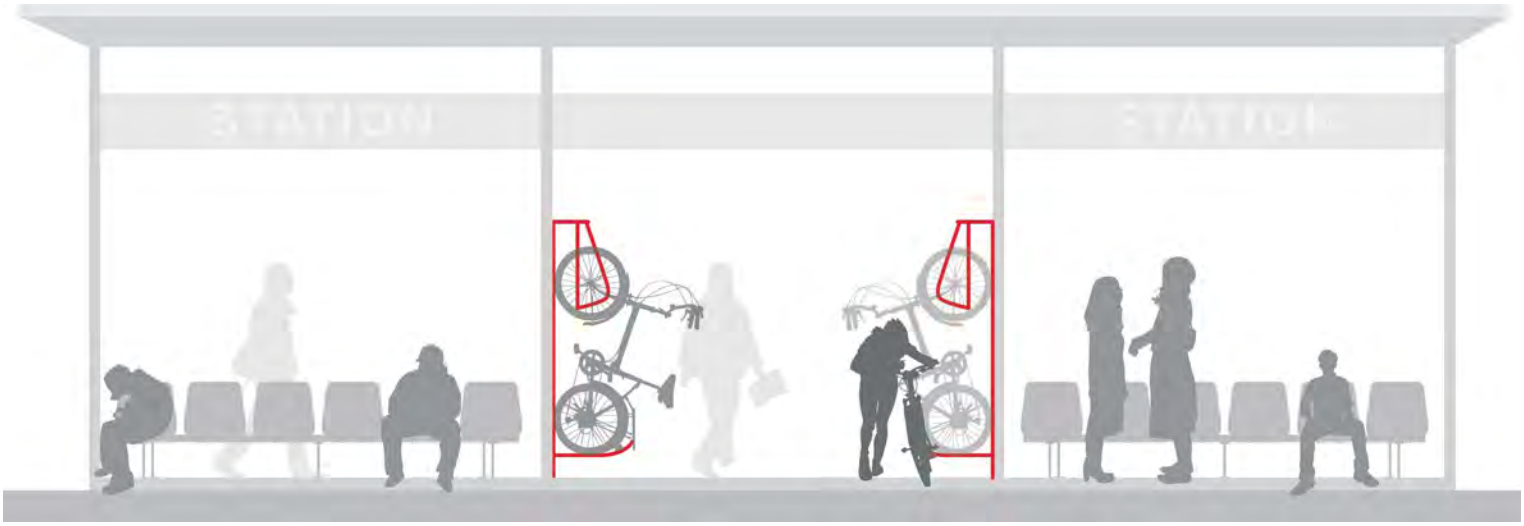


Figure 5.12: Bike rack configuration for a two-way light rail loading platform that is accessible to passengers on either direction

15 Provide long-term bicycle parking at Park & Ride lots and Transit Centers with options for free and fee-based accommodations.

Long-term bicycle parking options are meant to provide all-day accommodations for transit riders, and potentially longer, depending on payment options and the establishment of penalties to prevent abuse of the system. These options should be established for commuters, and transit riders who are using bicycles to help them travel greater distances. Because bicycles will remain out of sight or reach of their owners for long periods of time, it is important to provide shelter and allow for greater protection from theft, sun damage, rain and other outside elements. Both free and fee-based long-term bicycle parking provisions, as depicted in Figures 5.13-16, should be located at Park & Ride lots and Transit Centers, where METRO has adequate space. Most boarding areas at Park & Rides and Transit Centers are large enough for the installation of bike racks beneath the cover. This location, close to the loading area, is more convenient than in the automobile parking lot, where they are currently placed in some transit facilities. Likewise these boarding areas may be retrofitted to accommodate a series of bike lockers that operate on a membership or fee-based system, while considering the potential for expansion. Expansion of parking facilities may also include a bike cage; however, few current locations require that level bike parking capacity to date.

It is recommended to start with a few lockers at facilities (one to five) that are promoted with advertisements on buses and information posted through the METRO website and social media. Locker design varies, and should consider space accommodations on site. Figure 5.16 shows a configuration that could respond to the underutilization of space at a transit facility.

METRO should explore opportunities for using its Q Card as payment for long-term bike parking, such as lockers or cages. Several transit agencies across the United States utilize an hourly payment system for bike lockers and cages. For example, BART and TriMet use BikeLink facilities, a product created by eLock Technologies. Users pay twenty dollars for a BikeLink card, a credit that can be used at any facility with a varying hourly rate. The BikeLink facilities in the Bay Area range from $0.03 to $0.05 per hour, but may go as high as ten cents per hour while still remaining affordable (under a dollar for a workday). The addition of these facilities will require marketing to ensure current riders are aware of payment options and rates at different locations.

While other transit agencies use the BikeLink services with their own brand, such as the Compass Card in San Diego, Park Card in Santa Cruz, and the SmarTrip card in the Washington DC area, none use the system to charge for long-term bike parking facilities as a trip or a transfer. If pursued, rather than operating on an hourly basis, the lockers may be charged at a flat rate of $1.25 per day (same price as a transit trip), or function as

a transfer. This would address cost concerns expressed by focus group participants who indicated that cost might prevent them from using bike lockers on a fee basis. By functioning as a transfer, connecting bikes to transit remains an affordable option for riders, while reducing the risk of bicycle theft at transit facilities. This change in the parking program should be included in an awareness campaign with other initiatives to educate riders on how to use the system, stressing its ease of use within the METRO system.

Figure 5.13: Bike lockers can store bicycles and personal belongings. Image credit: cycleandstyle.com

Figure 5.14: Bike lids disguise bikes and provided added protection from outside elements. Image credit: flickr.com/photos/mr38

Figure 5.15: Bike cages offer security through a limited access shelter that operates on a fee or membership basis. Image credit: texbiker.net

Figure 5.16: Pie-shaped bike lockers offer a more space-efficient design. Image credit: landscapeonline.com

16 Develop a framework for bike hubs on METRO property that can be managed by outside entities.

A multi-function bike station might involve a mutually beneficial partnership between METRO and private companies or local organizations. The partnering entity or entities could provide a variety of services to bicyclists, such as secure bike parking, rentals, service repair, parts for purchase, personal lockers, showers, restrooms, food, and guides. This may also be a location where riders can receive transit information or purchase Q cards. If located near transit facilities, these bike hubs make bicycling a more attractive connector for users whose concerns about bicycle security or arriving to work sweaty are addressed. In addition to commuting, this becomes a great opportunity to cater to visitors and tourism, as seen in the services provided at the new McDonald's Cycle Center (Figure 5.17 and 5.18) at Millennium Park in Chicago:

Figure 5.17: Exterior of McDonald's Cycle Center at Millenium Park in Chicago Photo: treehugger.com

Figure 5.18: Bike repair station at McDonald's Cycle Center at Millenium Park in Chicago Photo: commons.wikimedia.org

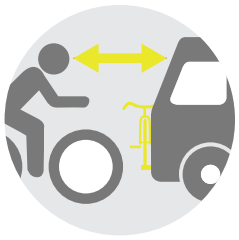
- 300 secure bicycle parking spaces
- Lockers, showers and towel service
- Bicycle rentals
- Bicycle repair shop
- Guided bicycle tours
- Bicycle camp
- Car sharing

A multifunctional bike hub could be part of METRO's comprehensive plan. Potential locations for such a venture may include the Addicks Park & Ride because of its access to the Energy Corridor and a high concentration of jobs, or East Downtown near EaDo/Stadium Station with easy access from the Columbia Tap Trail. METRO may be the landowner of a privately operated business or program in conjunction with a management district or non-profit such as BikeHouston. Alternatively, a bike hub could be achieved though an inter-local and/or public-private partnership.

17 Work closely with B-Cycle to identify potential locations for its Phase 4 expansion on or near METRO property.

Houston's Bike Share Program (operated by B-Cycle) began in 2012, and has since expanded across Downtown, Midtown, and Montrose, including a station at METRO's Downtown Transit Center. A METRO staff member, such as the proposed Bicycle Coordinator, should pursue a role in B-Cycle's Steering Committee, and work closely with B-Cycle planning staff to identify future locations at or adjacent to bicycle-friendly transit facilities, such as those connected to trails or on-street bicycle facilities.

METRO and B-Cycle would benefit from cross-promotions that encourage the use of transit and bike share in conjunction. A phase 4 B-Cycle expansion should be pursued in conjunction with the opening of the Green and Purple METRORail lines. This can then be promoted through a marketing campaign, and by combining information useful to both systems at transit facilities that feature a B-Cycle station, such as a map that includes B-Cycle stations, area destinations, and bicycle and transit routes.



CONNECT

The third principle for creating stronger access between the bicycle network and METRO's transit system is to provide safe connections for cyclists. Once cyclists have identified that using transit combined with biking will improve their commute and understand how they can store or bring their bicycle with them, safe, well-maintained routes to the transit connection are needed. Some 60% of respondents to the METRO Bike & Ride survey felt that lack of bicycle routes to transit was the most important barrier to increasing combined bicycling and transit trips in Houston. This answer was over twice as frequent as the next most common response.

There is a growing set of tools available to address improvements to the bikeway network. Cities across the world are investing in bicycle facilities to support a broader spectrum of cyclists, in particular those who identify themselves as "interested but concerned". This is typically the largest segment of the cycling population, and also the most likely to feel comfortable cycling when they are using a bikeway that dedicates space to them. Typical bikeways that are attractive to a broad range of cyclists include:

- Shared Use Paths or Trails
- Bike Lanes (standard and buffered)
- Cycle Tracks
- Shared Roadways (Sharrows and signed)

This section of the Recommendations chapter focuses on applying these tools within and around major METRO transit nodes to enhance a cyclist's ability to connect to the transit system. As most of these proposed bike routes and facilities extend beyond METRO's property, they will require strong partnerships with other local agencies, including the City of Houston and other local cities, management districts, Harris County and TxDOT. There are also improvements that METRO can make to bicycle parking and wayfinding to create better access to the transit system for cyclists. However, ***the following recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.*** All recommendations outside of METRO property must be coordinated with appropriate agency or agencies.

The recommendations have been developed with the current regional bicycle network in mind, also considering known projects in development at the time of this report. The City of Houston recently approved the Bayou Greenway Initiative, a major bond measure to complete a trail system along all of Houston's major bayous. Many of METRO's transit nodes are close to these existing or planned trails which present opportunities to extend the catchment area for transit users around these nodes. Several TxDOT Transportation Enhancement projects are also proposed in the vicinity, including transit nodes as well as projects by the Harris County Flood Control District, local management districts and other agencies.

Additionally, these recommendations are intended to support pedestrian and bicycle planning initiatives by the City of Houston, including efforts towards passing Complete Street policy. In October 2013, Mayor Parker made a Complete Streets Executive Order, a preliminary step to passing a Complete Streets policy. According to a Press Release made by the Mayor's Office, these efforts are meant to provide transportation options that safe, accessible and convenient for motorists, public transit riders, pedestrians, people of all abilities and bicyclists.

Transit Nodes

Within the METRO system, transit nodes such as Transit Centers, rail stations, and Park & Ride lots represent key points of access to the transit system because they are typically locations with high levels of service to a variety of destinations. As part of the overall effort to improve connections between bicycles and transit, METRO transit nodes were evaluated for bike accessibility. Specifically, surveys were taken of existing bike infrastructure, bike parking, and potential barriers to bicycle access.

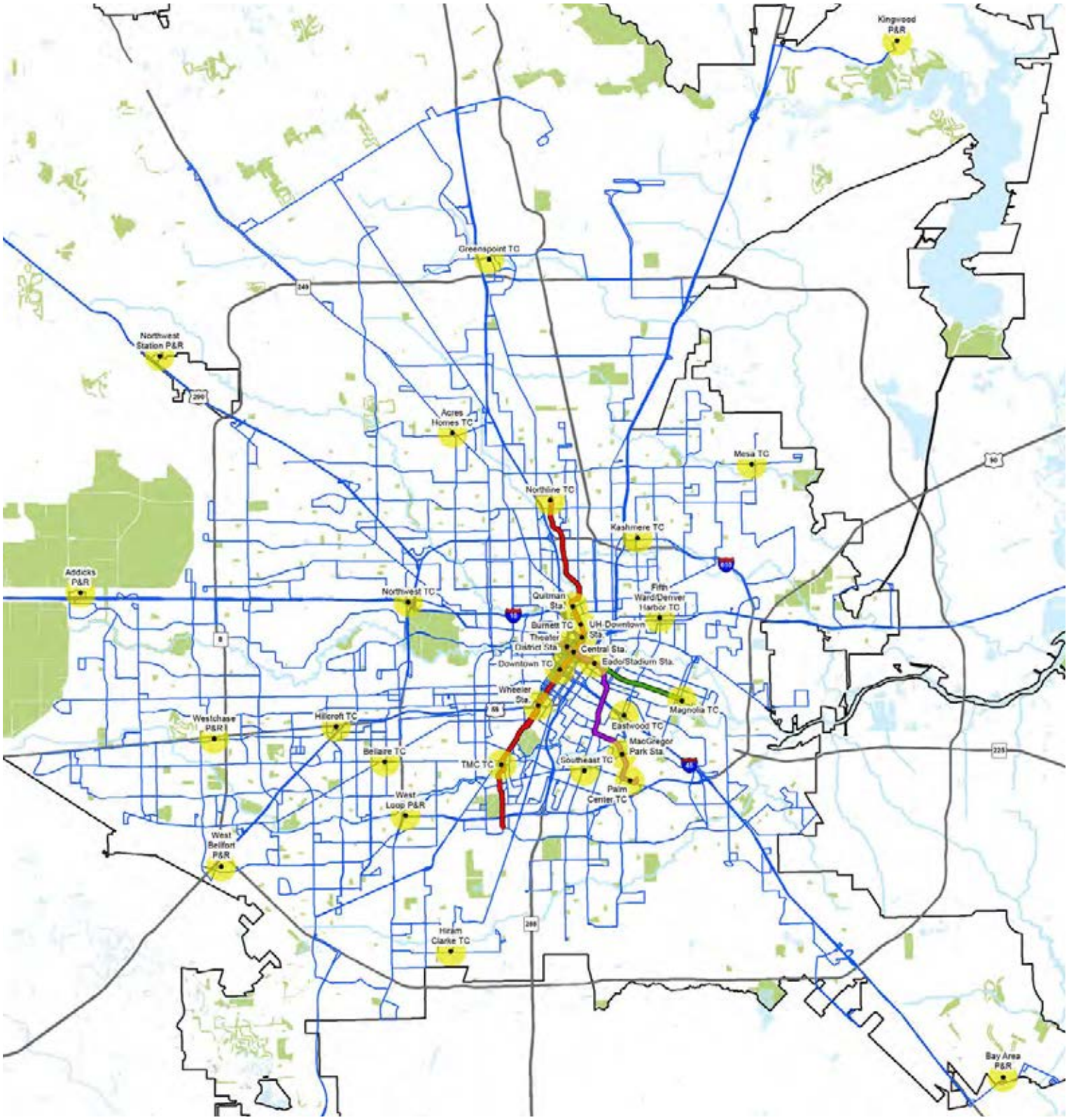
Selection of Transit Nodes
Thirty-one transit nodes were selected for further assessment to develop improvement recommendations. These locations were selected to provide a range of transit node types including Transit Centers (17), Park & Ride (7) and rail stations (7), both existing and planned as part of the new light rail lines. The nodes also provide a spectrum of contexts for bicycle connections. Some locations are in or near major employment centers like the Downtown CBD and the TMC. Others are in or near older, more urban neighborhoods like the Fifth Ward, Hiram Clarke and Houston's Near Northside. Park & Ride nodes are typically more suburban in character. The locations are also selected to represent geographically diversity across the service area with locations in all directions from the downtown core (See Figure 5.19).

In total, these locations show that bicycle access is relevant in all of these contexts where transit service is useful to cyclists. The recommendations outlined in this chapter are applicable to additional locations in the service area, as well as future locations where METRO invests in new transit nodes. These and other nodes also have potential to grow in usefulness to cyclists as METRO undertakes System Reimagining, a project rethinking how to best utilize current resources to improve the bus system. Where new or modified routes are developed that benefit higher ridership, these routes are likely to benefit cyclists as well, making the system more useful and relevant to all potential users.

The 31 transit nodes assessed as part of this report include:

Acres Homes Transit Center
Addicks Park & Ride
Bay Area Park & Ride
Bellaire Transit Center
Burnett Transit Center
Central Station / Main Street Square
Downtown Transit Center
EaDo / Stadium Station
Eastwood Transit Center
Fifth Ward / Denver Harbor Transit Center
Greenspoint Transit Center
Hillcroft Transit Center
Hiram Clarke Transit Center
Kashmere Transit Center
Kingwood Park & Ride
MacGregor Park Station
Magnolia Transit Center
Mesa Transit Center
Northline Transit Center
Northwest Station Park & Ride
Northwest Transit Center
Palm Center Transit Center
Quitman Station
Southeast Transit Center
Texas Medical Center Transit Center
Theater District Station
UH Downtown Station
West Bellfort Park & Ride
West Loop Park & Ride
Westchase Park & Ride
Wheeler Station

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.



Transit Network

- Red Line (Main Street/North)
- Green Line (East End)
- Purple Line (Southeast)
- Bus Routes

Transit Nodes

Figure 5.19: Transit Nodes Targeted for Improvements

Connection Recommendations

This section outlines the recommendations developed for the selected transit nodes where opportunities exist to improve bicycle connections. A systematic approach was taken to develop the recommendations and to support the consistent development of bicycle connectivity for other transit locations, including future locations that are developed by METRO. The recommendations focus on three major goals.

1. Connect to major bikeways
2. Connect to major destinations (especially outside of easy walking distance)
3. Connect neighborhoods to faster, more frequent transit service

As bicycle access to transit will be most beneficial when these three goals support one another, specific opportunities to improve Integration (e.g., parking and bike share), and Communications (e.g., signage and wayfinding) around each node were also identified.

The recommendations to Connect are defined as follows:

18 **Connect transit nodes to nearby bicycle facilities that expand the transit catchment area in a useful way.**

The typical access area around a transit stop is assumed to be the distance that can comfortably be covered within approximately 5 minutes. For a pedestrian this distance is typically assumed to be about one quarter mile, though people are known to walk farther for faster or more frequent service as these characteristics make the transit trip more attractive and total travel time shorter.

The greater speed traveled by a cyclist means that the coverage area around a transit node expands from about one quarter mile for a pedestrian to 1 or even 2 miles for a cyclist where quality routes exist. Therefore, connecting transit nodes to bicycle facilities, including the growing trail network in the Houston region as well as on-street facilities linked to destinations, can expand the reach of the transit system to many more users.

19 **Connect transit nodes to major destinations nearby (but outside walking distance) for which a bike connection would create a useful trip.**

Transit users make calculations about their overall travel time when planning their trip. Either implicitly or explicitly, they factor in estimated travel speeds and wait times for each segment of the trip. Based on this calculation, cycling becomes an attractive option to reach major destinations that are too far to conveniently walk but close enough that cycling can be faster than waiting for a transit connection. Cycling is also attractive where no direct transit connection is readily available. Recommendations have been developed to create these connections to major destinations within useful biking distance to major transit nodes.

20 **Connect neighborhoods to transit nodes that offer transit service most beneficial to cyclists (such as limited-stop, frequent, rail, and/or Park & Ride service)**

The Top 10 local routes for bike boardings (from METRO FY 2012 Bike Report) provide insight into characteristics that provide a compelling value proposition to cyclists as seen in Table 5.2.

Table 5.2: Features of Top 10 Bike Boarding Bus Routes

Rank	ROUTE		FREQUENT All Day	FREQUENT Peak Hours	EXPRESS Segment	LONG Overall Route Length
1	40	Telephone - Pecore		✓ ✓ ✓		✓ ✓ ✓
2	44	Acres Homes Limited		✓	✓ ✓ ✓	✓ ✓ ✓
3	46	Gessner Crosstown		✓ ✓ ✓		✓
4	50	Heights - Harrisburg	✓ ✓ ✓	✓ ✓ ✓		✓ ✓ ✓
5	52	Hirsch - Scott	✓ ✓ ✓	✓ ✓ ✓		✓ ✓ ✓
6	56	Airline Limited	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓
7	77	Liberty-MLK Limited		✓ ✓ ✓	✓	✓ ✓ ✓
8	82	Westheimer - West Oaks	✓	✓ ✓ ✓		✓
9	85	Antoine Limited		✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓
10	137	Northshore Limited		✓ ✓ ✓	✓ ✓ ✓	✓

FREQUENT

15 minutes or better ✓✓✓

16 to 20 minutes ✓

EXPRESS

4 miles or more ✓✓✓

Less than 4 miles ✓

LENGTH

20 miles or more ✓✓✓

15 - 20 miles ✓

Of the top ten routes in terms of total bike boardings, five are “limiteds” that run nonstop for part of the route. Nearly all of the routes are frequent during the peak periods or all day, with headways of 15 minutes or less. This makes sense given that these are the routes that are most likely to offer meaningful trip time benefits over a bike-only trip based on travel speed and wait time. Bike speeds are comparable to many of the local routes’ average speed (about 12 mph) so for local trips, especially shorter ones, bikes are time competitive or even superior to buses, especially after factoring in wait time for less frequent bus routes.

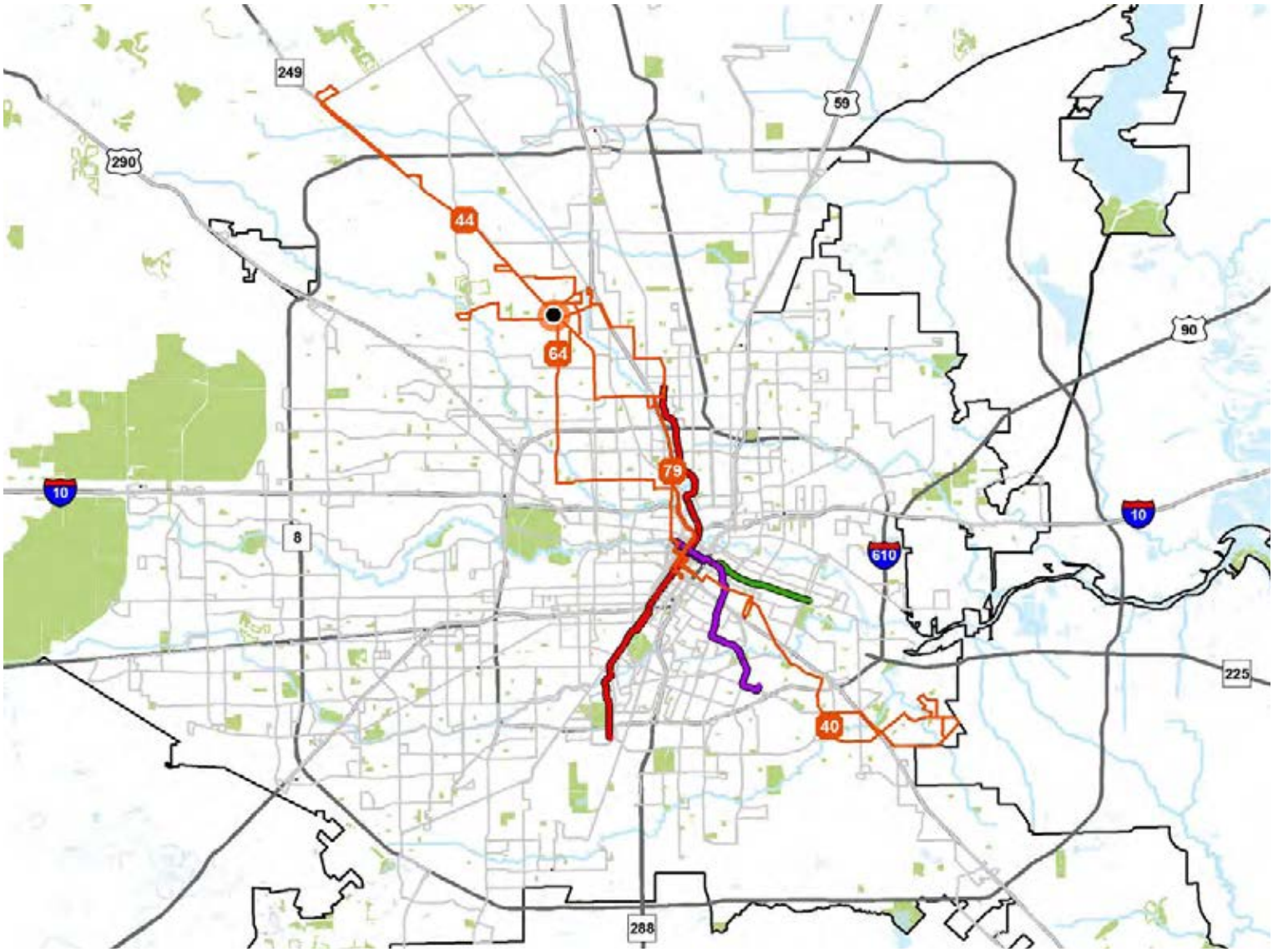
Some of the bike boarding success is driven by the length and quantity of revenue hours on these routes. More service should equal more bike trips overall. But these routes still perform exceptionally well based on productivity. Their length also may mean they cross barriers that may be more difficult to traverse on a bicycle. Rail stations and Park & Rides also provide connections to service that can be an attractive choice for cyclists based on speed, distance covered and crossing major barriers. Unfortunately data on bike boardings are less reliable at these locations for reasons including:

- Park & Ride users are more likely to park their bikes at the origin than put them in the on-vehicle storage on the Park & Ride buses.
- Bike boardings on rail are not counted separately from other passengers in METRO’s Automated Passenger Counter system.

Even given data challenges, high usage of bike parking facilities or on-board accommodations demonstrate that rail stations and Park & Rides represent attractive bike and ride locations due to high transit vehicle speeds and high frequencies in key travel periods.

Creating connections to transit nodes that allow access to strong transit service offerings can expand METRO’s bike and ride network.

ACRES HOMES TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 2.9 — Mode-Split

POPULATION: Low Density — 1.4 — High Density

TRANSIT CONNECTIONS

Local

40 Pecore

64 Lincoln City Circulator

Limited

44 Acres Homes Limited

Weekday Frequent

All Day or Peak

Figure 5.20: Acres Homes Transit Center Connections

Figure 5.21: Boarding platform and bike

Figure 5.22: Ramp to boarding area from driveway loading area

Acres Homes Transit Center is located in a relatively low-density area with few major destinations. As a result, bus routes are relatively widely spaced and infrequent. The Transit Center itself, however, is served by two routes to Downtown, one of which runs express for part of the way at least some of the time. Therefore, rather than wait on one particular bus, transit riders from the surrounding area may find it worthwhile to bike to the Transit Center where they have multiple options for completing their bus trip. Improved bike parking would make this option more appealing.

Activity centers/destinations within one mile:
No major destinations

Major barriers within one mile:
Undeveloped areas

Existing bike facilities within one mile:
None

Existing bicycle parking:
Two racks at ends of boarding area

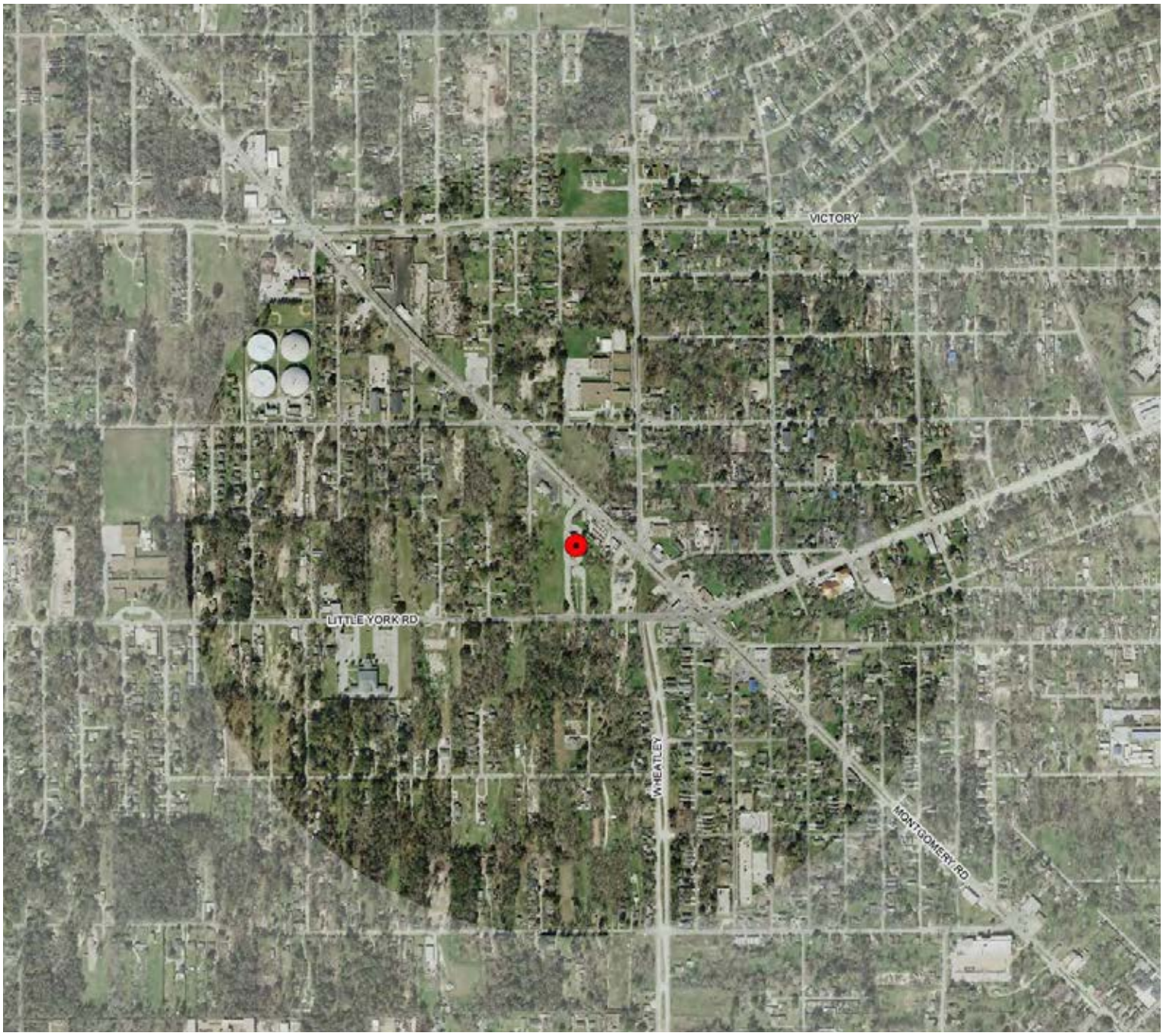
City: Houston

Management District: N/A

Weekday bus boardings: 360

Figure 5.23: Existing bike rack

Figure 5.24: Existing bike rack with bike



Acres Homes Transit Center Half-Mile Radius

Existing Bicycle Facilities

R Existing Bike Rack

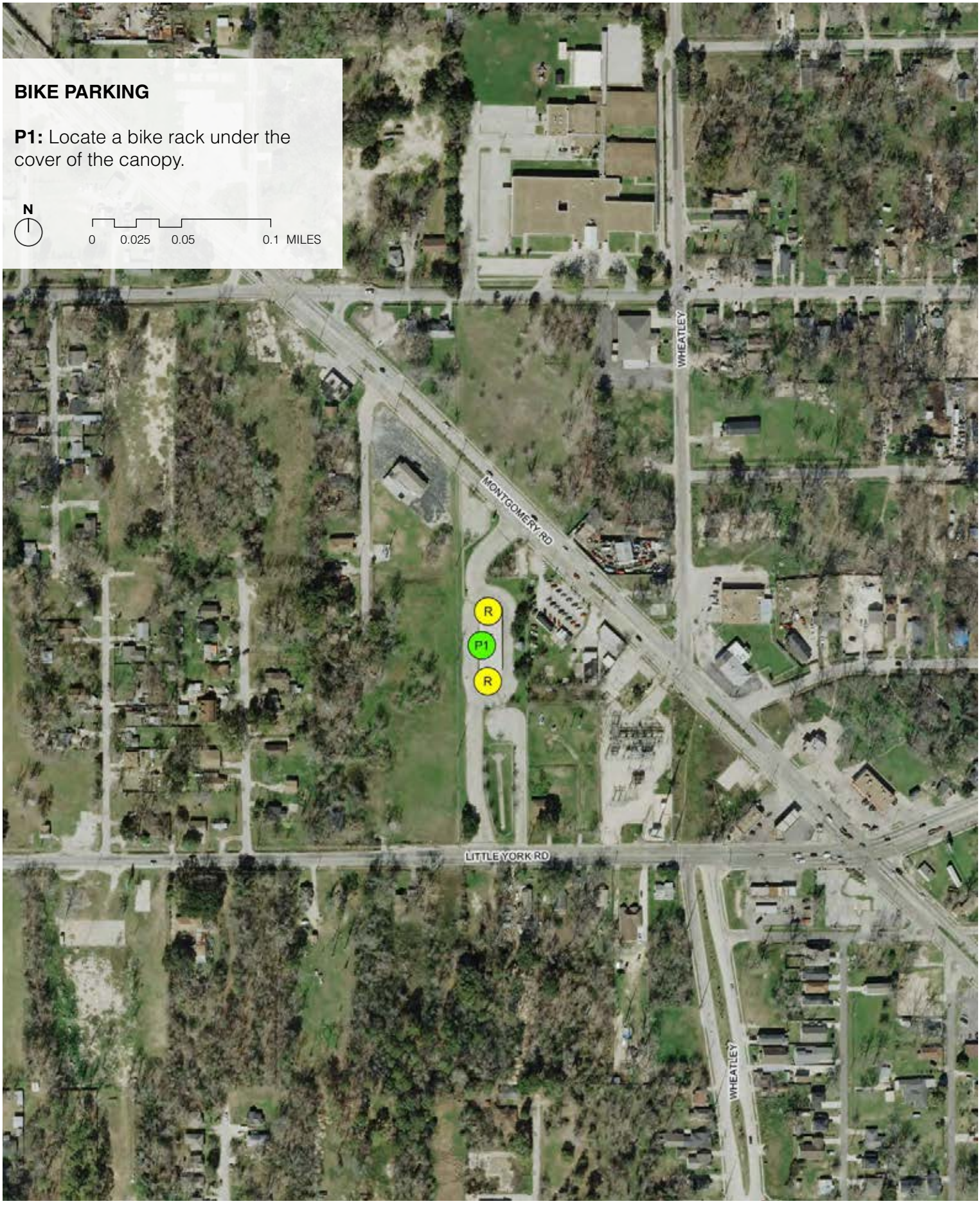
Recommended Facilities

P Bike Parking Recommendation

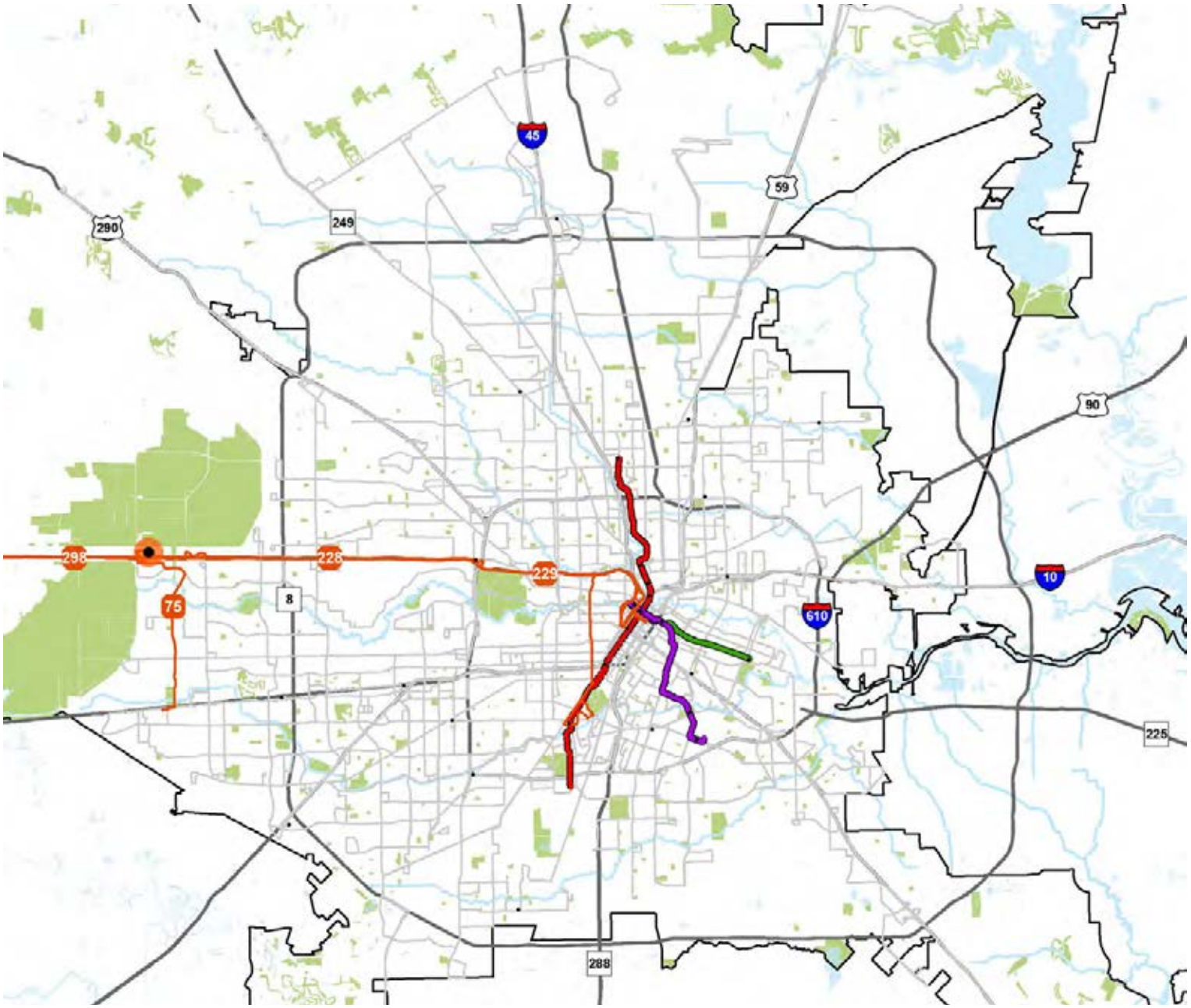
Figure 5.25: Acres Homes Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES


BIKE PARKING
P1: Locate a bike rack under the cover of the canopy.
N
0 0.025 0.05 0.1 MILES
MONTGOMERY RD
WHEATLEY
LITTLE YORK RD
WHEATLEY
R
P1
R

ADDICKS PARK & RIDE



INDEX

COMMUTE: Drive Alone — 2.2 — Mode-Split

POPULATION: Low Density — 1.3 — High Density

Local **Weekday Frequent**

75	Eldridge Crosstown	

Park & Ride

221	Kingsland	
228	Addicks	Peak
229	Kingsland/Addicks	
298	Kingsland/Addicks/TMC	Peak Direction

Figure 5.26: Addicks Park & Ride Connections

Addicks Park & Ride is located along the Katy Freeway (IH-10) within sight of numerous Energy Corridor office buildings. It is cut off, however, by IH -10 and adjacent frontage roads. The nearest crossing is the intersection with State Highway 6 which is challenging for cyclists and pedestrians.

A better option was made available when the North Extension of the Terry Hershey Park Trail opened in the summer of 2013. While not entirely direct, it provides for safe crossing of the freeway using a bayou underpass and connects to miles of interconnected trails. This connection will be useful both for residents of the area wishing to reach the Park & Ride and reverse-commute employees wishing to reach their workplaces.

The trailhead is located across an intersection from the Park & Ride lot, less than 200 yards from the boarding platform as the crow flies. As access to the lot is currently configured, however, cyclists will have to travel farther and share streets and driveways with vehicles. It would be a benefit to improve this access.

Bike parking at the lot can also be greatly improved. The bike racks are currently located out in the open on islands in the parking lot. An unused building exists alongside the boarding platform that the Energy Corridor District Bicycle Master Plan identifies as a potential “bike station.”

Activity centers/destinations within one mile:
Energy Corridor employment center

Major barriers within one mile:
IH-10 Katy Freeway, SH-6, Addicks Dam and Reservoir

Existing bike facilities within one mile:
Soon-to-open extension of Terry Hershey Park Trail

Existing bicycle parking:
Two racks in parking lot

City: Houston

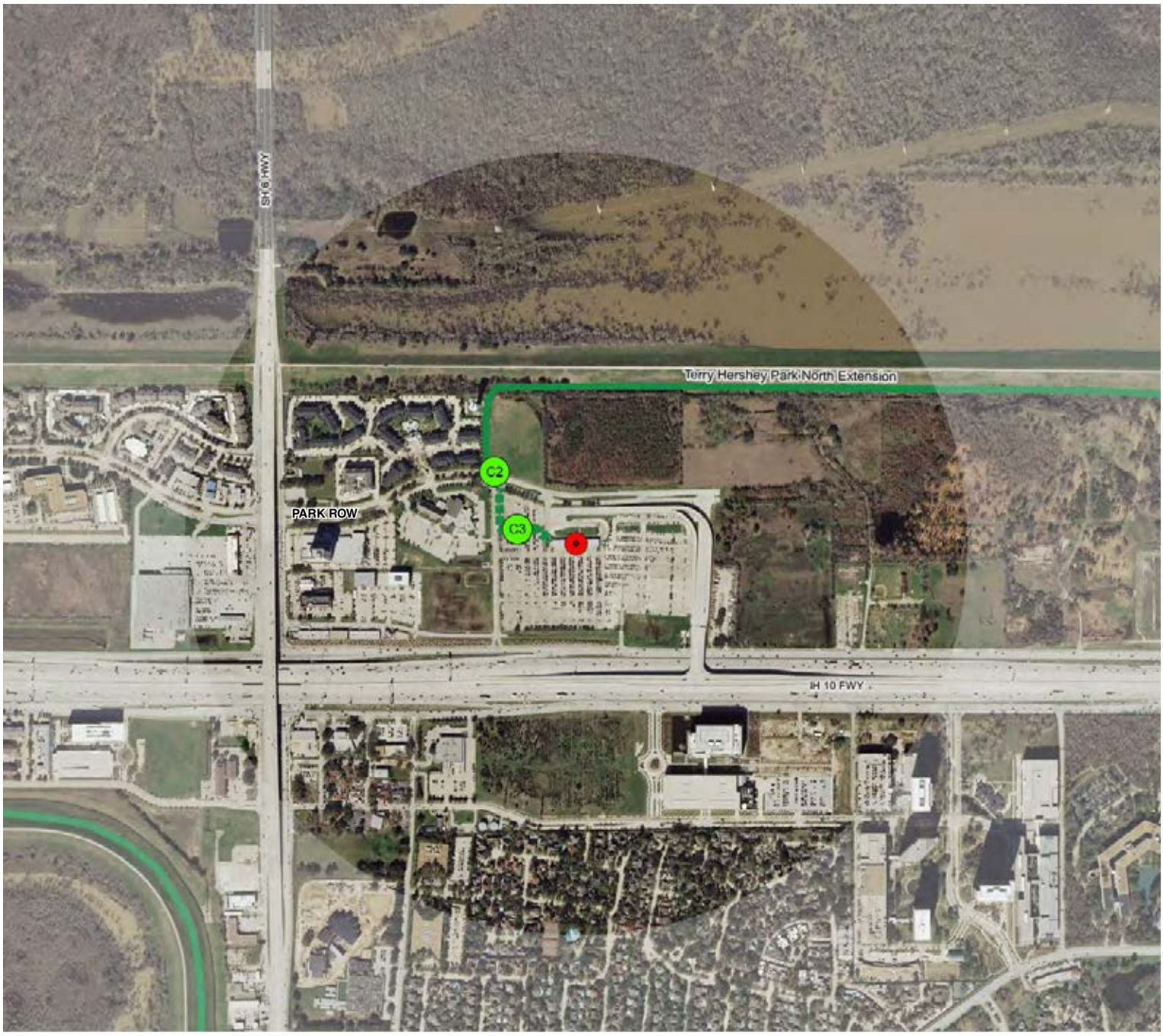
Management District: Energy Corridor

Weekday bus boardings: 1,694

Figure 5.27: Bike rack and office buildings across IH-10

Figure 5.28: Boarding platform

Figure 5.29: Unused building, potential for bike hub facility



Addicks Park & Ride Half-Mile Radius

Existing Bicycle Facilities

Shared-Use Path

R Existing Bike Rack

Recommended Facilities

Shared-Use Path

C Connection Recommendation

P Bike Parking Recommendation

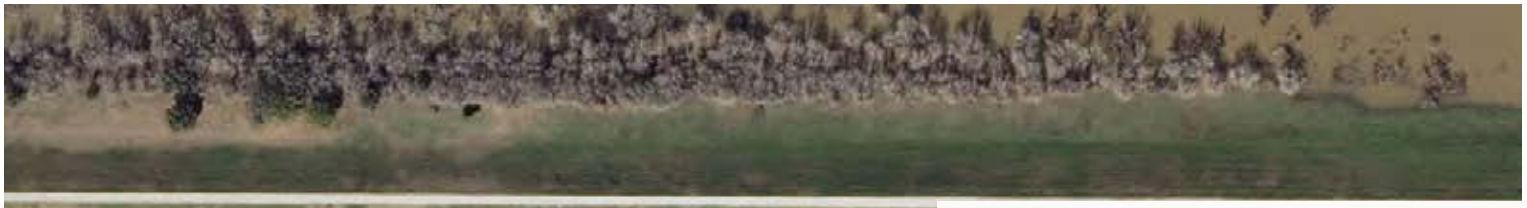
W Wayfinding Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

N

0 0.125 0.25 0.5 MILES

Figure 5.30: Addicks Park & Ride Recommendations



CONNECTION
TERRY HERSHEY
NORTH TRAIL EXTENSION

C1: Provide a gate or access point so trail users may enter the Park & Ride from the southeast corner of Park Row and Park & Ride Drive.

C2: Provide cycle track (outside of the roadway with curb and grade separation) along north side of Park Row and Park & Ride Drive intersection to provide access from the trailhead with a single street crossing.

C3: Explore constructing a shared-use path through existing grass areas and/or restriping the lot to provide a dedicated bike route from the corner of Park Row and Park & Ride Drive to the boarding platform.

BIKE PARKING

P1: Locate bike lockers under the platform canopy.

P2: Partner with the Energy Corridor District to provide enhanced bike parking such as the “bike station” proposed in the ECD Bicycle Master Plan.

WAYFINDING

W1: Post a map of the Energy Corridor bike trail network on the boarding platform.

W2: Provide signage to reinforce that Terry Hershey North Trail is the best route to Energy Corridor destinations since its starting direction is counterintuitive.

Energy Corridor may be a valuable partner for projects.

BAY AREA PARK & RIDE

INDEX

COMMUTE: Drive Alone — 2.3 — Mode-Split

POPULATION: Low Density — 1.7 — High Density

TRANSIT CONNECTIONS

Park & Ride

246 - Bay Area

249 - Monroe / Bay Area / Fuqua (Midday or late evening)

Weekday Frequent

Peak

Figure 5.31: Bay Area Park & Ride Connections

Bay Area Park & Ride is located in Clear Lake, in the southeast corner of the METRO service area, which provides commuter service to an area that is without local transit service. Therefore, bicycle access is essential for individuals without an automobile. Most bike parking amenities at Bay Area are exposed to the outside elements, except for one bike lid. There is limited space under the existing boarding area cover, however a few racks may be incorporated without obstructing circulation. An alternative would be build a cover or shelter over the existing bike parking area, and eventually provide bike lockers.

The area lacks bicycle infrastructure, however there are alternative routes through neighborhoods that may not be obvious to potential riders.

Activity centers/destinations within one mile:
Kindred Hospital Clear Lake
Clear Lake Rehabilitation Hospital
Shopping centers
Lyndon B. Johnson Space Center (2.5 miles)

Major barriers within one mile:
Busy roadways
Area wayfinding, including potential bike routes

Existing bike facilities within one mile:
N/A

Existing bicycle parking:
Exposed bike racks, bike lid

City: Houston

Management District: N/A

Figure 5.32: With only one bike lid, the alternative for covered bike parking is to lock one's bike onto secure objects under the boarding area cover

Figure 5.33: Bike parking is located to the west of the boarding area with plenty of space for additional amenities, such as a cover, shelter or bike lockers

Figure 5.34: Seating area under cover with limited space for the addition of bike parking

Bay Area Park & Ride Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- (R) Existing Bike Rack
- (L) Existing Bike Lid

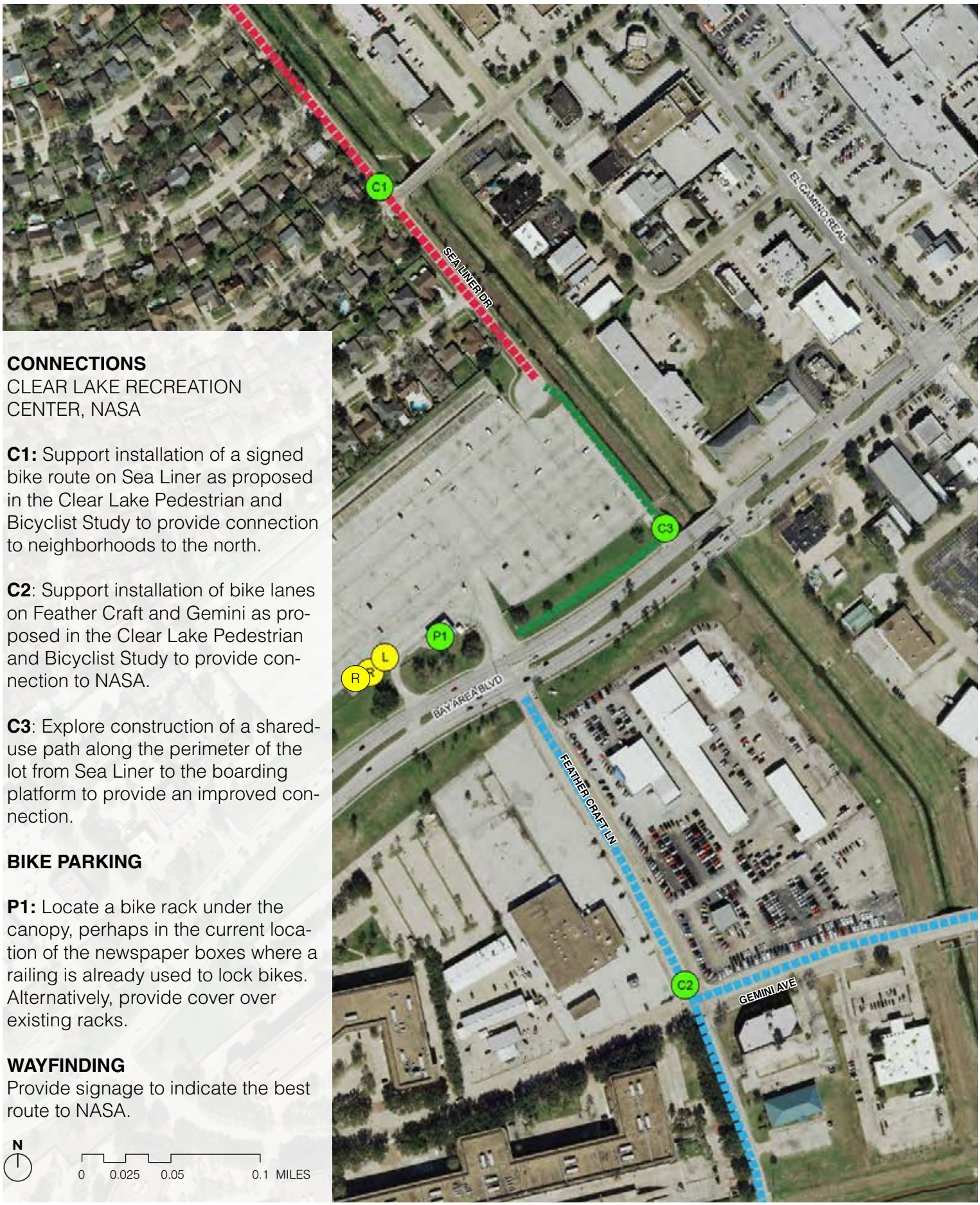
Recommended Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- (C) Connection Recommendation
- (P) Bike Parking Recommendation

Figure 5.35: Bay Area Park & Ride Recommendations

N

0 0.125 0.25 0.5 MILES



CONNECTIONS
CLEAR LAKE RECREATION CENTER, NASA

C1: Support installation of a signed bike route on Sea Liner as proposed in the Clear Lake Pedestrian and Bicyclist Study to provide connection to neighborhoods to the north.

C2: Support installation of bike lanes on Feather Craft and Gemini as proposed in the Clear Lake Pedestrian and Bicyclist Study to provide connection to NASA.

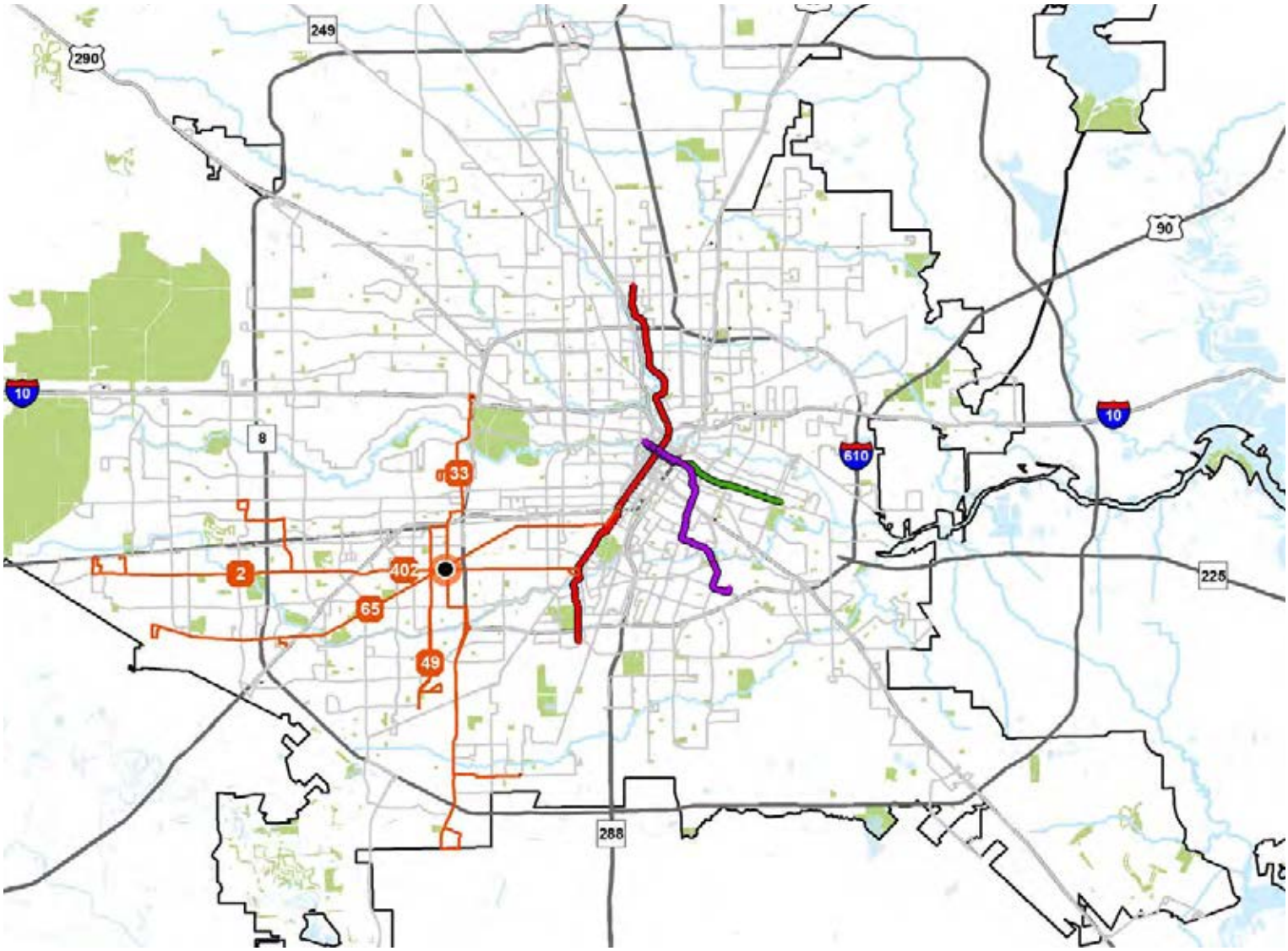
C3: Explore construction of a shared-use path along the perimeter of the lot from Sea Liner to the boarding platform to provide an improved connection.

BIKE PARKING

P1: Locate a bike rack under the canopy, perhaps in the current location of the newspaper boxes where a railing is already used to lock bikes. Alternatively, provide cover over existing racks.

WAYFINDING
Provide signage to indicate the best route to NASA.

BELLAIRE TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.6 — Mode-Split

POPULATION: Low Density — 2.7 — High Density

TRANSIT CONNECTIONS

2 - Bellaire
33 - Post Oak Crosstown
49 - Chimney Rock Crosstown
65 - Bissonnet
402 - Quickline Bellaire

Figure 5.36: Bellaire Transit Center Connections

Bellaire Transit Center is a busy transfer point among the frequent 2 Bellaire to TMC Transit Center, the 65 Bissonnet to Wheeler Station, and the 33 Post Oak and 49 Chimney Rock to the Galleria Area. It is also served by the peak-only, limited stop 402 Quickline to TMC Transit Center. It is located at the west end terminus of Paseo Park, a linear park along the median of Bellaire Boulevard. The S Rice bike lanes are discontinuous through the area, from north of Bissonnet to south of Bellaire Blvd, contrary to the city bikeway map. The extension of this facility would make the Transit Center a valuable connection for area residents.

Activity centers/destinations within one mile:
West Loop office buildings (0.4 mi)
Bellaire City Hall/library/municipal buildings (0.2 mi)
Elementary schools (0.2, 0.9 mi)
Bellaire High School (0.9 mi)

Major barriers within one mile:
Major roadways: Bissonnet, Bellaire
Highways: I-610 West Loop (0.5 mi east)

Existing bike facilities within one mile:
S Rice Ave bike lanes
Chimney Rock bike lanes

Existing bicycle parking:
An uncovered bike rack is located along the sidewalk at the Transit Center entrance, near the intersection of Rice Ave and Bellaire Boulevard.

City: Bellaire

Management District: N/A

Weekday bus boardings: 2,082


Figure 5.37: Bike rack across from Transit Center boarding area

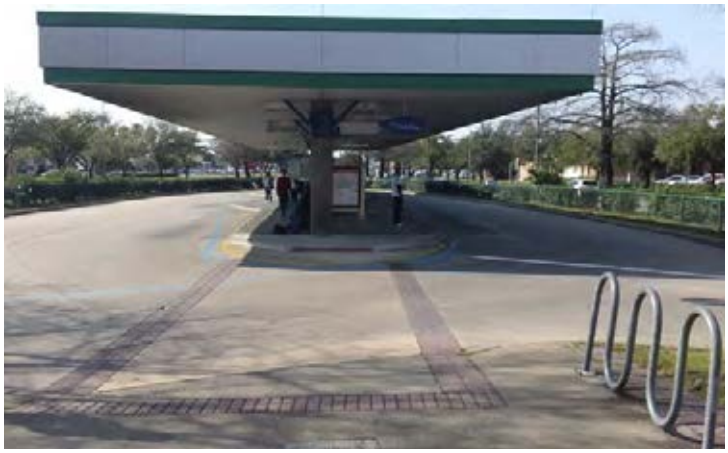


Figure 5.38: Uncovered bike rack on east end of Transit Center, separated from boarding area

Figure 5.39: Covered boarding area

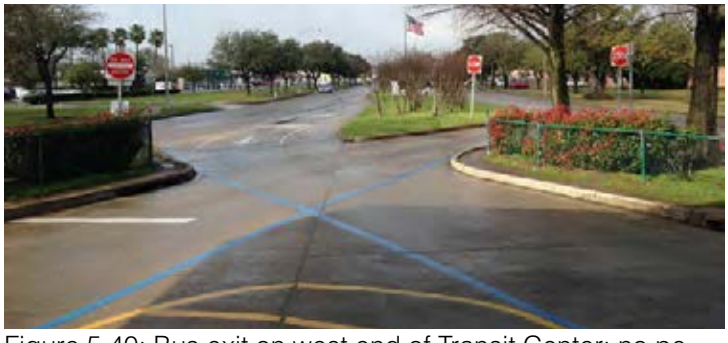
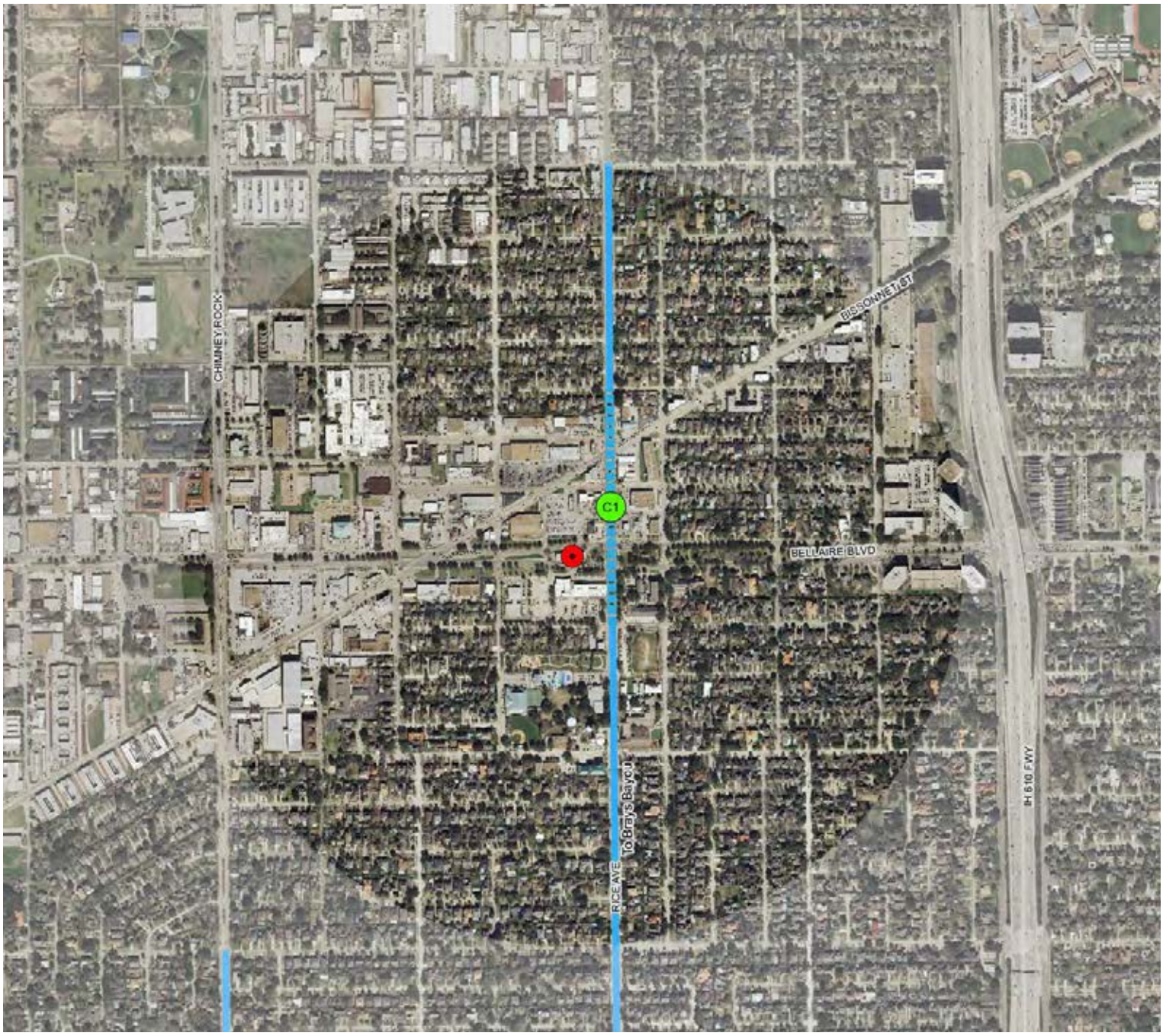


Figure 5.40: Bus exit on west end of Transit Center; no pedestrian access



Bellaire Transit Center Half-Mile Radius

Existing Bicycle Facilities

Bike Lane

R Existing Bike Rack

Recommended Facilities

Bike Lane

C Connection Recommendation

W Wayfinding Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.41: Bellaire Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

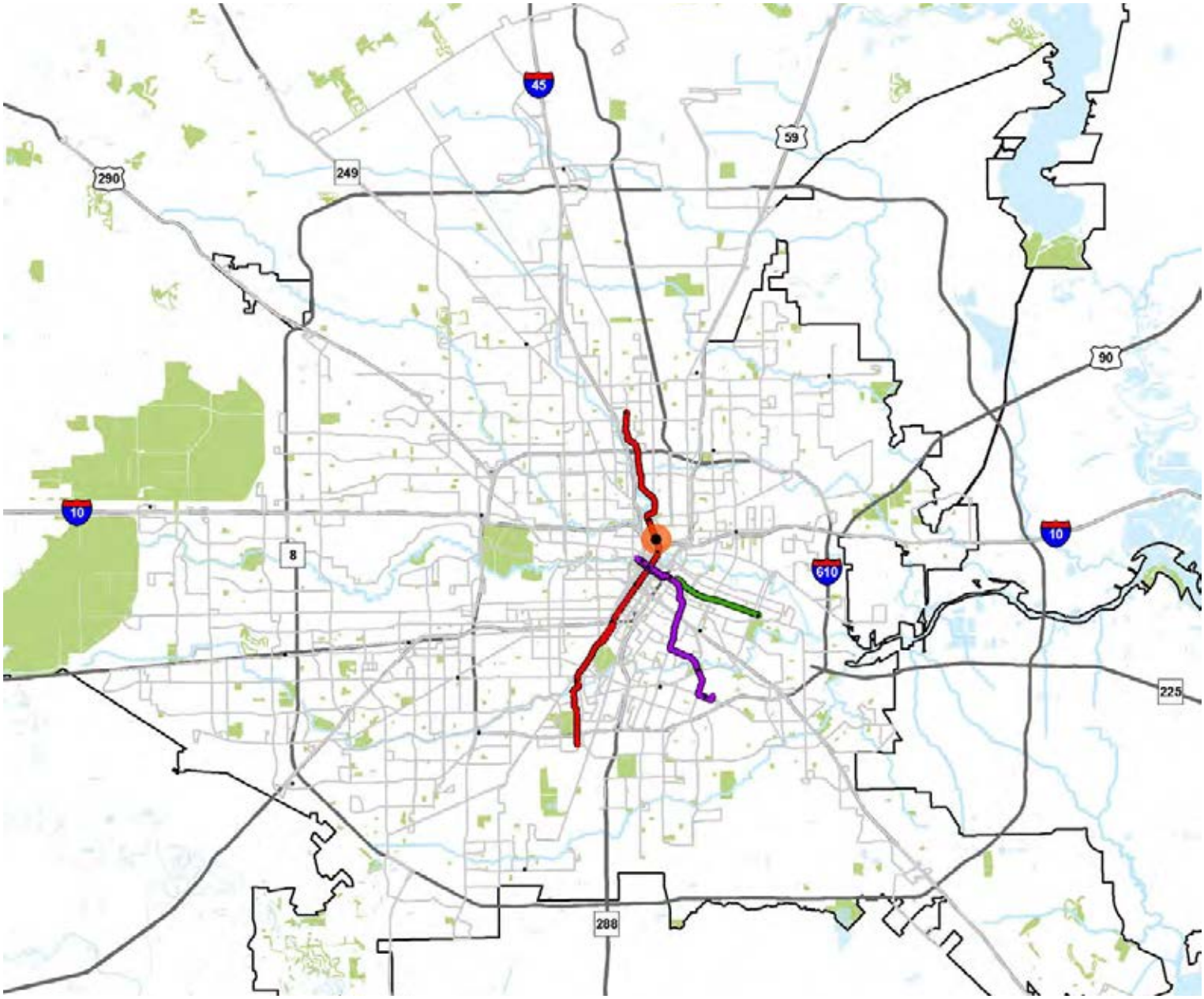
CONNECTION
SOUTH RICE BIKE LANES

C1: Support any future efforts to complete the South Rice bike lanes through the Bellaire downtown area. Bike lane would serve as a connector between Brays Bayou and Bellaire TC with the potential to extend north to the proposed Transit Center at Westpark.

The existing gap in bike lanes fall within the City of Bellaire, and require METRO to coordinate with the City of Bellaire and Houston. The City of Houston should explore connections south of the Transit Center to shared use paths along Brays Bayou, which would require an engineering and traffic study to determine its feasibility.

WAYFINDING:
Coordinate with the City of Bellaire Ad-Hoc Wayfinding Committee to provide wayfinding signage for cyclists disemarking at Transit Center.

BURNETT TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 4 — Mode-Split

POPULATION: Low Density — 2.1 — High Density

TRANSIT CONNECTIONS

Light Rail
Red Line

Weekday Frequent
All Day and Evening

Local
To Be Determined

Figure 5.42: Burnett Transit Center Connections

Burnett Transit Center/Casa de Amigos Station is planned to be a rail tie-in point for bus routes from the north of Downtown and the turnback for trains on the higher-frequency southern portion of the Red Line. A bike route connecting the Transit Center location to the White Oak Bayou trails is currently in development. A city project to reconstruct Main and Burnett to intersect at grade is also in development.

Activity centers/destinations within one mile:
UH-Downtown, Downtown, clinics, schools

Major barriers within one mile:
Railroad lines, White Oak Bayou, freeways

Existing bike facilities within one mile:
White Oak Bayou Trail, Fulton Street Bike Route

Existing bicycle parking:
n/a (under construction)

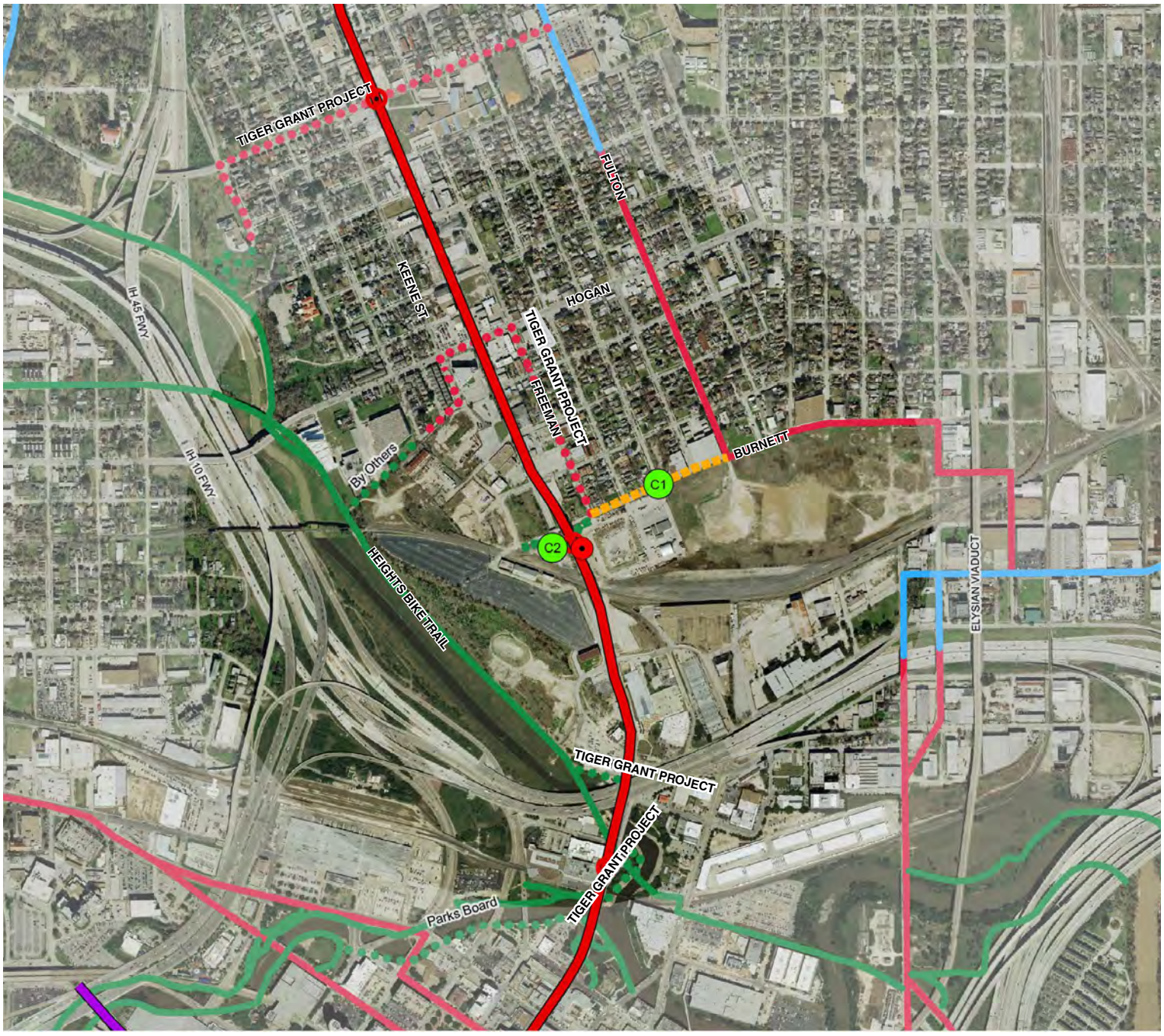
City: Houston

Management District: Greater Northside

Weekday bus boardings: n/a

Figure 5.43: Elevated station structure

Figure 5.44: Staircase from station to future Transit Center



Burnett Transit Center
Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- Facility In Development

Recommended Facilities

- Signed Shared Roadway
- Bike Lane
- Signed Bike Route
- C Connection Recommendation
- P Bike Parking Recommendation

Figure 5.44: Burnett Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTIONS
FULTON/BURNETT STREET BIKE ROUTE

C1: Connect the White Oak Bayou connection route on Freeman to the Fulton/Burnett Street bike route. Pending reconstruction of Burnett Street and new Transit Center offers the opportunity to provide bike accommodations.

C2: Longer term, provide a more direct connection to White Oak Bayou via bike lanes on Trentham.

C3: Work with the developer of the Hardy Yards to ensure easy bike access to the Transit Center.

BIKE PARKING

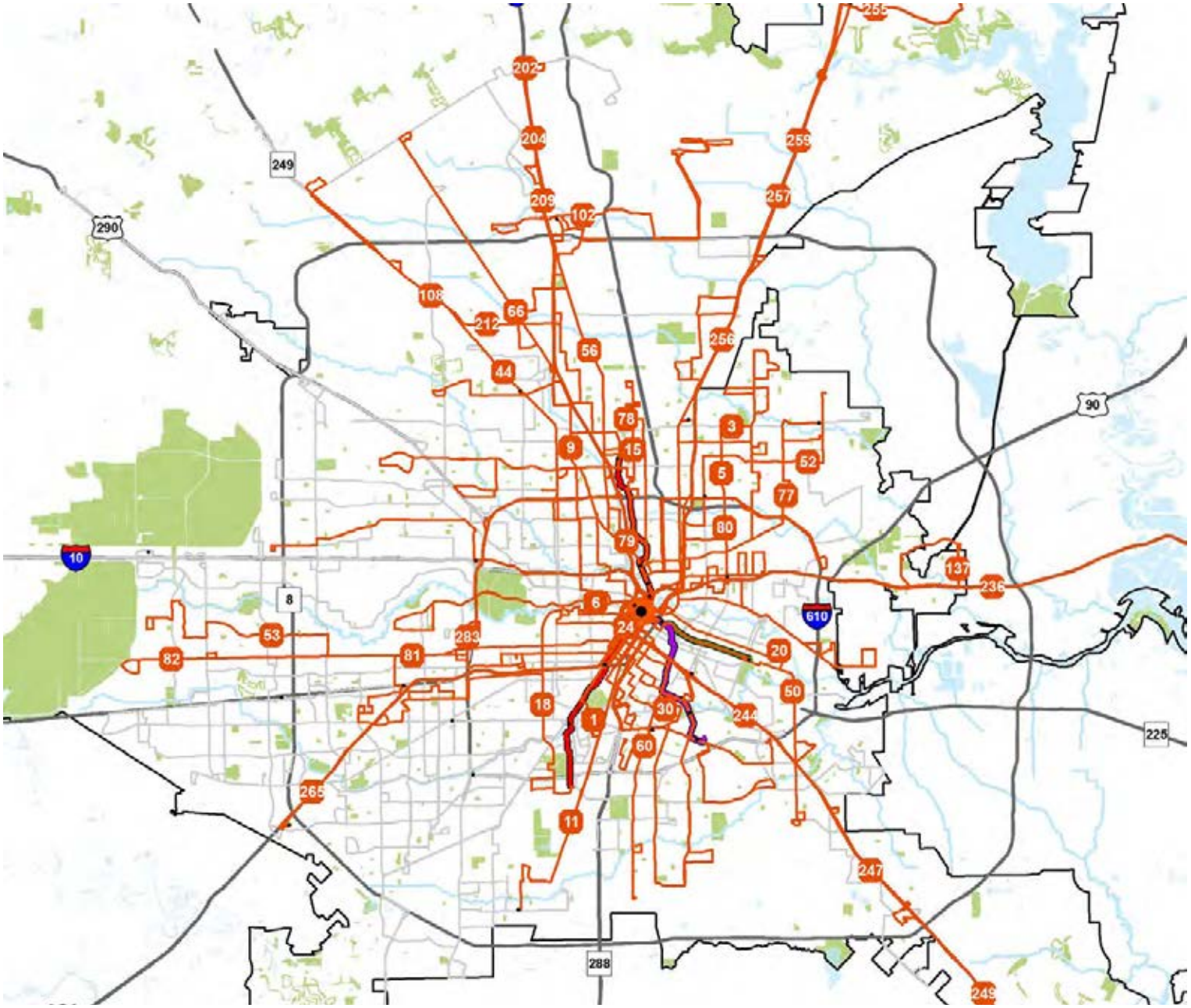
P1: Include enhanced bike parking in the design of the Transit Center.

P2: Include a bike share station in the design of the Transit Center.

WAYFINDING

Provide signage along the connection from White Oak Bayou.

CENTRAL STATION / MAIN STREET SQUARE



INDEX

COMMUTE: Drive Alone — 3.6 — Mode-Split

POPULATION: Low Density — 2.2 — High Density

TRANSIT CONNECTIONS

Light Rail
Red Line

Weekday Frequent?
All Day and Evening

Local, Limited, Park & Ride
Numerous routes on nearby streets

Figure 5.45: Central Station / Main Street Square Connections

Central Station, consisting of three platforms on Main, Capitol, and Rusk Streets, will be the crossing point for the Red and Green/Purple Lines. The northbound platform at Main Street Square is also nearby, just two blocks south of Central Station Main. Located in the heart of Downtown, many bike and transit connections in this area will likely include B-Cycle bike share.

Activity centers/destinations within one mile:
Downtown, Convention District

Major barriers within one mile:
Downtown freeways

Existing bike facilities within one mile:
Buffalo Bayou trails; bike routes on Congress, Preston, Caroline, Austin

Existing bicycle parking:
Bike rack on sidewalk

City: Houston

Management District: Downtown

Weekday bus boardings: n/a

Figure 5.46: Future Central Station Main platform

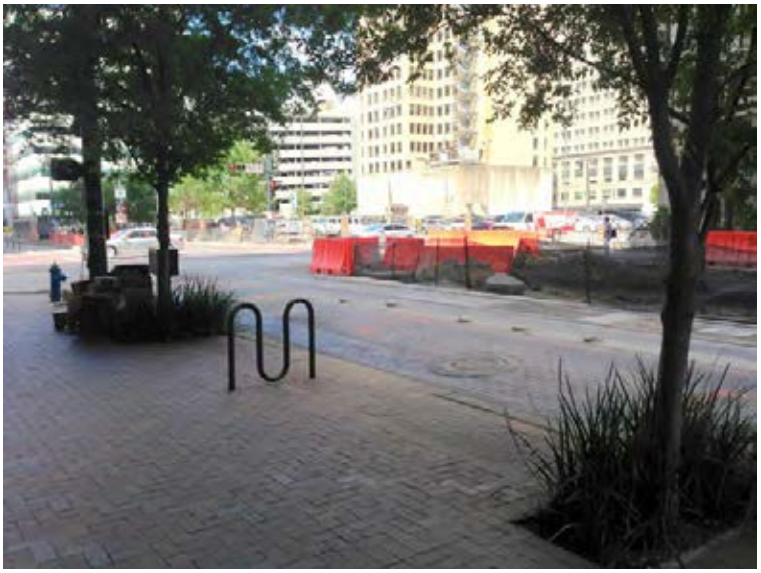
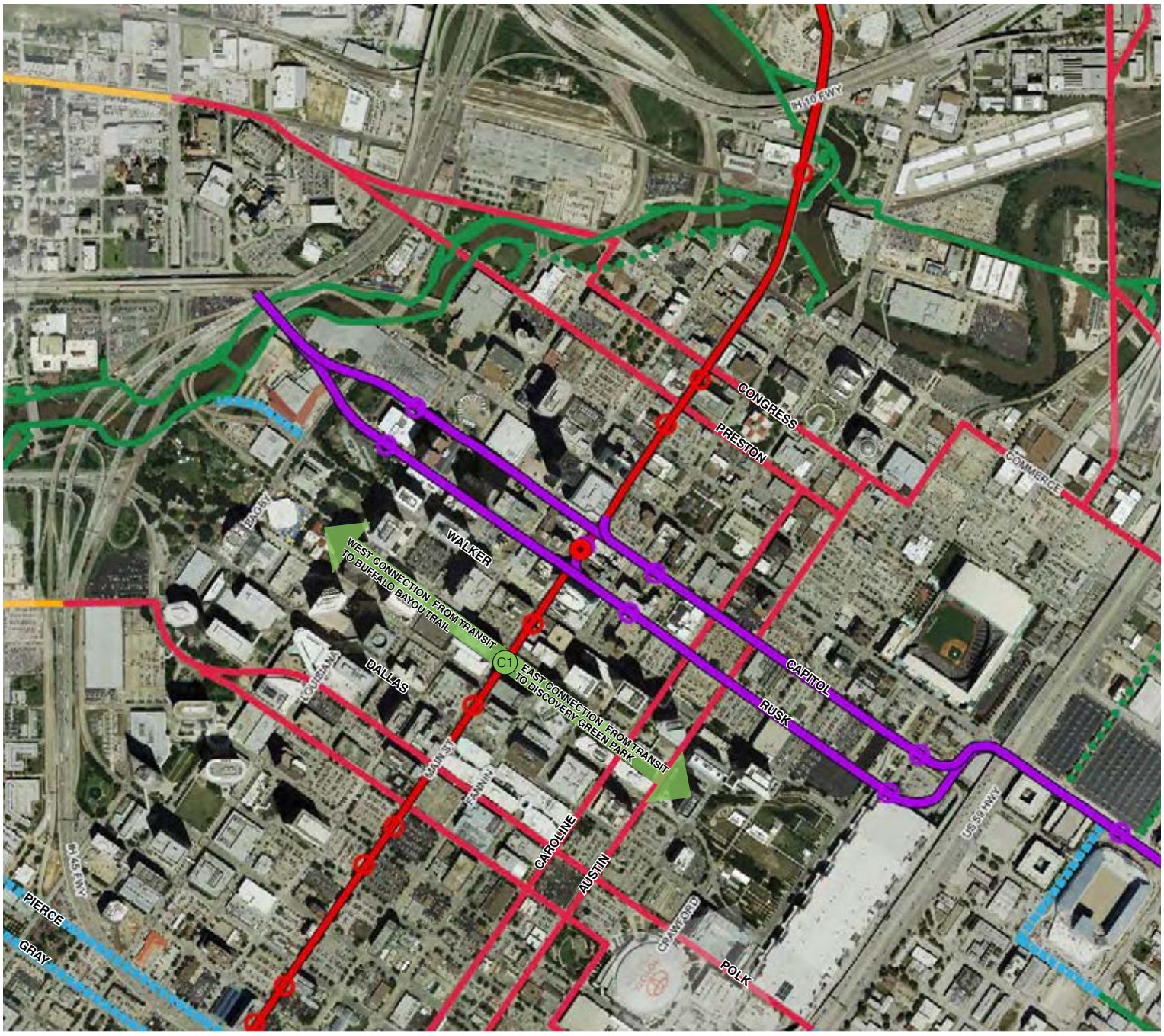


Figure 5.47: Existing bike rack on sidewalk



Central Station Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Signed Shared Roadway
- Signed Bike Route
- Facility In Development
- R Existing Bike Rack
- L Existing Bike Lid
- B Existing B-Cycle Station

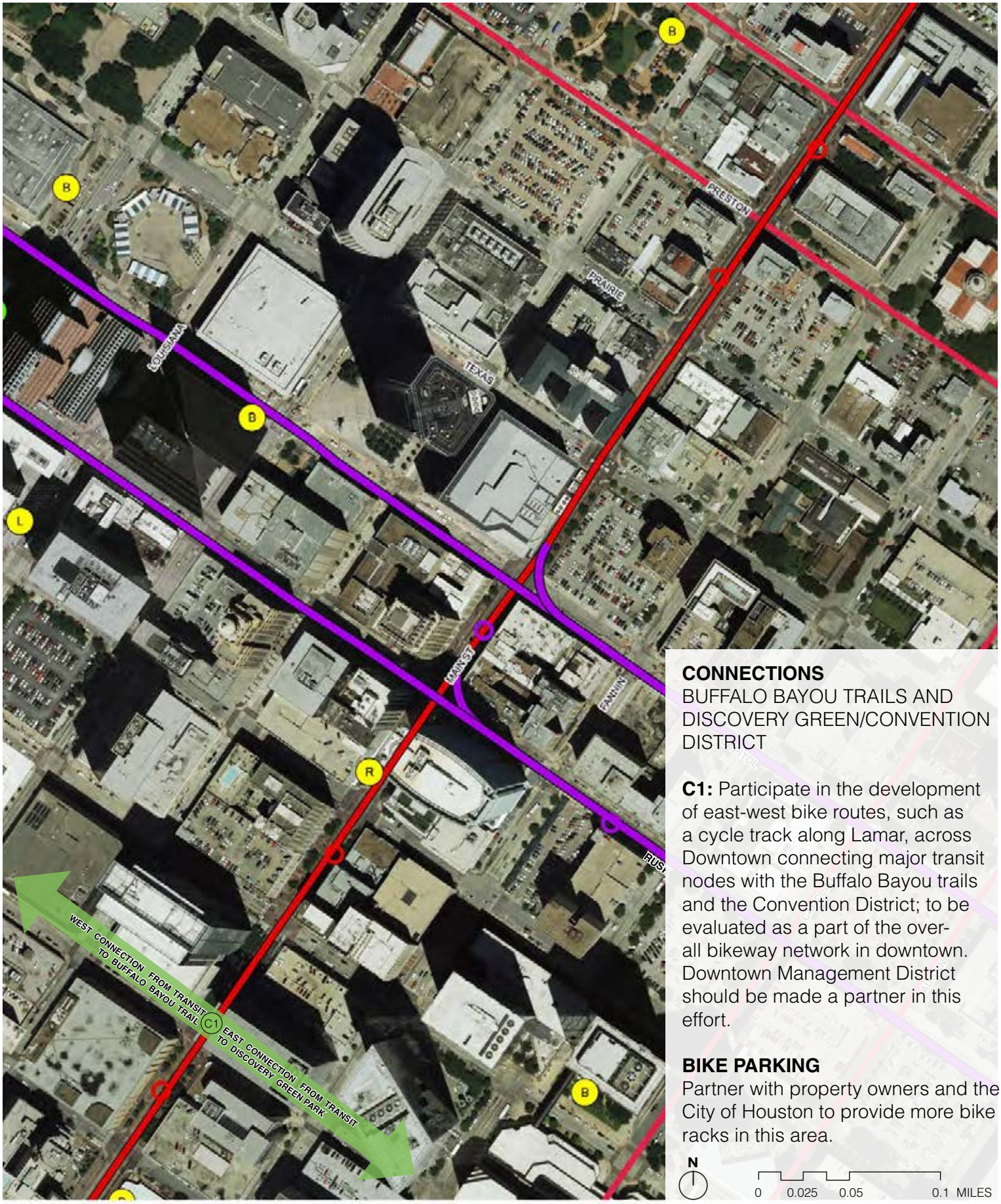
Recommended Facilities

- Shared-Use Path
- Bike Lane
- C Connection Recommendation
- Desired Connection

N

0 0.125 0.25 0.5 MILES

Figure 5.48: Burnett Transit Center Recommendations



CONNECTIONS
BUFFALO BAYOU TRAILS AND DISCOVERY GREEN/CONVENTION DISTRICT

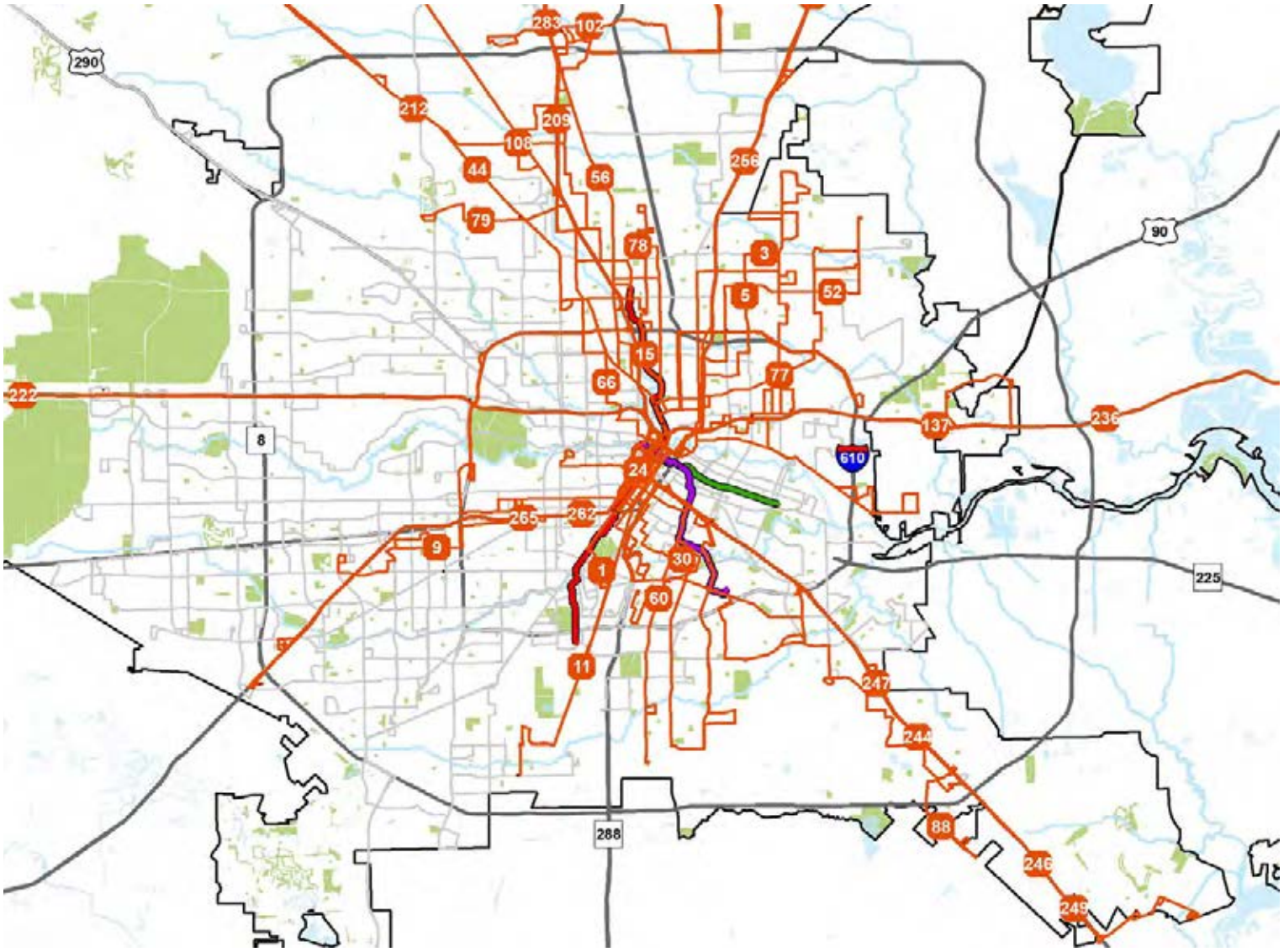
C1: Participate in the development of east-west bike routes, such as a cycle track along Lamar, across Downtown connecting major transit nodes with the Buffalo Bayou trails and the Convention District; to be evaluated as a part of the over-all bikeway network in downtown. Downtown Management District should be made a partner in this effort.

BIKE PARKING
Partner with property owners and the City of Houston to provide more bike racks in this area.

N

0 0.025 0.05 0.1 MILES

DOWNTOWN TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.4 — Mode-Split

POPULATION: Low Density — 2.2 — High Density

Map shows all routes with stops within two blocks (700 feet) of Transit Center

Figure 5.49: Downtown Transit Center Connections

TRANSIT CONNECTIONS

Light Rail		**Weekday Frequent**
	Red Line	All Day and Evening
Local		
11	Almeda/Nance	
15	Fulton	Peak
24	Northline	
30	Clinton/Cullen	
52	Hirsch/Scott	All Day
60	South MacGregor	
77	Liberty	
Limited		
77	Martin Luther King Limited	Peak

Downtown Transit Center is a major connection point among bus routes and the Red Line, which runs north-south. Therefore, the most important connections for cyclists are from the east and west. To the east, bike lanes run along Caroline and LaBranch Streets. To the west, dense multi-use developments would likely create demand for a bike connection to Downtown Transit Center.

Activity centers/destinations within one mile:
Downtown
Midtown

Major barriers within one mile:
Downtown freeways

Existing bike facilities within one mile:
McGowen Street bike route
Caroline Street bike route
Austin Street bike route
Clay Street bike route
Polk Street bike routes

Existing bicycle parking:
Series of racks
B-Cycle station

City: Houston

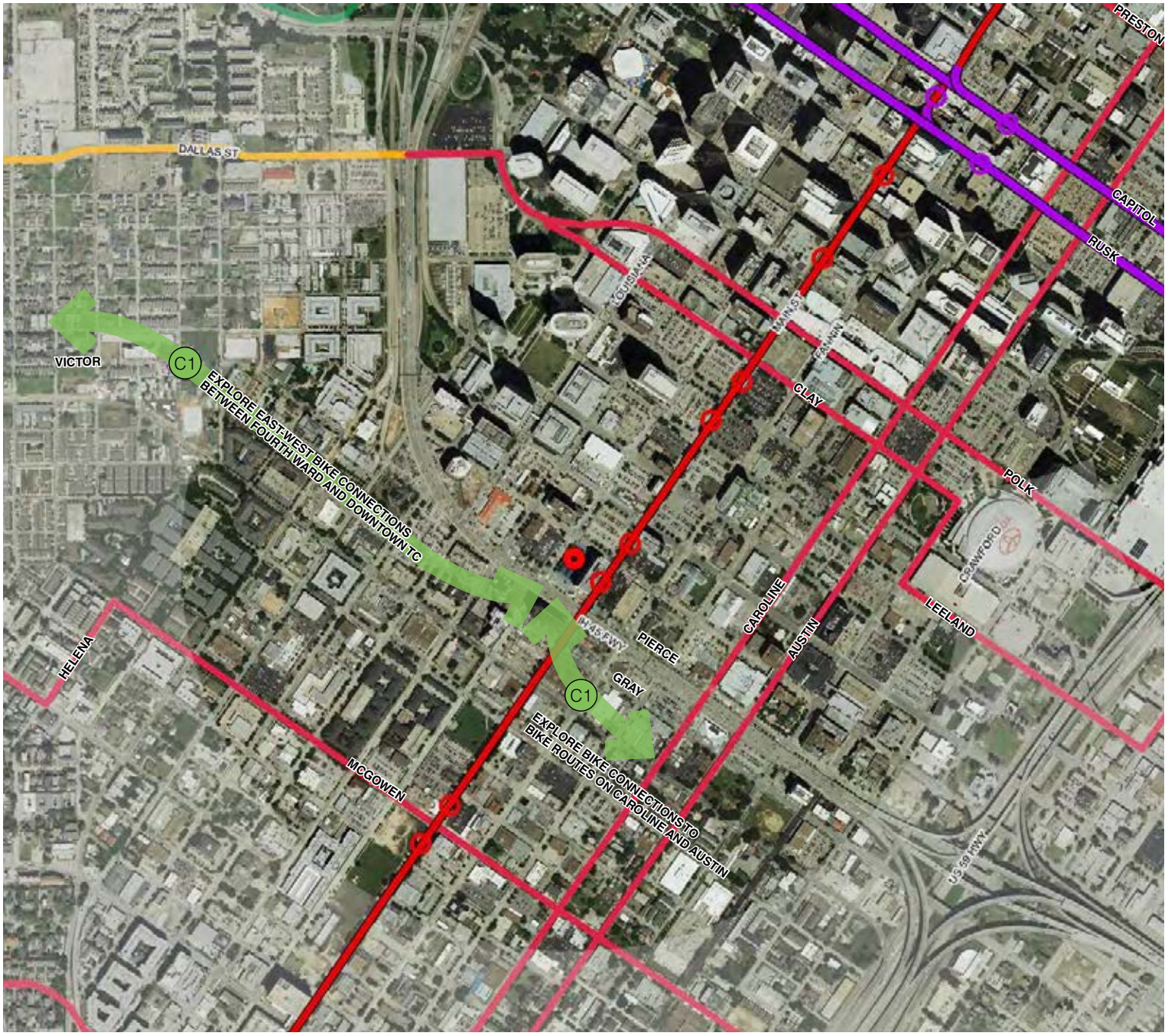
Management District: Houston Downtown

Weekday bus boardings: 2,745

Figure 5.50: Existing bike rack by light rail platform

Figure 5.51: Bike racks along sidewalk on west side of Transit Center

Figure 5.52: Existing bike racks by Transit Center



Downtown Transit Center
Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Signed Shared Roadway
- Signed Bike Route
- • • • • Facility In Development
- (R) Existing Bike Rack
- (L) Existing Bike Lid
- (B) Existing B-Cycle Station

Recommended Facilities

- (C) Connection Recommendation
- Desired Connection

N

0 0.125 0.25 0.5 MILES

Figure 5.53: Downtown Transit Center Recommendations

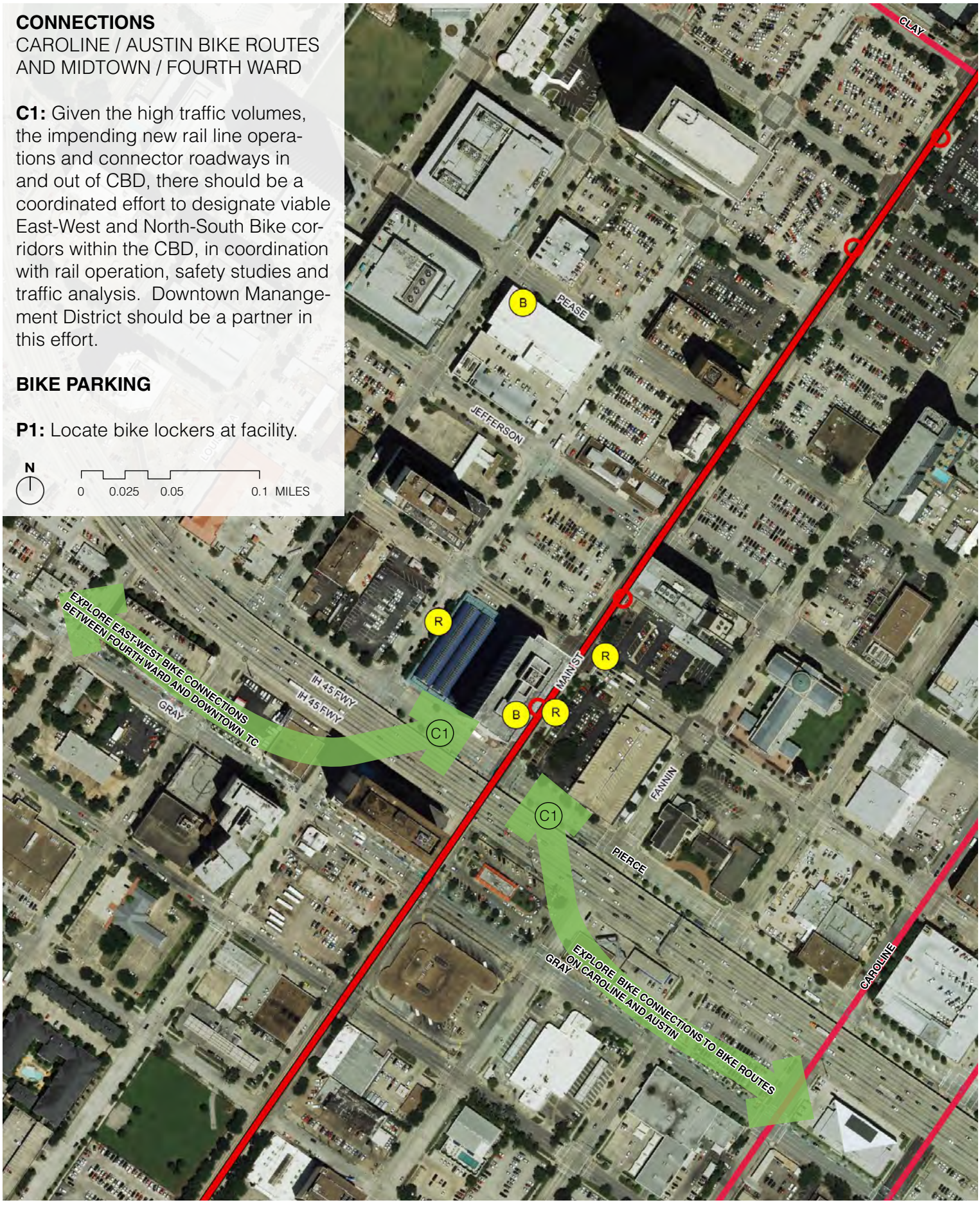
CONNECTIONS

CAROLINE / AUSTIN BIKE ROUTES AND MIDTOWN / FOURTH WARD

C1: Given the high traffic volumes, the impending new rail line operations and connector roadways in and out of CBD, there should be a coordinated effort to designate viable East-West and North-South Bike corridors within the CBD, in coordination with rail operation, safety studies and traffic analysis. Downtown Manangement District should be a partner in this effort.

BIKE PARKING

P1: Locate bike lockers at facility.



EADO / STADIUM STATION

INDEX

COMMUTE: Drive Alone — 3.8 — Mode-Split

POPULATION: Low Density — 2.0 — High Density

Figure 5.54: EaDo / Stadium Station Connections

EaDo/Stadium Station will open in 2014 along the Southeast (Purple) and East End (Green) METRORail lines. Destinations along those lines will include Downtown, the Theater District, and the University of Houston main campus. The site is currently served by the 50 Harrisburg which will be discontinued when the rail line opens. Construction in the area has disrupted bike route signage. The bike network around the stadium needs to be reviewed and modified.

Activity centers/destinations within one mile:
Dynamo Soccer Stadium
TSU Football Stadium
GRB Convention Center
Minute Maid Park
Downtown offices
EaDo residential developments

Major barriers within one mile:
US 59 (0.1 mi west)
Railroad tracks (0.2 mi northeast)

Existing bike facilities within one mile:
Columbia Tap Trail; ends at Walker & Dowling
Pole Street bike lanes

Existing bicycle parking:
Four bike racks located between the northwest entrance of Dynamo Stadium and the station. Two additional racks are located adjacent to the northeast corner of the stadium.

City: Houston

Management District: East Downtown

Figure 5.55: Future METRORail station adjacent to Dynamo Stadium

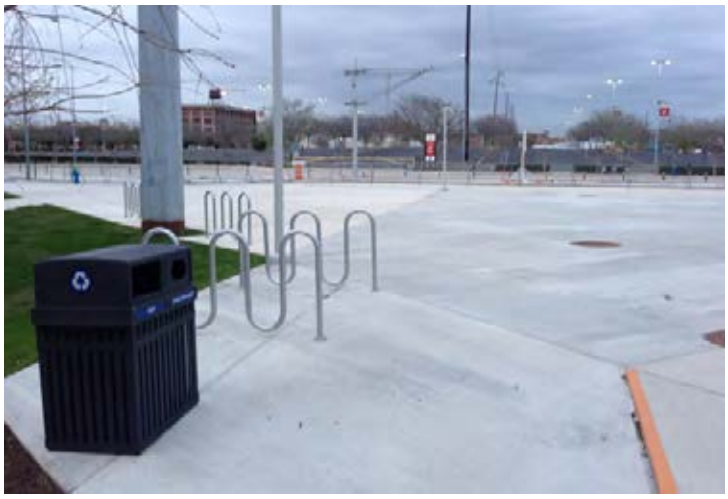


Figure 5.56: Existing bike racks at Dynamo Stadium, easily accessible from the METRORail station

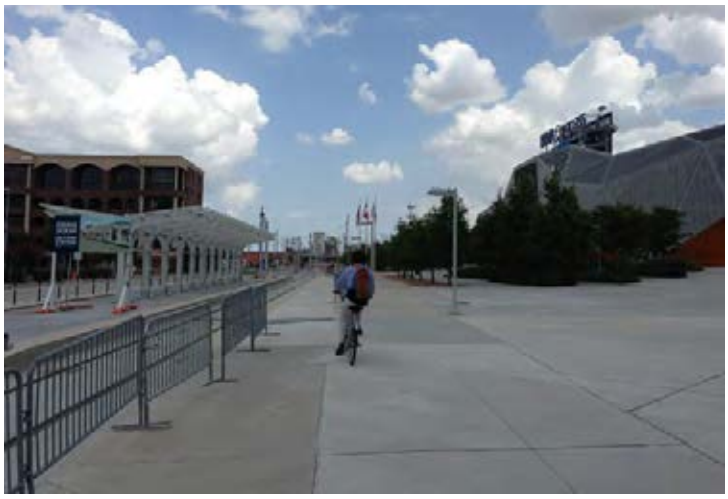
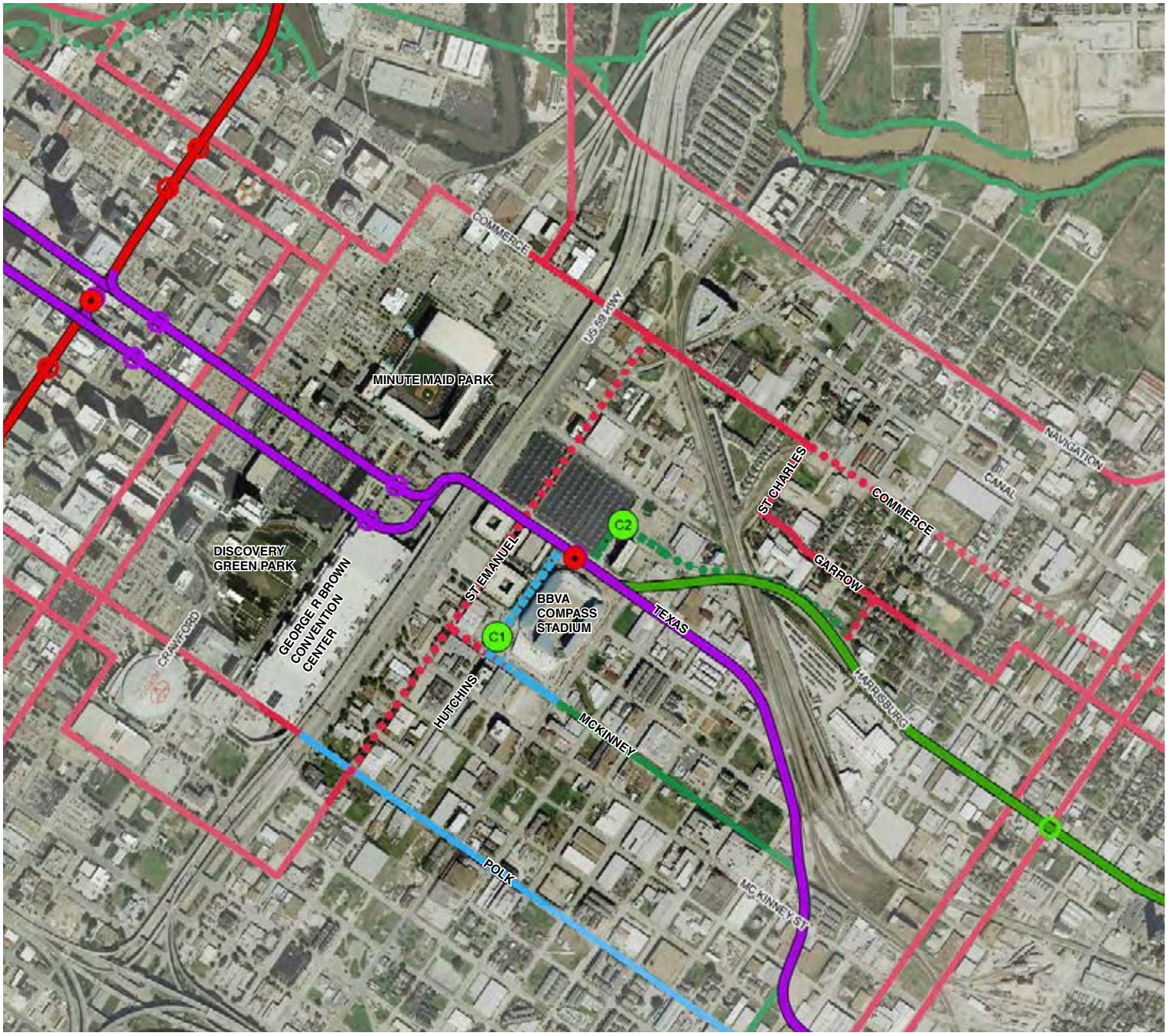


Figure 5.57: Wide sidewalk between METRORail station and Dynamo Stadium



EaDo / Stadium Station Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Green Line (East End)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- Facility In Development
- R Existing Bike Rack
- B Existing B-Cycle Station

Recommended Facilities

- Shared-Use Path
- Bike Lane
- C Connection Recommendation
- P Bike Parking Recommendation

N

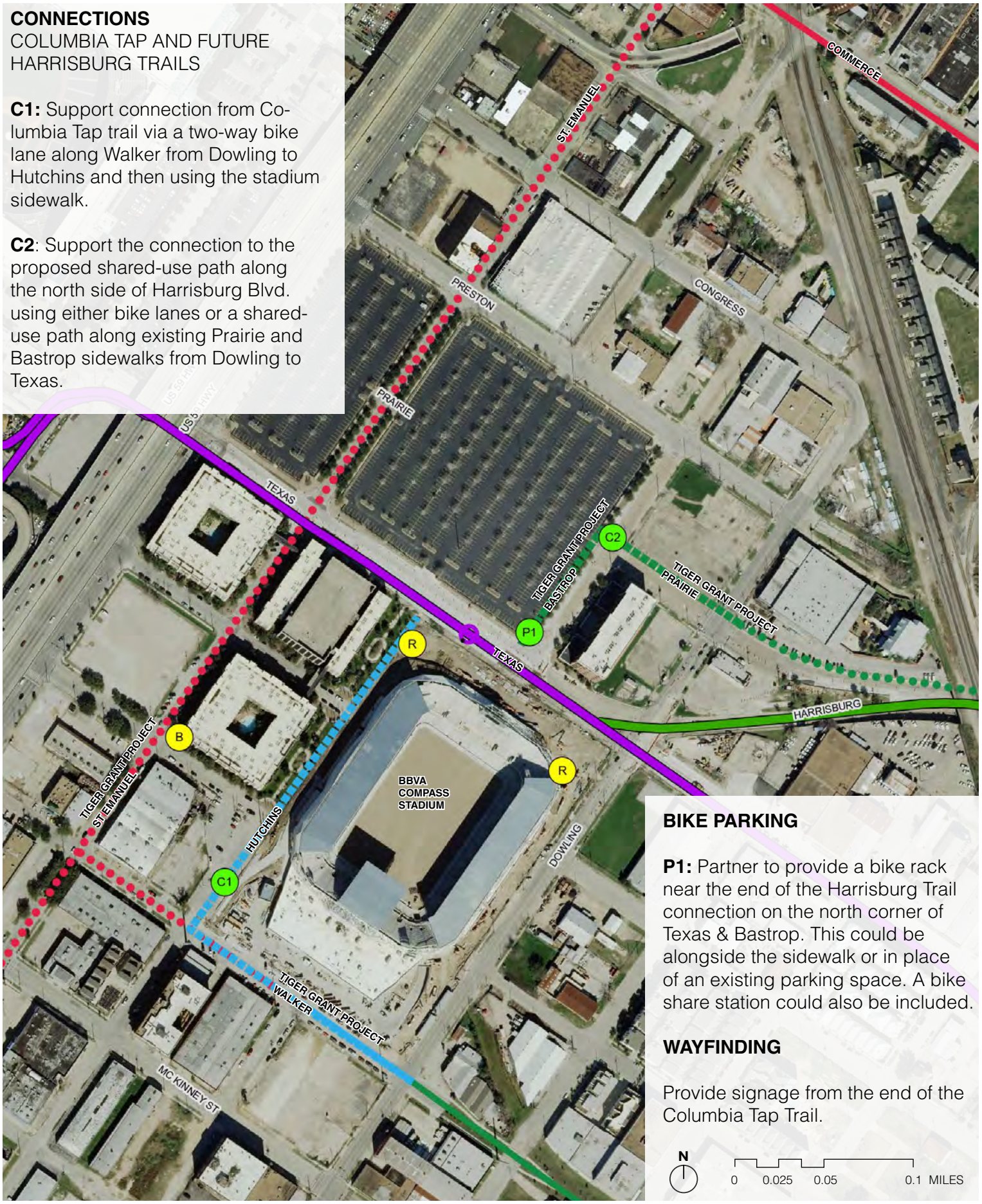
0 0.125 0.25 0.5 MILES

Figure 5.58: EaDo / Stadium Station Recommendations

CONNECTIONS
COLUMBIA TAP AND FUTURE HARRISBURG TRAILS

C1: Support connection from Columbia Tap trail via a two-way bike lane along Walker from Dowling to Hutchins and then using the stadium sidewalk.

C2: Support the connection to the proposed shared-use path along the north side of Harrisburg Blvd. using either bike lanes or a shared-use path along existing Prairie and Bastrop sidewalks from Dowling to Texas.



BIKE PARKING

P1: Partner to provide a bike rack near the end of the Harrisburg Trail connection on the north corner of Texas & Bastrop. This could be alongside the sidewalk or in place of an existing parking space. A bike share station could also be included.

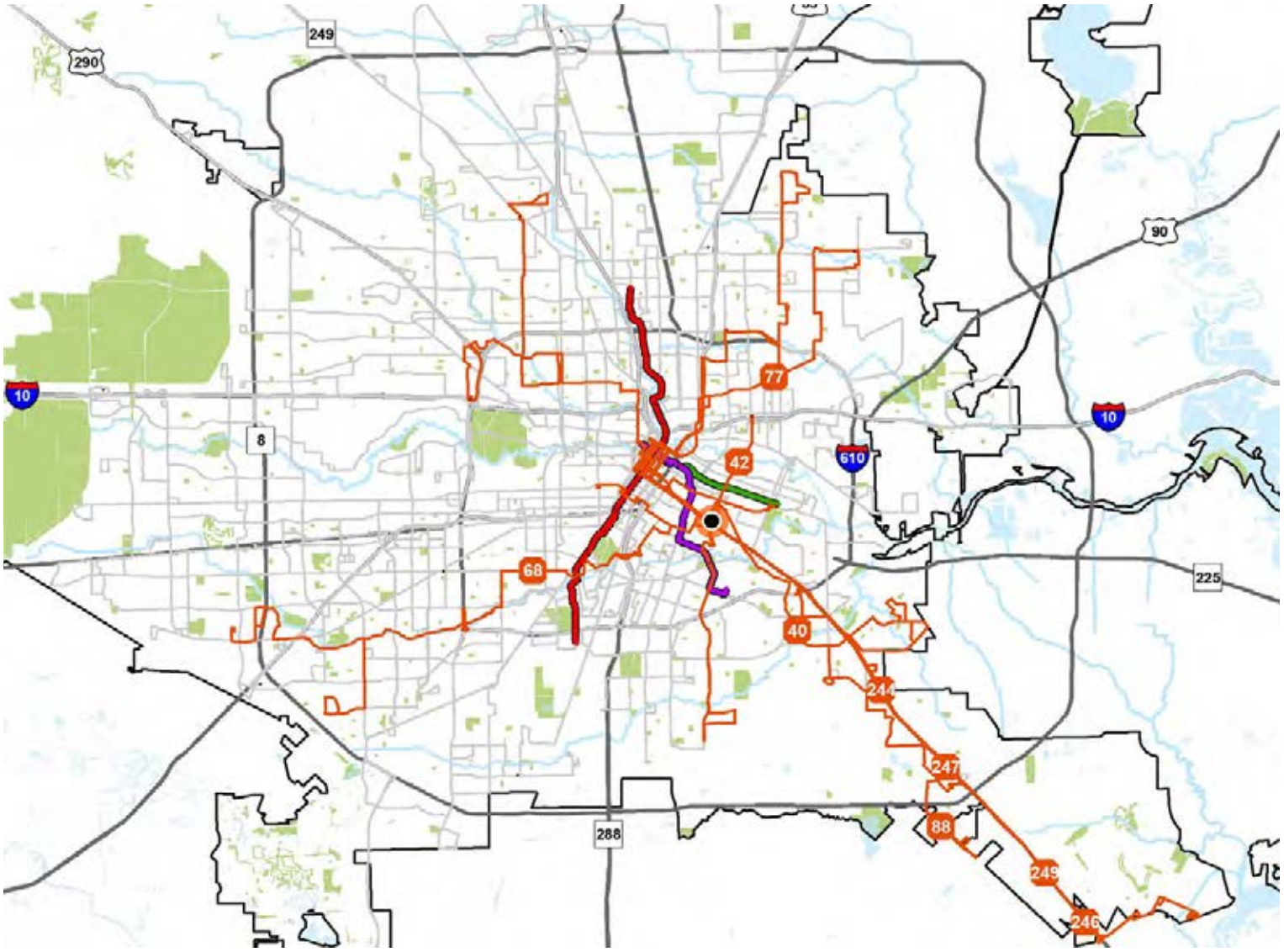
WAYFINDING

Provide signage from the end of the Columbia Tap Trail.

N

0 0.025 0.05 0.1 MILES

EASTWOOD TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 4 — Mode-Split

POPULATION: Low Density — 1.8 — High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
40	Telephone	Peak
42	Holman Crosstown	
68	Brays Bayou Crosstown	Peak
88	Hobby Airport	
Limited		
77	Martin Luther King Limited	Peak
Park & Ride		
244	Monroe	
246	Bay Area	
247	Fuqua	
249	Monroe / Fuqua / Bay Area	

Figure 5.58: Eastwood Transit Center Connections

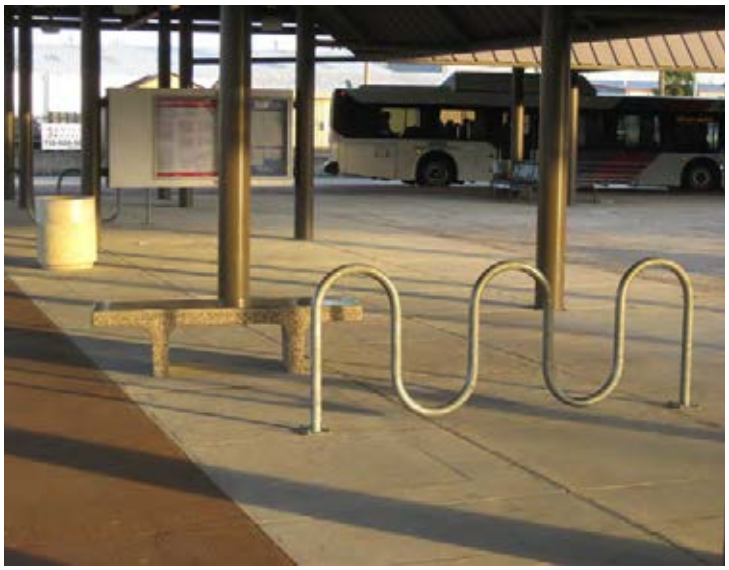


Figure 5.59: Existing bike racks under canopy

Figure 5.60: Two bike racks located under the boarding area canopy

Eastwood Transit Center offers connections among local, limited, park & ride, and UH shuttle buses. Although located very close to the UH campus, the underpass of Gulf Freeway, Spur 5, and the railroad tracks lacks adequate pedestrian or bicycle facilities and makes this connection difficult. Shuttle service is generally slow and infrequent, however, making a bicycle route desirable.

Activity centers/destinations within one mile:
University of Houston (UH) Central Campus
Austin High School

Major barriers within one mile:
IH-45 Gulf Freeway
Railroad lines

Existing bike facilities within one mile:
Dumble/Lombardy Street bike route
Cullen Street bike lanes

Existing bicycle parking:
Two racks under canopy

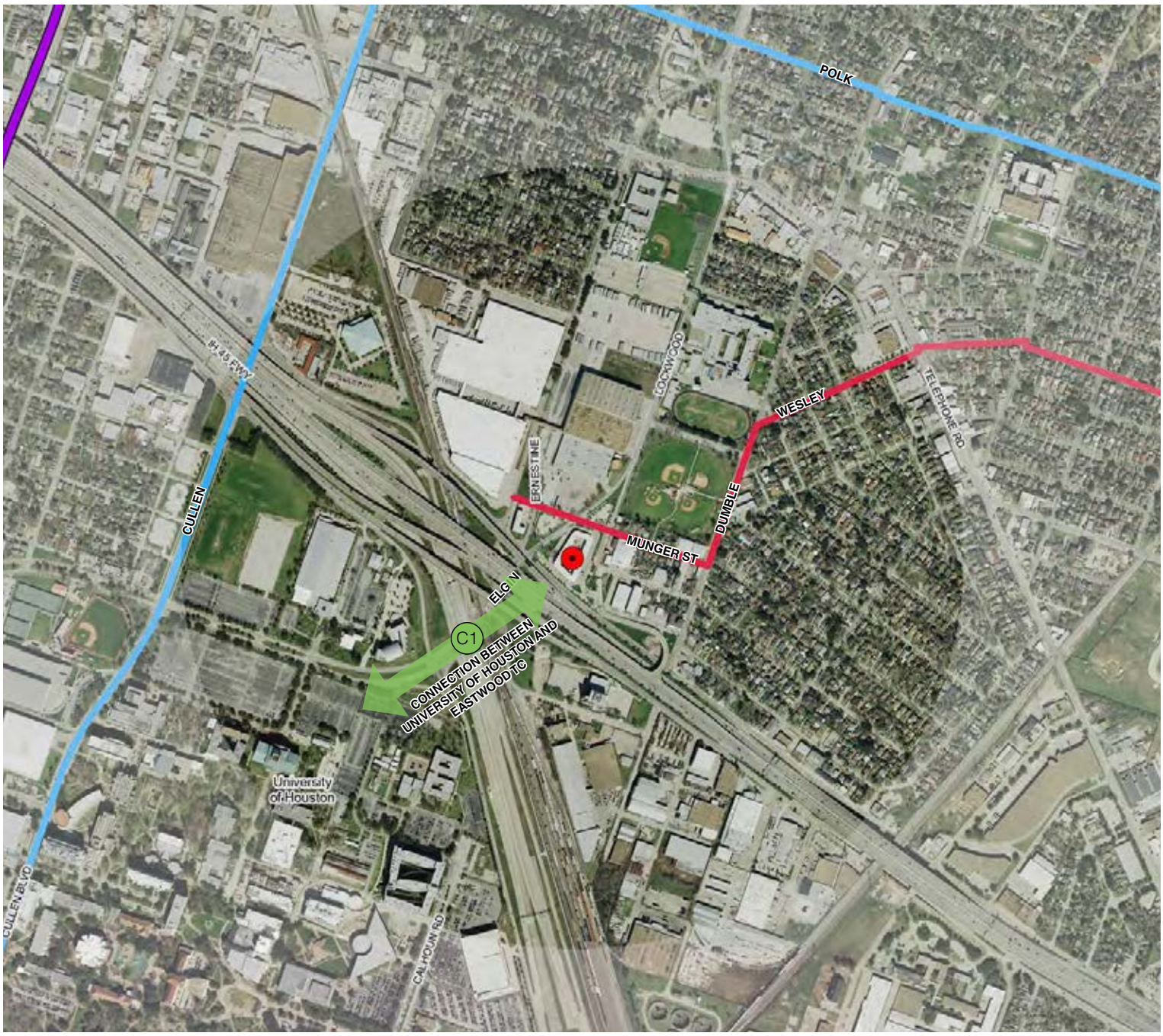
City: Houston

Management District: East End

Weekday bus boardings: 1,329

Figure 5.61: Walkway under IH-45 lacks proper sidewalk infrastructure

Figure 5.62: Unsafe crossing between Eastwood Transit Center and University of Houston



Eastwood Transit Center Half-Mile Radius

METRO Rail

Purple Line (Southeast)

Existing Bicycle Facilities

Bike Lane

Signed Bike Route

R Existing Bike Rack

Recommended Facilities

C Connection Recommendation

Desired Connection

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

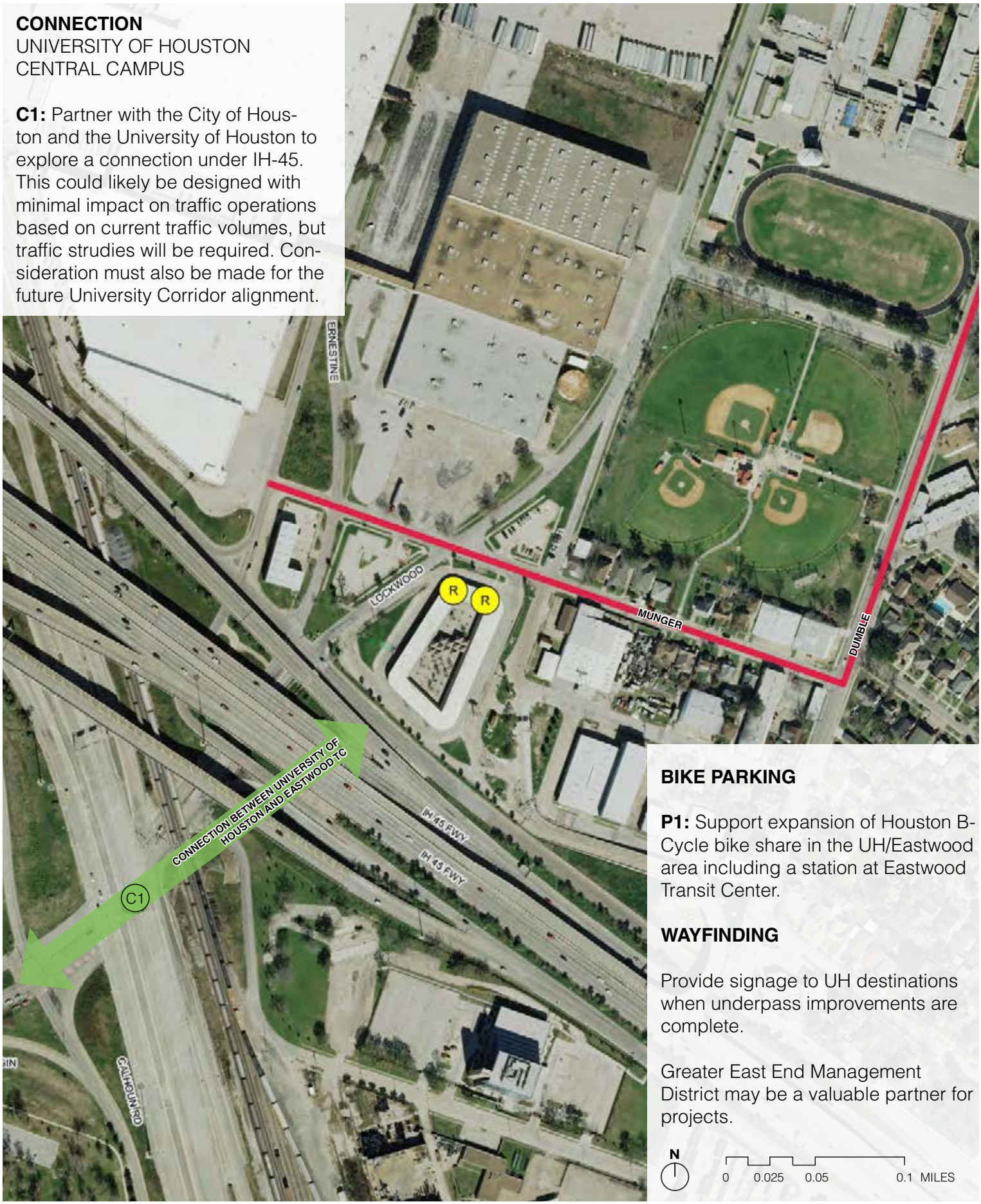
Figure 5.63: Eastwood Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTION
UNIVERSITY OF HOUSTON
CENTRAL CAMPUS

C1: Partner with the City of Houston and the University of Houston to explore a connection under IH-45. This could likely be designed with minimal impact on traffic operations based on current traffic volumes, but traffic strudies will be required. Consideration must also be made for the future University Corridor alignment.



BIKE PARKING

P1: Support expansion of Houston B-Cycle bike share in the UH/Eastwood area including a station at Eastwood Transit Center.

WAYFINDING

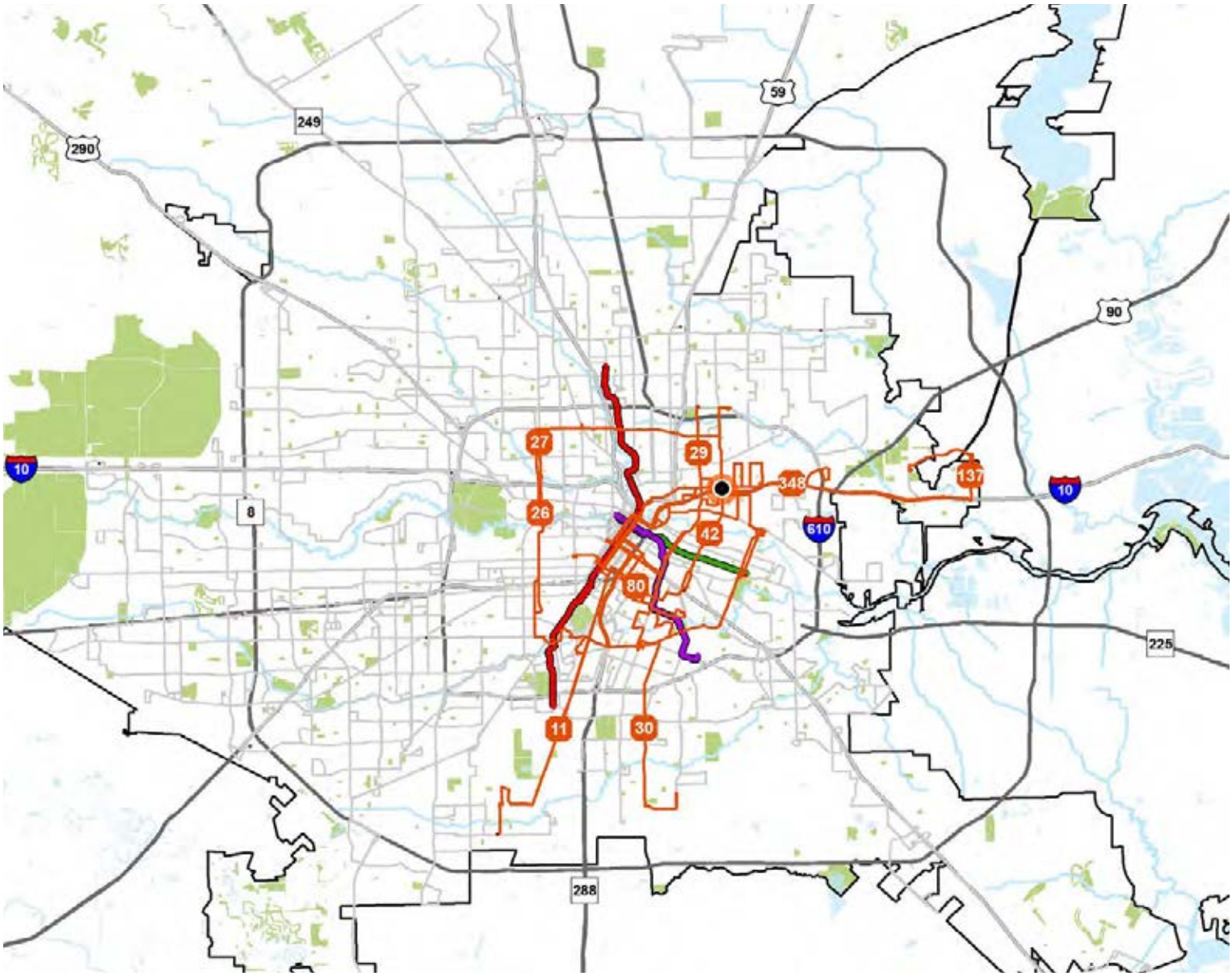
Provide signage to UH destinations when underpass improvements are complete.

Greater East End Management District may be a valuable partner for projects.

N

0 0.025 0.05 0.1 MILES

FIFTH WARD / DENVER HARBOR TRANSIT CENTER



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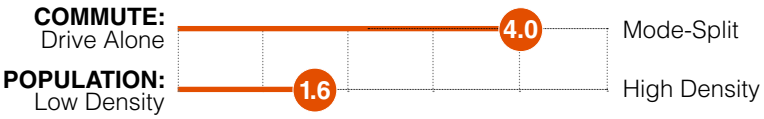


TRANSIT CONNECTIONS

Local

11	Almeda / Nance
26	Outer Loop Crosstown
27	Inner Loop Crosstown
29	TSU / UH Hirsch Crosstown
30	Clinton / Cullen
42	Holman Crosstown
80	Downling / Lyons
137	Northshore

Shuttle

348	Food Bank Shuttle

Figure 5.64: Fifth Ward / Denver Harbor Transit Center Connections

Fifth Ward/Denver Harbor Transit Center is embedded within the neighborhood with a relatively good grid network of local streets that serve the area, which contributes to good bicycle and pedestrian access to the Transit Center. The most needed improvements are along the Lockwood Drive bridge over IH-10, which have minimal pedestrian accommodations and no bicycle facilities. The Lyons Avenue bike lanes are in a good condition and appear to be up to current standards (4-5 feet wide). Six-foot wide sidewalks run along either side of the Transit Center, providing a direct connection for bicyclists and pedestrians to the loading platforms.

Activity centers/destinations within one mile:
Wheatley High School (0.35 miles southeast)
Atherton Elementary School(0.5 miles northwest)
Boyce-Dorian Park
Lyons Avenue Health Center
Finnegan Park
Commercial development along Lyons Avenue

Major barriers within one mile:
Highways (IH-10)
Englewood Rail Yard

Existing bike facilities within one mile:
Lyons Avenue bike lanes

Existing bicycle parking:
One bike rack

City: Houston

Management District: N/A

Weekday bus boardings: 960

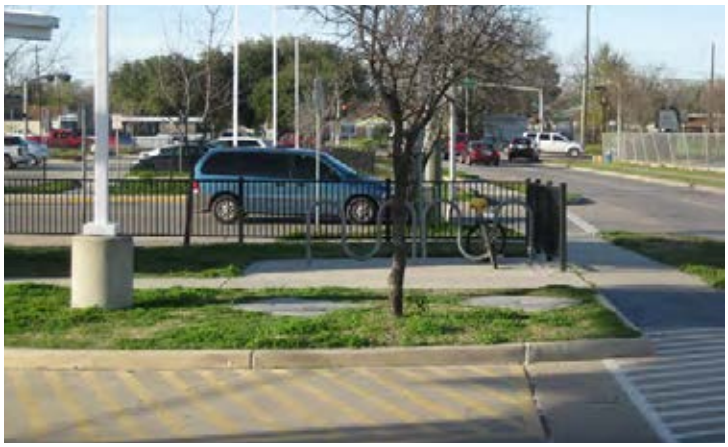
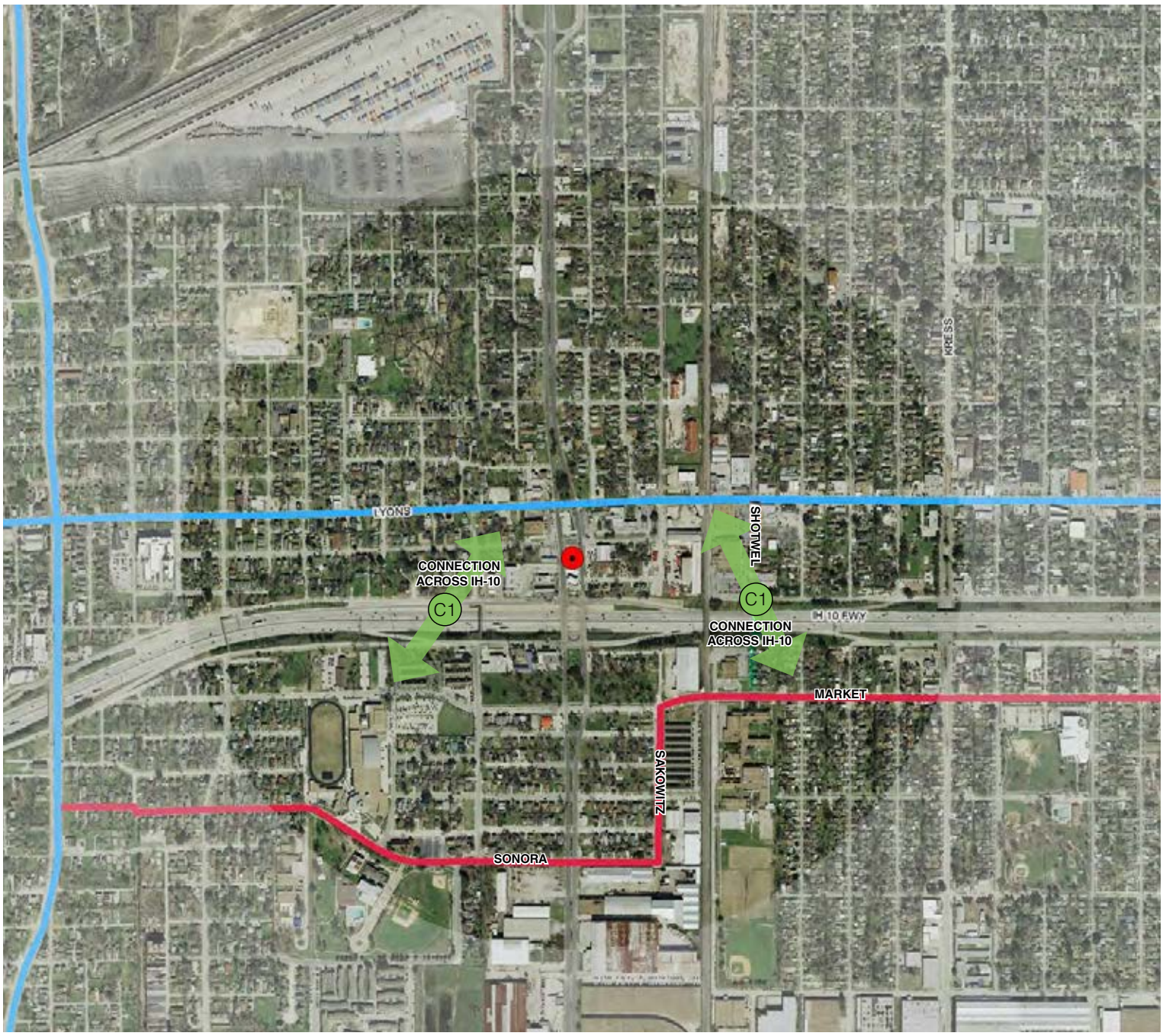


Figure 5.65: Bike rack at the north end of the Transit Center is accessible from Lockwood Drive

Figure 5.67: The bike parking are is connected to the transit platforms with a crosswalk

Figure 5.68: The border fencing provides a sense of security, which could be improved with a shelter or lockers

Figure 5.69: Bicyclist riding to rack from Lockwood Drive



5th Ward/Denver Harbor Transit Center

Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Bike Lane
- Signed Bike Route
- R Existing Bike Rack

Recommended Facilities

- C Connection Recommendation
- Desired Connection

N

0 0.125 0.25 0.5 MILES

Figure 5.70: Fifth Ward / Denver Harbor Transit Center Recommendations

CONNECTION
MARKET STREET BIKE ROUTE

C1: Explore provision of a bike connection across IH-10.

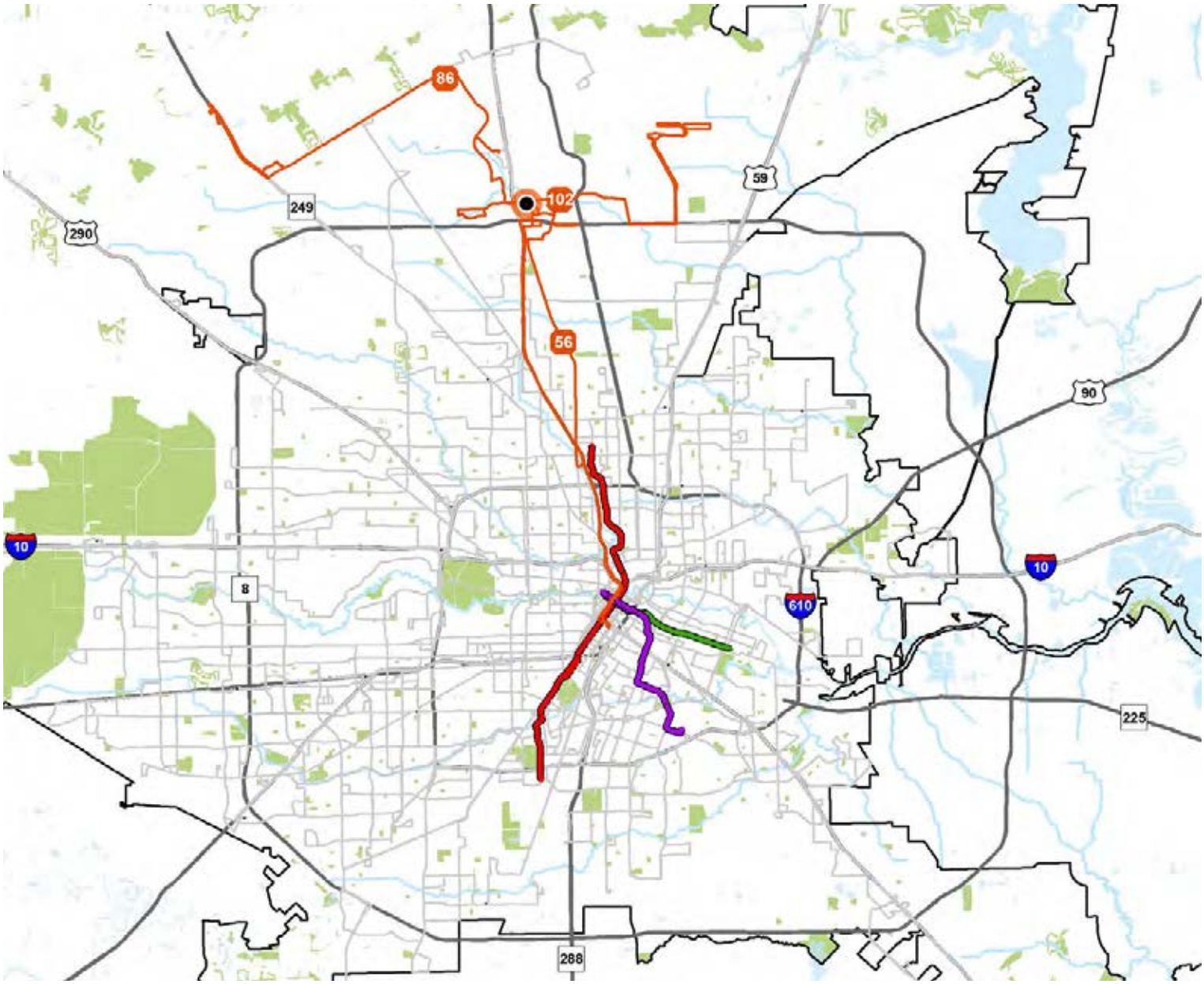
P1: Provide covered bike parking.

W1: Provide wayfinding signage from Lyons Avenue to Transit Center.

N

0 0.025 0.05 0.1 MILES

GREENSPOINT TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 4

POPULATION: Low Density — 1.8

Mode-Split

High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
86	FM 1960 Crosstown	Peak
102	Bush I.A.H.	
Limited		
56	Airline Limited	All day

Figure 5.71: Greenspoint Transit Center Connections

Greenspoint Transit Center consists of a pair of bus shelters along the west (southbound) side of Greenspoint Drive. It is served by two routes that operate along North Freeway to Downtown and therefore could be a convenient location for residents and employees in the area to make a bike and transit connection. A system of shared-use paths is currently being developed by the Greenspoint District.

There is no bike parking, but there is space available on the sidewalk near newstands and behind the bus shelters. Due to the low density of the area, with the mall and the business park, it seems like people may benefit from the use of a bike once they arrive, whereas bike parking may not be a high priority.

Activity centers/destinations within one mile:
Greenspoint Mall
International Flea Market
Greenspoint Plaza (employment)
CityView Park
Tom Wussow Park
Lone Star College - Greenspoint Center

Major barriers within one mile:
Sam Houston Parkway
H-45 North Freeway
Undeveloped areas
Low-density development, such as Greenspoint Mall parking lot

Existing bike facilities within one mile
Bayou trails connecting to Greens Road

Existing bicycle parking:
None

City: Houston

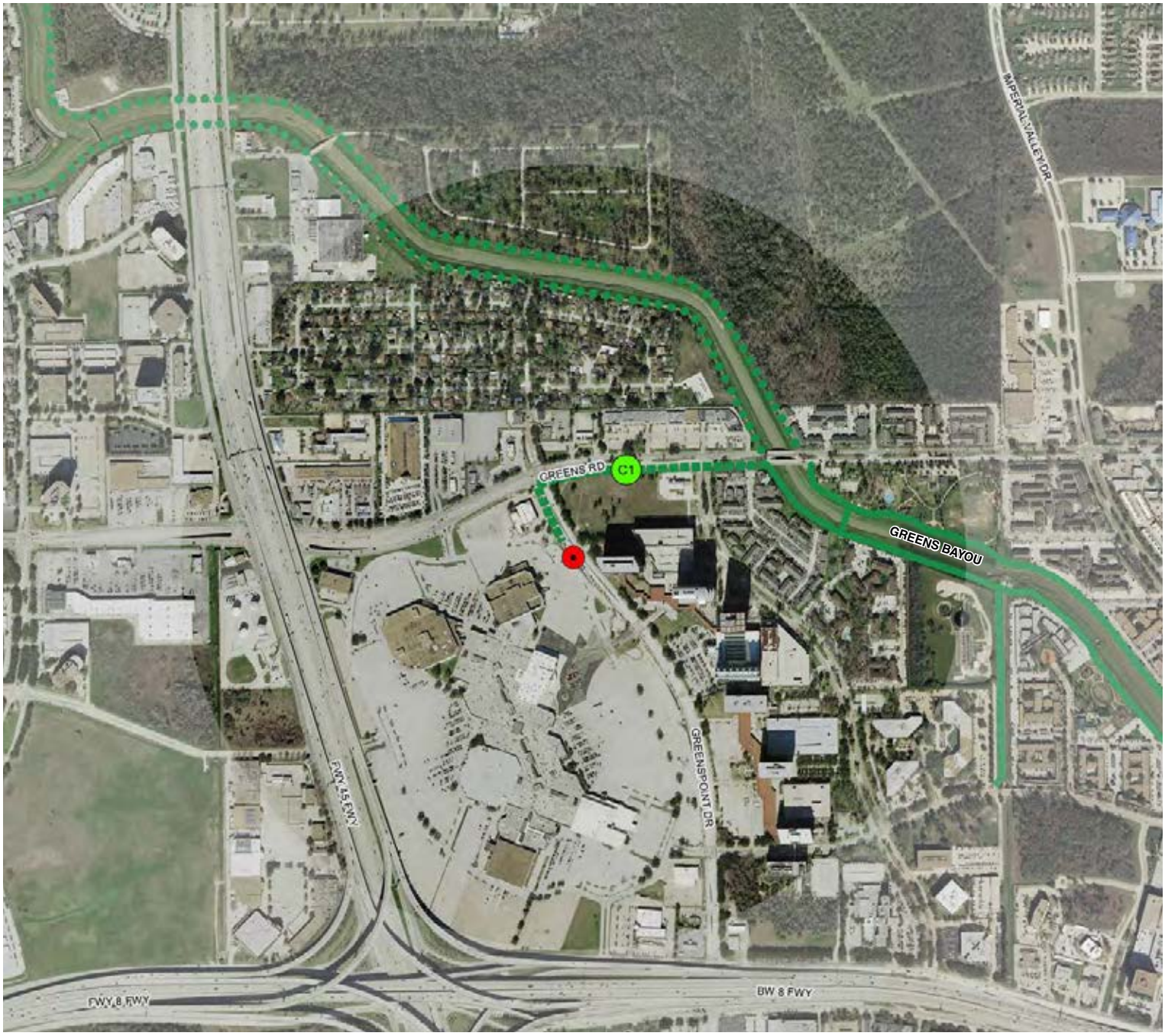
Management District: Greater Greenspoint

Weekday bus boardings: 106

Figure 5.72:The Greenspoint Transit Center has two bus shelters located along Greenspoint Drive

Figure 5.73: The facility is adjacent and accessible from Greenspoint mall, which likely functions like a Park & Ride

Figure 5.74: The Transit Center has rider amenities, such as trash cans, benches, pedestrian lighting and a shelter, but lacks bike parking facilities



Greenspoint Transit Center Half-Mile Radius

Existing Bicycle Facilities

Shared-Use Path

Facility In Development

Recommended Facilities

Shared-Use Path

C Connection Recommendation

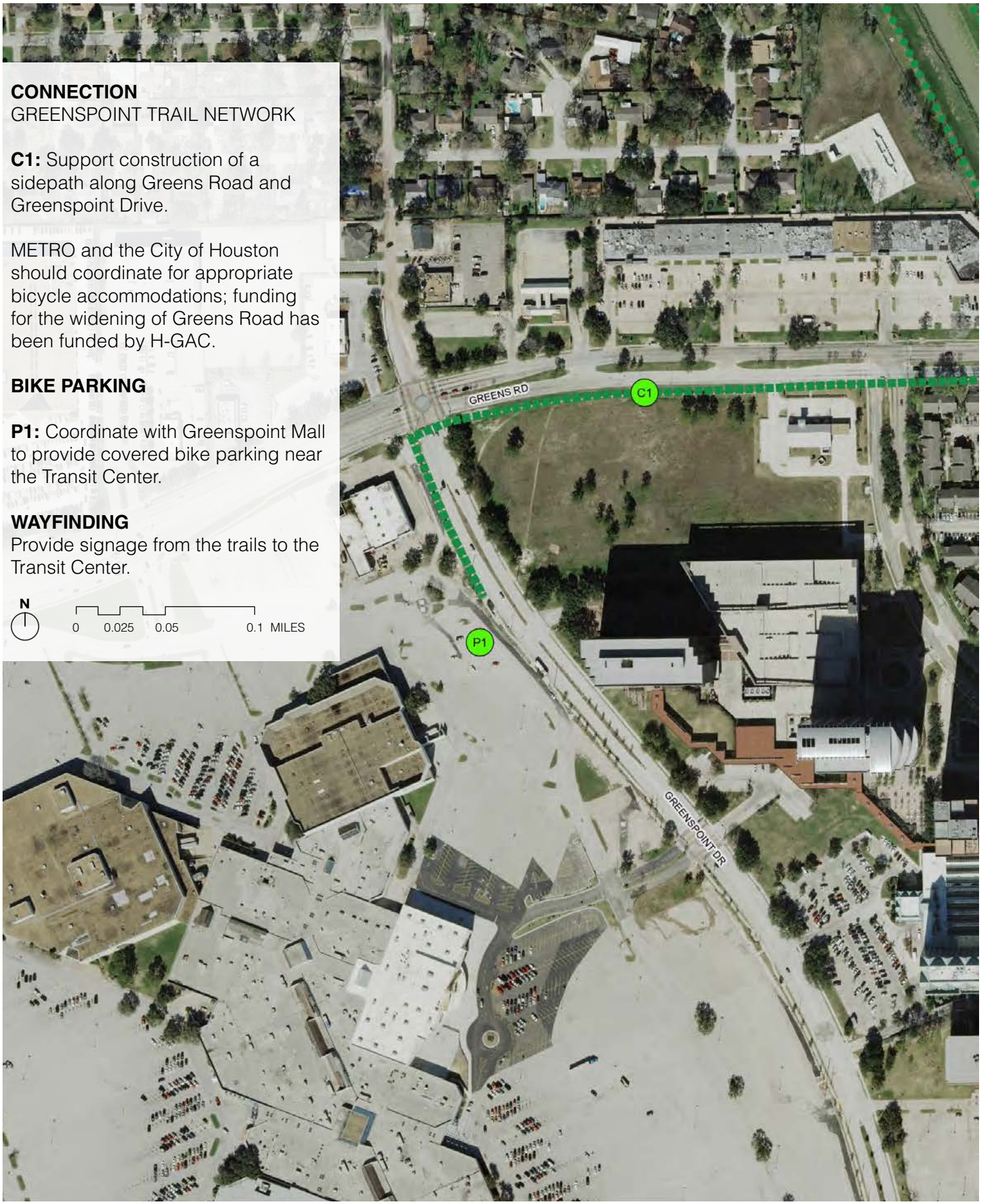
P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.75: Greenspoint Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES



CONNECTION
GREENSPOINT TRAIL NETWORK

C1: Support construction of a sidepath along Greens Road and Greenspoint Drive.

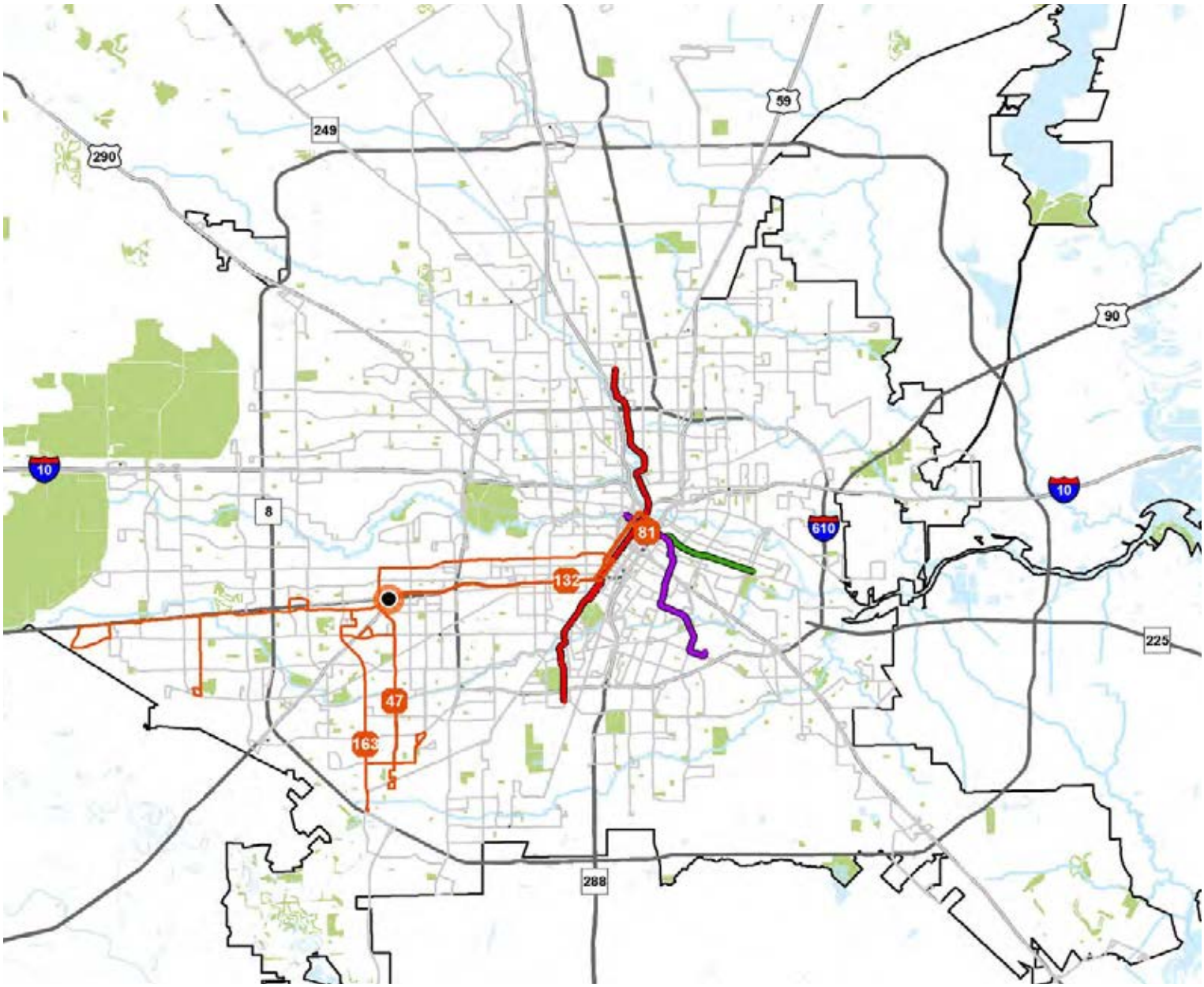
METRO and the City of Houston should coordinate for appropriate bicycle accommodations; funding for the widening of Greens Road has been funded by H-GAC.

BIKE PARKING

P1: Coordinate with Greenspoint Mall to provide covered bike parking near the Transit Center.

WAYFINDING
Provide signage from the trails to the Transit Center.

HILLCROFT TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 4.1 — Mode-Split

POPULATION: Low Density — 3.4 — High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
47	Hillcroft Crosstown	
81	Westheimer-Sharpstown	
132	Harwin	Peak Direction
164	Fondren	Peak

Figure 5.76: Hillcroft Transit Center Connections

Hillcroft Transit Center is located next to the interchange of Westpark Tollway and US-59 Southwest Freeway, making access by foot or bike difficult. The Transit Center features express service to Downtown and Wheeler Station via the 163 Fondren Limited and 132 Harwin Limited. As the terminus of the proposed Blue LRT line, this Transit Center will likely become an even more significant connection point in the future. As such, it's an important connection point for passengers on other local buses and potentially for cyclists as well. Worn-in footpaths indicate that people are already accessing the Transit Center from the Gulfton neighborhood on the east side of US-59 Southwest Freeway even though a safe crossing of the feeder roads doesn't exist. To the southwest are the dense residential and commercial neighborhoods of Sharpstown.

Activity centers/destinations within one mile:
Sharpstown Mall
Mahatma Gahndi District
high density neighborhoods

Major barriers within one mile:
US-59 Southwest Freeway
Westpark Tollway

Existing bike facilities within one mile:
Bike routes and lanes in Sharpstown and Gulfton neighborhoods

Existing bicycle parking:
Bike racks across parking lot lanes

City: Houston

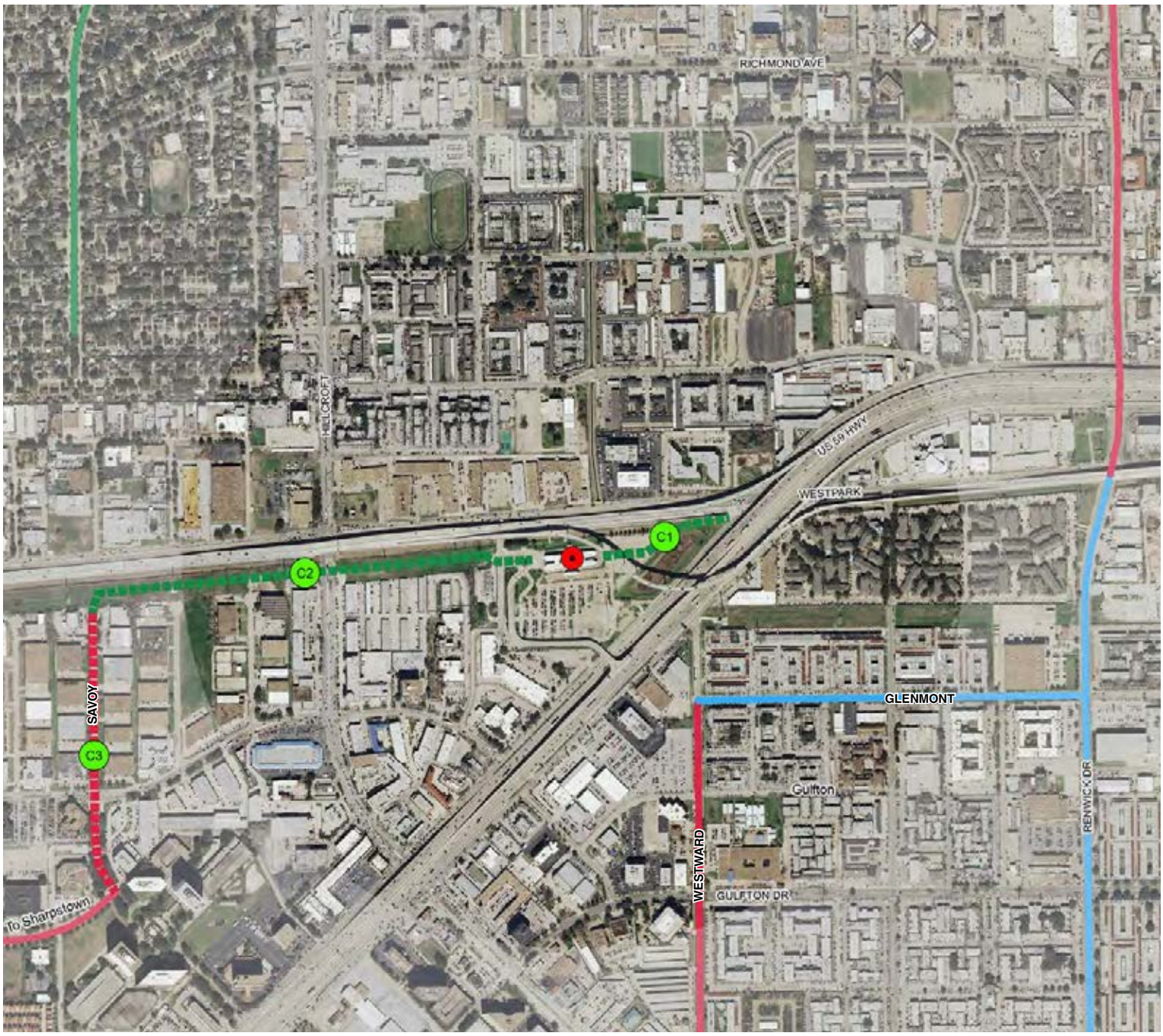
Management District: Sharpstown

Weekday bus boardings: 1,842

Figure 5.77: Bikes on front of 132 - Harwin, leaving Hillcroft Transit Center

Figure 5.78: Bike racks are located between the parking lot and transit boarding area

Figure 5.79: There is space for bike parking facilities (covered racks or lockers) on the Transit Center boarding area



Hillcroft Transit Center Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- (R) Existing Bike Rack

Recommended Facilities

- Shared-Use Path
- Signed Bike Route
- (C) Connection Recommendation
- (P) Bike Parking Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.80: Hillcroft Transit Center Recommendations

CONNECTIONS
SHARPSTOWN AND GULFTON

C1: Provide a shared-use path to the southwest corner of US-59 Southwest Freeway and Westpark Drive and restripe the parking lot to provide connection to the boarding platform. Well-worn footpaths indicate that this is a route people already use. Explore ways to provide a safe crossing of Southwest Freeway and install a shared-use path in the METRO-owned Westpark right of way at least as far as Rampart Street. Footpaths indicate that this is a well-used route despite unimproved conditions. Bike facilities within CenterPoint or METRO right-of-way will require agreement with the appropriate agencies.

C2: Explore installing a shared-use path in the CenterPoint right-of-way to connect to Savoy Drive and ultimately the existing bike route to Sharpstown Center.

C3: Provide a connection to the Transit Center from Sharpstown (by way of the CenterPoint right-of-way) with bicycle facilities on Savoy Drive as identified on the CoH Bikeway Plan.

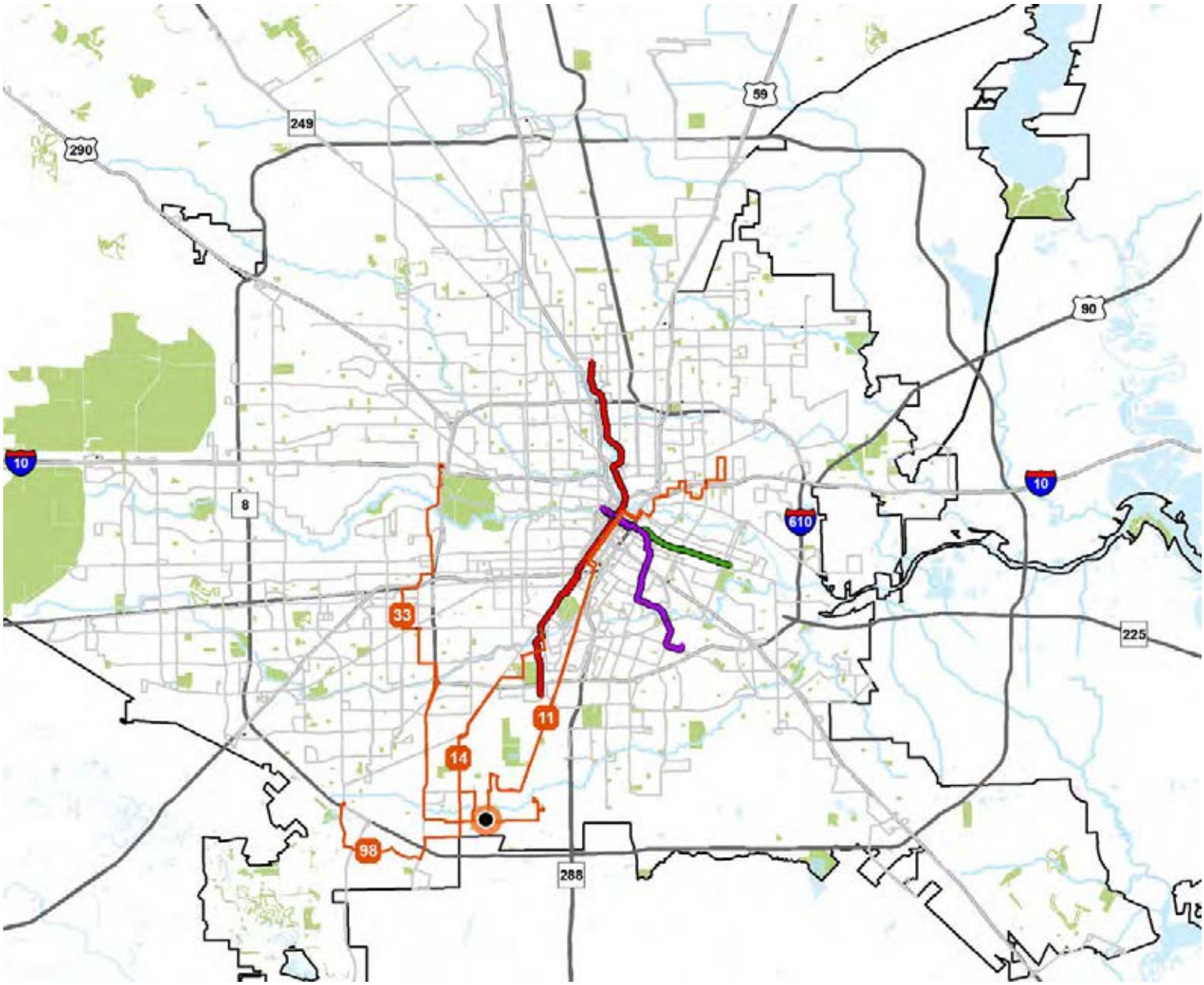
BIKE PARKING

P1: Locate a bike rack under the canopy.

WAYFINDING
Provide signage along new connections.

N
0 0.025 0.05 0.1 MILES

HIRAM CLARKE TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 2.7

POPULATION: Low Density — 1.7

Mode-Split

High Density

TRANSIT CONNECTIONS

Local		Weekday Frequent
11	Almeda	All Day or Peak
14	Hiram Clarke	
33	Post Oak Crosstown	
98	Briargate Circulator	

Figure 5.80: Hiram Clarke Transit Center Connections

Hiram Clarke Transit Center is the terminus for bus routes to Downtown and the Texas Medical Center. Residential density to the south is relatively low, but residents of those neighborhoods wishing to access transit may find bicycling a convenient way to do it in the absence of bus routes. Shared-use path are proposed along Sims Bayou a few blocks north of the Transit Center, potentially connecting it to numerous other neighborhoods, schools, and parks.

Activity centers/destinations within one mile:
Townwood Park (along Sims Bayou)(½ mile north)
Wildheather Park (1 mile)
Hiram Clarke Multi-Service Center
Church
School
Residential developments

Major barriers within one mile:
Sims Bayou
Undeveloped areas
Major roadways without bicycle facilities

Existing bike facilities within one mile:
Proposed Sims Bayou trails

Existing bicycle parking:
Bike racks in parking lot

City: Houston

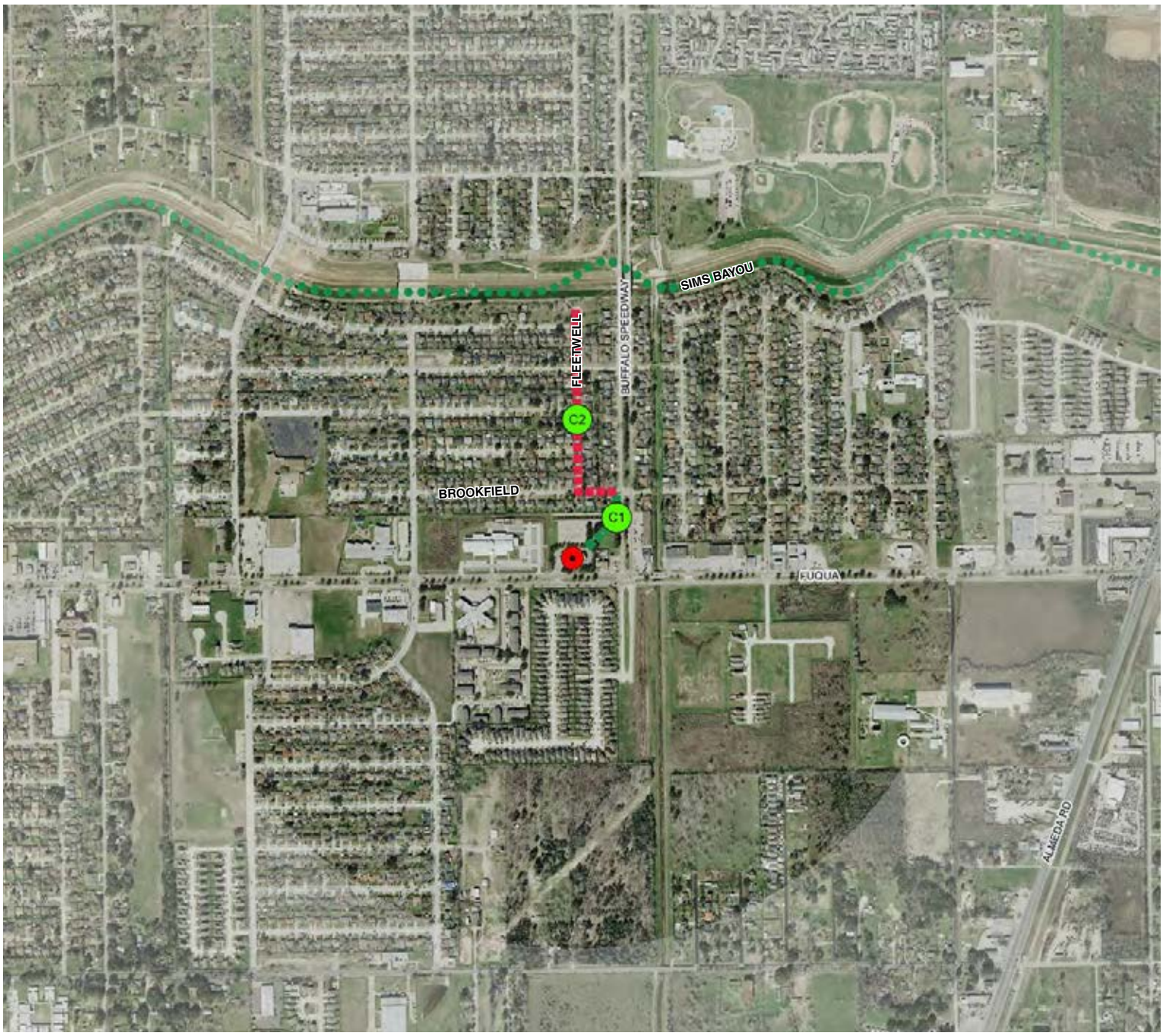
Management District: Five Corners

Weekday bus boardings: 899

Figure 5.81: There is enough space under the cover of the Hiram Clarke Transit Center for bike parking facilities, which should be placed in a way that won't obstruct circulation

Figure 5.82: Two bike racks have been installed in a parking space at the facility, which is easily accessible to the boarding area, but should be covered

Figure 5.83: A pathway connects the Hiram Clarke Transit Center parking lot to Buffalo Speedway, which will offer a useful connection to Sims Bayou (connection supported with directional signage)



Hiram Clarke Transit Center Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Facility In Development
- R Existing Bike Rack

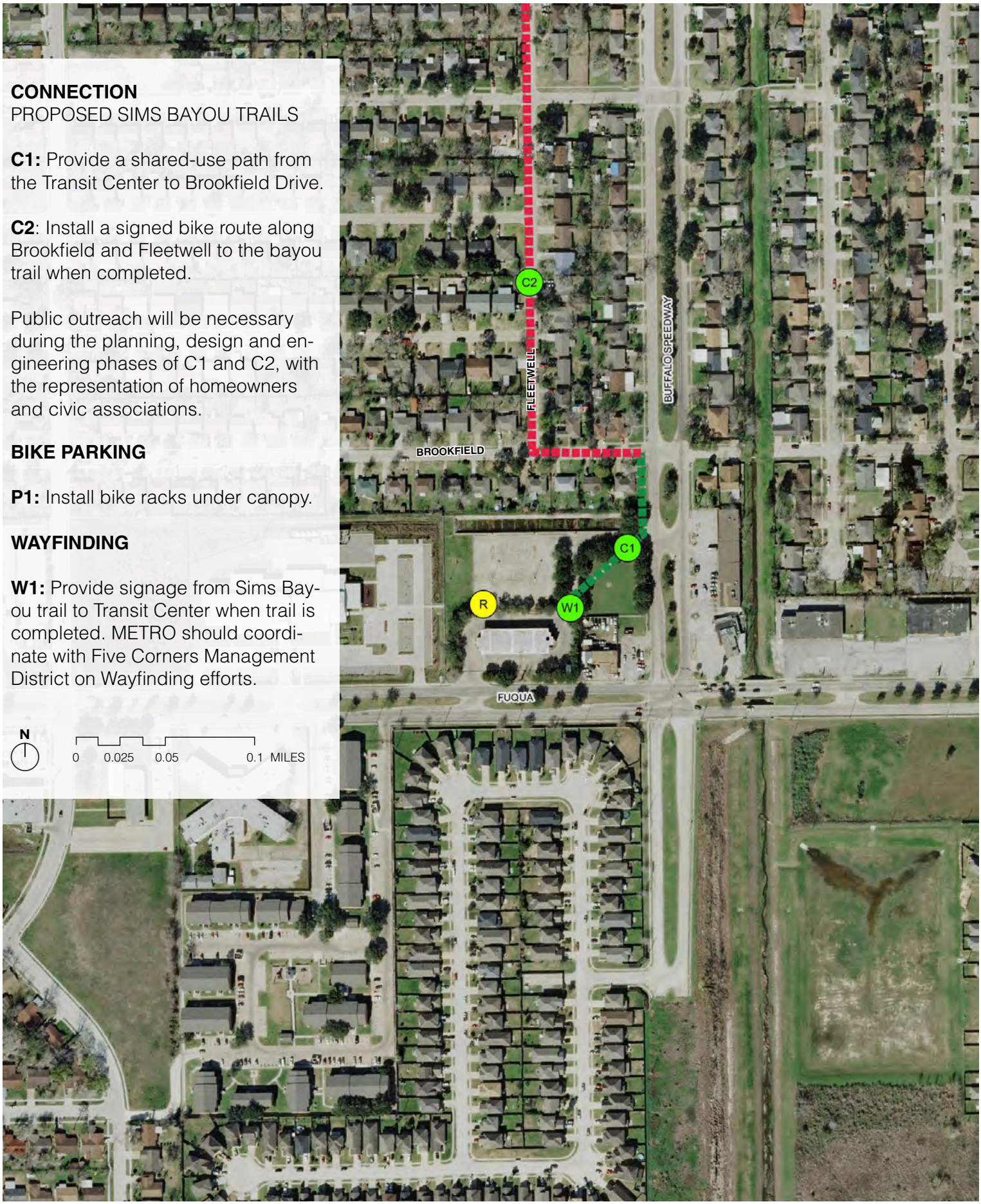
Recommended Facilities

- Shared-Use Path
- Signed Bike Route
- C Connection Recommendation
- W Wayfinding Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.84: Hiram Clarke Transit Center Recommendations



CONNECTION
PROPOSED SIMS BAYOU TRAILS

C1: Provide a shared-use path from the Transit Center to Brookfield Drive.

C2: Install a signed bike route along Brookfield and Fleetwell to the bayou trail when completed.

Public outreach will be necessary during the planning, design and engineering phases of C1 and C2, with the representation of homeowners and civic associations.

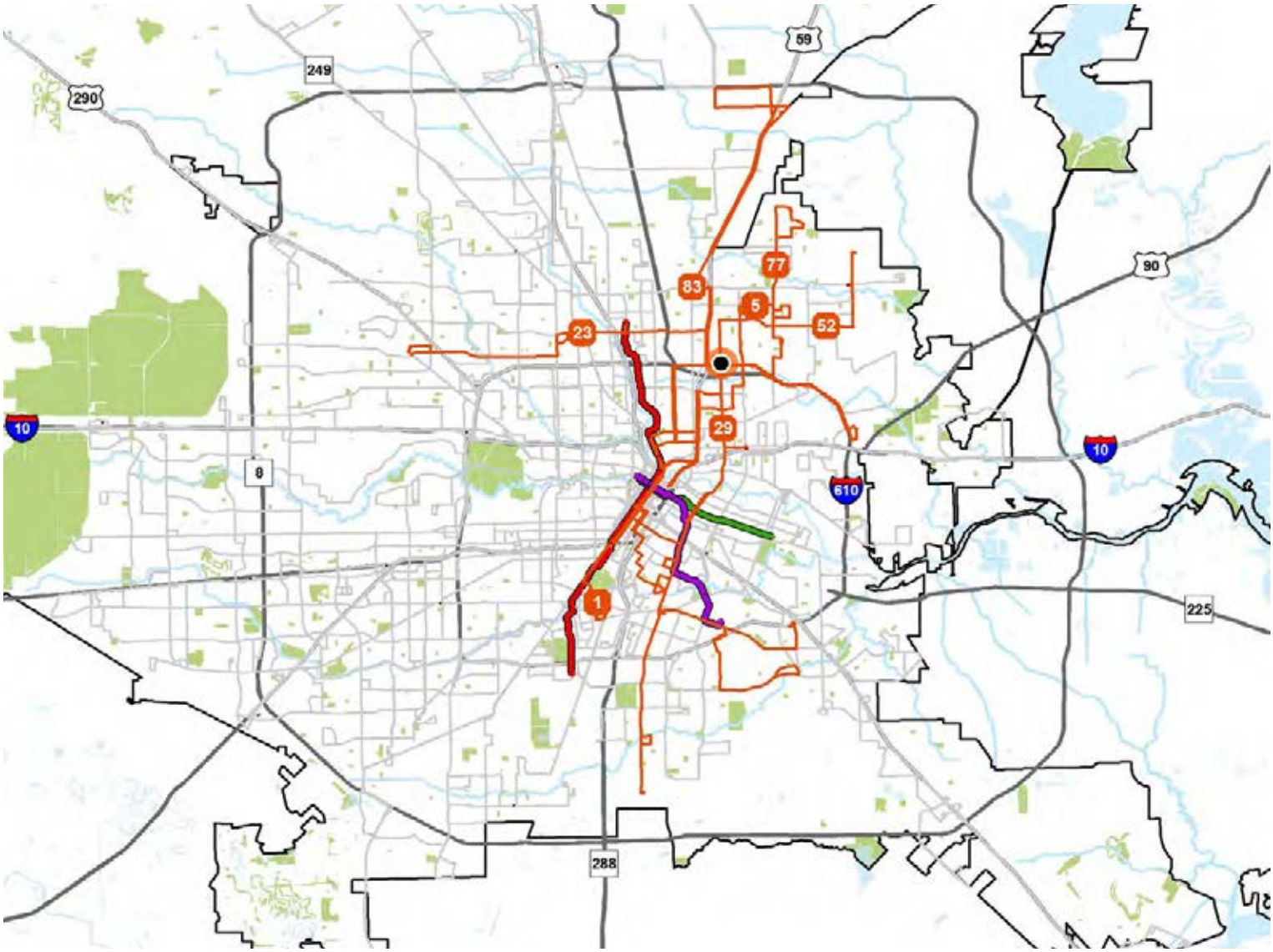
BIKE PARKING

P1: Install bike racks under canopy.

WAYFINDING

W1: Provide signage from Sims Bayou trail to Transit Center when trail is completed. METRO should coordinate with Five Corners Management District on Wayfinding efforts.

KASHMERE TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.7

POPULATION: Low Density — 1.3

Mode-Split

High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
1	Hospital	All Day
5	Kashmere	
23	Crosstimbers Crosstown	
29	TSU/UH Hirsch Crosstown	
52	Hirsch	Peak
77	Liberty	
83	Lee Road Circulator	

Figure 5.85: Kashmere Transit Center Connections

Kashmere Transit Center is located in a primarily residential area hemmed in by railroad lines and freeways. Bike lanes along Hirsch Road connect to it directly and provide bike connections to the north and south, crossing Hunting Bayou which is proposed to have a shared-use path. LBJ Hospital is located less than a mile to the east but doesn't have a convenient bike connection.

Overall bicycle access to the Kashmere Transit Center seems good. Stronger off-road connections to Key Middle School and Barbara Jordan High School may be desirable, especially at the intersection of Hirsch Road and Kelley Street, because students and their parents may not feel comfortable riding in the street between the Transit Center and the schools.

Activity centers/destinations within one mile:
Key Middle School
Barbara Jordan High School
LBJ Hospital

Major barriers within one mile:
IH-610 North Loop
Railroad lines

Existing bike facilities within one mile:
Hirsch Road bike lanes

Existing bicycle parking:
Bike rack under canopy

City: Houston

Management District: N/A

Weekday bus boardings: 2,040

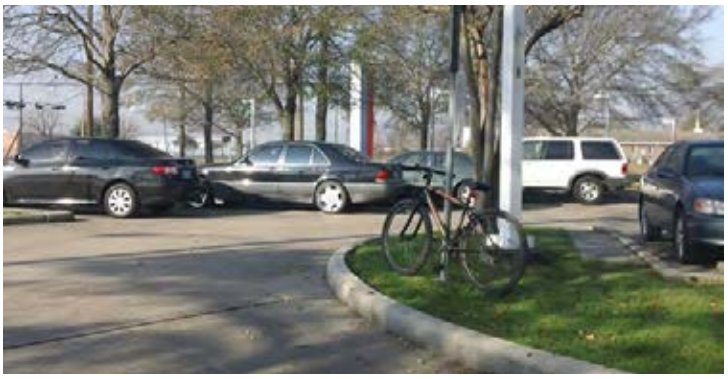
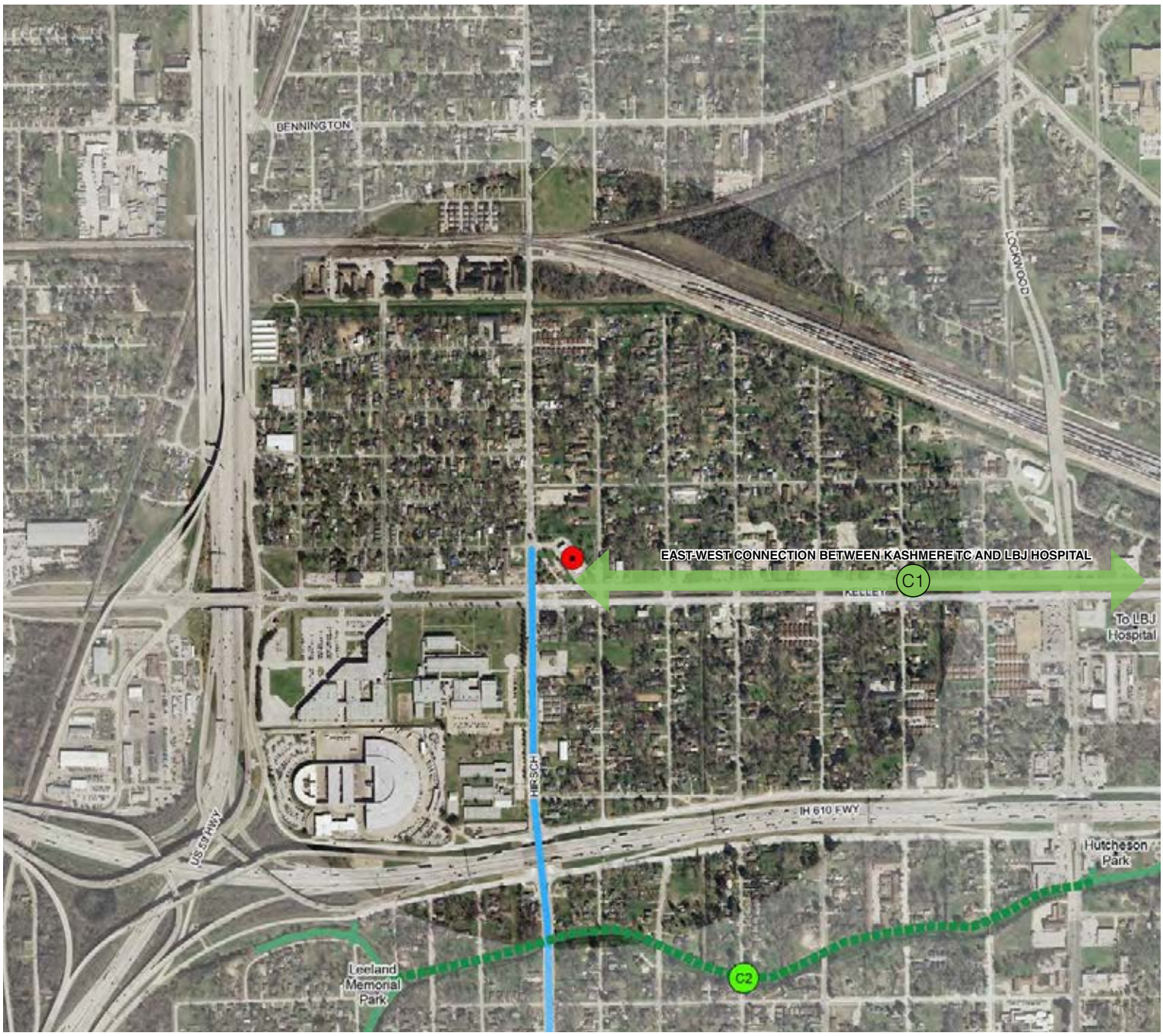


Figure 5.86: Bike locked to a pole in the Transit Center parking lot

Figure 5.87: Bike rack located under the Transit Center canopy

Figure 5.88: Bike loaded onto the front of a bus

Figure 5.89: Bike locked to bike rack under Transit Center canopy



Kashmere Transit Center Half-Mile Radius

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- R Existing Bike Rack

Recommended Facilities

- Shared-Use Path
- C1 Connection Recommendation
- Desired Connection

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.90: Kashmere Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

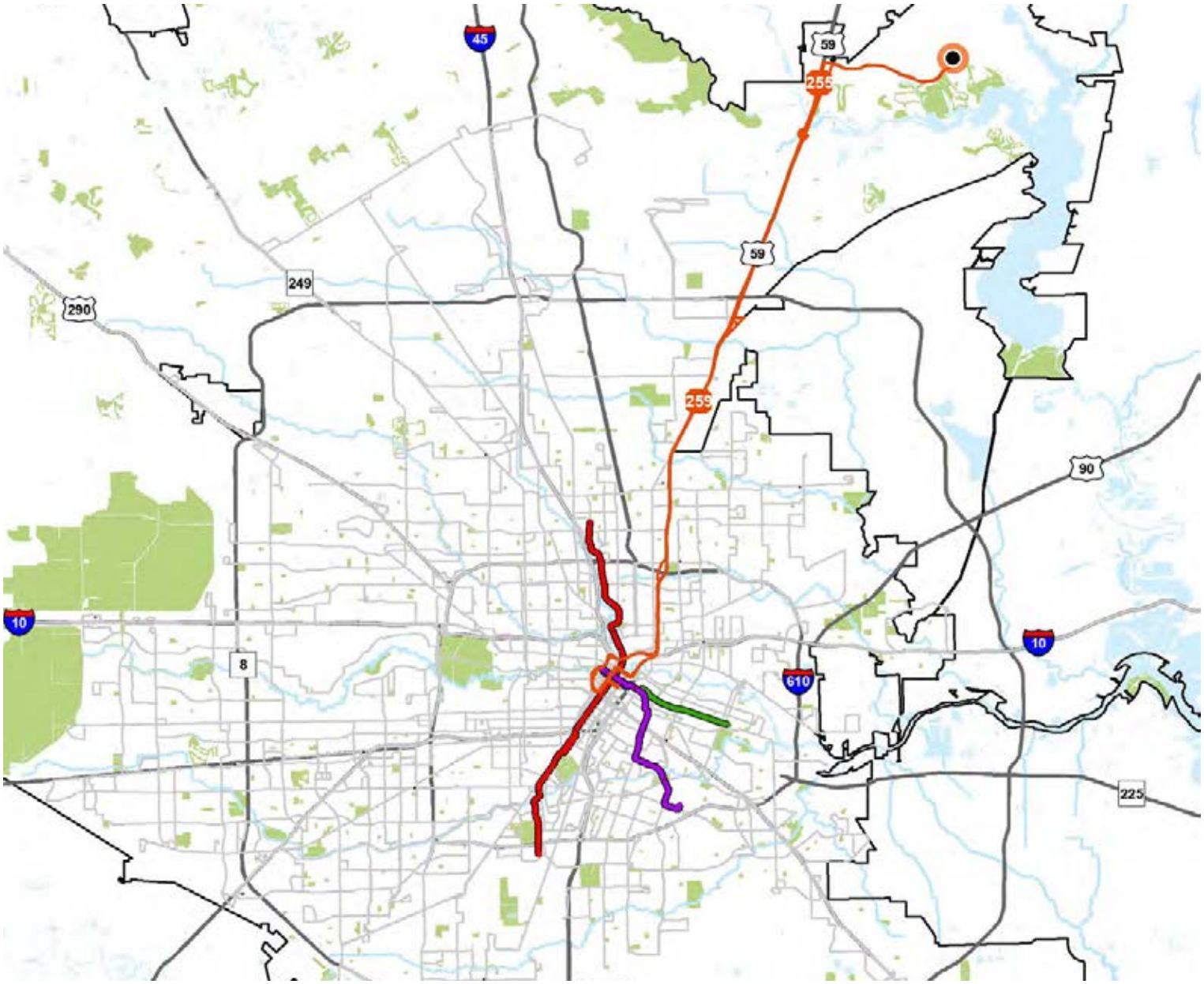
CONNECTIONS
LBJ HOSPITAL, HUNTING BAYOU TRAILS

C1: Support the development of an east-west connection to LBJ Hospital. A traffic/engineering study is needed to determine the feasibility of bike infrastructure along Kelley.

C2: Support the completion of the Hunting Bayou Trail from Leeland Memorial Park to Lockwood and Hutcheson Park with connection to the Hirsch Road bike lanes. This project is part of the Bayou Greenway Initiative.

WAYFINDING
Provide signage along the proposed connections.

KINGWOOD PARK & RIDE



INDEX

COMMUTE: Drive Alone — 2.3 — Mode-Split

POPULATION: Low Density — 1.5 — High Density

TRANSIT CONNECTIONS

Parl & Ride

255 Kingwood

259 Kingwood/Eastex
Townsen (midday or late evening)

Figure 5.91: Kingwood Park & Ride Connections

Kingwood Park & Ride is located deep inside the Kingwood master-planned community and is the farthest out facility in the Eastex Freeway corridor. Frequent peak service is offered by the 255 Kingwood and hourly off-peak service by the 259 Kingwood/Eastex/Townsen. It currently operates with about 62% of its 1,034 spaces filled.

The major thoroughfares are not suitable for bicycles, though most have sidewalks/paths intended for bike use. Additionally neighborhood streets are suitable for bicyclists, and provide direct connectivity to the Transit Center.

Activity centers/destinations within one mile:
Low-density neighborhoods
Apartment buildings
Commercial development
Creekwood Middle School (0.5 mile)

Major barriers within one mile:
Drainage ditch
Natural, undeveloped areas
Suburban street network

Existing bike facilities within one mile:
Description

Existing bicycle parking:
Description

City: Houston

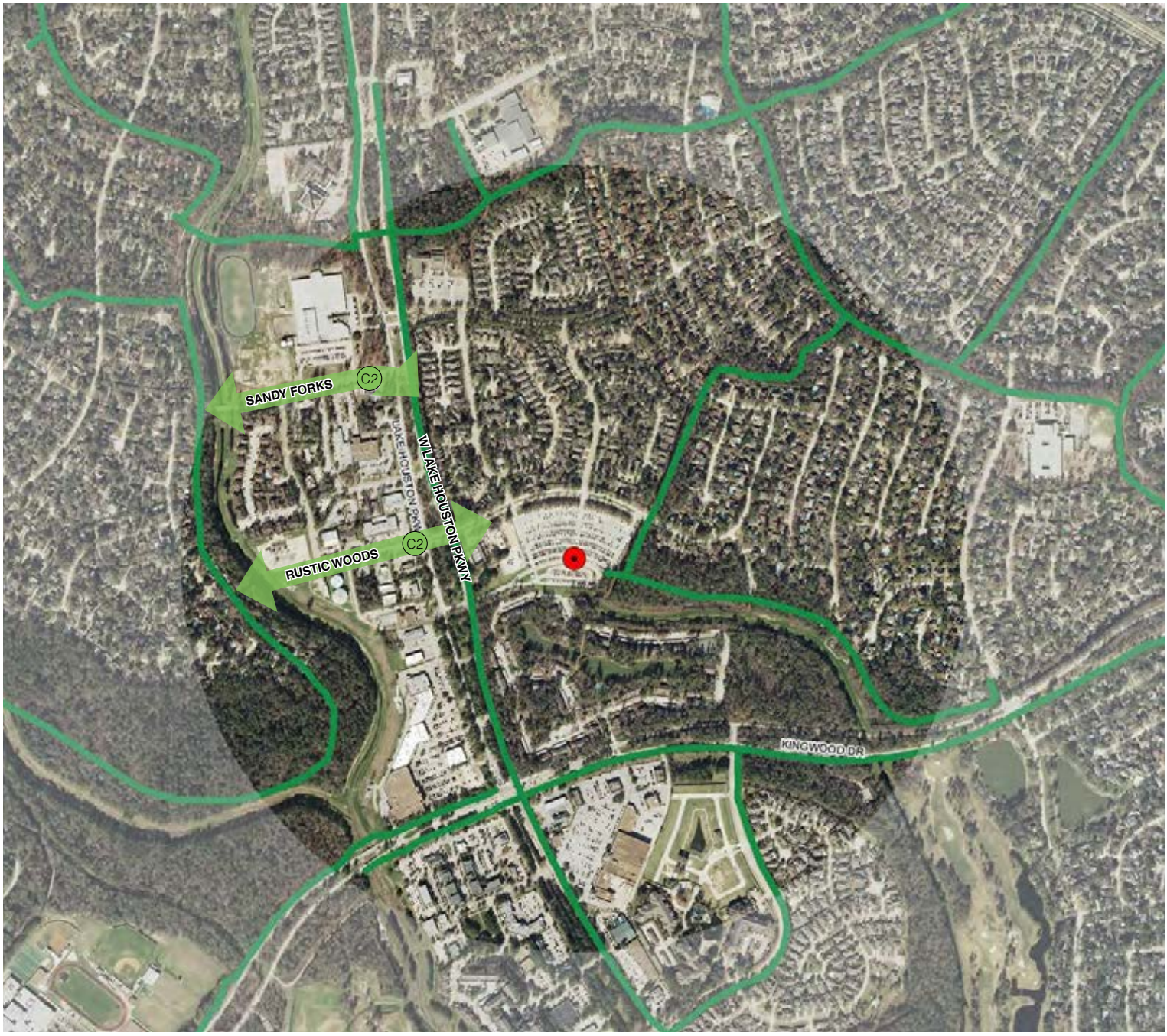
Management District: N/A

Figure 5.92: Trail access to Kingwood Park & Ride lacks wayfinding

Figure 5.93: Walkway leading to the Transit Center from the main entrance

Figure 5.94: The bike racks at Kingwood Park & Ride are well used, making the site a good candidate for improve bike parking facilities, such as lockers

Figure 5.95: To improve efficient use of space and Transit Center circulation, maps could be installed within other vertical surfaces, such as the dividing wall behind the map pictured above, without creating clutter



Kingwood Park & Ride Half-Mile Radius

Existing Bicycle Facilities

Shared-Use Path

R Existing Bike Rack

Recommended Facilities

C Connection Recommendation

Desired Connection

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.96: Kingwood Park & Ride Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTION
GREENBELT TRAILS

C1: Replace missing wheel stops to prevent vehicles from overhanging and blocking the sidewalk connection to the Greenbelt Trails.

C2: Additional connections should be explored to neighborhoods west of West Lake Houston Pkwy; possible streets include Rustic Woods and Sandy Forks.

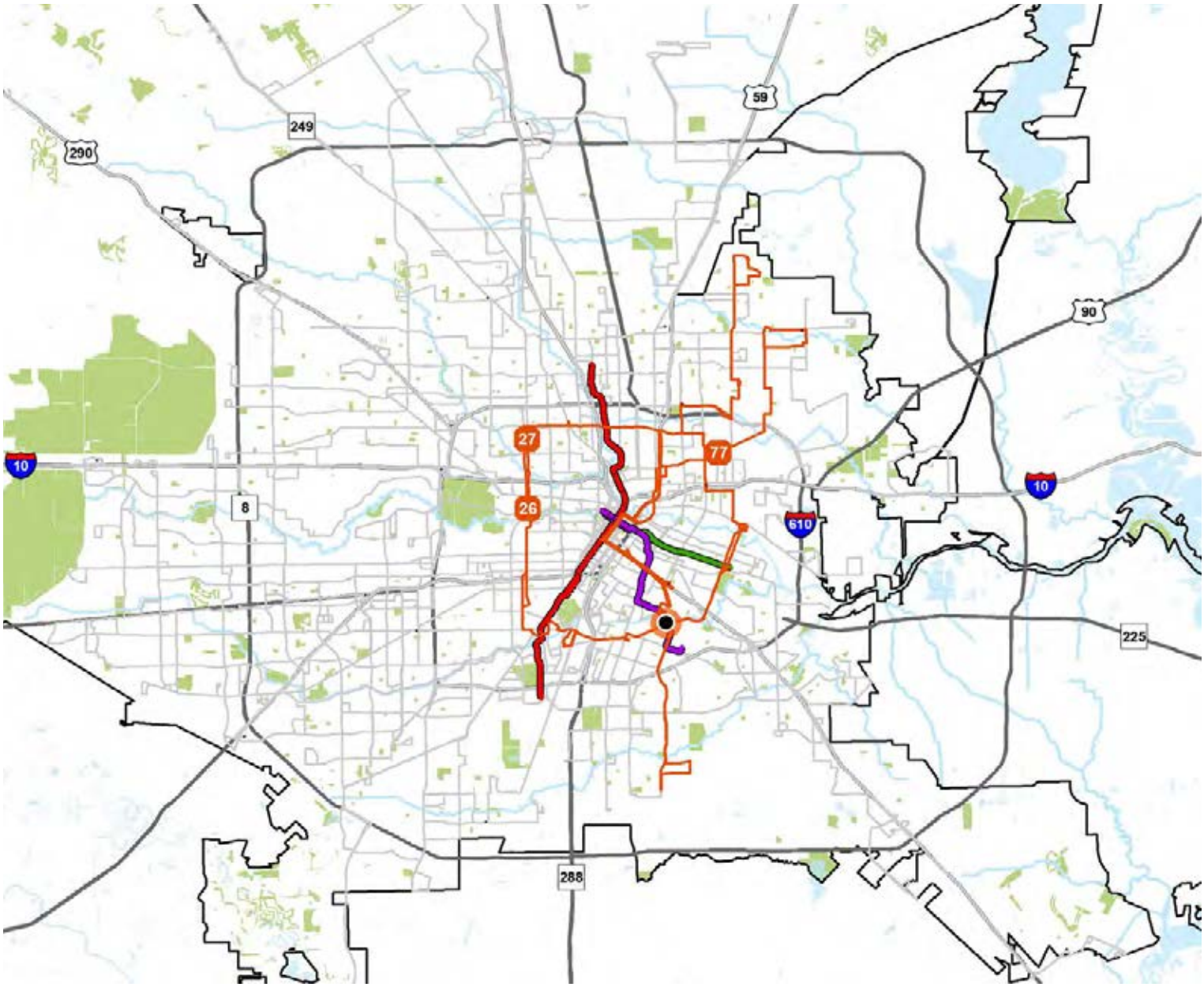
BIKE PARKING
Provide cover for bike parking

WAYFINDING
Provide signage along existing Greenway Trails to the Park & Ride lot.

N

0 0.025 0.05 0.1 MILES

MACGREGOR PARK STATION



INDEX

COMMUTE: Drive Alone — 3.9 — Mode-Split

POPULATION: Low Density — 1.6 — High Density

TRANSIT CONNECTIONS

Light Rail

		Weekday Frequent
	Purple Line (2014)	All Day

Local

26	Outer Loop Crosstown
27	Inner Loop Crosstown

Limited

77	Martin Luther King Limited	Peak

Figure 5.97: MacGregor Park Station Connections

MacGregor Park Station will serve the park and is near the Brays Bayou trails, though UH South/University Oaks Station will be closer to the bayou and may offer a better connection. For cyclists coming from areas further out, Palm Center may be a better destination as it is the terminal station.

Activity centers/destinations within one mile:
MacGregor Park
School

Major barriers within one mile:
Brays Bayou
Incomplete Spur 5 Freeway creates barrier to the east
Old Spanish Trail (US 90A) not ideal for bicycle use
MacGregor Park (little need for access)
Railroad tracks to the east

Existing bike facilities within one mile:
Brays Bayou trails (have to cross through MacGregor Park from the bayou trail to reach the station)

Existing bicycle parking:
N/A (under construction)

City: Houston

Management District: Greater Southeast

Weekday bus boardings: N/A

Figure 5.98: METRORail station under construction; little activity adjacent to the site

MacGregor Park Station Half-Mile Radius

METRO Rail

Purple Line (Southeast)

Existing Bicycle Facilities

Shared-Use Path

Bike Lane

Signed Bike Route

Facility In Development

Recommended Facilities

P Bike Parking Recommendation

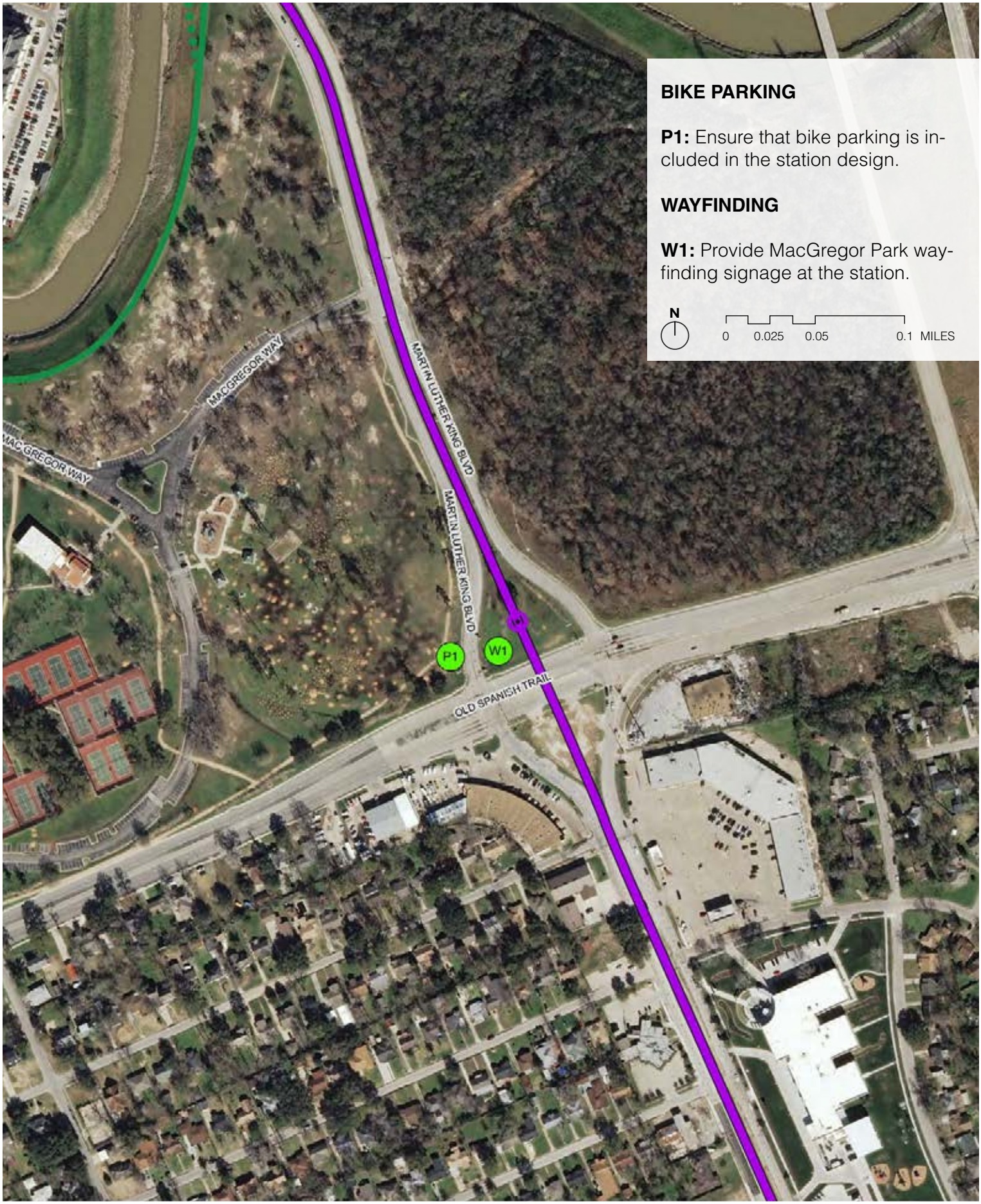
W Wayfinding Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.99: MacGregor Park Station Recommendations

N

0 0.125 0.25 0.5 MILES



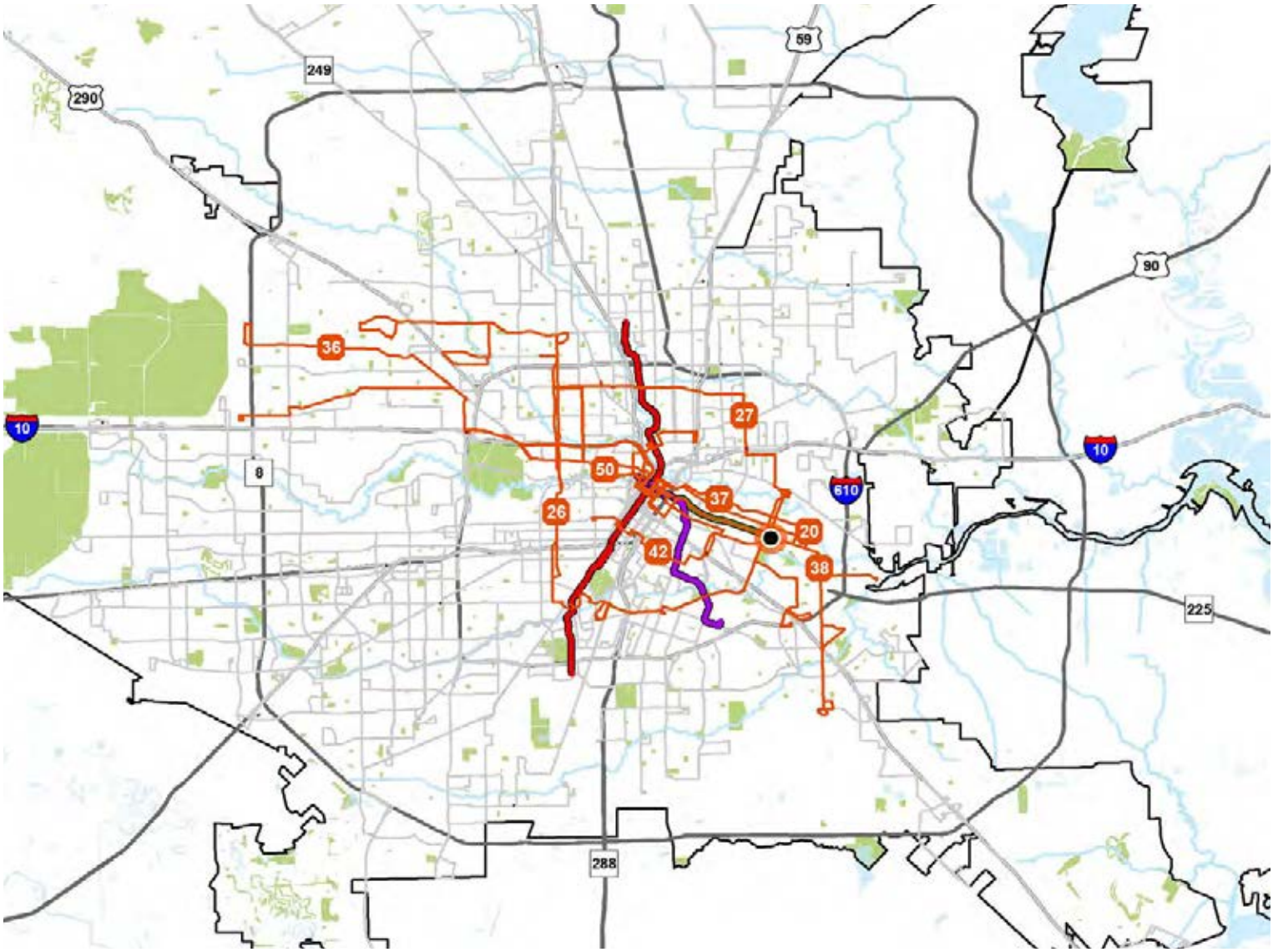
BIKE PARKING

P1: Ensure that bike parking is included in the station design.

WAYFINDING

W1: Provide MacGregor Park wayfinding signage at the station.

MAGNOLIA TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.8 — Mode-Split

POPULATION: Low Density — 2.1 — High Density

TRANSIT CONNECTIONS

Light Rail		**Weekday Frequent**
	Green Line (2015)	All Day
Local		
20	Canal	
26	Outer Loop Crosstown	
27	Inner Loop Crosstown	
36	Lawndale	
37	El Sol Crosstown	
38	Manchester Dock Circulator	
42	Holman Crosstown	
50	Harrisburg	All Day

Figure 5.100: Magnolia Transit Center Connections

Magnolia Transit Center will serve as the eastern terminus of the Green Line and therefore will be a likely connection point for cyclists wishing to access transit. A project currently in development by Harris County Precinct 2 and the Greater East End District will integrate it with existing and new bike routes throughout the East End, including the nearby Brays Bayou trails.

Activity centers/destinations within one mile:
Magnolia Multi-Service Center
Library
Elementary schools
Mayor's Assistance Center
Bus terminals (intercity)
Grocery stores
Retail development
Single-family residential

Major barriers within one mile:
Brays Bayou
Railroad lines
Golf course

Existing bike facilities within one mile:
Brays Bayou trails
Harrisburg trails
Sunset trails

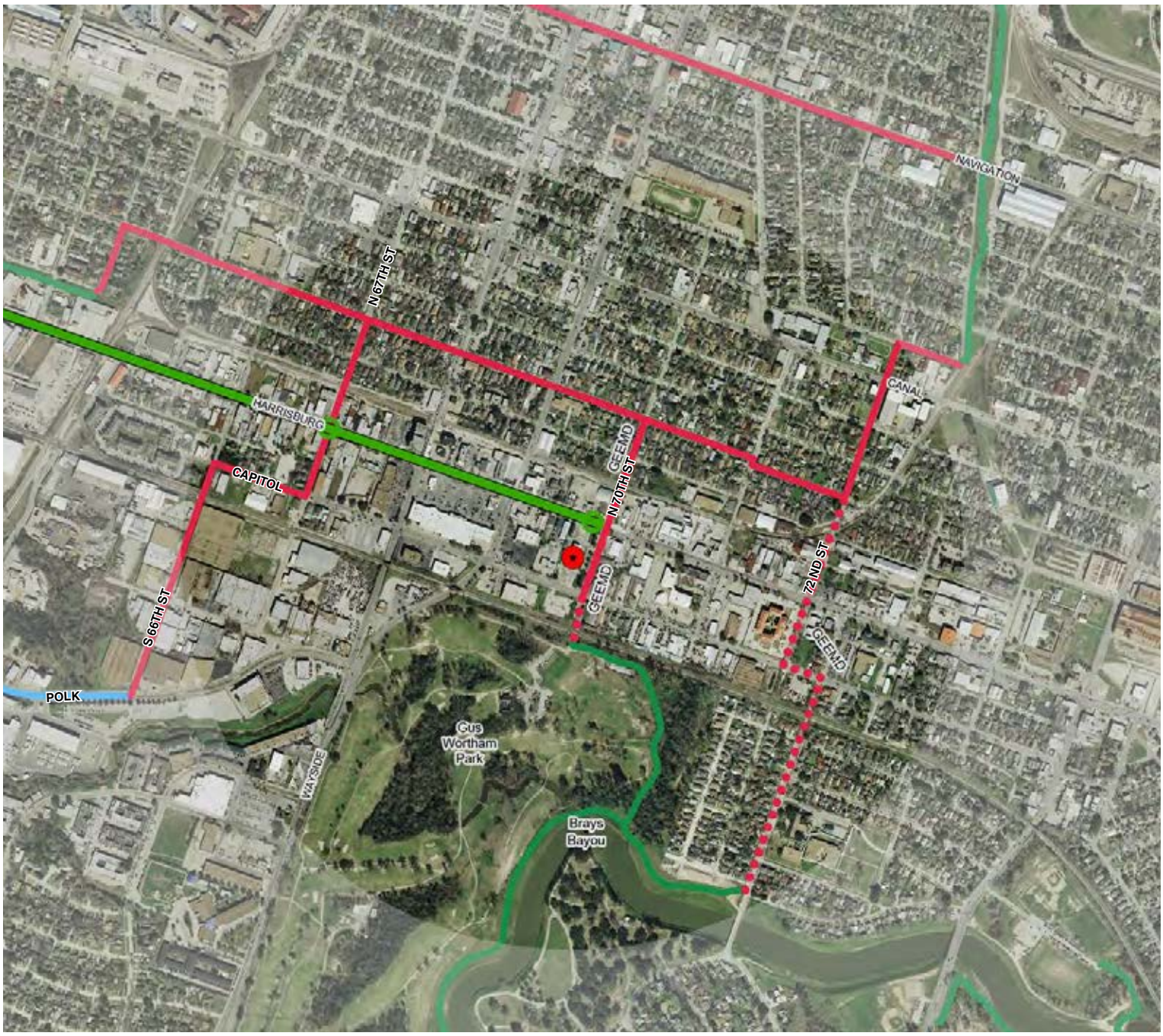
Existing bicycle parking:
Two bike racks under canopy

City: Houston

Management District: East End

Weekday bus boardings: 1,286

Figure 5.101: Two bike racks located under the Transit Center canopy



Magnolia Transit Center Half-Mile Radius

METRO Rail

Green Line (East End)

Existing Bicycle Facilities

Shared-Use Path

Bike Lane

Signed Bike Route

Facility In Development

Existing Bike Rack

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.102: Magnolia Transit Center Recommendations

N

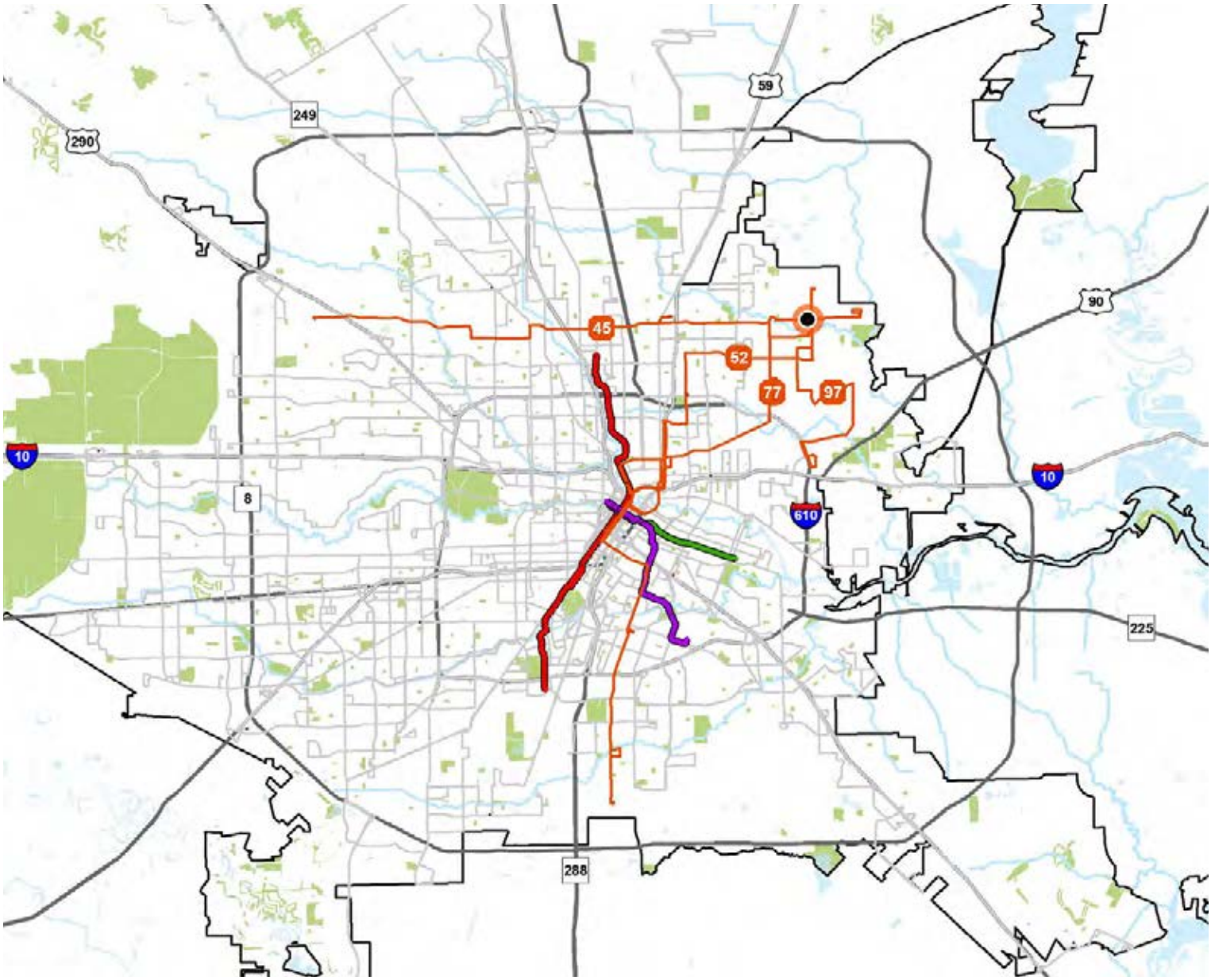
0 0.125 0.25 0.5 MILES

CONNECTIONS
BRAYS BAYOU, HARRISBURG AND SUNSET TRAILS

No recommendations. Connections to Brays Bayou and Sunset Trails are being addressed by Harris County Precinct 2 and Greater East End Management District project currently in development.

Greater East End Management District may be a valuable partner for wayfinding and bike parking projects.

MESA TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 2.8

POPULATION: Low Density — 1

Mode-Split

High Density

TRANSIT CONNECTIONS

Local		Weekday Frequent
45	Tidwell Crosstown	
52	Hirsch	All Day
77	Liberty	
97	Settegast Shuttle	

Figure 5.103: Mesa Transit Center Connections

Mesa Transit Center is a small facility consisting of three bus shelters in a shopping center parking lot. It currently provides no bike parking, even though bikes have been observed locked to light poles. Halls Bayou, located a few hundred feet to the south, is part of the Bayou Greenway Initiative and is programmed to one day have a shared-use path.

Activity centers/destinations within one mile:
Schools (YES Prep North Forest Campus)

Major barriers within one mile:
Halls Bayou
Undeveloped areas

Existing bike facilities within one mile:
None

Existing bicycle parking:
None

City: Houston

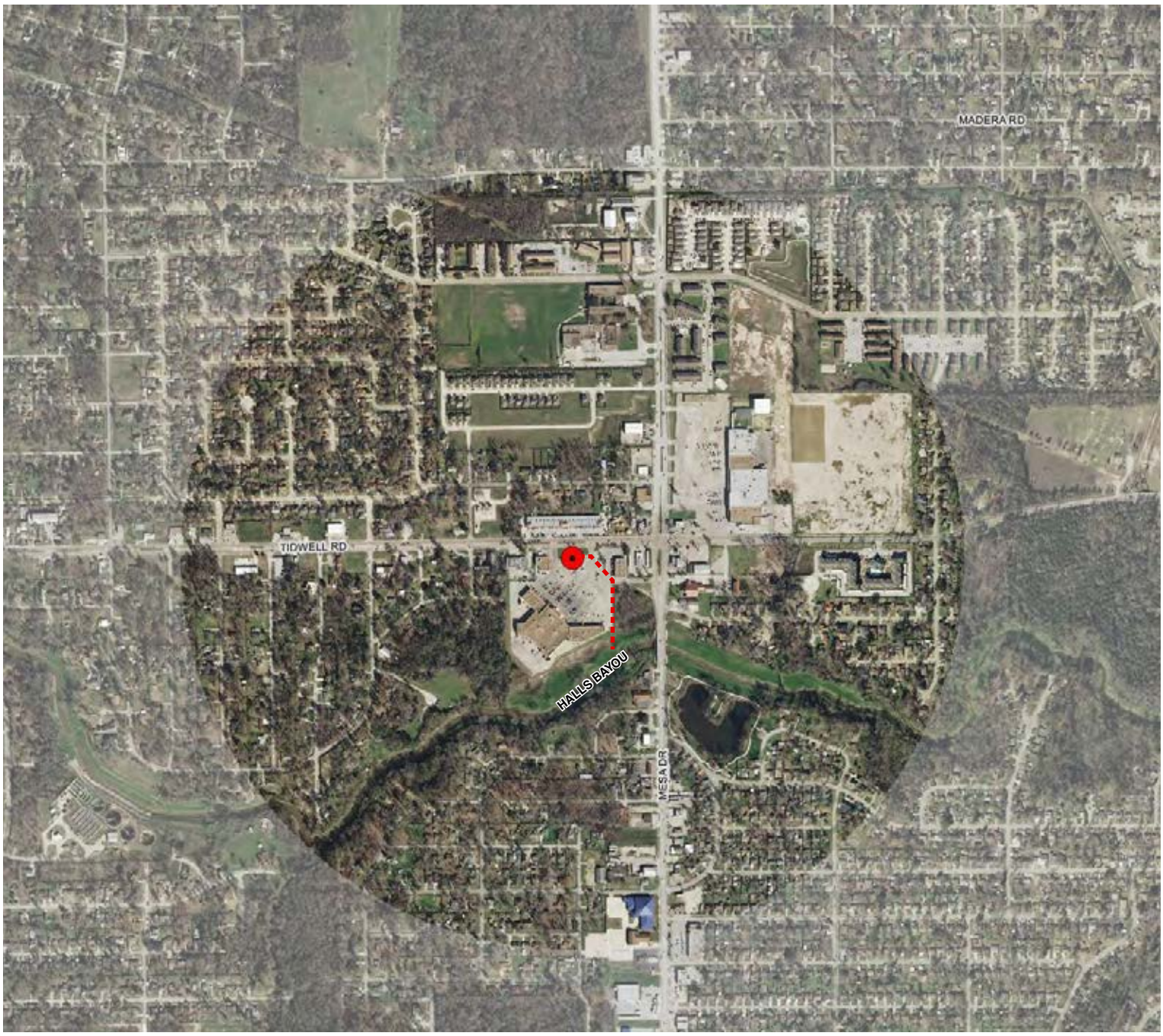
Management District: N/A

Weekday bus boardings: 592

Figure 5.104: Crosswalk leading from shopping center parking lot to bus shelters of Mesa Transit Center

Figure 5.105: View from the parking lot

Figure 5.106: View from Tidwell and shopping center driveway



Mesa Transit Center Half-Mile Radius

Recommended Facilities

Signed Bike Route

C Connection Recommendation

P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.107: Mesa Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

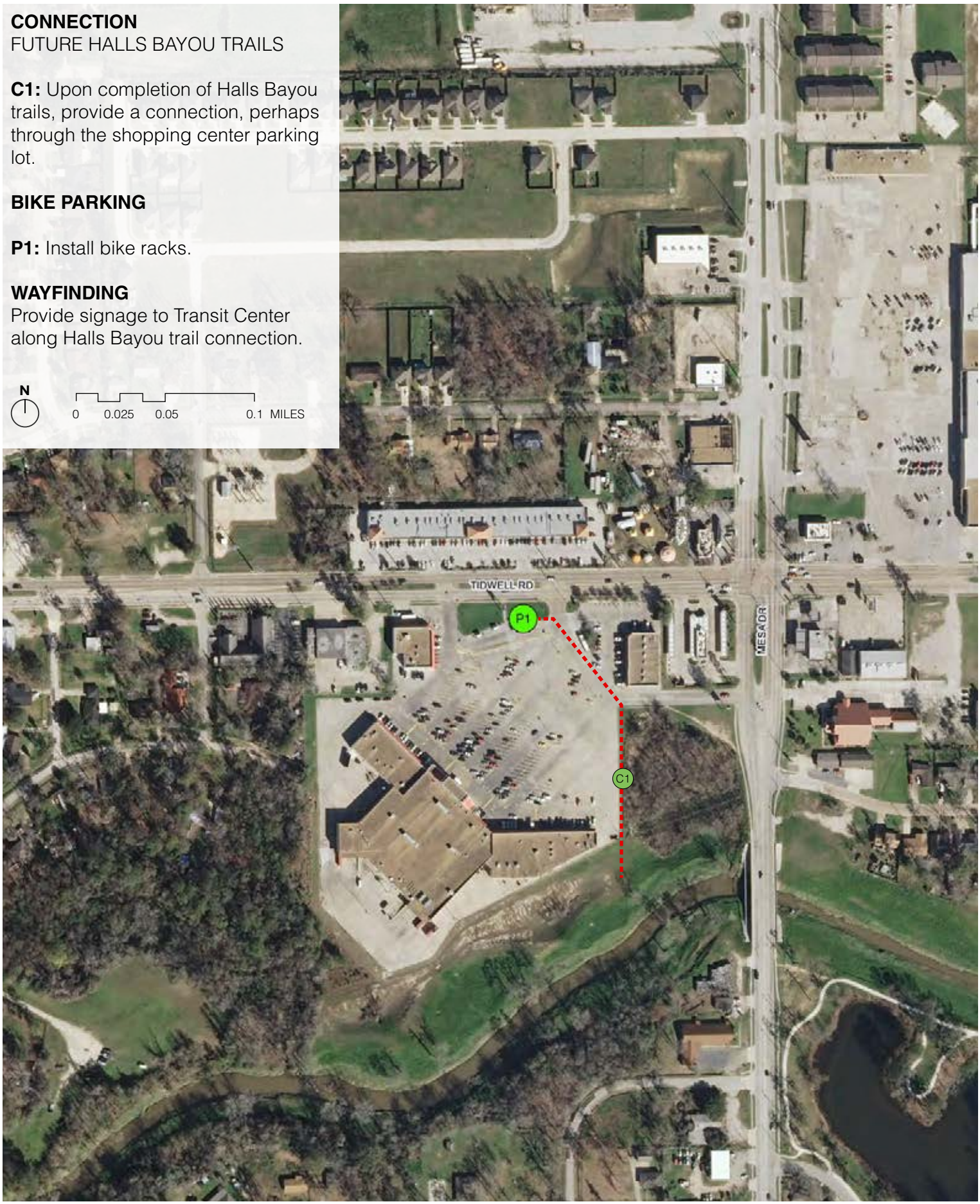
CONNECTION
FUTURE HALLS BAYOU TRAILS

C1: Upon completion of Halls Bayou trails, provide a connection, perhaps through the shopping center parking lot.

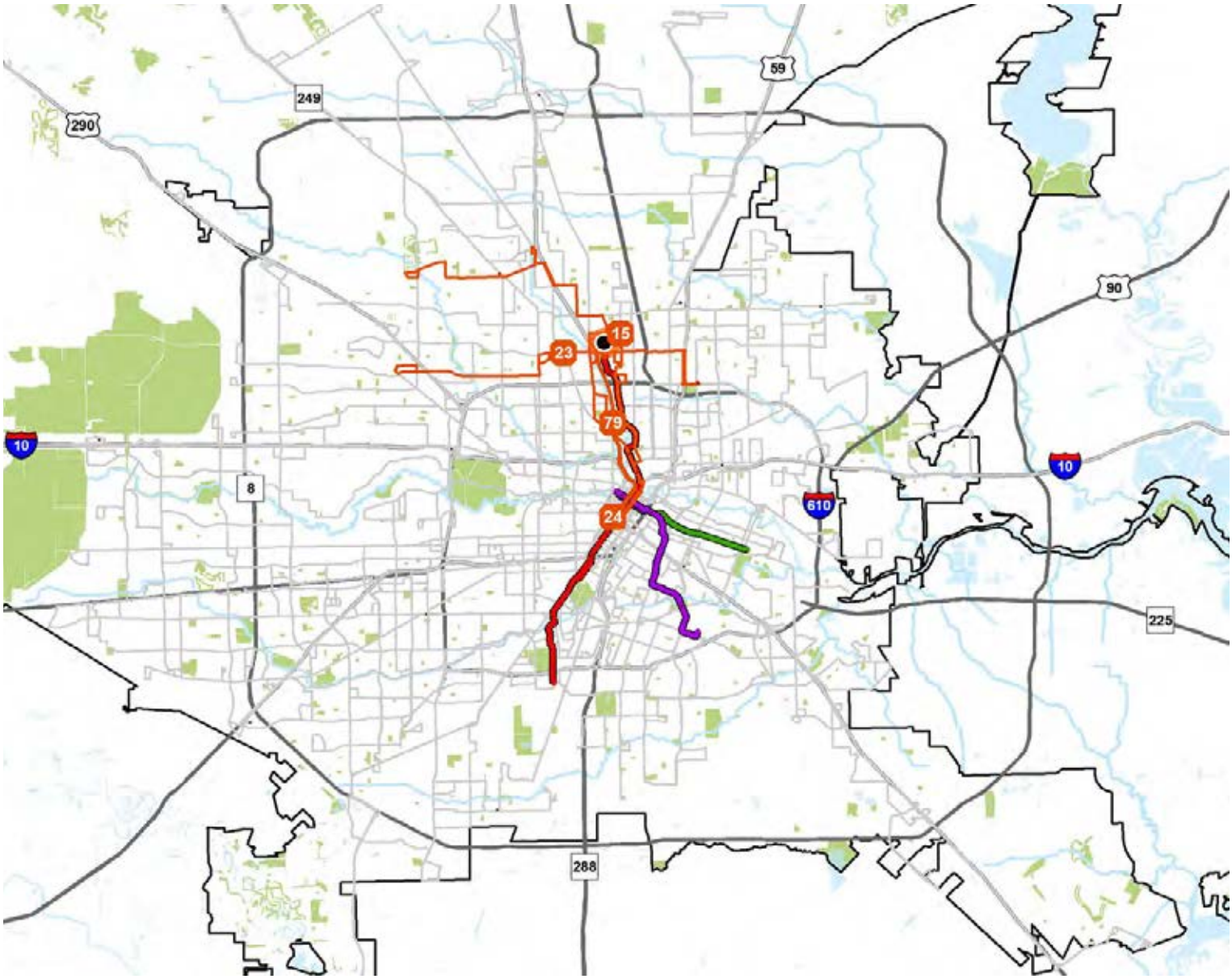
BIKE PARKING

P1: Install bike racks.

WAYFINDING
Provide signage to Transit Center along Halls Bayou trail connection.



NORTHLINE TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.8 — Mode-Split

POPULATION: Low Density — 2 — High Density

TRANSIT CONNECTIONS

Light Rail — **Weekday Frequent**

Red Line (Dec. 2013) — All Day

Local

15 Fulton — Peak

23 Crosstimbers Crosstown

24 Northline

Limited

79 West Little York Limited

Figure 5.108: Northline Transit Center Connections

Northline Transit Center serves as the northern terminus of the Red Line extension and is therefore a likely connection point for cyclists wishing to access transit. To the west, IH-45 North Freeway creates a significant barrier, but access to the north and east is easier, especially along neighborhood streets. Providing parking and a safe route to the Transit Center could make these connections more convenient.

Activity centers/destinations within one mile:
Northline Commons
HCC campus
Schools

Major barriers within one mile:
IH-45 North Freeway
Vast parking lots

Existing bike facilities within one mile:
Crosstimbers bike lanes

Existing bicycle parking:
None

City: Houston

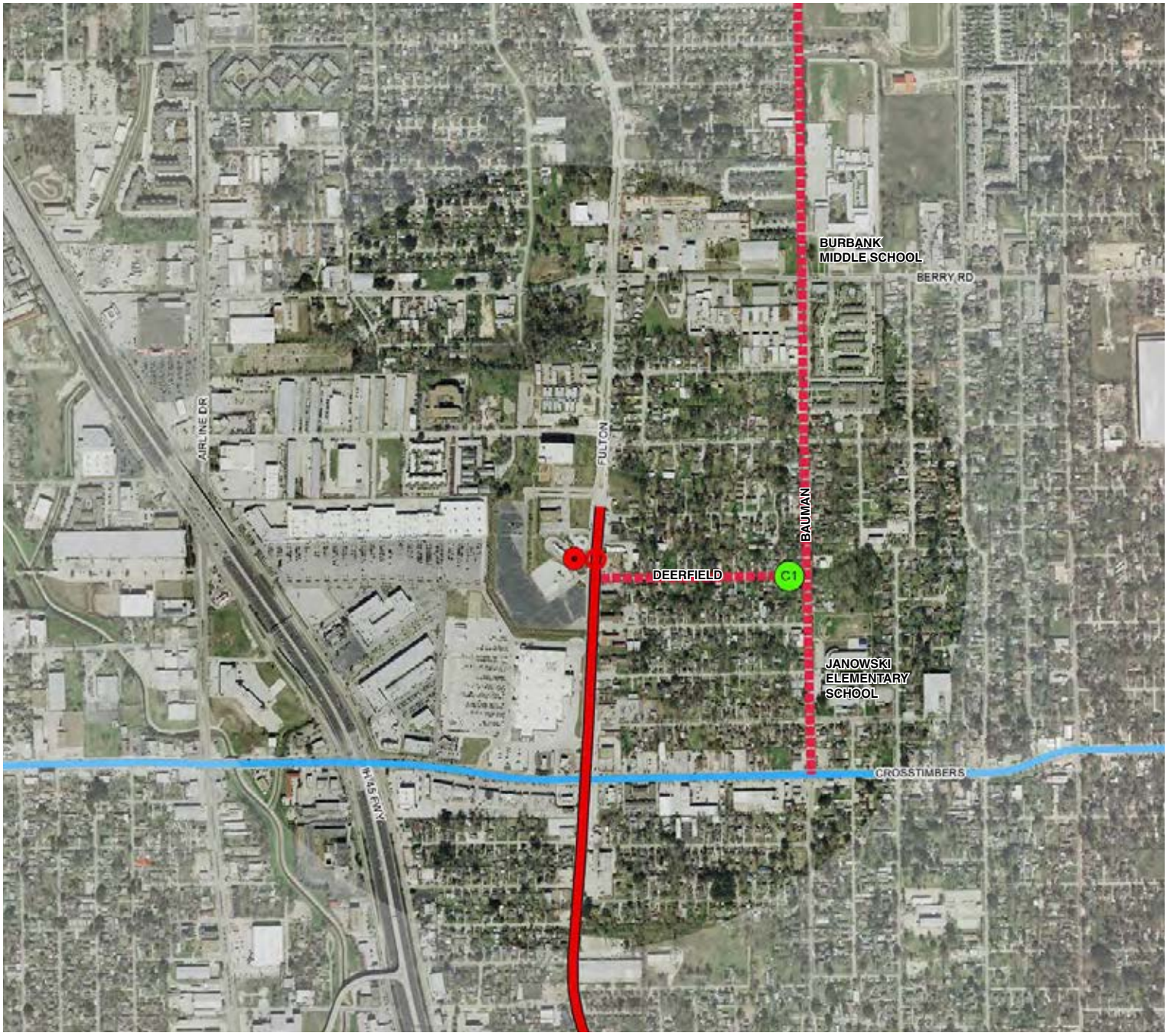
Management District: Greater Northside

Weekday bus boardings: 360

Figure 5.109: Bus loading area


Figure 5.110: No bike parking available at Northline Transit Center


Figure 5.112: Limited space available under canopy for bike parking



Northline Transit Center Half-Mile Radius

METRO Rail

Red Line (Main Street/North)

Existing Bicycle Facilities

Bike Lane

Recommended Facilities

Signed Bike Route

C Connection Recommendation

P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.113: Northline Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTION
NEIGHBORHOODS TO EAST AND NORTH

C1: Partner with the City of Houston to provide signed bike routes along Deerfield and Bauman to connect the Crosstimbers bike lanes, Janowski Elementary School, Burbank Middle School and the neighborhood to the north.

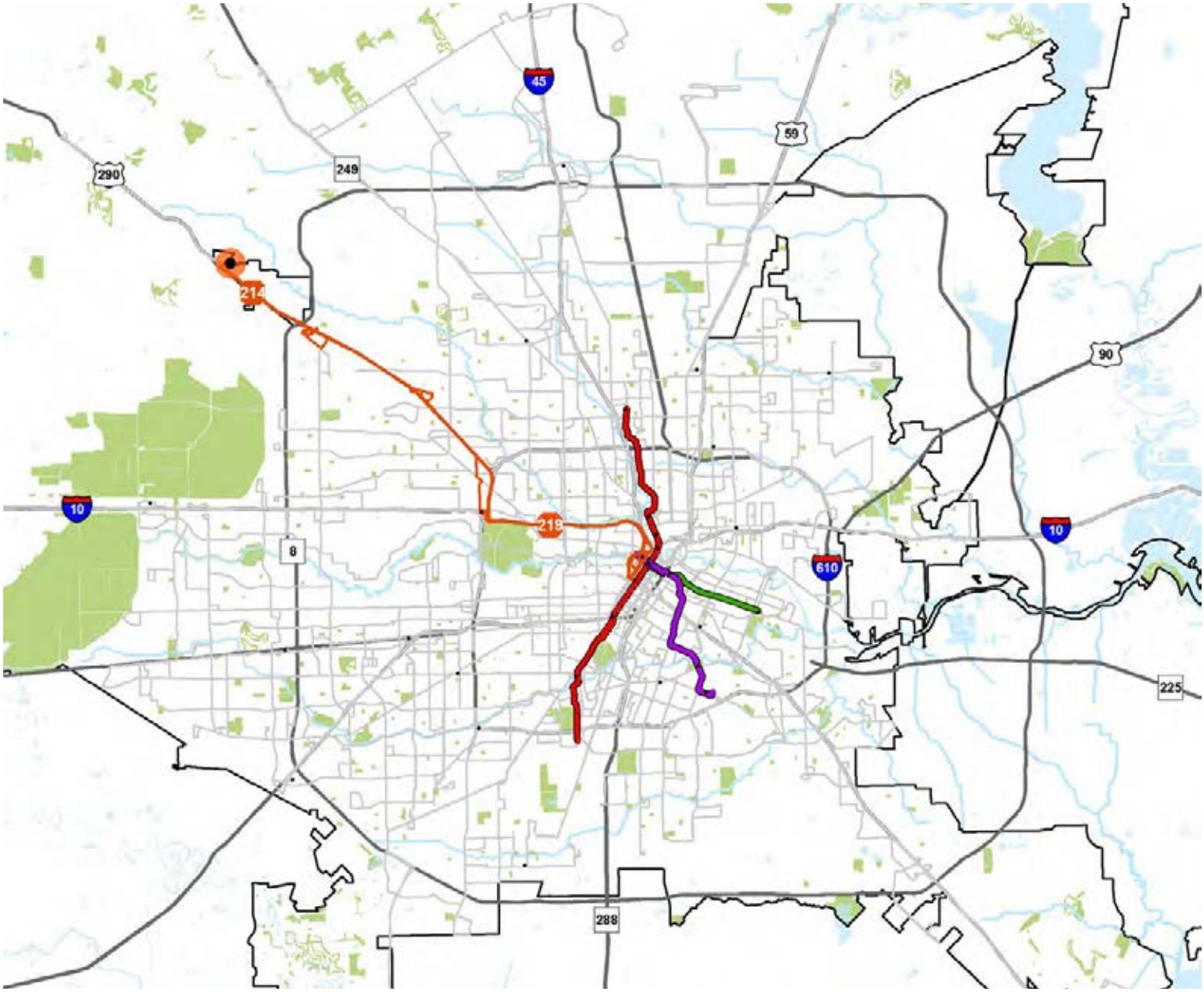
Bike route on Bauman Street should connect to bicycle facilities on E Crosstimbers Street to the south, and may extend as far north as Little York Rd.

BIKE PARKING

P1: Provide covered bike parking.

WAYFINDING
Provide signage along best bike routes to the Transit Center.

NORTHWEST STATION PARK & RIDE



INDEX

COMMUTE: Drive Alone — 1.6

POPULATION: Low Density — 1.8

Mode-Split

High Density

TRANSIT CONNECTIONS

Park & Ride

214	Northwest Station
219	Northwest Station/West Little York-Pinemont

Weekday Frequent

Peak

Figure 5.114: Northwest Station Park & Ride Connections

Figure 5.115: Bike rack and bikes

Figure 5.116: Boarding platform

Northwest Station Park & Ride is located along US-290 Northwest Freeway and is among METRO's largest and busiest lots. In December, 2012 over 86% of its 2,392 spaces were used. Buses to Downtown Houston operate every five minutes during peak periods

The Park & Ride is located in unincorporated Harris County. Surrounding land use includes undeveloped land, big box retail, and multifamily residential. Improved pedestrian and bicycle connections to the large apartment developments in the area could allow riders to access the Park & Ride more conveniently than parking in the available, remote, and increasingly scarce spaces in the lot.

Activity centers/destinations within one mile:
No major destinations

Major barriers within one mile:
Undeveloped areas, US-290 Northwest Freeway

Existing bike facilities within one mile:
None

Existing bicycle parking:
One bike rack

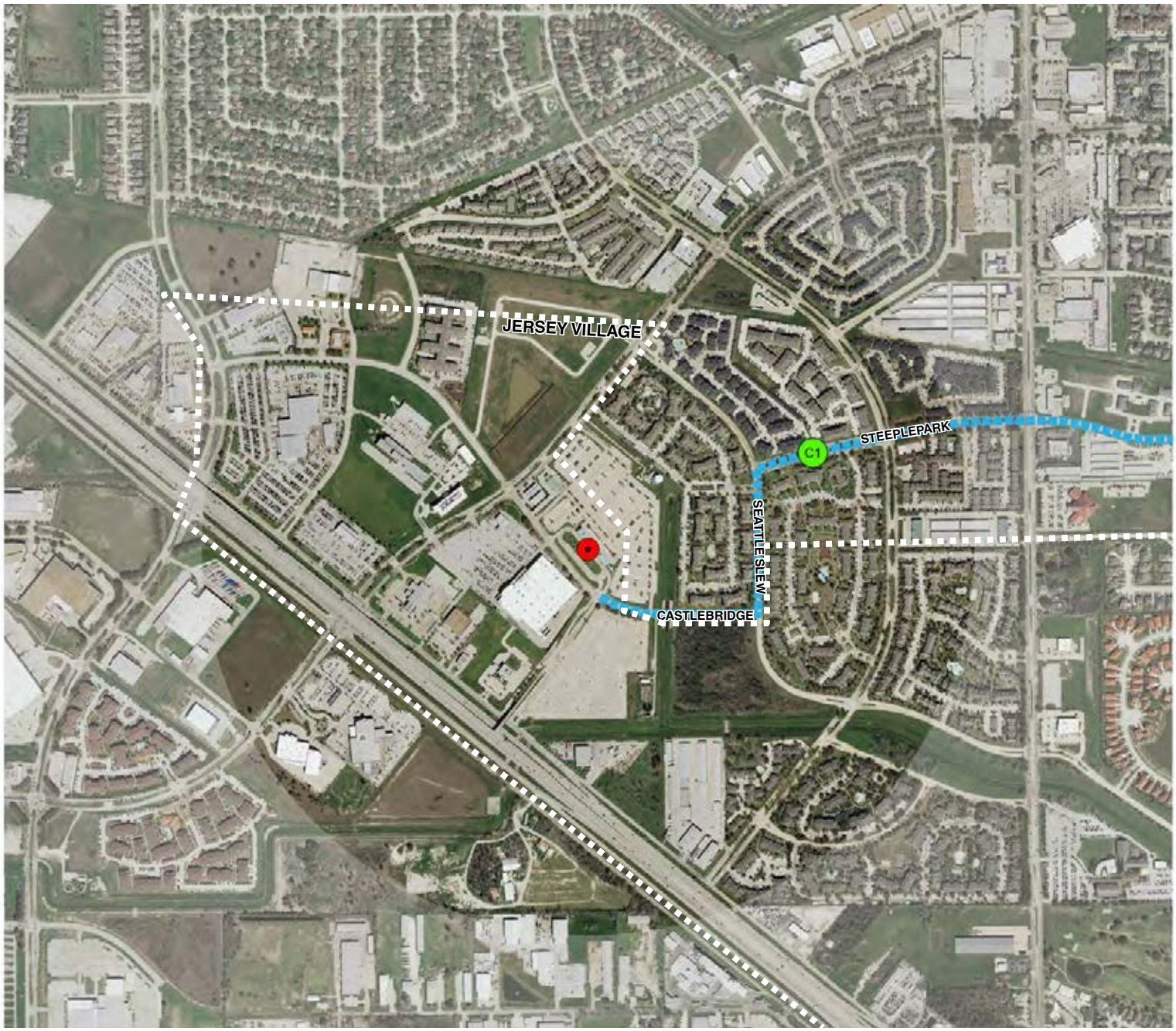
City: Jersey Village & unincorporated Harris County

Management District: N/A

Weekday bus boardings: 1,415

Figure 5.117: Sidewalk ends at the edge of METRO property and does not reach nearby apartments

Figure 5.118: Footpath indicates need for sidewalks to surrounding development



Northwest Station Park & Ride Half-Mile Radius

Existing Bicycle Facilities

R Existing Bike Rack

Recommended Facilities

Bike Lane

Signed Bike Route

C Connection Recommendation

P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

N

0 0.125 0.25 0.5 MILES

Figure 5.119: Northwest Station Park & Ride Recommendations

CONNECTIONS
NEARBY APARTMENT DEVELOPMENTS

C1: Support installation of bike lanes on Castlebridge, Seattle Slew, and Ranchstone and shared lanes on Steeplepark to provide connections to the numerous surrounding apartment developments.

Coordination with Jersey Village will be necessary.

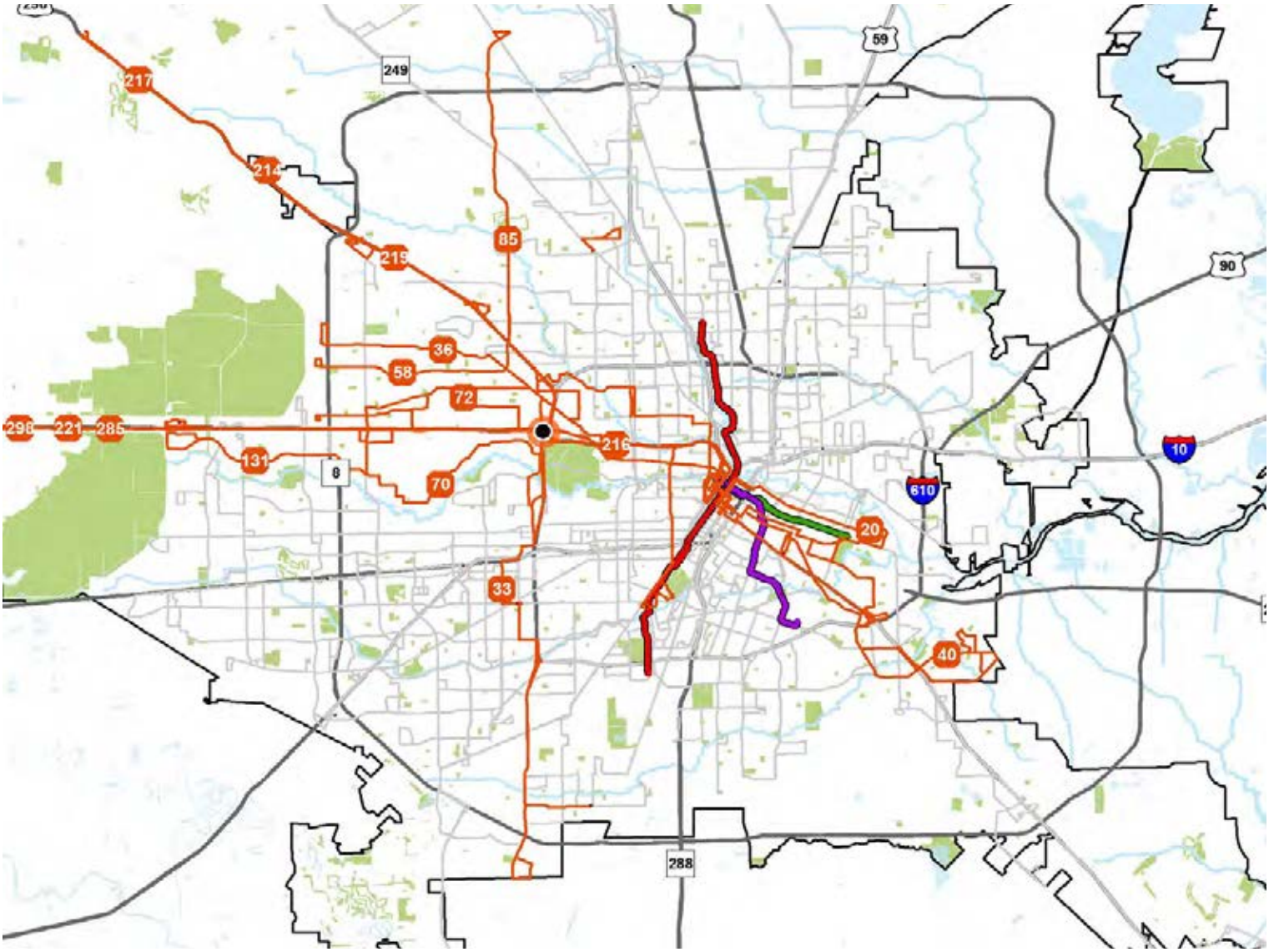
BIKE PARKING

P1: Locate bike racks under the canopy.

WAYFINDING

Provide signage along the bike routes to direct cyclists to the Park & Ride.

NORTHWEST TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 1.6 — Mode-Split

POPULATION: Low Density — 1.1 — High Density

TRANSIT CONNECTIONS

Local

33	Post Oak Crosstown
36	Kempwood
40	Pecore
58	Hammerly
70	Memorial
72	Westview Circulator

Limited

20	Long Point Limited
85	Antoine Limited
131	Memorial Limited

Weekday Frequent

Peak

Figure 5.120: Northwest Transit Center Connections

Northwest Transit Center is located at the interchange of IH-610 West Loop and IH-10 Katy Freeway and sees very high levels of both local and Park & Ride bus traffic. North Post Oak Road offers bike lanes to the north and south, but no bike facilities are provided along Old Katy Road to the east. The intended pedestrian and bicycle route into the site itself is circuitous, and as a result there is evidence of passengers walking and biking across the grass between the boarding platform and the street.

A shared use path has been proposed along Old Katy Road and existing wide shoulders act as bike lanes.

Activity centers/destinations within one mile:
Schools
Church
Entertainment Center

Major barriers within one mile:
IH-10 Katy Freeway
IH-610 West Loop

Existing bike facilities within one mile:
North Post Oak bike lanes

Existing bicycle parking:
Bike racks in parking lot

City: Houston

Management District: N/A

Weekday bus boardings: 2,849

Park & Ride		Weekday Frequent
214	Northwest Station	Peak Direction
216	Pinemont / West Little York	Peak Direction
217	Cypress	Peak Direction
219	Pinemont/West Little York/ Northwest Station	
221	Kingsland	
285	Kingsland/Uptown	
298	Kingsland/Addicks/TMC	Peak Direction

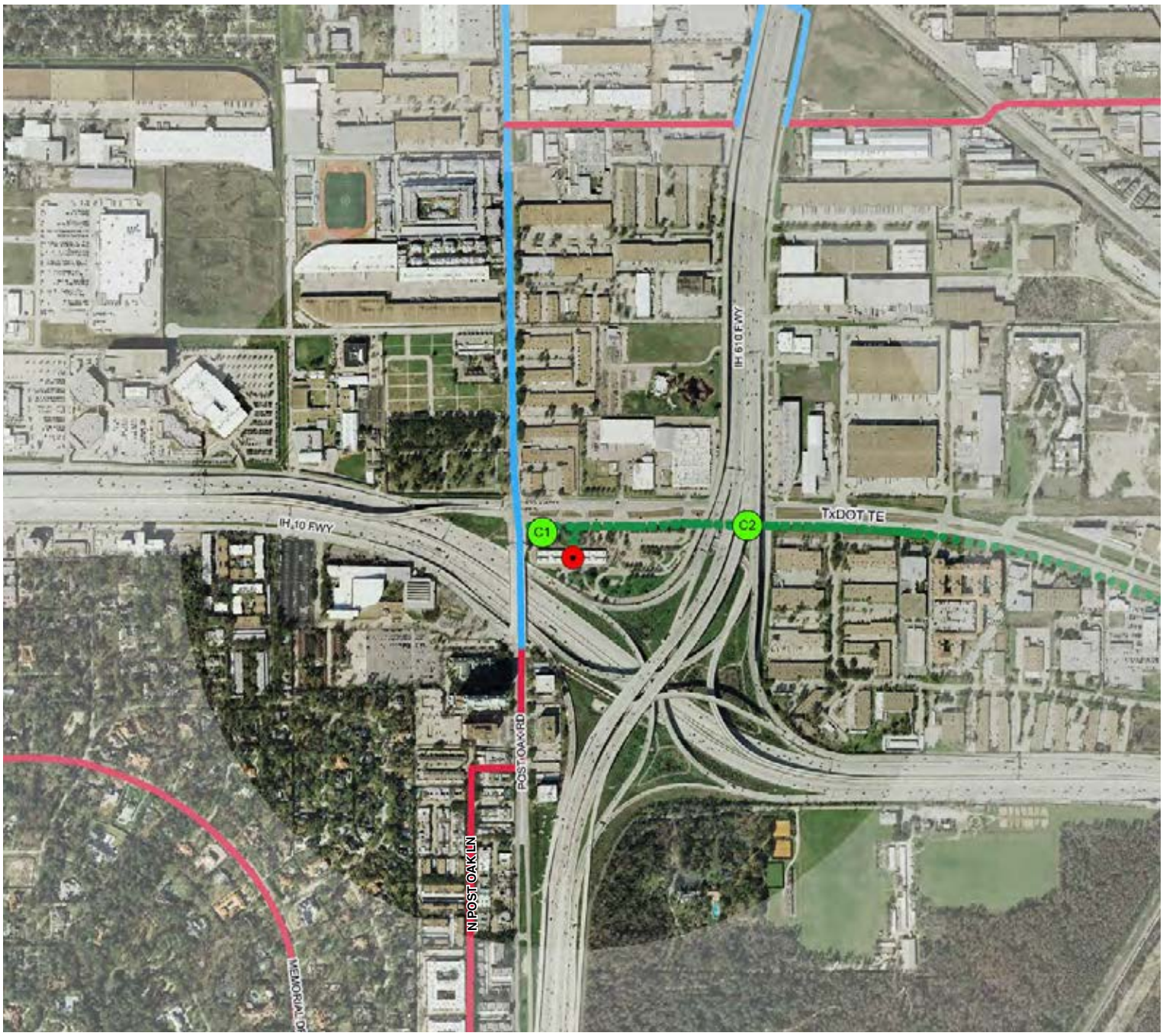
Figure 5.121: Bike rack located in Transit Center parking lot

Figure 5.122: Ramp to Transit Center from the parking lot

Figure 5.123: Bikes locked to the outside of the parking lot fence (boarding area side) -- bike rack located on the opposite side

Figure 5.124: Space available on the boarding area for bike parking

Figure 5.125: A worn path leading towards Post Oak Ln indicates desire for direct walkway



Northwest Transit Center Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- Facility In Development
- R Existing Bike Rack

Recommended Facilities

- Shared-Use Path
- C1 Connection Recommendation
- P1 Bike Parking Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.126: Northwest Transit Center Recommendation

CONNECTION
N POST OAK BIKE LANES, PROPOSED OLD KATY ROAD TRAIL

C1: Install a shared-use path from the corner of Old Katy and N Post Oak to the boarding platform.

C2: Construct a shared use path along Old Katy Road connecting to TxDOT TE project, the Old Katy bikeway, which extends from North Post Oak to Washington Bridge over IH-10.

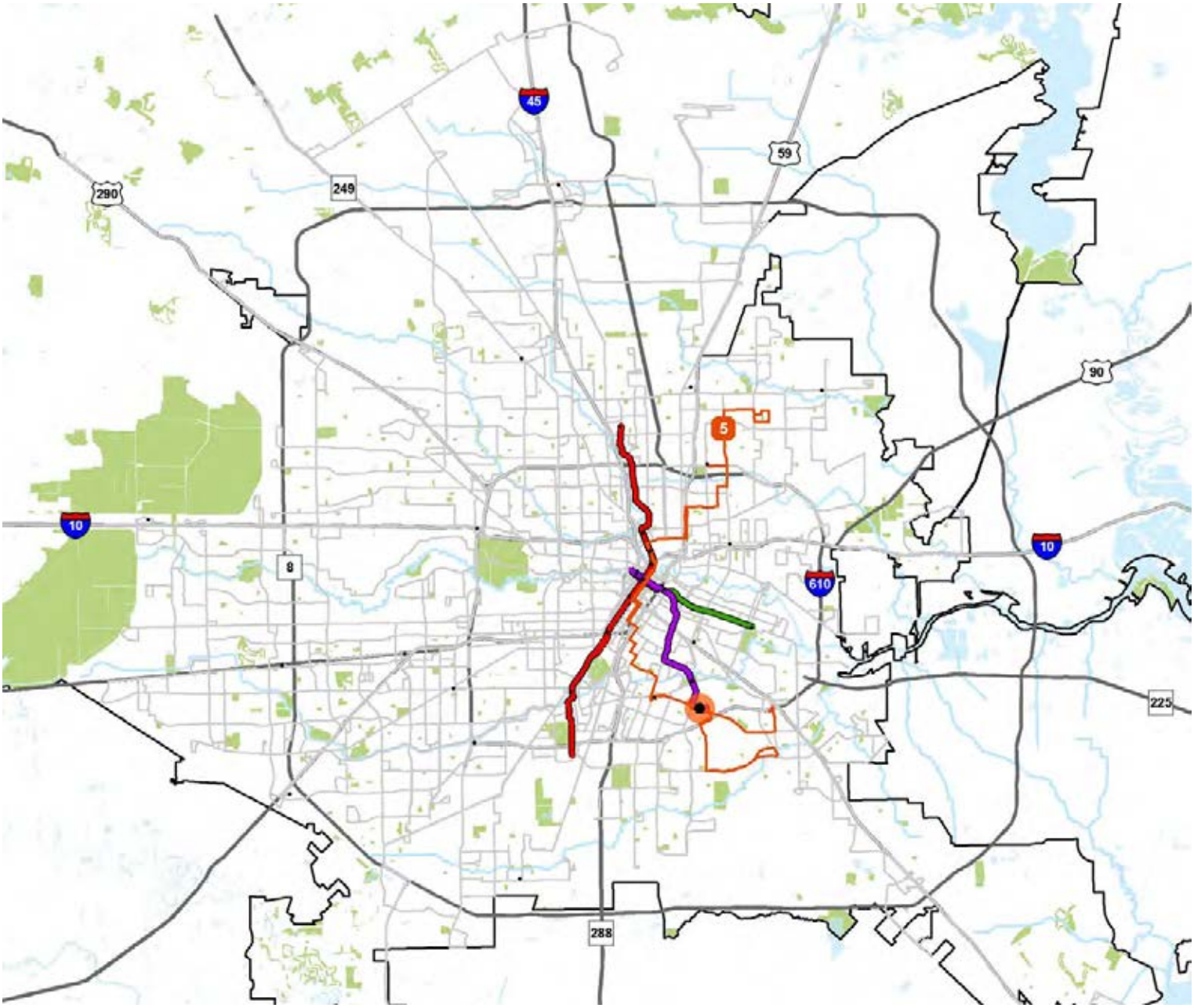
BIKE PARKING

P1: Install covered parking closer to or underneath the canopy.

N

0 0.025 0.05 0.1 MILES

PALM CENTER TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.6 — Mode-Split

POPULATION: Low Density — 1.8 — High Density

TRANSIT CONNECTIONS

Light Rail		**Weekday Frequent**
Purple Line (2014)		All Day
Local		
5	Southmore	Peak
426	TMC Swiftline (future)	TBD

Figure 5.127: Palm Center Transit Center Connections

Figure 5.128: Sign announcing future station with platform in the background

Figure 5.129: Eastbound bus bay with platform on the right

Palm Center Transit Center will be the terminus of the Purple Line when it opens in 2014. The light rail platform will be located in the median of Griggs Road and bus bays for connecting bus routes will be located along the curb in both directions.

Activity centers/destinations within one mile:
Palm Center
Houston Texans YMCA
KIPP Peace and Liberation Academies

Major barriers within one mile:
Railroad lines

Existing bike facilities within one mile:
Griggs, Calhoun, Yellowstone, Wayside bike routes

Existing bicycle parking:
None (under construction)

City: Houston

Management District: Greater Southeast

Weekday bus boardings: n/a (under construction)

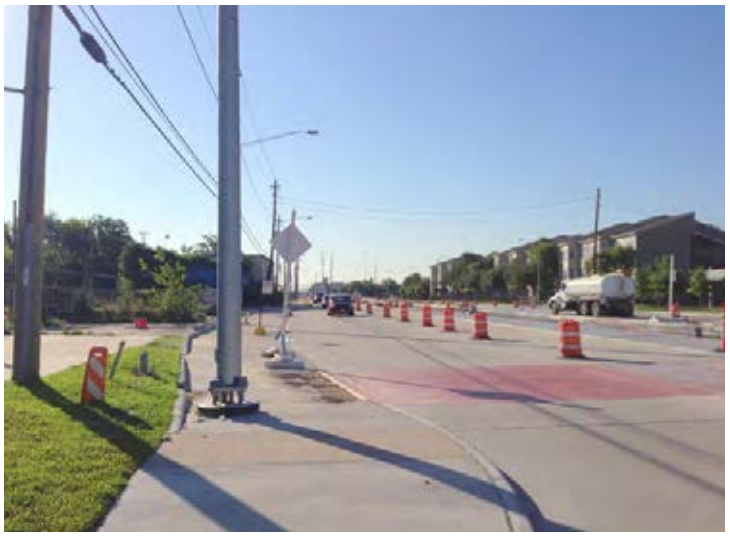


Figure 5.130: Westbound bus bay with station entrance to the right

Figure 5.131: Light rail platform under construction

Palm Center Transit Center Half-Mile Radius

METRO Rail

Purple Line (Southeast)

Existing Bicycle Facilities

Bike Lane

Signed Bike Route

Recommended Facilities

Bike Lane

Signed Bike Route

C1 Connection Recommendation

P1 Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.132: Palm Center Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTIONS
YELLOWSTONE/MLK BIKE ROUTES

C1: Support installation of a signed bike route on Beekman to connect the station to the existing bike route on Yellowstone and MLK.

Public outreach will be necessary during the planning, design and engineering phases. Early coordination with MacGregor Palm Terrace Civic Association is recommended.

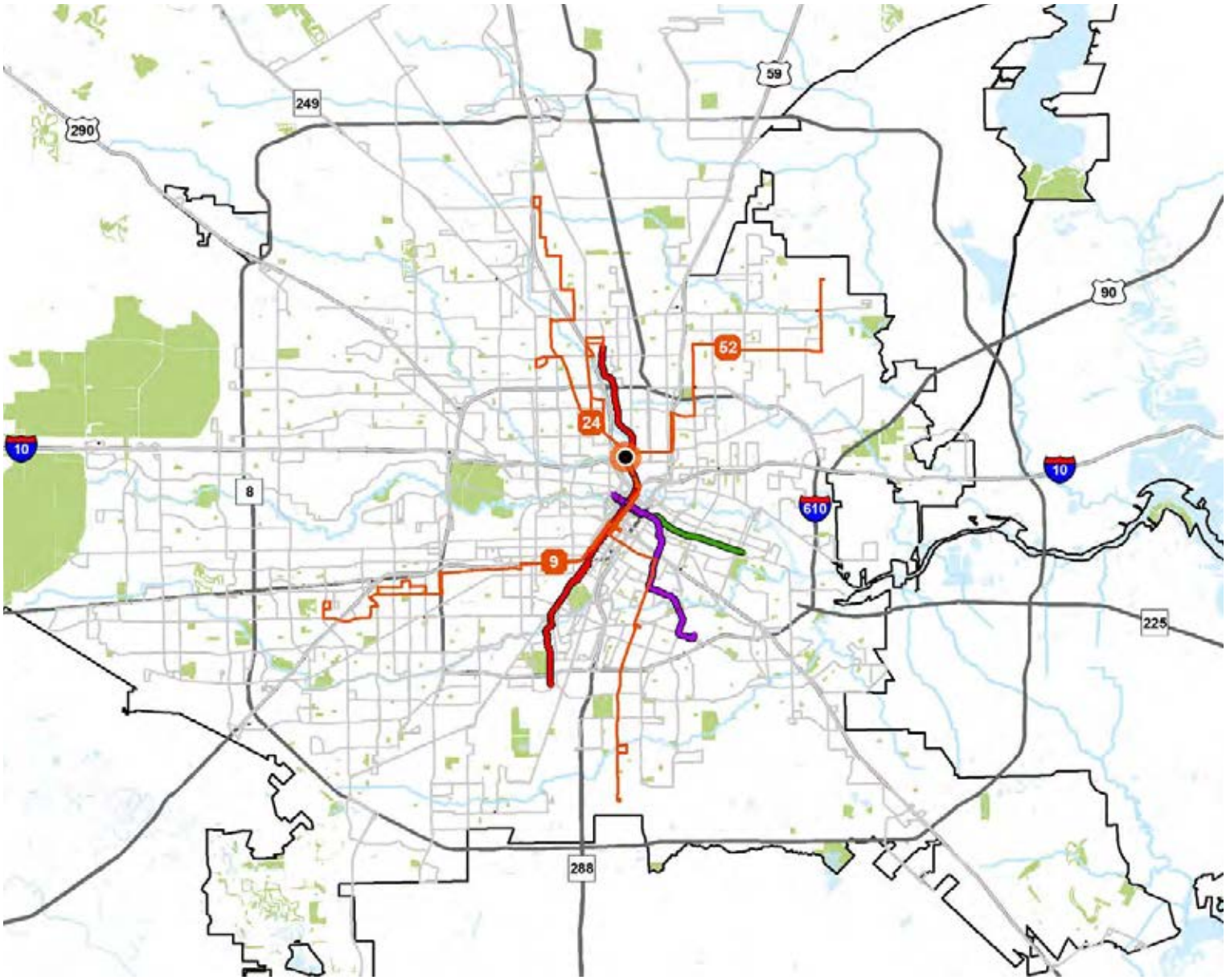
C2: Support installation of bike lanes along the existing Yellowstone bike route between Cullen and MLK.

BIKE PARKING

P1: Locate bike racks near the station and under cover, perhaps using surplus parking spaces in the Palm Center parking lot.

WAYFINDING
Provide signage along the bike route to direct cyclists to the station.

QUITMAN STATION



INDEX

COMMUTE: Drive Alone — 3.8 — Mode-Split

POPULATION: Low Density — 2.3 — High Density

TRANSIT CONNECTIONS

Light Rail		**Weekday Frequent**
	Red Line (Dec. 2013)	All Day
Local		
9	North Main	
24	Northline	
52	Hirsch	All Day

Figure 5.133: Quitman Station Connections

Quitman Station is located at North Main and Quitman along the Red Line extension. A signed bike route along Quitman Street is currently in development, connecting to White Oak Bayou in the west and the Fulton Street bike lanes in the east. A kiss & ride facility constructed alongside the station offers the opportunity for bike parking.

Activity centers/destinations within one mile:
Schools
Clinics

Major barriers within one mile:
IH-45 North Freeway
White Oak Bayou

Existing bike facilities within one mile:
Quitman bike route in development
White Oak Bayou trail

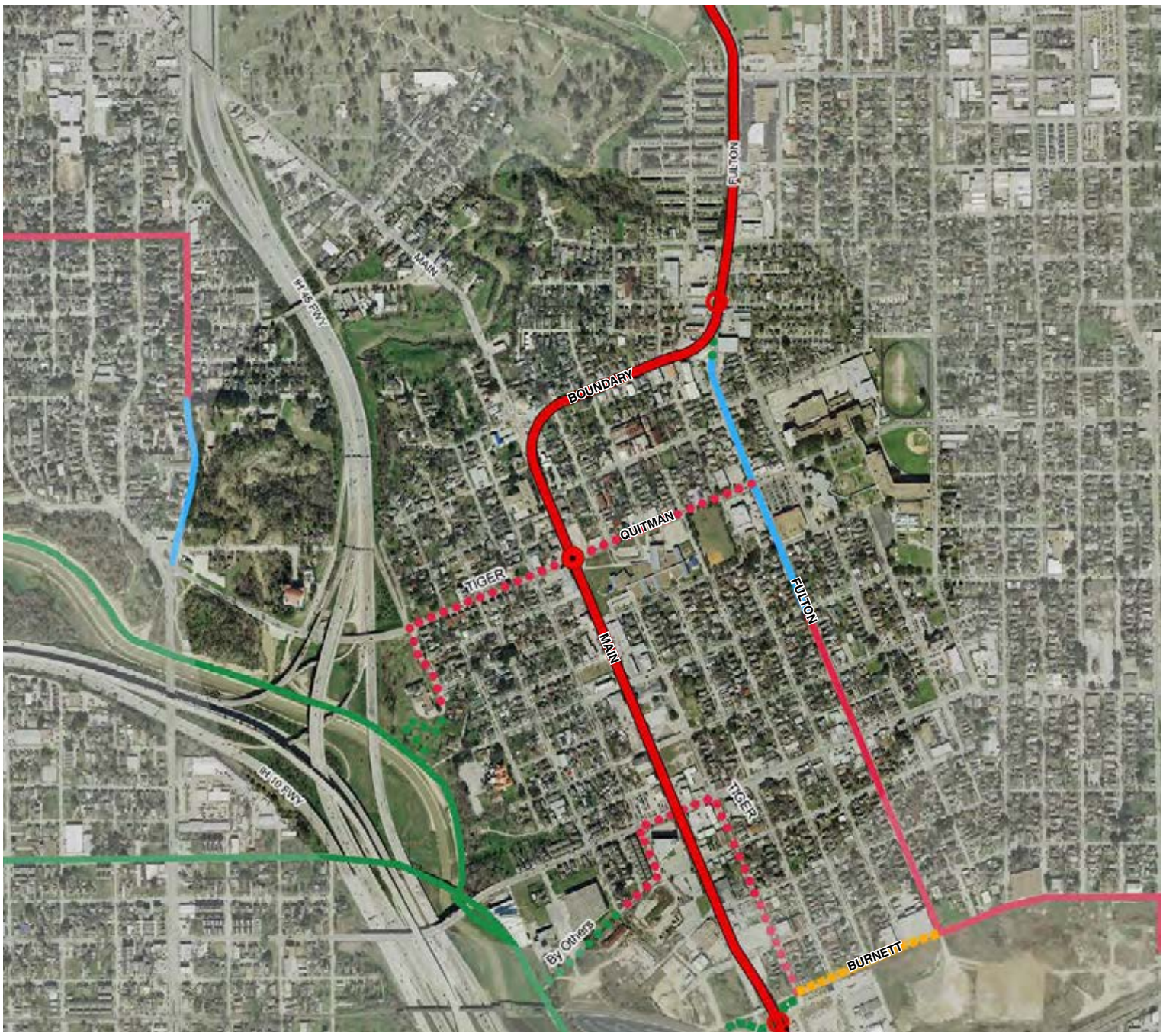
Existing bicycle parking:
N/A

City: Houston

Management District: Greater Northside

Weekday bus boardings: N/A

Figure 5.134: Quitman Station under construction



Quitman Station Half-Mile Radius

METRO Rail

Red Line (Main Street/North)

Existing Bicycle Facilities

Shared-Use Path

Bike Lane

Signed Bike Route

Facility In Development

Recommended Facilities

Shared-Use Path

Signed Shared Roadway

P1 Bike Parking Recommendation

W1 Wayfinding Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.135: Quitman Station Recommendations

N

0 0.125 0.25 0.5 MILES

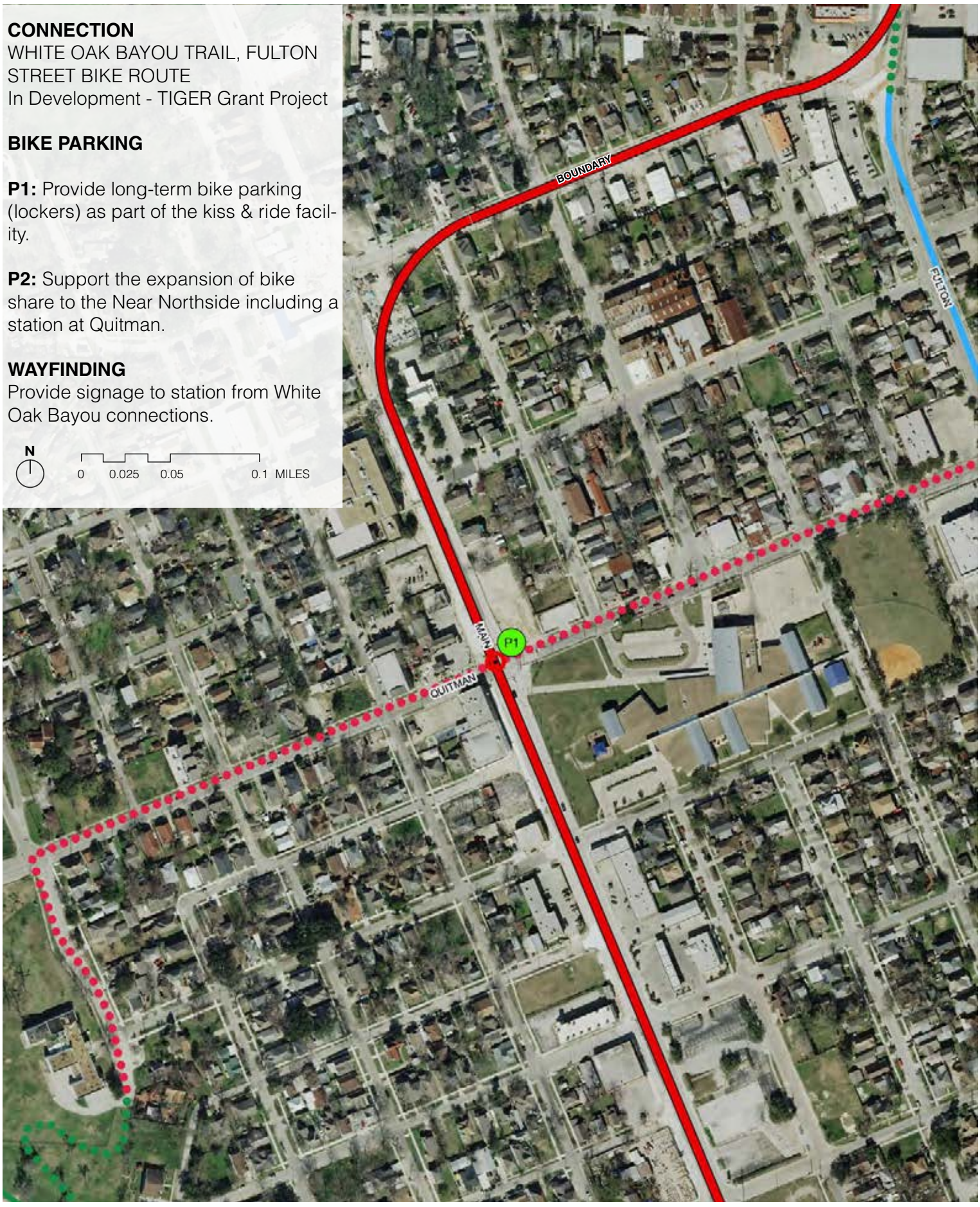
CONNECTION
WHITE OAK BAYOU TRAIL, FULTON STREET BIKE ROUTE
In Development - TIGER Grant Project

BIKE PARKING

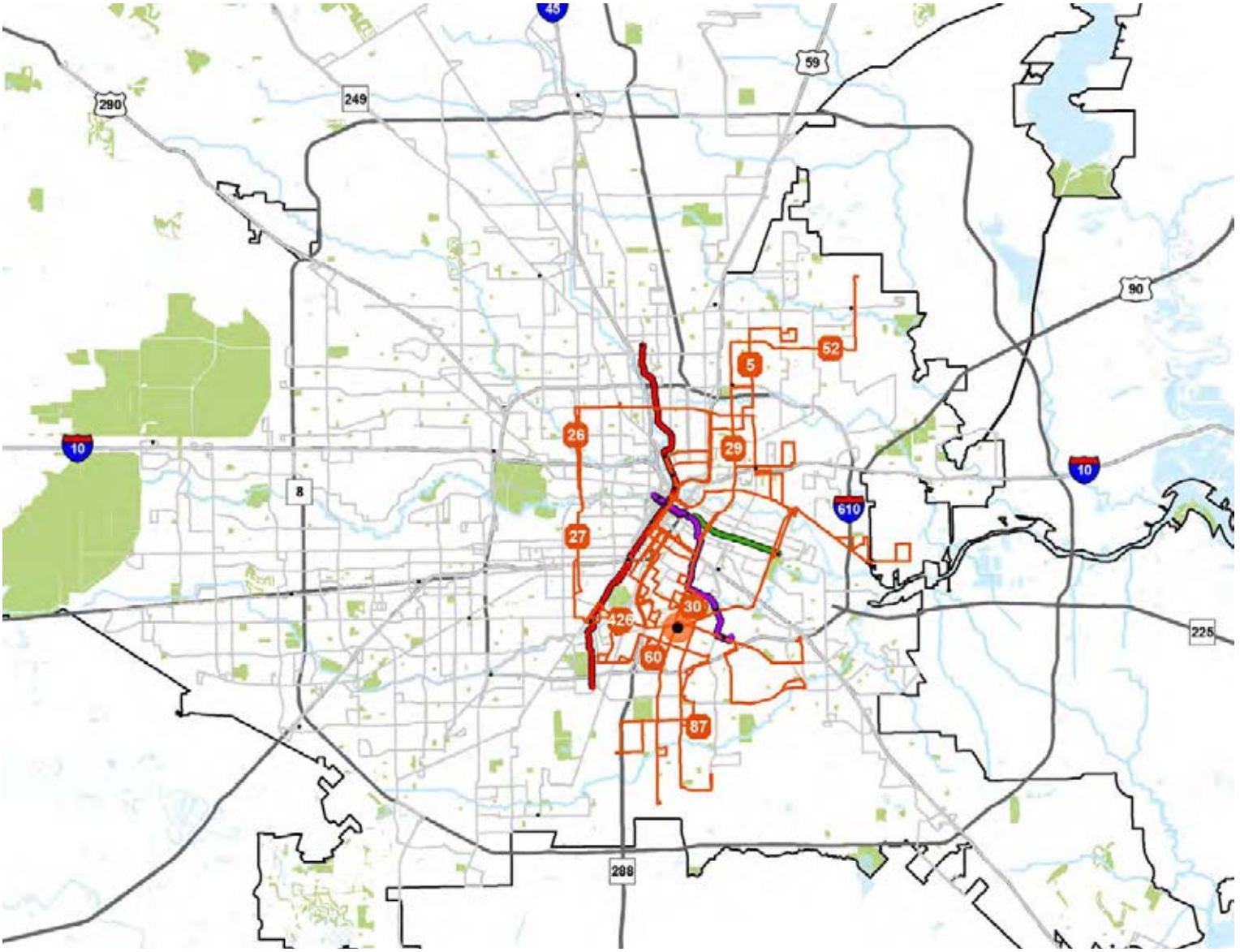
P1: Provide long-term bike parking (lockers) as part of the kiss & ride facility.

P2: Support the expansion of bike share to the Near Northside including a station at Quitman.

WAYFINDING
Provide signage to station from White Oak Bayou connections.



SOUTHEAST TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.4 — Mode-Split

POPULATION: Low Density — 1.9 — High Density

TRANSIT CONNECTIONS

Local		Weekday Frequent
5	Southmore	Peak
26	Outer Loop Crosstown	
27	Inner Loop Crosstown	
29	TSU/UH Hirsch Crosstown	
30	Cullen	
52	Scott	All Day
60	South MacGregor	
87	Sunnyside/TMC	
426	TMC Swiftline	Peak

Figure 5.136: Southeast Transit Center Connections

Southeast Transit Center is a busy transfer point among routes serving the southeast part of the city. It is located in a relatively low-density commercial and residential area. Numerous bus connections to Downtown and the Texas Medical Center are available, including some limited-stop and express service.

Activity centers/destinations within one mile:
No major destinations

Major barriers within one mile:
No major barriers

Existing bike facilities within one mile:
Tierwester, Dixie, Yellowstone bike routes

Existing bicycle parking:
One rack

City: Houston

Management District: Greater Southeast

Weekday bus boardings: 2,715

Figure 5.137: Bike rack located across the bus road from the boarding platform

Figure 5.138: Boarding platform

Southeast Transit Center Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- R Existing Bike Rack

Recommended Facilities

- Signed Bike Route
- C Connection Recommendation
- P Bike Parking Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.139: Southeast Transit Center Recommendations

CONNECTIONS
TIERWESTER AND CALHOUN BIKE ROUTES

C1: Support installation of a signed bike route along Griggs, Scottcrest, Porter, St. Augustine, and Perry to serve the Transit Center and connect existing bike routes.

Public outreach will be necessary during the planning, design and engineering phases. Early coordination with Scott Terrace Civic Association is recommended.

BIKE PARKING

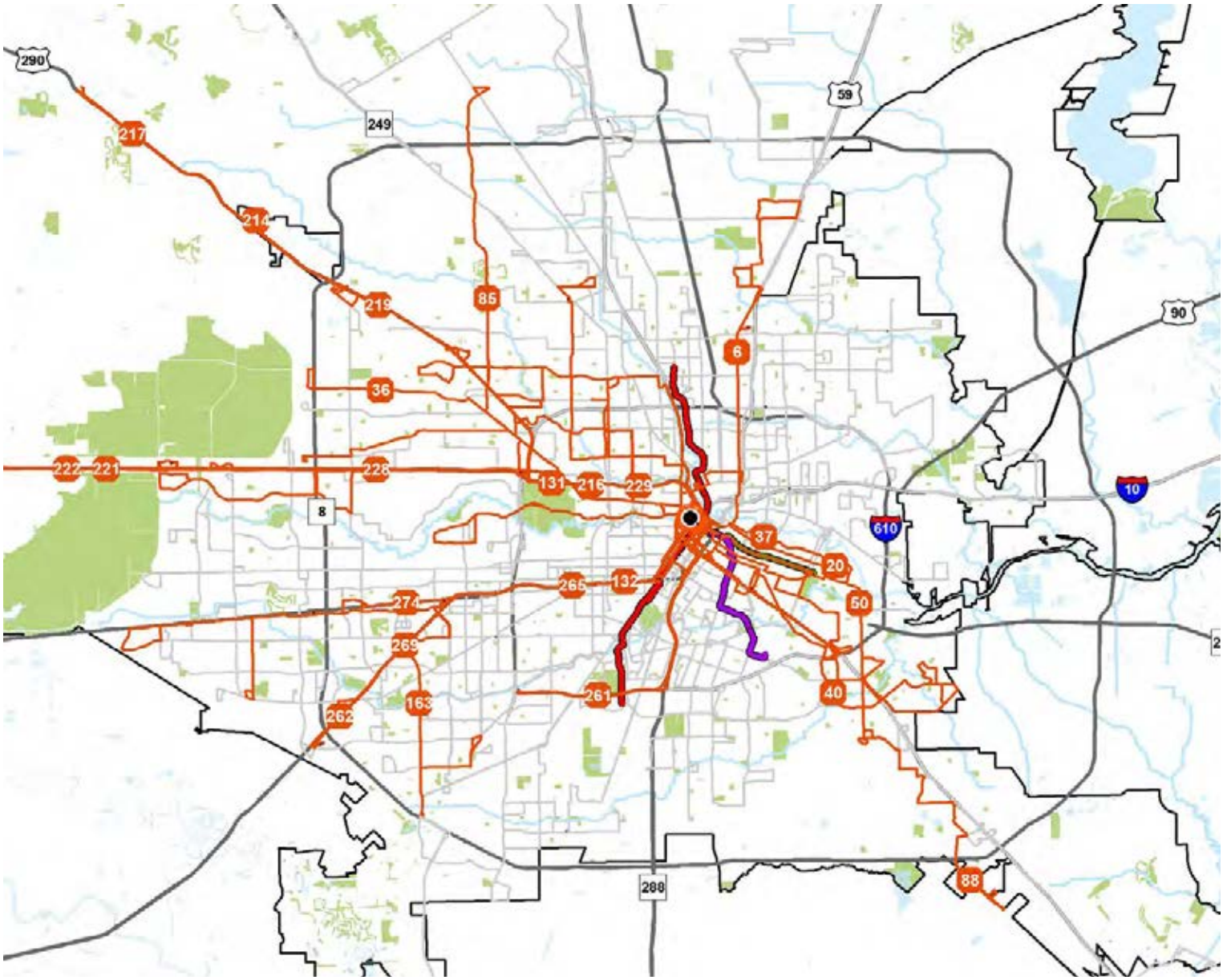
P1: Locate bike racks under the canopy or in another location under cover.

WAYFINDING
Provide signage along the bike routes to direct cyclists to the Transit Center.

N

0 0.025 0.05 0.1 MILES

TEXAS MEDICAL CENTER TRANSIT CENTER



INDEX

COMMUTE: Drive Alone — 3.3 — Mode-Split

POPULATION: Low Density — 2.4 — High Density

Figure 5.140: Texas Medical Center Transit Center Connections

TMC Transit Center is the busiest Transit Center in the METRO system. It is the terminus for a number of busy bus routes. The Brays Bayou trails pass nearby but do not connect. The trails could potentially deliver riders to the Transit Center from residential areas or from the Transit Center to employment and educational destinations.

Activity centers/destinations within one mile:
Texas Medical Center

Major barriers within one mile:
Brays Bayou

Existing bike facilities within one mile:
Brays Bayou trails

Existing bicycle parking:
Four racks

City: Houston

Management District: N/A

Weekday bus boardings: 6,940

TRANSIT CONNECTIONS

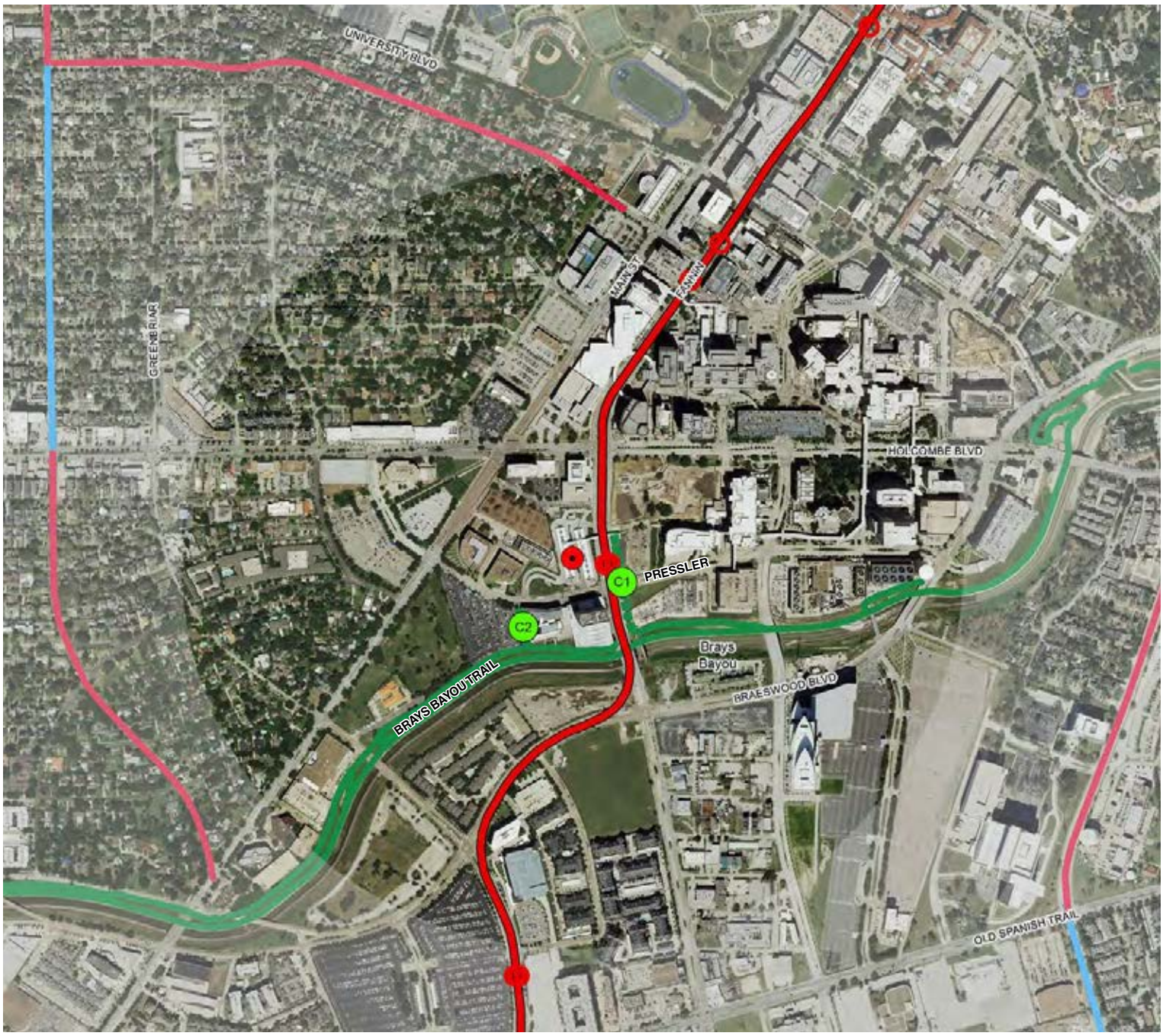
Light Rail		**Weekday Frequent**
	Red Line	All Day and Evening
Local		
2	Bellaire	All Day
4	Beechnut	Peak Direction
8	South Main	
10	Willowbend	
14	Hiram Clarke	All Day
26	Outer Loop Crosstown	
27	Inner Loop Crosstown	
34	Montrose Crosstown	
68	Brays Bayou Crosstown	Peak
73	Bellfort Crosstown	All Day
402	Quickline Bellaire	Peak
426	Swiftline	Peak
Park & Ride		**Weekday Frequent**
170	Missouri City Express	Peak
292	West Bellfort / Westwood	Peak Direction
297	South Point / Monroe	Peak Direction
298	Kingsland/Addicks/ NWTC	Peak Direction

Figure 5.141: TMC Transit Center boarding area

Figure 5.142: Four bike racks adjacent to Transit Center

Figure 5.143: Crosswalk leading from bike racks to boarding area

Figure 5.144: Space available under Transit Center canopy for bike parking



TMC Transit Center Half-Mile Radius

METRO Rail

Red Line (Main Street/North)

Existing Bicycle Facilities

Shared-Use Path

Bike Lane

Signed Bike Route

R Existing Bike Rack

Recommended Facilities

Shared-Use Path

C Connection Recommendation

P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.145: Texas Medical Center Transit Center Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTION
BRAYS BAYOU TRAIL

C1: Install a shared-use path along the east side of Fannin Street, where there is an existing sidewalk, from the bayou trail to the Transit Center stair tower.

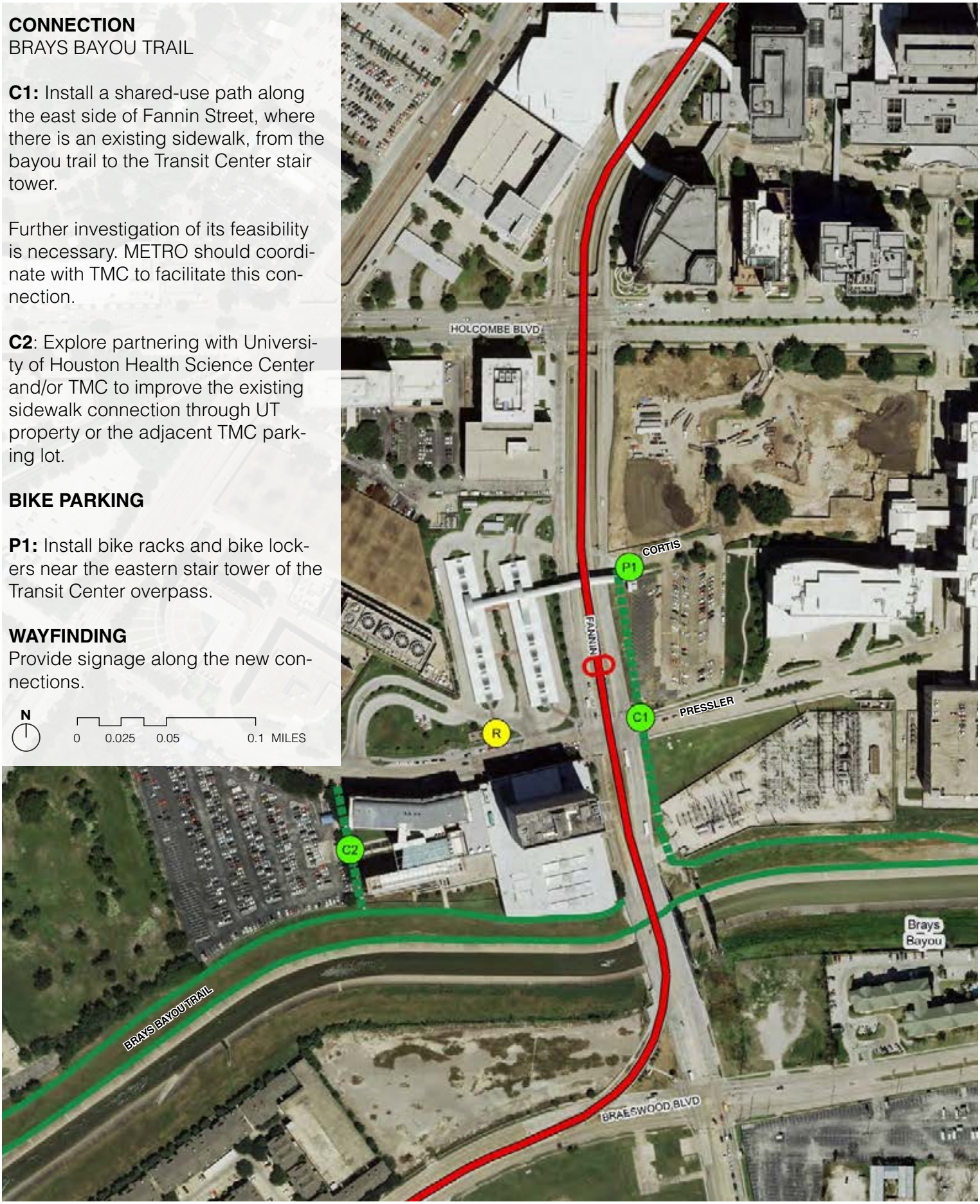
Further investigation of its feasibility is necessary. METRO should coordinate with TMC to facilitate this connection.

C2: Explore partnering with University of Houston Health Science Center and/or TMC to improve the existing sidewalk connection through UT property or the adjacent TMC parking lot.

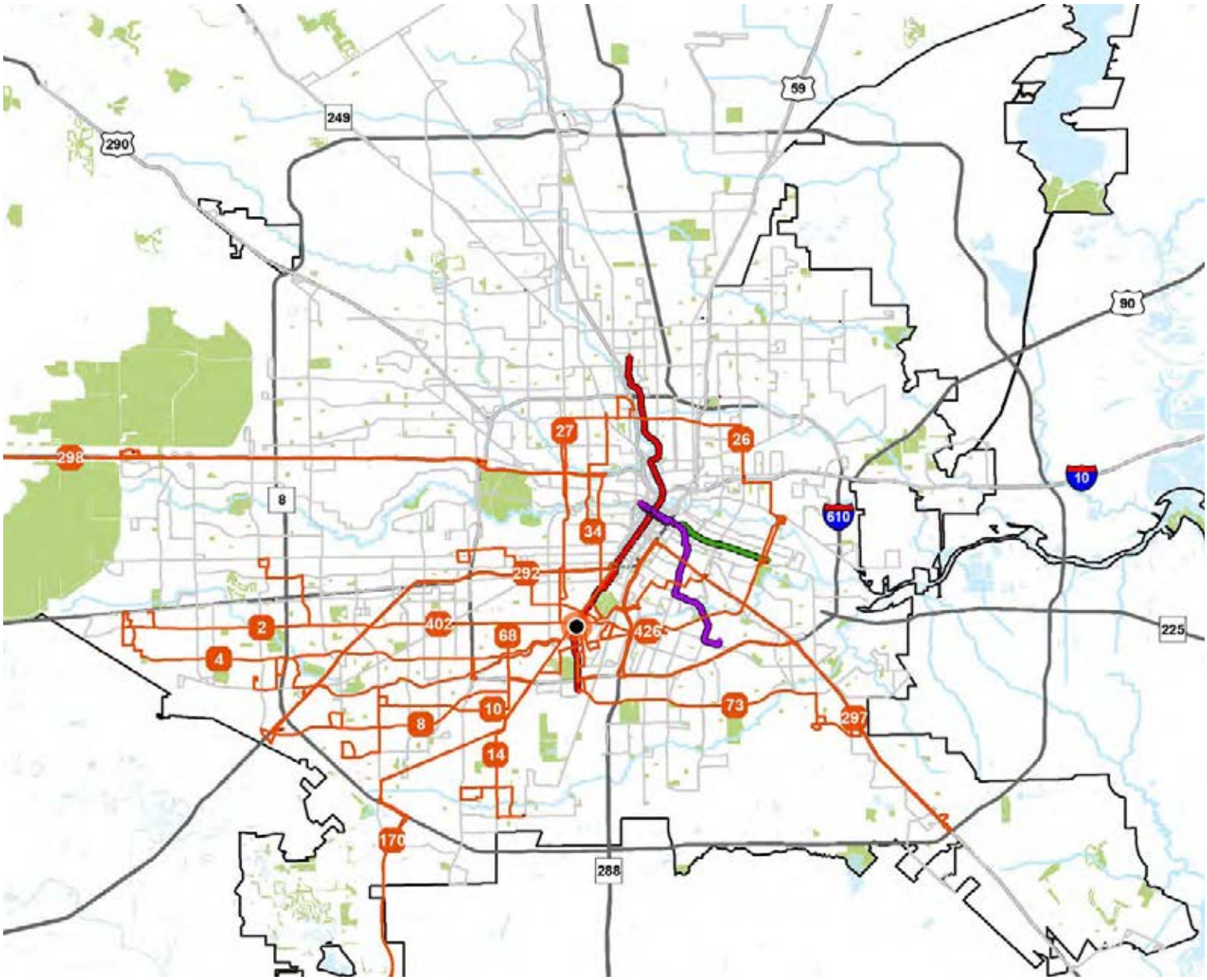
BIKE PARKING

P1: Install bike racks and bike lockers near the eastern stair tower of the Transit Center overpass.

WAYFINDING
Provide signage along the new connections.



THEATER DISTRICT STATION



INDEX

COMMUTE: Drive Alone — 3.5 — Mode-Split

POPULATION: Low Density — 2.4 — High Density

TRANSIT CONNECTIONS

Light Rail	**Weekday Frequent**
Green Line (2014)	All Day
Purple Line (2014)	All Day

Local, Limited, Park & Ride

Numerous routes on nearby streets

Figure 5.146: Theater District Station Connections

Theater District Station will be the western terminus of the Green and Purple Lines when they are completed in 2014. It is located near the Buffalo Bayou trails but no easy connection currently exists.

Activity centers/destinations within one mile:
Downtown

Major barriers within one mile:
Buffalo Bayou

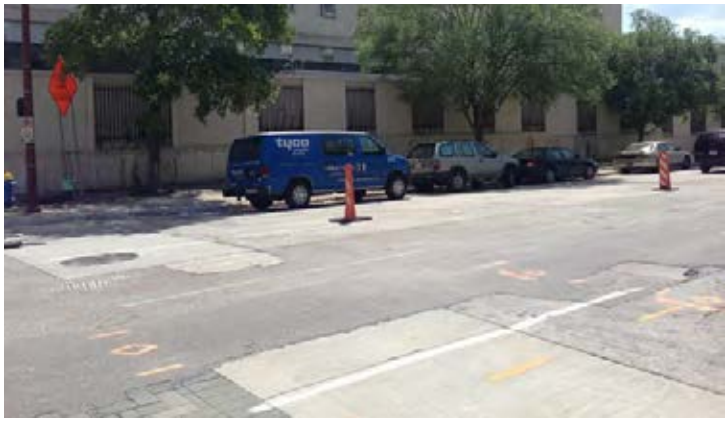
Existing bike facilities within one mile:
Buffalo Bayou trails

Existing bicycle parking:
Private racks and lids

City: Houston

Management District: Downtown

Weekday bus boardings: N/A



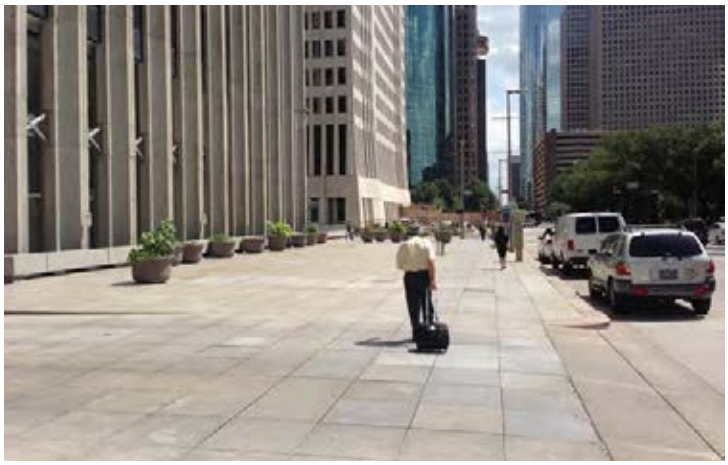
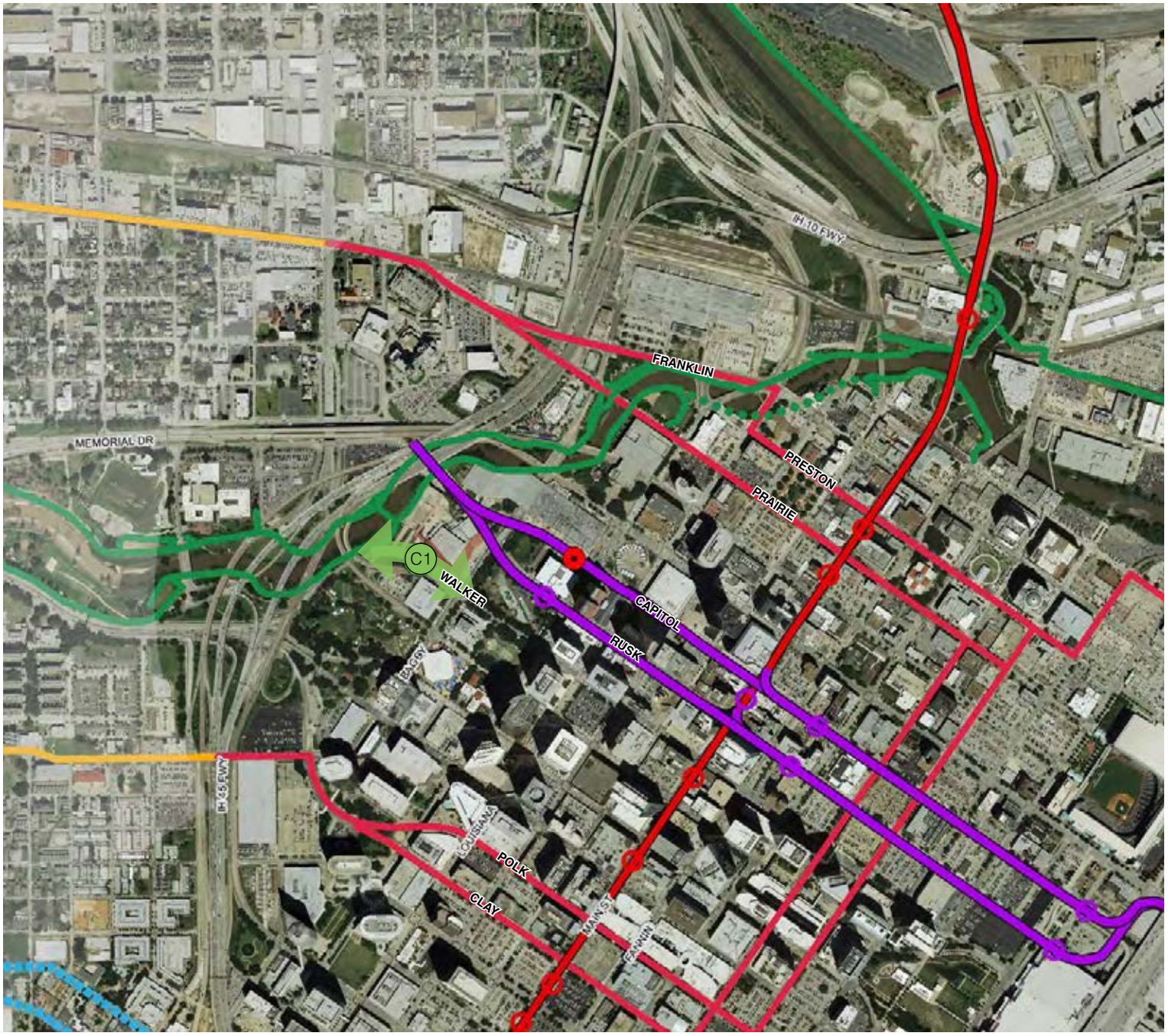


Figure 147: Street and walkway conditions surrounding future METRORail station



Theater District Station Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Signed Shared Roadway
- Signed Bike Route
- Facility In Development
- (L) Existing Bike Lid
- (B) Existing B-Cycle Station

Recommended Facilities

- (C) Connection Recommendation
- (P) Bike Parking Recommendation
- Desired Connection

N

0 0.125 0.25 0.5 MILES

Figure 5.148: Theater District Station Recommendations

CONNECTION
BUFFALO BAYOU TRAILS

C1: Explore connections from Buffalo Bayou Trails to Bagby Street, Tranquility Park, and Theater District Station, as part of a coordinated effort to designate viable bike connections in the CBD.

BIKE PARKING

P1: Partner with the City of Houston and/or property owners to ensure that bike racks and bike lockers are installed in the vicinity of the station platforms.

P2: Support the installation of a Houston B-Cycle bike share station at Tranquility Park in proximity to the westbound platform.

WAYFINDING
Provide signage along connection to Bayou Trails.

N
0 0.025 0.05 0.1 MILES

UH-DOWNTOWN STATION

INDEX

COMMUTE: Drive Alone — 4.1 — Mode-Split

POPULATION: Low Density — 2.1 — High Density

TRANSIT CONNECTIONS

Light Rail
Red Line

Weekday Frequent
All Day and Evening

Figure 5.149: UH-Downtown Station Connections

UH-Downtown is the current terminus of the Red Line and will soon be a hub for bayou trails. While the Buffalo and White Oak Bayou trails both pass directly underneath the station, the elevation difference makes connections difficult. A stair case from the UH-Downtown plaza offers one option, but is clearly not ideal for bikes. A trail spur currently in design will connect the White Oak trail to the north end of the Main Street bridge, offering a better option. The idea of an elevator from station level to trail level has also been suggested. The possibility exists for an existing freight elevator in the building to serve this function.

Activity centers/destinations within one mile:
Downtown
UH-Downtown

Major barriers within one mile:
Buffalo Bayou
White Oak Bayou
IH-10

Existing bike facilities within one mile:
Buffalo Bayou trails
White Oak Bayou trail

Existing bicycle parking:
Two racks on UH-D plazas

City: Houston

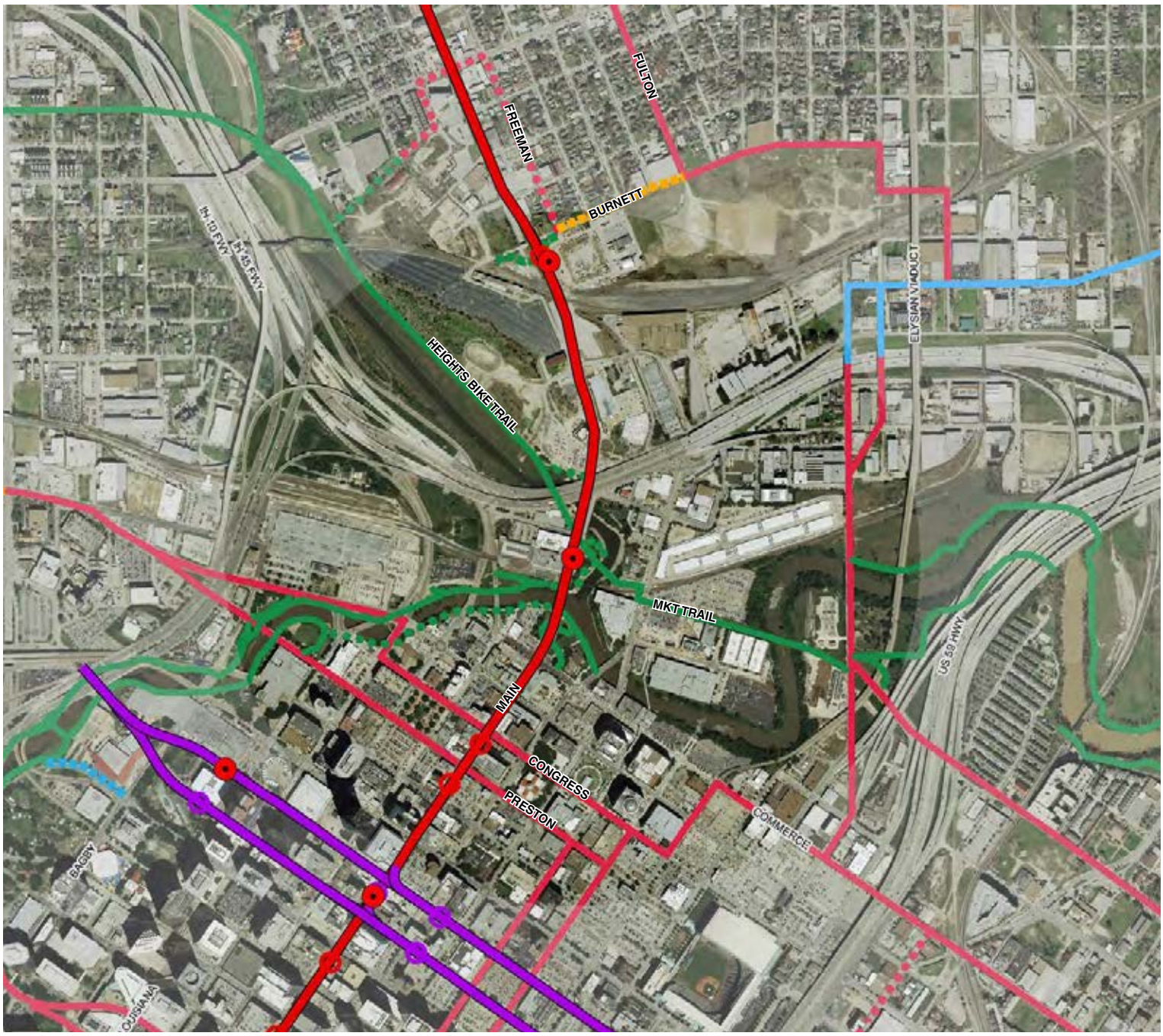
Management District: Downtown

Weekday bus boardings: N/A

Figure 5.150: Covered bike racks at UH-Downtown campus

Figure 5.151: Pedestrian crossing point on the south side of the station

Figure 5.152: Shared-use path located near the UH-Downtown Station, below the Main Street bridge



UH-Downtown Station Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

METRO Rail

- Red Line (Main Street/North)
- Purple Line (Southeast)

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- Facility In Development
- R Existing Bike Rack
- B Existing B-Cycle Station

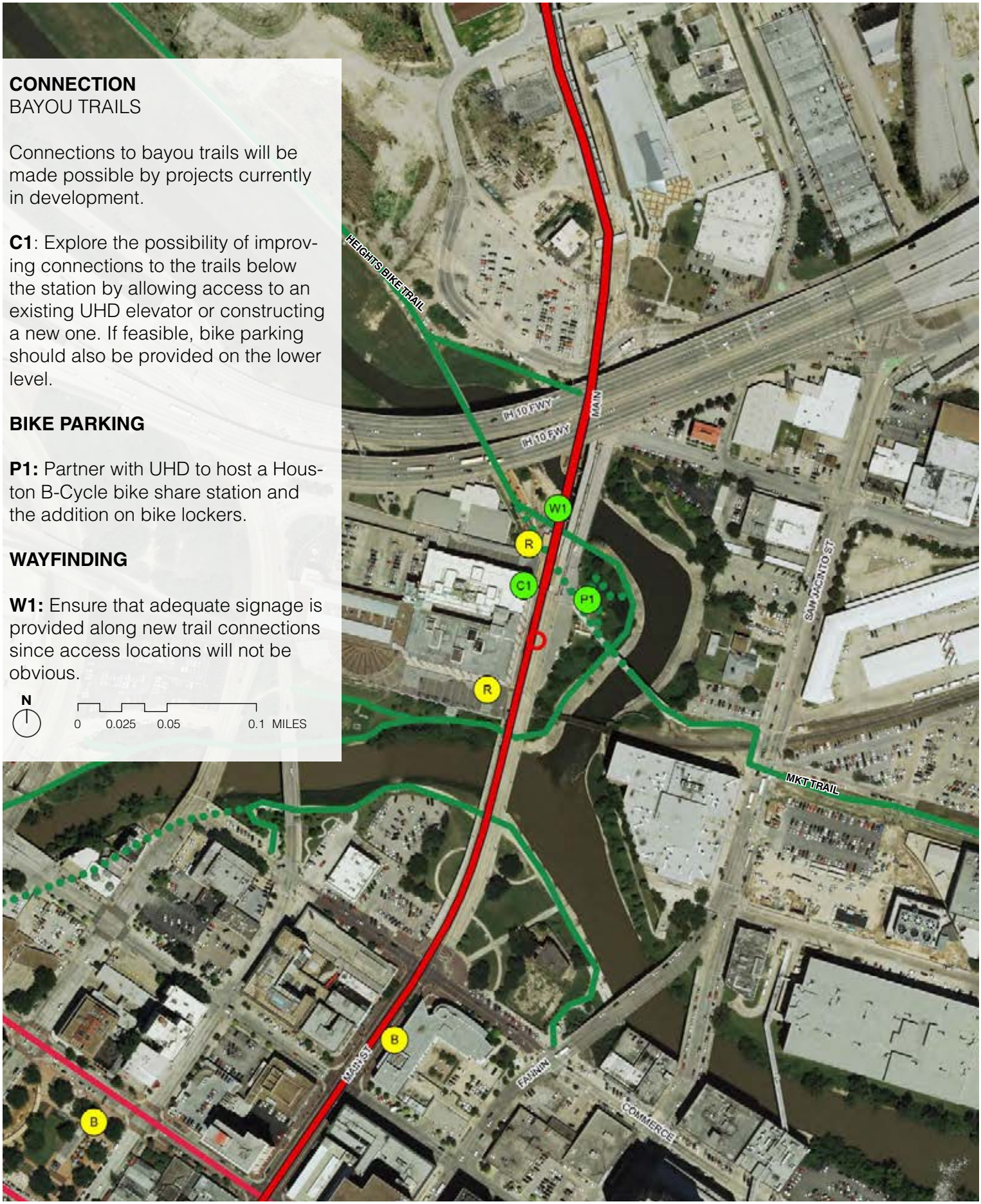
Recommended Facilities

- C Connection Recommendation
- P Bike Parking Recommendation
- W Wayfinding Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.153: UH-Downtown Station Recommendations



CONNECTION
BAYOU TRAILS

Connections to bayou trails will be made possible by projects currently in development.

C1: Explore the possibility of improving connections to the trails below the station by allowing access to an existing UHD elevator or constructing a new one. If feasible, bike parking should also be provided on the lower level.

BIKE PARKING

P1: Partner with UHD to host a Houston B-Cycle bike share station and the addition on bike lockers.

WAYFINDING

W1: Ensure that adequate signage is provided along new trail connections since access locations will not be obvious.

N

0 0.025 0.05 0.1 MILES

WEST BELLFORT PARK & RIDE

INDEX

COMMUTE: Drive Alone — 2.6 — Mode-Split

POPULATION: Low Density — 2.1 — High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
8	South Main	
19	Wilcrest Crosstown	

Park & Ride		
265	West Bellfort	Peak
269	Westwood / West Bellfort	
292	West Bellfort / Westwood	Peak Direction

Figure 5.154: West Bellfort Park & Ride Connections

West Bellfort is one of METRO's busiest Park & Ride lots and is nearing capacity. It is located just south of the interchage of Southwest Freeway and Beltway 8. A shared use path along Keegans Bayou is to pass the site on the opposite bank. Connecting to the trail could increase ridership at the Park & Ride without the expense of adding parking.

Activity centers/destinations within one mile:
None

Major barriers within one mile:
US-59 Southwest Freeway
Beltway 8

Existing bike facilities within one mile:
Keegans Bayou Trail in development

Existing bicycle parking:
Rack at each end of boarding area

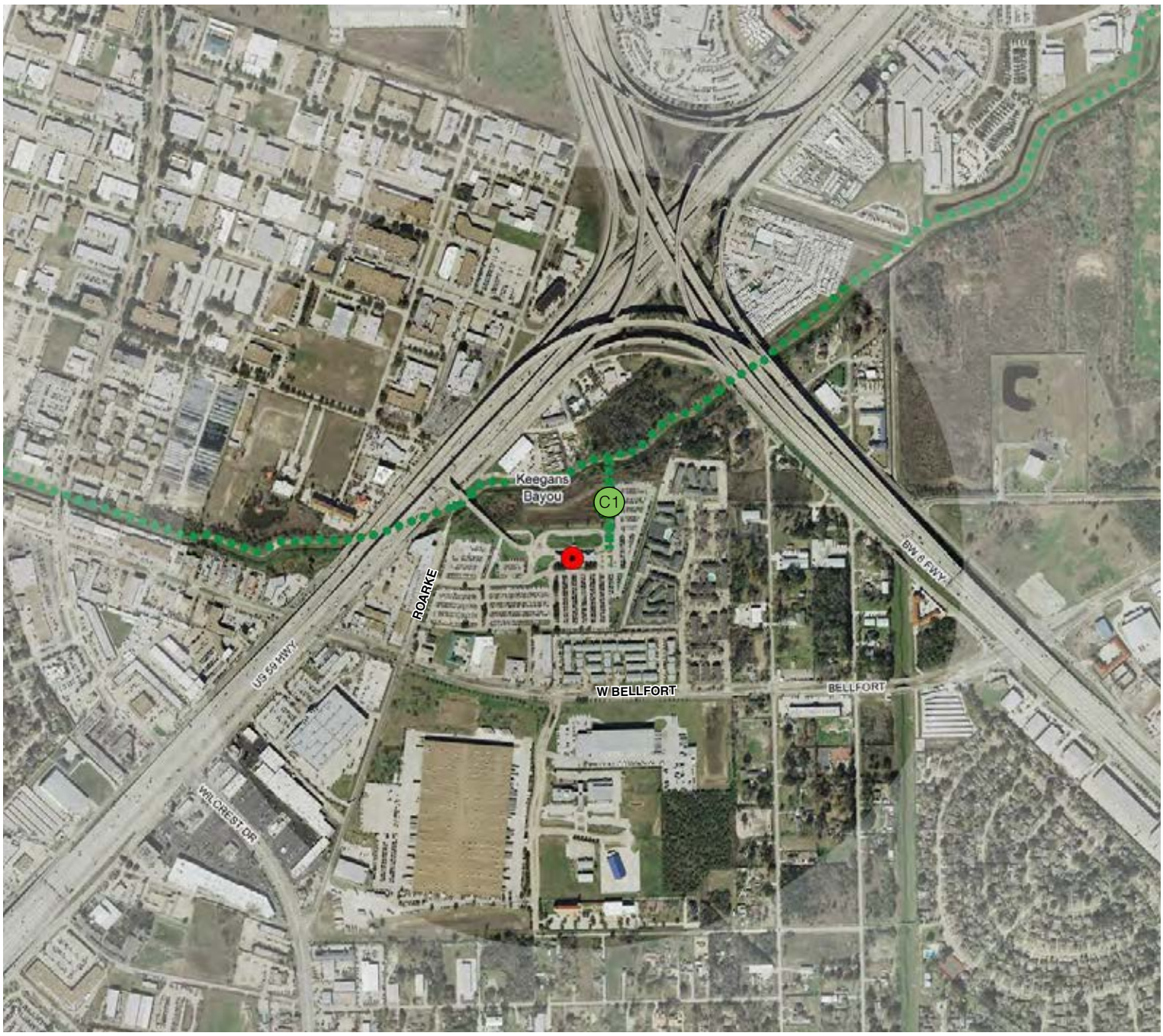
City: Houston

Management District: Brays Oaks

Weekday bus boardings: 2,048

Figure 5.155: Sidewalk leading to boarding area with bike rack at the edge (uncovered)

Figure 5.156: Bike locked to the rack



West Bellfort Park & Ride
Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Facility In Development
- R Existing Bike Rack

Recommended Facilities

- Shared-Use Path
- C Connection Recommendation

Figure 5.157: West Bellfort Park & Ride Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTION
KEEGANS BAYOU TRAIL

C1: Provide connection to the Keegans Bayou Trail currently in development by pursuing partnerships to construct a bikeway bridge to the shared-use path. Bike connections could be a cost-effective way to address capacity constraints as this lot which has seen utilization rates of 95% in recent counts.

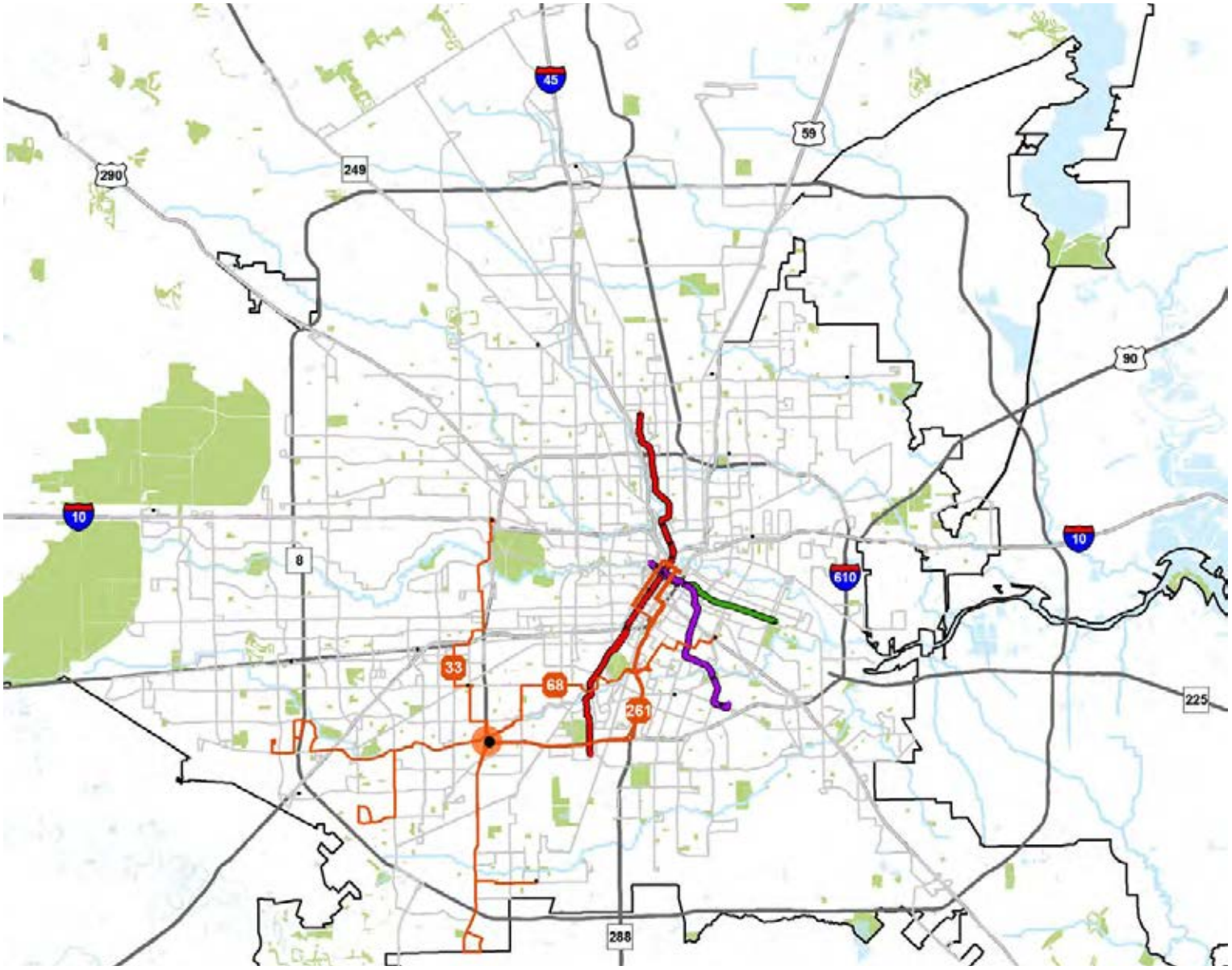
BIKE PARKING
Increased rack space, preferably covered, may be necessary with the bayou trail connection.

WAYFINDING
Provide signage along bayou trail connection.

N

0 0.025 0.05 0.1 MILES

WEST LOOP PARK & RIDE



INDEX

COMMUTE: Drive Alone — 1.9 — Mode-Split

POPULATION: Low Density — 2 — High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
33	Post Oak Crosstown	Peak
68	Brays Bayou Crosstown	Peak
Park & Ride		
261	West Loop	Peak Direction

Figure 5.158: West Loop Park & Ride Connections

West Loop Park & Ride is located at the southwest corner of the IH-610 loop and surrounded by freeway ramps. Weekday peak park & ride service is provided to Downtown, though it does not have the benefit of an HOV lane. Local service to the Texas Medical Center and Uptown is available seven days a week.

Activity centers/destinations within one mile:
No major destinations

Major barriers within one mile:
IH-610 West/South Loop

Existing bike facilities within one mile:
Brays Bayou trails

Existing bicycle parking:
Four racks

City: Houston

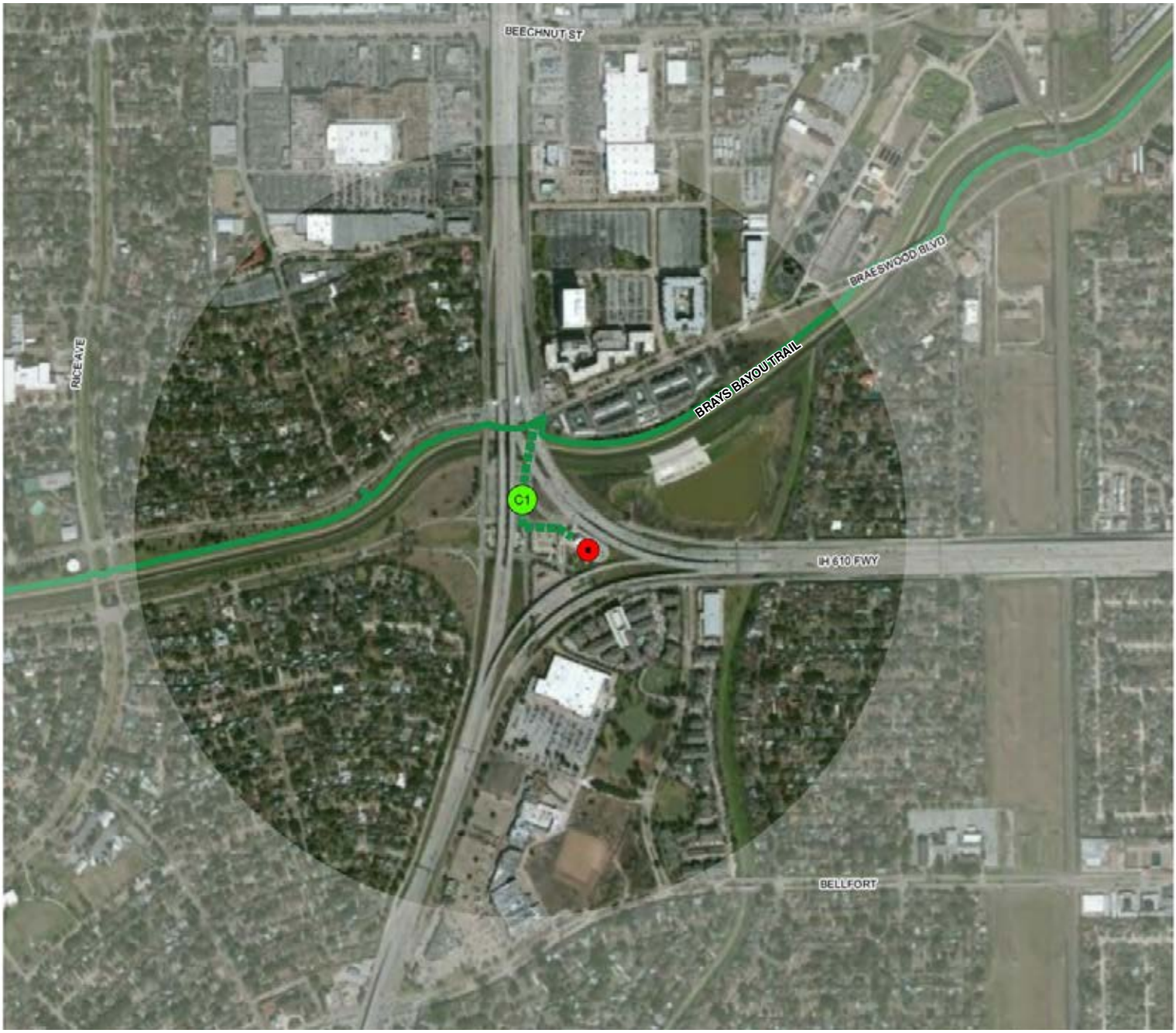
Management District: None

Weekday bus boardings: 630

Figure 5.159: Bike racks located across from the boarding platform, separated by a fence and shrubs

Figure 5.160: Boarding platform with IH-610 in the background

Figure 5.161: Space under canopy that could potentially be used for bike racks



West Loop Park & Ride Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- R — Existing Bike Rack

Recommended Facilities

- Shared-Use Path
- C — Connection Recommendation
- P — Bike Parking Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.162: West Loop Park & Ride Recommendations

CONNECTIONS
BRAYS BAYOU TRAIL

C1: In coordination with Project Brays, support installation of a bicycle/pedestrian crossing of the bayou to connect the park & ride to the Brays Bayou trail. This could take the form of modifications to an existing bridge or installation of a dedicated bike/ped bridge.

BIKE PARKING

P1: Locate bike racks under the canopy.

WAYFINDING
Provide signage to direct cyclists to the park & ride.

N

0 0.025 0.05 0.1 MILES

WESTCHASE PARK & RIDE

INDEX

COMMUTE: Drive Alone — 2.9 — Mode-Split

POPULATION: Low Density — 2.7 — High Density

TRANSIT CONNECTIONS

Local		**Weekday Frequent**
8	South Main	
19	Wilcrest Crosstown	

Park & Ride		
265	West Bellfort	Peak
269	Westwood / West Bellfort	
292	West Bellfort / Westwood	Peak Direction

Figure 5.163: Westchase Park & Ride Connections

Westchase Park & Ride is a relatively new facility and is served by the Monday-Saturday 132 Harwin Limited to Hillcroft TC and Wheeler Station and the peak-only 274 Westchase/Gessner Park & Ride to Downtown. The boarding platform has six bus bays, but only two are currently used. The parking lot is vast and currently operates at about 10% of its 1,468 vehicle capacity. The hike & bike trail from Richmond to Bellaire is expected to be constructed this summer. A connection to the Park & Ride fence will be provided; METRO will determine what to do from there. Possibilities include utilizing the existing walkways though the parking lot or restriping the lot to provide bike lanes.

Activity centers/destinations within one mile:
Westchase District: retail, office space, apartments (across Westpark Tollway)

Major barriers within one mile:
Drainage ditch to the west
Westpark Tollway (north border)
Beltway (0.4 mi east)
Vacant parcels

Existing bike facilities within one mile:
Harwin-Wilcrest-Richmond bike lanes
Westchase Trail (in design, construction expected summer, 2013)

Existing bicycle parking:
Bike racks (uncovered) are located alongside the kiss-and-ride lane.

City: Houston

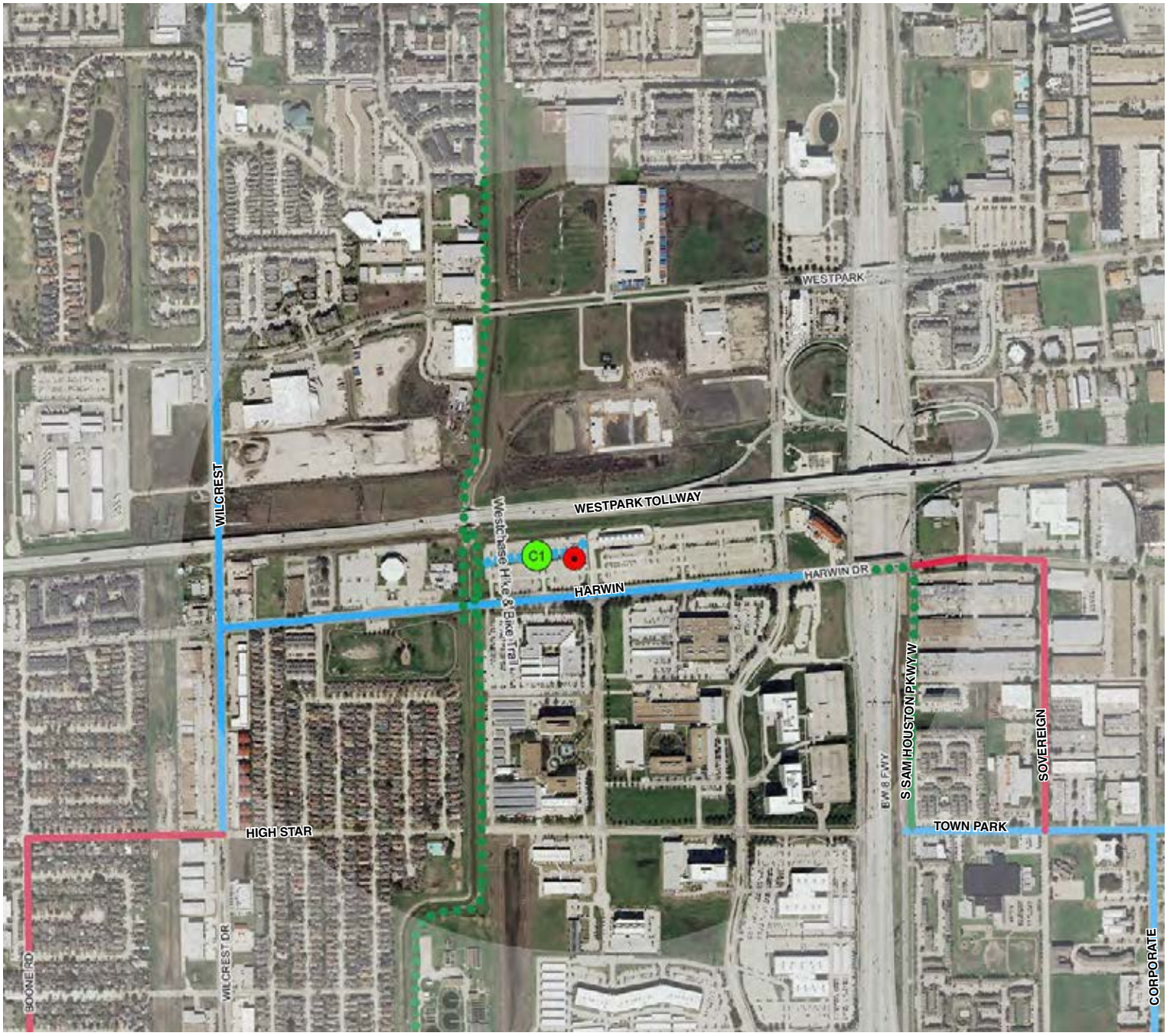
Management District: Westchase

Figure 5.164: Covered boarding area

Figure 5.165: Bike rack located between the kiss-and-ride lane and parking lot

Figure 5.166: Space under the boarding area canopy

Figure 5.167: Potential connection point along the future Westchase Hike & Bike Trail



Westchase Park & Ride Half-Mile Radius

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Existing Bicycle Facilities

- Shared-Use Path
- Bike Lane
- Signed Bike Route
- Facility In Development
- R — Existing Bike Rack

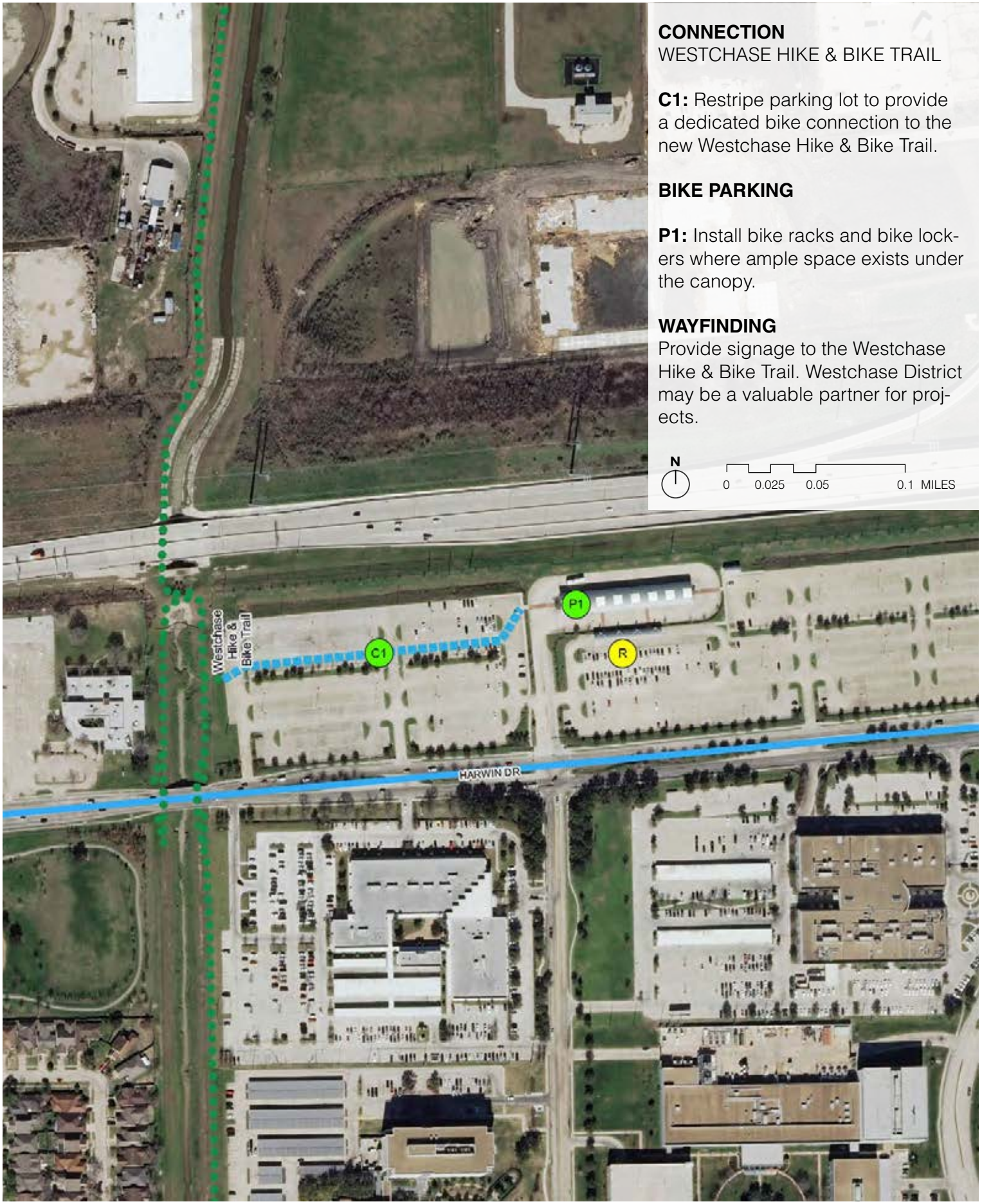
Recommended Facilities

- Bike Lane
- C — Connection Recommendation
- P — Bike Parking Recommendation

N

0 0.125 0.25 0.5 MILES

Figure 5.168: Westchase Park & Ride Recommendations



CONNECTION
WESTCHASE HIKE & BIKE TRAIL

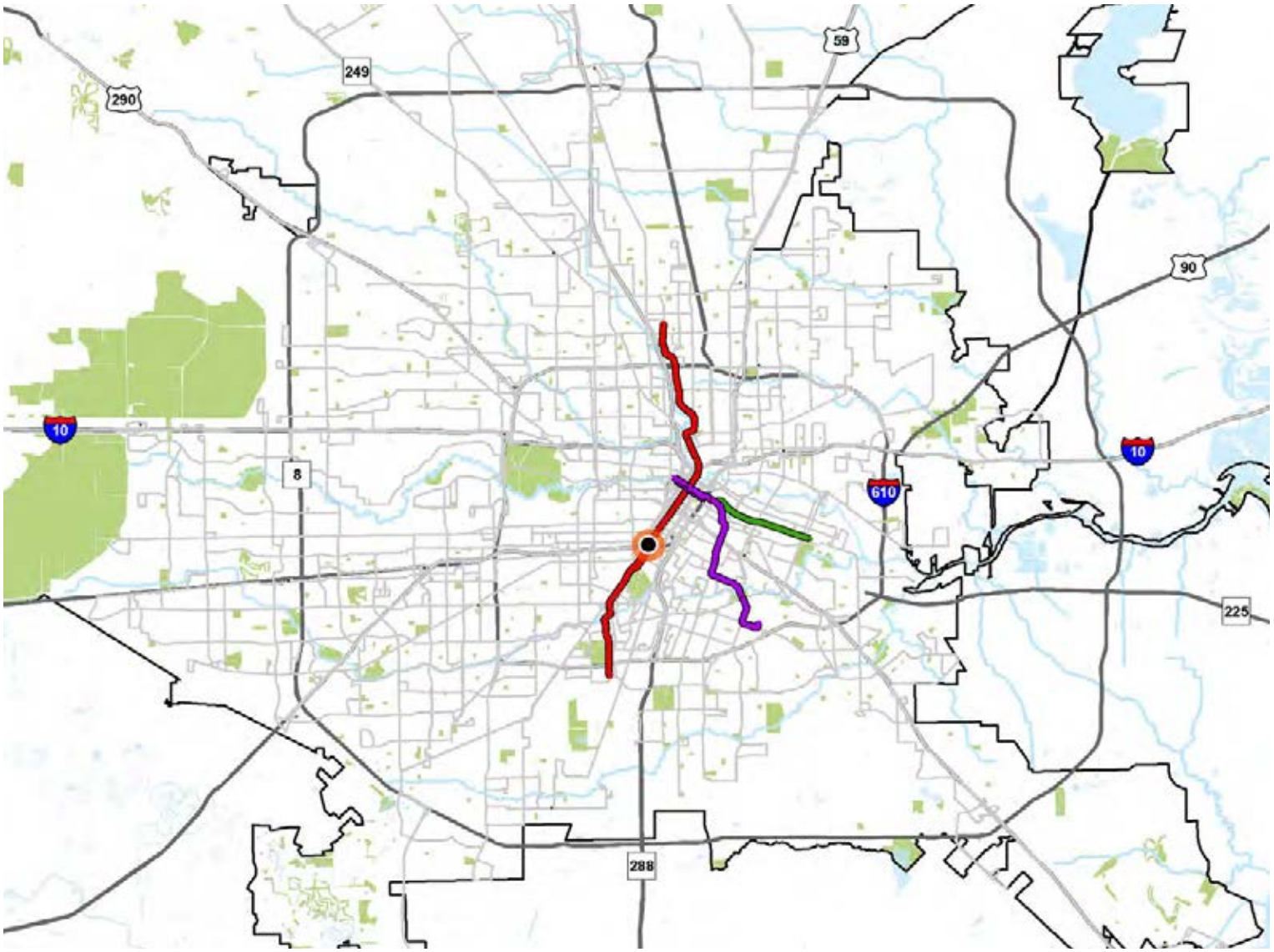
C1: Restripe parking lot to provide a dedicated bike connection to the new Westchase Hike & Bike Trail.

BIKE PARKING

P1: Install bike racks and bike lockers where ample space exists under the canopy.

WAYFINDING
Provide signage to the Westchase Hike & Bike Trail. Westchase District may be a valuable partner for projects.

WHEELER STATION



INDEX

COMMUTE: Drive Alone — 3.5 — Mode-Split

POPULATION: Low Density — 2.4 — High Density

TRANSIT CONNECTIONS

Light Rail		**Weekday Frequent**
	Red Line	All Day and Evening
Local		
1	Hospital	All Day
8	South Main	
25	Richmond	All Day
60	South MacGregor	
65	Bissonnet	Peak Direction
Limited		
132	Harwin Limited	Peak Direction

Figure 5.169: Wheeler Station Connections

Wheeler Station is an important connection point where bus passengers can board the Red Line to Downtown or the Texas Medical Center. It is the rail tie-in location for the 25 Richmond and 65 Bissonnet, busy bus routes to Houston's west and southwest sides, and the 132 Harwin Limited, which operates nonstop from Hillcroft Transit Center. These frequent and limited stop services are likely to appeal to cyclists as they offer short waits and quicker trips. A secure location to park bikes would make connections at Wheeler Station even more appealing.

Wheeler Station is also 1.25 miles west of Texas Southern University, though no direct bus route exists. Bus service to the east of the station is relatively sparse, but a grid of lower-volume streets makes bicycle travel a convenient option. A north-south bike route along Caroline Street currently exists. Enhancing bicycle connections in the east-west direction could help bicyclists make the connection to transit.

Activity centers/destinations within one mile:
Residential
Retail
Educational Uses
Museum uses

Major barriers within one mile:
US 59
Spur 527

Existing bike facilities within one mile:
Caroline Street bike route

Existing bicycle parking:
One rack near the south end of the rail platform

City: Houston

Management District: Midtown

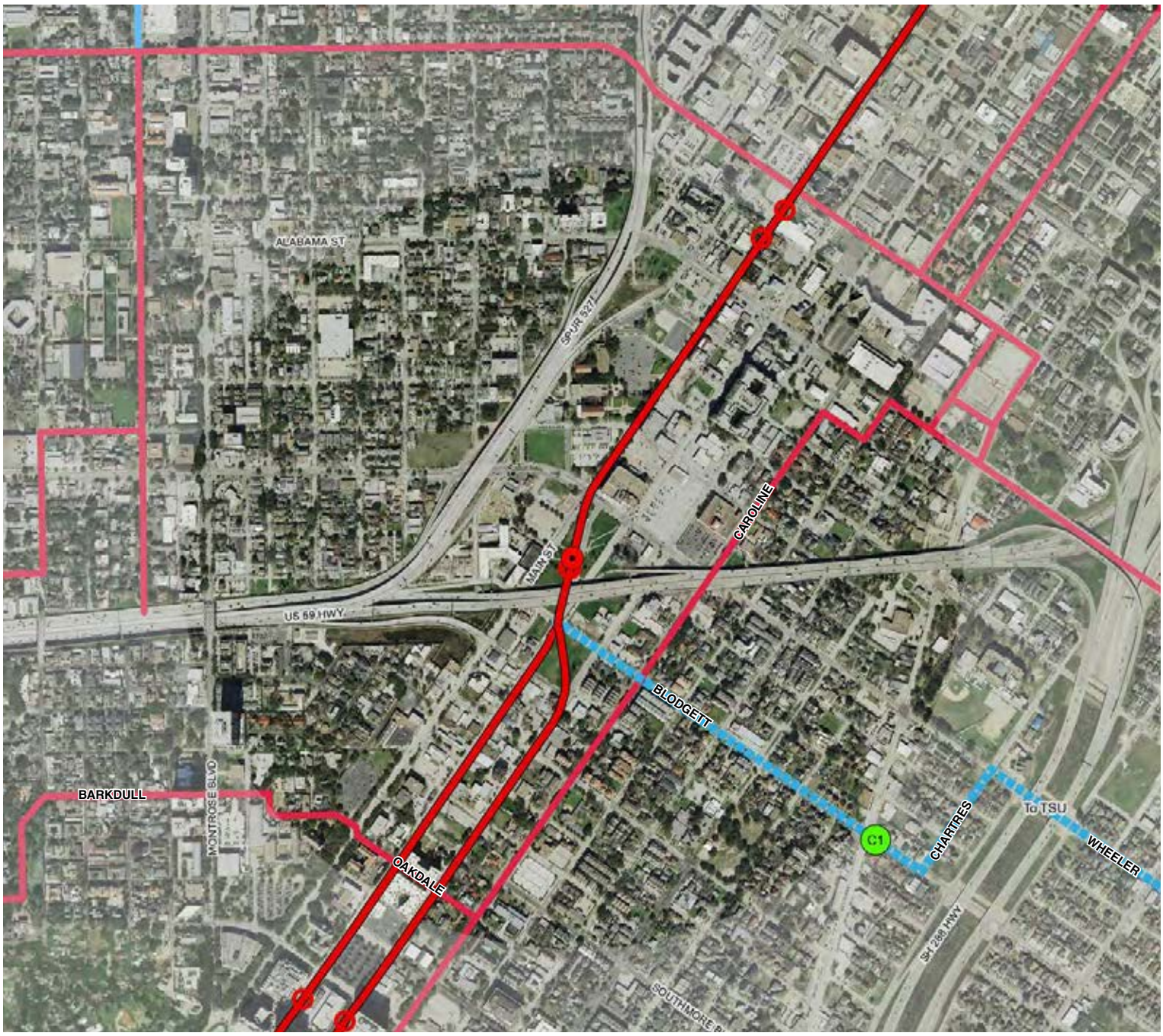
Weekday bus boardings: 2,767

Figure 5.170: Light rail boarding area

Figure 5.171: Bike rack located on the west side of the Transit Center – cross tracks to reach boarding area


Figure 5.172: Uncovered bike rack


Figure 5.173: Connection to northeast – space available for covered bike parking



Wheeler Station Half-Mile Radius

METRO Rail

Red Line (Main Street/North)

Existing Bicycle Facilities

Signed Bike Route

R Existing Bike Rack

Recommended Facilities

Bike Lane

C Connection Recommendation

P Bike Parking Recommendation

Note: Recommendations do not reflect engineering-level analysis or constitute capital commitment. Traffic studies must be conducted prior to implementing any on-street bicycle facilities.

Figure 5.174: Wheeler Station Recommendations

N

0 0.125 0.25 0.5 MILES

CONNECTIONS

CAROLINE BIKE ROUTE, TSU, COLUMBIA TAP TRAIL

C1: Support the development of bike lanes and/or a bike route along Blodgett, Chartres, and Wheeler to connect to Texas Southern University and the Columbia Tap Trail.

East-west connectivity to Wheeler Station can be explored in further detail through Museum Park Livable Centers Study, expected to begin in 2014.

BIKE PARKING

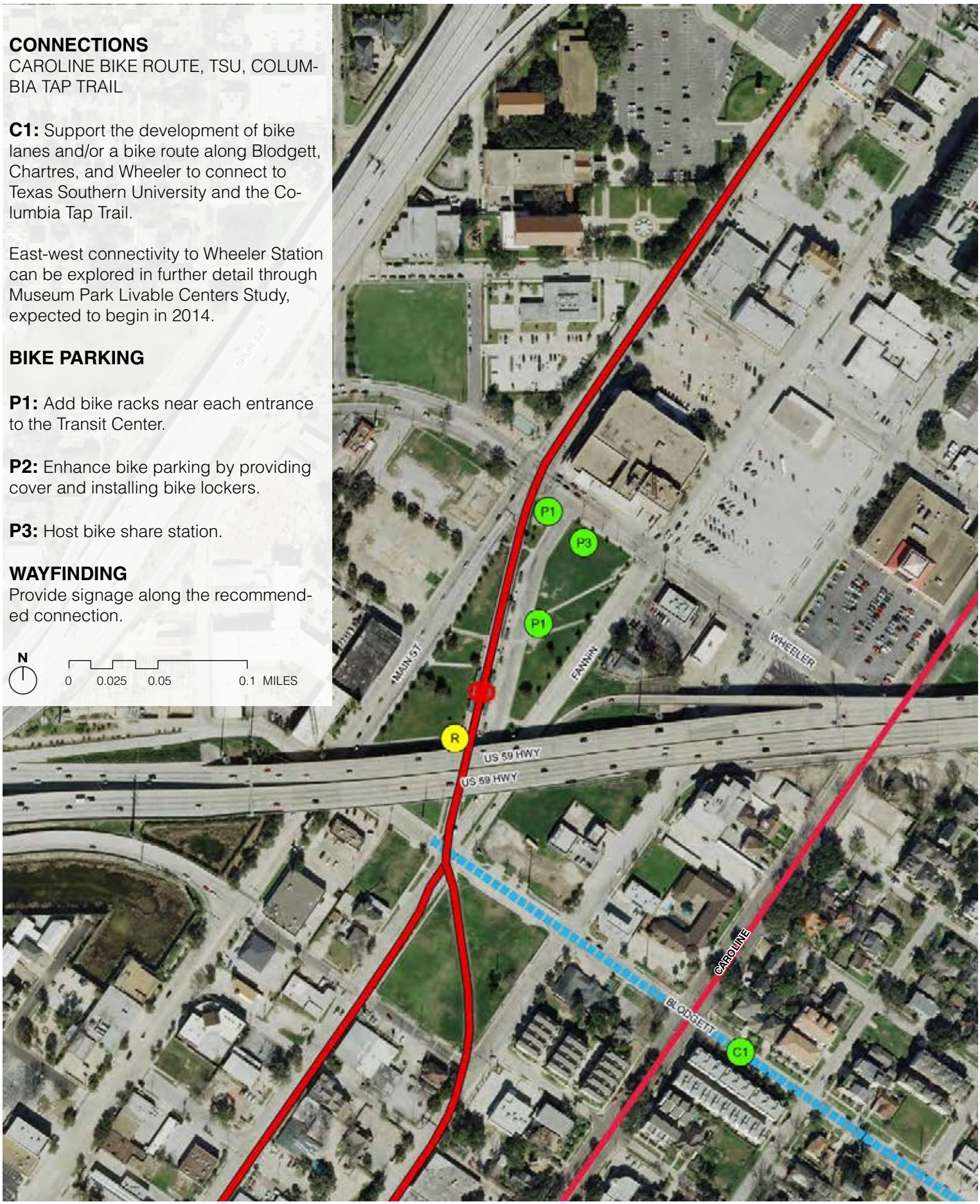
P1: Add bike racks near each entrance to the Transit Center.

P2: Enhance bike parking by providing cover and installing bike lockers.

P3: Host bike share station.

WAYFINDING

Provide signage along the recommended connection.



CHAPTER 6
IMPLEMENTATION

Recommendations to communicate the value of biking to transit, better integrate bicycles into the transit system, and connect cyclists to the system have been presented.

This chapter focuses on the strategies, funding sources, partnerships and priorities necessary to implement those ideas. It finishes with a discussion of how METRO can apply the findings of this study to future system improvements.

The fourth principle of the recommendations framework is the development of a clear approach for prioritization and implementation of the principles and strategies for Communicate, Integrate and Connect outlined in the previous chapter of this report.

Capital improvements to create connections will require partnerships with outside entities. These may include management districts, member cities, TIRZs and MUDs, among others. Communications recommendations must be thought through to ensure support throughout initiation and on-going management, as they may require internal support within METRO or outreach and education to the public through partnerships. For example, the placement of bicycle racks (a capital project) would benefit from coordination with METRO's marketing department in order to purchase custom racks that are designed according to the METRO brand. If METRO chooses to designate a primary bicycle coordinator within the agency, this person (in conjunction with the proposed Bicycle Advisory Committee) can ensure a coordinated effort to achieve the vision for a bicycle-friendly transit system.

Communicate, Integrate and Connect recommendations are organized in Table 6.1, which describes the recommendations, indicating whether they are applicable to the following categories:

Policy

Recommendations for new or altered policies represent the "top" level improvements that create and maintain the approach METRO takes toward enhancing bike-to-transit integration. These typically require input and engagement at the senior staff and board level. These recommendations do not require capital expenditures though may set guideline for how to approach prioritization. For example, Recommendation 10 (allowing bikes on the train during peak hours now that all runs will be two car trains) would be a policy decision to be made at the board level.

Program

Program recommendations represent the most direct ways in which METRO staff will interact with cyclists and other members of the public, including a proposed Bicycle Advisory Committee that will play a major role in prompting future improvements and evaluating the success of existing ones. Programs include both ongoing promotion of bicycle-friendliness in the system as well as pilot projects to evaluate potential improvements. Though these programs are expected to be of lower cost than capital improvements, they will nevertheless require staff time and other outlays, which should be prioritized before infrastructure improvements and funded through the existing METRO bicycle program funding.

Capital Improvements

Capital improvement recommendations are primarily focused on the improvement of integration between the bicycle and transit systems through on-vehicle accommodations, bicycle parking, and bike share. Capital improvements are also required to create Connections and support Wayfinding Recommendations, which are further specified within individual transit nodes. As such, the associated costs and prioritization for those recommendations are included with each node.

Maintenance costs must be seriously considered with the development of new facilities and infrastructure and negotiated between the agencies involved or affects by new projects.

		RECOMMENDATION	TYPE	IMPLEMENTATION NOTES
COMMUNICATE	1	Establish a team to assist METRO with bicycle issues, including a Bicycle Coordinator, Bicycle Working Group and Bicycle Advisory Committee.	Program	› Approval of and hiring of new position › Committee/department coordination › External partnerships
	2	Create a bicycle-oriented brand, logo, and consistent marketing material.	Program	› Material development › Committee/department coordination
	3	Develop a Bike & Ride Education Program.	Program	› Committee/department coordination › External partnerships
	4	Expand data collection and data sharing efforts.	Program, Capital Improvement	› Committee/department coordination
	5	Add wayfinding signage to trails, Transit Center, Park & Ride lots, and METRORail Stations where the bike and transit connections are not visibly apparent.	Capital Improvment	› External partnerships › See Tables 3 to 6
	6	Develop location-specific bicycle and transit network maps for transit activity centers, such as Transit Centers and METRORail Stations.	Program, Capital Improvement	› Partner with management entities and member cities to coordinate plans
	7	Develop a system-wide map indicating transit routes and facilities with bicycle routes.	Program	› Coordinate data sharing
	8	Create a multi-modal online trip planning tool.	Program	› Technology development
	9	Improve real-time information available through mobile apps and cell phone technology.	Program, Capital Improvement	› Technology development › Marketing material development
INTEGRATE	10	Reevaluate peak hour restrictions on METRORail annually, or with major system changes that may alter light rail car capacity.	Policy, Program	› Service evaluation › Policy changes
	11	Install vertical racks on train cars as space allows.	Capital Improvement	› Purchase and install racks › Education/marketing material development
	12	Initiate a pilot project to test the feasibility of 3-bike racks on the front of buses.	Program, Capital Improvement	› Purchase and install racks › Data collection / evaluation
	13	Provide short-term bicycle parking accommodations at or adjacent to select bus stops and METRORail stations without obstructing the pedestrian walkway.	Policy, Program, Capital Improvment	› External partnerships › Policy for short-term bicycle parking limitations and handling › Purchase and install racks › See Tables 3 to 6
	14	Explore potential design options to outfit future METRORail station platforms with space for short-term bicycle parking.	Program, Capital Improvement	› Design review › Policy for short-term bicycle parking limitations and handling › Purchase / install racks
	15	Provide long-term bicycle parking at Park & Ride lots and Transit Centers with options for free and fee-based accommodations.	Program, Capital Improvement	› Purchase / install racks › Establish payment options for users › See Tables 3 to 6
	16	Develop a framework for bike hubs on or near METRO property that can be managed by outside entities.	Program, Capital Improvement	› External partnerships › Potential capital improvement projects › Marketing opportunities
	17	Work closely with B-Cycle to identify potential locations for Phase 3 expansion on METRO property.	Program, Capital Improvement	› External partnerships › Purchase B-Cycle stations › Marketing opportunities
CONNECT	18	Connect transit nodes to nearby bicycle facilities that expand the transit catchment area in a useful way.	Capital Improvement	› External partnerships › See Tables 3 to 6
	19	Connect transit nodes to major destinations nearby (but outside walking distance) for which a bike connection would create a useful trip.	Capital Improvement	› External partnerships › See Tables 3 to 6
	20	Connect neighborhoods to transit nodes that offer transit service most beneficial to cyclists (such as limited-stop, frequent, rail, and/or Park & Ride service)	Capital Improvement	› External partnerships › See Tables 3 to 6

Table 6.1: Communication and Integration Recommendations

Implementing the Recommendations at Transit Nodes

To provide clear examples of how the Communicate, Integrate, and Connect Recommendations can be implemented in key locations, thirty-one of METRO's transit nodes were assessed to improve bicycle access. These transit nodes provide a broad spectrum of locations, service availability, and surrounding land uses as examples for implementing recommendations to strengthen bike-to-transit connections. Park & Rides, Transit Centers and METRORail stations serve as locations of concentrated boarding and alighting activity where potential investments in improved bicycle access can have the greatest benefit to the most transit riders and were therefore the focus of this assessment.

One of the principal goals of the METRO Bike & Ride Study is to "improve bicycle access to METRO facilities with a focus on the highest potential locations." Though recommendations have been made for only a subset of all the possible transit locations that could be targeted for improvements, they still represent a large enough set of recommendations that successful implementation may require prioritization. So what locations and parts of the system should METRO prioritize in order to best improve the value for bike-to-transit users and increase usefulness and ridership of the transit system overall?

Prioritization

Prioritizing transit nodes requires considering why people connect bike trips to transit and at which nodes connections are most likely to occur. Based on an assessment of where bike to transit trips currently occur, it can be inferred that these connections are made primarily for two reasons:

- Connections to Transit Services at the Node: The available transit services provide cyclists an more advantageous trip versus than the trip bicycle alone. Transit lines that are frequent, fast, long, and/or cross major barriers typically provide trips that afford a meaningful advantage to a cyclist.

- Connections to Destinations from the Node: Having a bicycle expands the reach of the transit trip and provides flexibility to the rider. Transit nodes with a concentration of activity nearby, but outside the range of an easy walk or transit connection, are most likely to benefit from improved bicycle access.

To determine the relative priority of the transit nodes, a prioritization scoring system was developed. Each of the transit nodes was assessed based on criteria related to these two factors to evaluate its potential role in connecting more cyclists to transit. The scoring system is summarized in Table 6.2. The same scoring system can also be applied to future locations for potential system improvements to gauge their relative value.

	PRIORITIZATION MATRIX									
		TRANSIT CONNECTIONS AT NODE				CONNECTIONS FROM NODE				
Tier	TRANSIT NODE	Bike Boardings Route Connection	Higher Level of Transit Service	Top 10 Productivity Bus Route	Transit Subtotal	Population Density	Near Dedicated Bicycle Facility	Major Destinations	Adjacent to Major Barrier	Connections Subtotal
1	TMC TC	0	3	2	5	2	5	3	0	10
	UH-Downtown Station	0.5*	3	0.5*	4	2	5	3	0	10
	Westchase P&R	0	2	0	2	3	5	3	0	11
	Wheeler TC	1	3	2	6	3	1	1	1	6
	Theater District Station	1	3	1	5	3	3	1	0	7
	Downtown TC	2	1	2	5	3	1	1	1	6
	Quitman Station	1	3	0	4	3	3	1	0	7
	Addicks P&R	0	2	0	2	0	5	3	1	9
	West Bellfort P&R	0	2	0	2	2	5	1	1	9
2	Bellaire TC	0	3	2	5	3	1	1	0	5
	Hillcroft TC	0	3	2	5	3	0	1	1	5
	EaDo/Stadium Station	1	3	0	4	2	3	1	0	6
	MacGregor Park Station	1	3	0	4	2	3	1	0	6
	Magnolia TC	1	3	0	4	1	5	0	0	6
	Eastwood TC	2	1	0	3	2	1	3	1	7
	West Loop P&R	0	2	0	2	1	5	1	1	8
3	Burnett Station	1	1	0	2	2	3	1	1	7
	Greenspoint TC	1	1	0	2	1	3	3	0	7
	Kashmere TC	2	3	0	5	0	1	1	1	3
	Mesa TC	1	2	1	4	0	3	0	0	3
	Palm Center Station	1	3	0	4	1	1	1	1	4
	Northline TC	0	3	0	3	2	1	1	1	5
	Bay Area P&R	0	2	0	2	1	1	3	1	6
	Central Station	0	1	0	1	3	3	1	0	7
4	Hiram Clarke TC	0	3	1	4	0	3	0	0	3
	Kingwood P&R	0	2	0	2	0	5	0	0	5
	Southeast TC	1	3	1	5	1	0	0	0	1
	Fifth Ward/Denver Harbor TC	1	3	0	4	0	1	0	1	2
	Northwest TC	2	1	1	4	0	0	1	1	2
	Acres Homes TC	2	3	0	5	0	0	0	0	0
	Northwest Station P&R	0	2	0	2	1	0	0	1	2
		1 - Single 2 - Multiple Connection to FY2012 Top 10 Bike Boarding Routes; Adjuestments made for lower productivity ends of hooked route	1 Peak frequent, rail (not end), Limited (not nearest Downtown), 2 Park & Ride (Not in Downtown), 3 - Rail (End Station), all-day frequent, limited stop nearest Downtown	1 - Single 2 - Multiple		Population Density within 2 miles 3 - Top Quartile 2 - 2nd Quartile 1 - Third Quartile 0 - Fourth Quartile	1 - Bike Route or Lane, 3 - Shared-Use Path but Far, 5 - Nearby Shared-Use (<0.25 miles) Expands Catchment Area	1 - Local Destination, 2 - Regional or Several Local, 3 - Several Regional Outside walking distance or fast transit connection; Qualitative assessment of where bike connections make sense	1 - Yes, based on Team Analysis Includes freeways and other major barriers	

* Half-points represent facilities with frequent transit routes within a block of the station, but not connected directly to it.

Table 6.2: Prioritization Matix

Factors related to Transit Services at the Node

The following criteria were identified to assess the access that a particular transit node provides cyclists, with a focus on access to the types of transit service that are most likely to provide an advantage over bicycling alone. (See Table 6.2: Prioritization Matrix).

- FY 2012 Top Ten Bike Boardings Route Connection: One key measure of the usefulness of a node to cyclists is if bike-to-transit riders are already using the routes that serve the node. Therefore, transit nodes served by routes that ranked in the FY 2012 top ten in overall bike boardings were prioritized, and nodes that were served by multiple high-bike-boarding routes were given additional points.

- Higher Level Transit Service: Through discussions with cyclists in public meetings and focus groups, as well as assessment of current bicycle boardings, themes emerged about what types of transit service cyclists find most useful. Not unlike all passengers on transit, cyclists tend to value transit service that allow them to travel faster, wait less time and/or cross major barriers or long distances more easily than would be possible on their bikes. Cyclists tend to be more sensitive to these issues because their alternative is riding their bike, which can be much faster than walking and comparable to or faster than transit that is slow, infrequent or indirect. Therefore, nodes that provide access to preferred types of service were scored higher, with more points for connections to higher speed service.

  - Limited routes (which run segments of their route on freeways) make up a large share of the top-performing bike-to-transit routes.

  - Park & Ride and light rail service were scored higher as they also represent services likely to be attractive to cyclists due to factors like speed and frequency.

  - Transit nodes served by routes that provide all-day frequent service were also prioritized, as these represent the core of the local bus network where cyclist wait times would be minimized and service levels are typically highest.

- Top Ten Productivity Bus Route: Top performing bus routes for all riders, as measured by productivity (boardings per revenue hour), are typically so because they connect strong activity centers over long distances with relatively frequent service along easy-to-understand routes. The 52 Scott, 2 Bellaire, 45 Tidwell and 46 Gessner are examples of routes with high productivity. Nodes served by these routes also scored higher in the prioritization.

Factors related to Connections to Destinations from the Node

The transit service provided at a particular transit node is only part of the equation that determines the prioritization of bicycle access improvements at that node. It is also important to evaluate the surrounding development patterns and destinations. The likelihood of providing meaningful improvements to a cyclist's access to transit is related to the density of population and activity in the cycling catchment area around each node. To support prioritization, each transit node was assessed against the following criteria (See Table 6.2: Prioritization Matrix).

- Population Density (within Two Miles): One of the benefits of connecting bike trips to transit is that they expand the catchment area for transit beyond the typical one-quarter mile radius often assumed to be a comfortable walking distance. A greater number of people within the catchment area increases the ridership potential from the area. To assess a transit node's potential, the residential population within 2 miles of the node was determined based on 2010 Census information. Locations with higher relative population to other transit nodes were given higher priority scores for implementation.

- Nearby Dedicated Bicycle Route that Expands Catchment Area: Another way that the catchment area for a transit node can be expanded is by creating connections to major bicycle facilities that support higher-speed, safer bike trips. Facilities with dedicated bikeways such as shared use paths (trails) are most advantageous to increase the ability for cyclist to access transit. With projects in place to expand the existing trail system in the METRO service area, such as the Bayou Greenway Initiative, the potential benefit from connecting to these trails will only increase. Several METRO transit nodes are near, or have direct access to, existing or planned trails. These transit nodes were given higher prioritization scores. Transit nodes that connect to existing routes that may be less advantageous to travel speeds and separation from traffic, such as shared lanes or on-street bicycle routes, were also identified but given slightly lower priority than those with direct, off-street trail access.

- Major Destination Nearby (but Outside Walking Distance or Fast Transit Connection): When transit riders reach a node such as a Transit Center they

have several options to reach their final destinations. They can walk if the distance is short enough and there is a path to get there. They can transfer to another transit route if the connections are timely and provide more direct access. Cycling supports connections to destinations that may be slightly too long to walk from a transit node but represent a relatively short ride via bike. Riding can be significantly faster if there is any wait time involved in making a transit connection. Therefore, transit nodes that have strong destinations just outside the walk range have been given higher prioritization scores. An example of this would be a location like the Addicks Park & Ride, where using the new trail system to reach Energy Corridor destinations on the south side of I-10 may be too far to comfortably walk but relatively easy to bike if the connections were more convenient.

- Adjacent to Major Barrier: The last criterion used for prioritization is the identification of locations where an investment in improved connectivity would have multiple access benefits for the METRO facility. Locations where freeway crossings or major freight rail yards exist, and where projects have been identified that would support bicycle as well as pedestrian connections, have been given a higher prioritization score. For example, improving the crossings at the intersection of US 59 and Westpark would have significant benefits for cyclists as well as pedestrians trying to access Hillcroft Transit Center from the Gulfton neighborhood.

Based on a ranking of transit nodes using these criteria, the transit nodes were broken into quartiles to support the development of implementation timelines and budgeting. The transit node quartiles are shown in Tables 6 through 9. Within each quartile the transit nodes are shown in alphabetical order.

Proposed Implementation Timelines for Improvement Opportunities

The availability of funding resources and the contingency of some projects on others necessitate further prioritization so that projects can be scheduled in a logical manner to take advantage of funding as it becomes available. As many of the recommendations, particularly those related to connections, are outside of METRO's exclusive control and require partnerships with local jurisdictions and landowners, actual implementation timing is likely to vary regardless of what quartile the transit node is in. Each recommended improvement was developed with consideration of project cost, ease of implementation, and impact on METRO's goals related to ridership and increasing access to transit.

Within each priority quartile, projects were broken out into three timeframes for implementation as follows:

- Short-term – Projects with low cost or previously identified funding that do not require extensive right-of-way or coordination with other projects or jurisdictions and that can be implemented in one to three years. These are typically "signs and paint" type projects that can be implemented relatively easily with proper coordination.

- Medium-term – Medium-cost projects or higher-cost projects that can be implemented in three to seven years. These may have a larger capital component or require the identification of a partner to be successfully implemented.

- Long-term – Typically higher-cost projects that will involve coordination with other projects and partnership with several stakeholders and agencies. These projects may require seven or more years to implement.

The priority ranking for each project is tentative and based on existing conditions. Projects may be accelerated or decelerated based on availability of funding, local priorities, or the scheduling of contingent projects.

By using both the transit node priority quartiles and the relative implementation timeframes for each project, METRO can develop an implementation strategy that can be tailored to available resources and funding.

In all, 104 recommendations were developed as implementation projects to increase bicycle access to transit at the 31 transit nodes. The total cost of these recommendations is approximately $4.6 million with $4.2 million identified for infrastructure connections. This includes the cost of implementation of all possible recommendations, however estimations are limited where additional engineering studies

are needed. Potential approaches to address these costs are discussed in the Implementation Strategies section of this chapter.

The 104 projects are summarized on the following four tables. The summaries include the following information about each project:

- Project Description – A brief description of the major elements of each project. A more thorough description can be found on the pages for that node in the Recommendations chapter.
- Timeframe – Short, medium or long term as discussed above. In addition to organizing the projects by priority quartile, they have also been organized by timeframe (short, medium, long-term) in Appendix VIII of this report.
- Ease of Implementation – A qualitative assessment of the overall ease of implementation for a project. This assessment includes consideration of cost, community support, right-of-way requirements, regulatory hurdles, coordination with other agencies and jurisdictions, and overall project scope. A project with high ease of implementation could theoretically be implemented quickly and inexpensively once a sponsor is identified. Ease of implementation is represented as:
- Cost – Estimated cost of the identified improvement opportunity. Cost estimates for each project were developed based on planning-level conceptual designs and used TxDOT low-bid cost estimates for preceding 12 months as of April 1, 2013 as well as other inputs related to items like bicycle stations and other bicycle parking strategies.
- Potential Partners – As many of the recommendations will require METRO to identify partners to support implementation, specific partners for each project have been identified. This includes local government agencies, management districts, utility and drainage districts and other organizations that support bicycle improvements in the region.

High-Level Cost Benefit Assessment of Improvements

A simple way to think about the benefits that investment into improved bicycle access to transit may create is to think about the incremental number of trips that METRO would need to generate over a ten-year period to cover the cost of that implementation. A ten year time frame was used, as most of the recommendations result in infrastructure with at least a ten-year useful life, frequently much longer. The ridership needed to cover the cost can vary for local trips versus park & ride trips due to the higher fare for a ride on the park & ride system. The analysis below shows that for every $100,000 in capital costs METRO would need to generate between 6 and 11 daily round-trip boardings to have a positive cost-benefit ratio.

Table 6.3

	Local Trip	Park & Ride Trips
Cost of Improvement	$100,000	$100,000
Annual Days of Operation	365	254
One Way Fare (Est.)	$1.25	$3.00
Roundtrip rider per day for 10-year paypack period	11.0	6.6

These assumptions do not include additional benefits of air quality improvements, reductions of congestion, and the potential that more people have access to useful transit, improving their transportation options and quality of life. With the continued investment in regional bikeways in the METRO service area through projects like the Bayou Greenway Initiative, it is likely that total cycling trips will continue to grow above the regional rate of growth in the region. Based on the assessment of transit nodes, it is most likely that corresponding ridership increases would be possible in locations where conditions support bicycle access to useful transit service.

Potential Next Steps and Strategies for Implementation

In addition to the prioritization of transit nodes and development of a timeframe for each recommendation, thought was given to how to most effectively implement the recommendations. The following provides a summary of key implementation strategies for METRO to consider.

- Leverage local dollars by aggressively seeking federal funding. Typically grants for federal programs require local entities to provide a 20% local match with the grant providing the remaining 80%. For the recommendations at the transit nodes analyzed in this study, local match dollars in the range of $0.9-1.0 million could allow complete implementation.

  Recent projects in the Houston region including the $15 Million TIGER – Bicycle Access to Transit grant and New Freedom grants to support new sidewalks to transit in Houston's East End are examples of projects that have been able to leverage local dollars with federal grants. In New York, JARC/New Freedom funding was utilized to implement a large-scale wayfinding project in their service area.

- Designate a certain percentage of the annual capital improvements budget to implement improvements in bicycle access to transit. Target top-quartile, easy to implement projects first.

- Divide recommendations into smaller sets for implementation. For example, group bicycle storage recommendations to implement improvements across multiple nodes at once (e.g., complete all the nodes within one prioritization quartile together). Implementing at scale may be advantageous for pricing of materials, labor and for marketing purposes.

- Group short-term wayfinding and signage recommendations to implement across several nodes at once (e.g., complete all the nodes within one prioritization quartile together); many of the signage and wayfinding projects are linked to related capital projects. Identify those that are not dependent on another project for short-term implementation.

- Encourage METRO service area jurisdictions to set aside a percentage of their General Mobility funding for bicycle projects.

- Seek partners for connections requiring capital improvements early in the planning process. Actively manage prioritization based on level of partner involvement and potential support in order to most effectively utilize available funding.

- Reassess priorities as new information becomes available; as new counts of on-site bike parking are performed or new bike boarding data become available, reassess criteria for prioritization.

- Consider maintenance costs and develop partnerships with local jurisdictions to maintain infrastructure outside of METRO property.

	FIRST PRIORITY QUARTILE						
	RECOMMENDATION		DESCRIPTION	TIME FRAME	EASE OF IMPLEMENTATION	COST	PARTNERS AND NOTES
ADDICKS PARK & RIDE	W1	Wayfinding	Trail map of surrounding trail network	Short	■□□□	$900	
	W2	Wayfinding	Signage to reinforce that Terry Hershey North Trail is the best route to Energy Corridor destinations	Short	■□□□	$900	
	P1	Parking	Relocate bike racks to covered area	Short	■□□□	$1,000	
	C2	Connectivity	Cycle track connection to existing trail on Park Row	Medium	■■□□	$6,880	Coordinate with City of Houston and the Energy Corridor District
	C3	Connectivity	Trail Connection	Medium	■■□□	$100,350	Coordinate with City of Houston and the Energy Corridor District
	P2	Parking	Refrofit existing building for secure bike parking	Medium	■■□□	$5,000	
	C1	Connectivity	Opening in fence for trail access	Medium	■□□□	N/A	
DOWNTOWN TRANSIT CENTER	P1	Parking	Covered Bike Rack	Short	■□□□	$20,000	
	C1	Connectivity	Bike Connections	Long	■■■■	N/A	Coordinate with City of Houston and Downtown District; Cost to be determined after further analysis
QUITMAN STATION	P1	Parking	Covered Parking	Short	■□□□	$20,000	
	P2	Parking	Bike Share Station	Medium	■■□□	N/A	Coordinate with Houston B-Cycle; Cost must be negotiated with and potential sponsors identified
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once connection to White Oak Bayou trail is complete
THEATER DISTRICT STATION	P1	Parking	Covered Bike Rack	Short	■□□□	$1,000	
	P2	Parking	Bike Share Station	Short	■■□□	N/A	Coordinate with Houston B-Cycle; Cost must be negotiated with and potential sponsors identified
	W1	Wayfinding	Wayfinding	Short	■□□□	$900	
	C1	Connectivity	Two-way buffered bike connections from Buffalo Bayou	Long	■■■■	N/A	Coordinate with the City of Houston and Downtown District; Cost to be determined after further analysis
TMC TRANSIT CENTER	C2	Connectivity	Shared-Use Path	Short	■■□□	$13,600	Coordinate with the City of Houston UH Health Service Center / TMC
	P1	Parking	Covered Bike Rack	Short	■□□□	$1,000	
	W1	Wayfinding	Wayfinding	Short	■□□□	$900	
	C1	Connectivity	Shared-Use Path	Medium	■■■□	$103,730	Coordinate with Texas Medical Center

Table 6.4: Transit Node Implementation: First Priority Quartile

	[CONTINUED] **FIRST PRIORITY QUARTILE**						
	RECOMMENDATION		**DESCRIPTION**	**TIME FRAME**	**EASE OF IMPLEMENTATION**	**COST**	**PARTNERS AND NOTES**
UH-DOWNTOWN STATION	C1	Connectivity	Use existing elevator for trail access	Medium	■■■□	N/A	Coordinate with the City of Houston and UH Downtown
	W1	Wayfinding	Wayfinding	Short	■□□□	$450	
	P1	Parking	Bike Share Station	Medium	■■□□	N/A	Coordinate with the Houston B-Cycle, City of Houston and UH Downtown; Cost must be negotiated with and potential sponsors identified
WEST BELLFORT PARK & RIDE	P1	Parking	Covered Bike Rack	Short	■□□□	$1,000	
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once bayou trails are constructed
	C1	Connectivity	Shared-Use Path / Bridge	Long	■■■□	$500,000	Coordinate with Harris County Flood Control District
WESTCHASE PARK & RIDE	P1	Parking	Covered Bike Rack	Short	■□□□	$1,000	
	C1	Connectivity	Bike lanes across parking lot connecting future trail	Medium	■□□□	$8,450	Pursue once bayou trails are constructed
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once bayou trails are constructed
WHEELER STATION	P1	Parking	Covered Bike Rack	Short	■□□□	$1,500	
	P2	Parking	Bike Parking Station / Cage	Short	■■□□	$20,000	
	P3	Parking	Bike Share Station	Short	■■□□	N/A	Coordinate with Houston B-Cycle; Cost must be negotiated with and potential sponsors identified
	C1	Connectivity	Bike Lanes	Medium	■■■□	$84,190	Coordinate with City of Houston; may require modification to MTFP
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once C1 is implemented
WEST LOOP PARK & RIDE	C1	Connectivity	Install ped/bike bayou crossing with new bridge or modification of existing	Medium	■■■□	$110,000	Coordinate with Project Brays
	P1	Parking	Relocate bike racks to covered area	Short	■□□□	$1,000	
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	

	SECOND PRIORITY QUARTILE						
	RECOMMENDATION		DESCRIPTION	TIME FRAME	EASE OF IMPLEMENTATION	COST	PARTNERS AND NOTES
BELLAIRE TC	C1	Connectivity	Support Bike Lanes on South Rice Avenue	Long	■■■□	N/A	Coordinate with City of Bellaire; road may need to be widened
	W1	Wayfinding	Wayfinding	Short	■□□□	$900	Coordinate with the City of Bellaire Ad-Hoc Wayfinding Committee
EADO / STADIUM STATION	C1	Connectivity	Two-Way Bike Lane / Shared-Use Path	Short	■□□□	$139,950	Coordinate with City of Houston
	C2	Connectivity	Shared-Use Path	Short	■□□□	$123,040	Coordinate with City of Houston, Greater East End District, and EaDo District
	P1	Parking	Covered Parking	Short	■■□□	$20,000	Coordinate with City of Houston, Harris County Sports Authority, and potentially Houston Bike Share
	W1	Wayfinding	Wayfinding from Columbia-Tap Trail	Medium	■□□□	$900	
EASTWOOD TRANSIT CENTER	P1	Parking	Bike Share Station	Medium	■■□□	N/A	Coordinate with Houston B-Cycle; Cost must be negotiated with and potential sponsors identified
	C1	Connectivity	Shared-Use Path	Long	■■■□	$270,120	Coordinate with City of Houston, Greater East End District, TxDOT, and University of Houston (coordinate integration with UH Master Plan)
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue after completion of C1
HILLCROFT TRANSIT CENTER	C1	Connectivity	Shared-Use Path	Short	■■□□	$139,350	CenterPoint
	P1	Parking	Covered Bike Racks	Short	■□□□	$500	Locate racks under canopy
	W1	Wayfinding	Wayfinding	Short	■□□□	$900	
	C2	Connectivity	Shared-Use Path	Long	■■■□	$468,360	Coordinate with City of Houston, CenterPoint and Sharpstown District
	C3	Connectivity	Signed Bike Route	Long	■□□□	$1,926	Coordinate with City of Houston and Sharpstown District; Pursue after completion of C2
MACGREGOR PARK STATION	W1	Wayfinding	Wayfinding	Short	■□□□	$450	
	P	Parking	Covered Bike Rack	Short	■□□□	$1,000	

Table 6.5: Transit Node Implementation: Second Priority Quartile

	THIRD PRIORITY QUARTILE						
	RECOMMENDATION		DESCRIPTION	TIME FRAME	EASE OF IMPLEMENTATION	COST	PARTNERS AND NOTES
BAY AREA PARK & RIDE	C2	Connectivity	Support signed bike route on Feather Craft	Short	■□□□	N/A	Coordinate with City of Houston; provide input only
	C1	Connectivity	Support signed bike route on Sea Liner	Short	■□□□	N/A	Coordinate with City of Houston; provide input only
	P1	Parking	Covered Parking	Short	■□□□	$20,000	
	C3	Connectivity	Shared-Use Path	Medium	■■□□	$137,920	
	W1	Wayfinding	Wayfinding in Area	Medium	■□□□	$1,800	Pursue once area bicycle improvement are constructed
BURNETT TRANSIT CENTER	P1	Parking	Covered Parking	Short	■□□□	$20,000	
	P2	Parking	Bike Share Station	Medium	■■□□	N/A	Coordinate with Houston B-Cycle; Cost must be negotiated with and potential sponsors identified
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue after completion of connections to White Oak Bayou trails
	C1	Connectivity	Bike Lanes along Burnett	Long	■□□□	$12,090	Coordinate with City of Houston and Greater Northside District; pursue after Burnett Street is constructed
	C2	Connectivity	Direct connection to White Oak Bayou via bike lanes on Trentham	Long	■■■□	N/A	
	C3	Connectivity	Develop Hardy Yards with good bicycle connectivity	Long	■□□□	N/A	Coordinate with City of Houston and Greater Northside District
CENTRAL STATION	C1	Connectivity	Explore cycle track along Lamar connecting Buffalo Bayou to Discovery Green	Long	■■■■	N/A	Coordinate with City of Houston; Cost to be determined after further analysis
	P1	Parking	Bike Rack	Short	■■□□	$2,000	Coordinate with City of Houston and private property owners
GREENSPOINT TRANSIT CENTER	P1	Parking	Covered Parking	Short	■■□□	$20,000	Coordinate with Greenspoint Mall
	C1	Connectivity	Shared-Use Path	Long	■■■□	$188,160	Coordinate with City of Houston and Greenspoint District
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue after completion of Greens Bayou trails
KASHMERE TRANSIT CENTER	C1	Connectivity	Bike Connections along Kashmere	Long	■■□□	N/A	Coordinate with City of Houston
	C2	Connectivity	Shared-Use Path	Long	■■■□	$750,900	Coordinate with City of Houston
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue after completion of C1 and C2

Table 6.6: Transit Node Implementation: Third Priority Quartile

	(CONTINUED) THIRD PRIORITY QUARTILE						
	RECOMMENDATION		DESCRIPTION	TIME FRAME	EASE OF IMPLEMENTATION	COST	PARTNERS AND NOTES
MESA TRANSIT CENTER	P1	Parking	Covered Bike Rack	Long	■□□□	$1,000	Pursue after completion of C1
	C1	Connectivity	Shared-Use Path	Long	■■□□	N/A	Coordinate with private shopping center; pursue after completion of Halls Bayou trails
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue after completion of C1
NORTHLINE TRANSIT CENTER	P1	Parking	Covered Parking	Short	■□□□	$20,000	
	C1	Connectivity	Signed Bike Route	Medium	■□□□	$2,814	Coordinate with City of Houston and Greater Northside District
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue after completion of C1
PALM CENTER STATION	C1	Connectivity	Signed Bike Route	Medium	■□□□	N/A	Coordinate with City of Houston, Greater Southeast Management District, MacGregor Palm Terrace Civic Association and the Southeast Houston Transformaton Alliance
	C2	Connectivity	Bike Lanes	Medium	■□□□	N/A	
	P1	Parking	Covered Parking	Short	■□□□	$20,000	Locate covered bike rack near station or at Palm Center
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once bike connections are established

	FOURTH PRIORITY QUARTILE						
	RECOMMENDATION		DESCRIPTION	TIME FRAME	EASE OF IMPLEMENTATION	COST	PARTNERS AND NOTES
ACRES HOMES TC	P1	Parking	Covered Parking	Medium	■□□□	$20,000	
FIFTH WARD/ DENVERHARBOR	W1	Wayfinding	Wayfinding from Lyons Ave to Transit Center	Short	■□□□	$900	
	P1	Parking	Covered Parking	Medium	■■□□	$20,000	
	C1	Connectivity	Connections across IH-10	Long	■■■■	N/A	Coordinate with City of Houston and TxDOT
HIRAM CLARKE TRANSIT CENTER	P1	Parking	Covered Parking	Medium	■□□□	$20,000	
	C1	Connectivity	Shared-Use Path	Long	■■□□	$69,870	Coordinate with City of Houston and Five Corners District; Pursue once trails are constructed
	C2	Connectivity	Signed Bike Route	Long	■□□□	$1,500	Coordinate with City of Houston and Five Corners District; Pursue once bayou trail construction is complete
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue once bayou trails are constructed
KINGWOOD PARK & RIDE	C1	Connectivity	Wheel Stops	Short	■□□□	N/A	
	C2	Connectivity	Connections west of West Lake Houston Pkwy	Long	■■■■	N/A	Coordinate with City of Houston
	P1	Parking	Covered Parking	Medium	■□□□	$20,000	
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	
NORTHWEST TRANSIT CENTER	C1	Connectivity	Shared-Use Path	Medium	■■□□	$32,040	
	P1	Parking	Covered Parking	Medium	■□□□	$20,000	
	C2	Connectivity	Shared-Use Path	Long	■■■■	$389,520	Coordinate with TxDOT
NORTHWEST STATION P&R	C1	Connectivity	Bike Lanes	Long	■■□□	N/A	Coordinate with Jersey Village
	P1	Parking	Covered Bike Rack	Short	■□□□	$1,000	
	W1	Wayfinding	Wayfinding	Medium	■□□□	$900	Pursue once bike lanes are established
SOUTHEAST TRANSIT CENTER	C1	Connectivity	Signed Bike Route	Long	■■□□	N/A	Coordinate with City of Houston and Greater Southeast MD
	P1	Parking	Covered Bike Rack	Medium	■□□□	$1,000	Install racks under canopy
	W1	Wayfinding	Wayfinding	Long	■□□□	$900	Pursue once bike route is established

Table 6.7: Transit Node Implementation: Fourth Priority Quartile

Funding Sources

Though many proposed improvements may be funded internally through METRO's Capital Improvement Program (CIP) process, there are also other funding sources that may be leveraged. These include federal programs and city, state and local sources and partnerships. For improvements that are located outside of METRO facilities, leveraging partnerships in conjunction with METRO funds will be a major component of implementation.

METRO's CIP is largely based on agency priorities matched with project costs. The CIP is funded through various sources including federal formula funding, grants and local sales tax revenues. Each of these funding sources has requirements regarding the types of projects eligible. The local sales tax revenues are the most flexible and likely funding source to be utilized for projects connecting bikes to transit. Projects recommended through this study may be included in METRO's CIP if they meet agency priorities and have an infrastructure basis. Projects that include purchasing equipment or signage, constructing new access, installation of accommodations, maintenance or rehab work would all be eligible for inclusion.

Funding Sources for Partners

- City of Houston Capital Improvement Program and ReBuild Houston: The ReBuild Houston Initiative, approved by Houston voters in 2010, will address the ongoing improvement of drainage and street infrastructure with four funding sources: drainage utility fees, developer impact fees, ad valorem taxes, and third-party funds, including funding from METRO. The planning process for improvements in the CIP program follows four steps: identify needs, prioritize needs (worst first), develop solutions, and refer candidate projects. As portions of this funding are provided by METRO's General Mobility Program, bicycle improvements that improve connections to METRO facilities may be encouraged during street reconstructions relating to ReBuild Houston.

- Tax Increment Reinvestment Zones (TIRZ) budgets are funded through increased tax revenue that comes from development within the zones. This funding may be leveraged for street and quality of life improvements, especially when a case can be made that the improvement will increase the real estate tax revenues for the zones.

- Management District General Funds: Management District general fund revenue is obtained through the issuance of bonds paid for through ad valorem taxes, assessments, impact fees or other sources as established by the district. Management Districts also have the standing to apply for many types of federal and state funding.

Federal Funding Sources

MAP-21 (Moving Ahead for Progress in the 21st Century): MAP-21 went into effect on October 1, 2012, providing funding for programs with highway, transit, and non-motorized transportation improvements for fiscal years 2013 and 2014, replacing SAFETEA-LU legislation. The following MAP-21 programs could provide funding for future bicycle and transit linked improvements:

- Surface Transportation Program (STP) provides funding for projects that preserve or improve conditions and performance on any Federal aided highway, bridge projects on any public road, facilities for non-motorized transportation, transit capital projects and public bus terminals and facilities.

- Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides a flexible funding source for transportation projects and programs to help meet the requirements of the Clean Air Act.

- Transportation Alternatives (TA) includes funding for transportation alternative projects and recreational trails, among other activities.

- Federal transit programs, such as 5307 (Urbanized Area Formula Grants), 5310 (Enhanced Mobility of Seniors and Individuals with Disabilities), 5339 (Bus and Bus Facilities Program), could potenially be used to fund bicycle projects that expand access to, and use of, public transportation.

Evaluation of Effectiveness

In addition to the proposed recommendations, additional improvements to the connectivity between the City of Houston's bicycle system and the METRO system may become desirable, especially under two important circumstances: major service changes, such as the ongoing System Reimagining study, that alter the potential desirability of improvements at existing Transit Centers, Park & Rides or train stations, or the addition of new Transit Centers, Park & Rides and train stations. In these situations, METRO should evaluate potential improvements to wayfinding, bicycle parking and infrastructure by a similar set of criteria as used in prioritizing improvements in this study.

Evaluation Criteria for Improved Transit Nodes

Following significant service changes or the construction of new bicycle facilities, the following evaluation criteria should guide the desirability for improved bicycle facilities:

- Is a top 10 bicycle boarding route providing new service to the facility?

  0 points if no, 1 point if yes, 2 points if multiple routes

- Has the frequency of transit service increased, adding to the potential of the service to provide cyclists an advantaged trip?

  0 points if no peak hour frequent service at the station, 1 point for at least one peak hour frequent bus service, 2 points for Park & Ride Service, 3 points for Rail

- Is a top 10 bicycle productivity route providing new service to the facility?

  0 points if no, 1 point if yes, 2 points if multiple routes

- Does a new, dedicated bicycle facility expand the catchment area of the facility?

  1 point for bicycle lane > 0.5 miles, 1 point for a Shared-Use Path <0.25 miles, 2 points for Shared-Use Path >0.25 miles

- Have new destinations been constructed or population or job density expanded significantly in proximity to the facility?

  0 points for no destinations, 1 for a local destination, 2 for a regional destination, 3 for more than one regional destinations

Using these criteria, nodes can be assigned numeric values from 0 to 13. Using Table 6.3, they can be targeted immediately for improved bicycle parking, wayfinding and bicycle facilities, such as lanes, paths or signed routes, which will provide connection to the station.

Criteria for New Transit Nodes

Additionally, METRO may construct numerous additional facilities in the coming years. Some improvements, such as bicycle parking and wayfinding, may be added to all of these facilities at very low incremental cost during construction and should accompany all new construction. Others, such as potential connectivity improvements, must be evaluated on a case-by-case basis. The following criteria should be applied while evaluating potential improvements:

- Is a top 10 bicycle boarding route providing service to the facility?

  0 points if no, 1 point if yes, 2 points if multiple routes

- Does the facility accommodate high level transit service?

  0 points if no peak hour frequent service at the station, 1 point for at least one peak hour frequent bus service, 2 points for Park & Ride Service, 3 points for Rail

- Is a top 10 bicycle productivity route providing service to the facility?

  0 points if no, 1 point if yes, 2 points if multiple routes

- Is a dedicated bicycle facility in close proximity that can expand the catchment area of the facility?

  1 point for bicycle lane > 0.5 miles, 1 point for a Shared-Use Path <0.25 miles, 2 points for Shared-Use Path >0.25 miles

- Are major destinations or significant population or job density in proximity to the facility?

  0 points for no destinations, 1 for a local destination, 2 for a regional destination 3 for more than one regional destinations.

- Is the facility adjacent to a major barrier (highways, disrupted grid, waterways)?

  0 if no, 1 if yes

Using these criteria, nodes can be assigned numeric values from 0 to 13. Using Table 6.3, they can be targeted immediately for improved bicycle parking, wayfinding and bicycle facilities, such as lanes, paths or signed routes, which will provide connection to the station.

	0 TO 4 POINTS	5 TO 8 POINTS	9 TO 13 POINTS
TRANSIT CENTERS	**Parking:** Provide at least 6 covered parking spaces for cyclists. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps. **Facilities:** None.	**Parking**: Provide 6 covered parking spaces for cyclists with an increase of 1 space for every 300 boardings. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide signed bicycle route or bicycle lane connections to nearby lanes or trails.	**Parking:** Provide 6 covered parking spaces with an increase of 1 space for every 300 boardings. Pilot 2 to 4 bicycle lockers. **Wayfinding**: Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide bicycle lane or shared-use path connection to nearby lanes or trails **Bicycle Share**: Consider as a location for B-Cycle expansion.
PARK & RIDE STATIONS	**Parking:** Provide at least 6 covered parking spaces for cyclists **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps **Facilities:** None	**Parking:** Provide 6 covered parking spaces for cyclists with an increase of 1 space for every 200 boardings. Pilot 2 to 4 bicycle lockers. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide signed bicycle route or bicycle lane connections to nearby lanes or trails.	**Parking:** Provide 6 covered parking spaces with an increase of 1 space for every 200 boardings. Pilot 4 to 6 bicycle lockers. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide bicycle lane or shared-use path connection to nearby lanes or trails.
METRORail STATIONS	**Parking:** Provide at least 6 covered parking spaces for cyclists **Wayfinding**: Incorporate bicycle wayfinding into existing station signs and maps **Facilities:** None	**Parking:** Provide 6 covered parking spaces for cyclists with an increase of 1 space for every 400 boardings. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide signed bicycle route or bicycle lane connections to nearby lanes or trails. **Bicycle Share**: Consider as a location for B-Cycle expansion.	**Parking:** Provide 6 covered parking spaces with an increase of 1 space for every 400 boardings. Pilot 2 to 4 bicycle lockers. **Wayfinding:** Incorporate bicycle wayfinding into existing station signs and maps and provide direction, distance and destination signage on nearby trails and bicycle lanes and at the station. **Facilities:** Provide bicycle lane or shared-use path connection to nearby lanes or trails **Bicycle Share:** Consider as a high-potential location for B-Cycle expansion.

Table 6.8: Potential Future Improvements

Future bicycle parking improvements and upgrades

Bicycle parking, including racks and lockers, has the advantage of being both relatively inexpensive and flexible. Improved data collection regarding the usage of bicycle racks at Transit Centers, along with data regarding the usage of bicycle lockers, will give METRO an advantage in adding additional parking amenities at new and existing transit stations.

As suggested in Table 6.8, different types of METRO facilities will have different parking needs. Park & Ride facilities, for example, will have a greater need for long term (full day) parking, while METRORail stations may be better targets for BikeShare stations. As suggested in the recommendations section, METRO should establish policies regarding minimum bicycle parking provisions at stations, which could be tied to boardings. For example, a ratio of 1 bicycle parking space for every 200 daily boardings would provide 10 bicycle parking spaces at West Bellfort Park & Ride, which has approximately 2000 daily boardings, or 35 bicycle parking spaces at Texas Medical Center Transit Center, which has almost 7000. A ratio of 1 to 300 would provide 7 and 24 spaces respectively. A pilot program involving regular counts regarding the use of racks should be established to tailor a proper ratio and provide data that will establish the necessity of adding additional racks or upgrading to bicycle lockers. As in vehicle parking, both too little and too much parking availability represent a problem. Too little parking will lead to a belief that it is difficult to ride to METRO and encourage people not to ride. Too much parking makes it appear as though fewer people are bicycling. In the previous example of West Bellfort Park & Ride, if 7 of the racks (or 70%) are found to be used regularly, additional parking could be established to reduce the used racks to 50% of the total and lockers could be piloted at the facility.

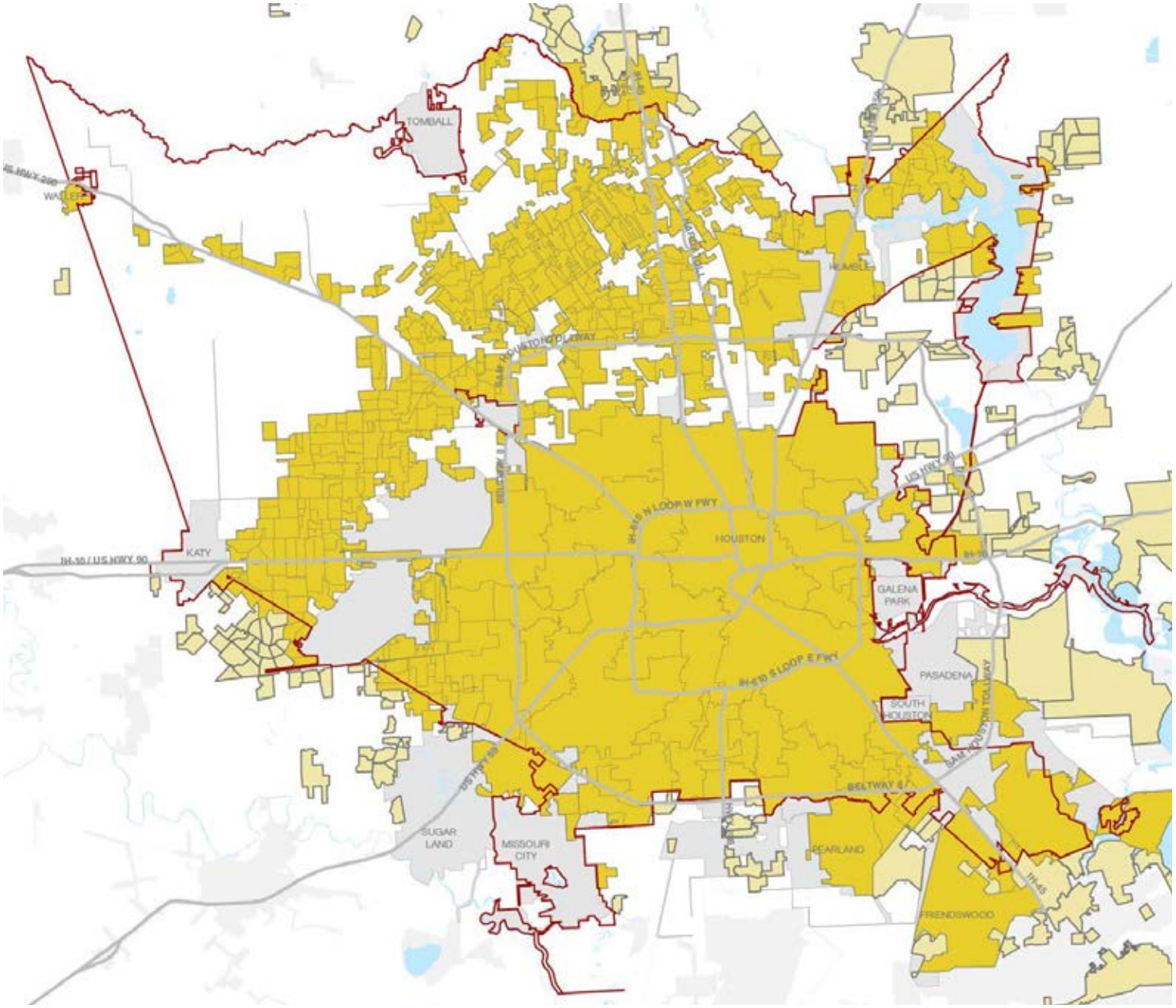
Additionally, as bicycle lockers are mobile, if data collection shows them to be underutilized at a particular node they can be relocated to other locations after a trial period.

APPENDIX

APPENDIX I

Municipal Utility Districts Per Census Tract

METRO Service Area



MUNICIPAL UTILITY DISTRICTS (MUD)

- METRO SERVICE AREA
- MUD intersecting Service Area
- MUD outside Service Area

Source: Houston - Galveston Area Council

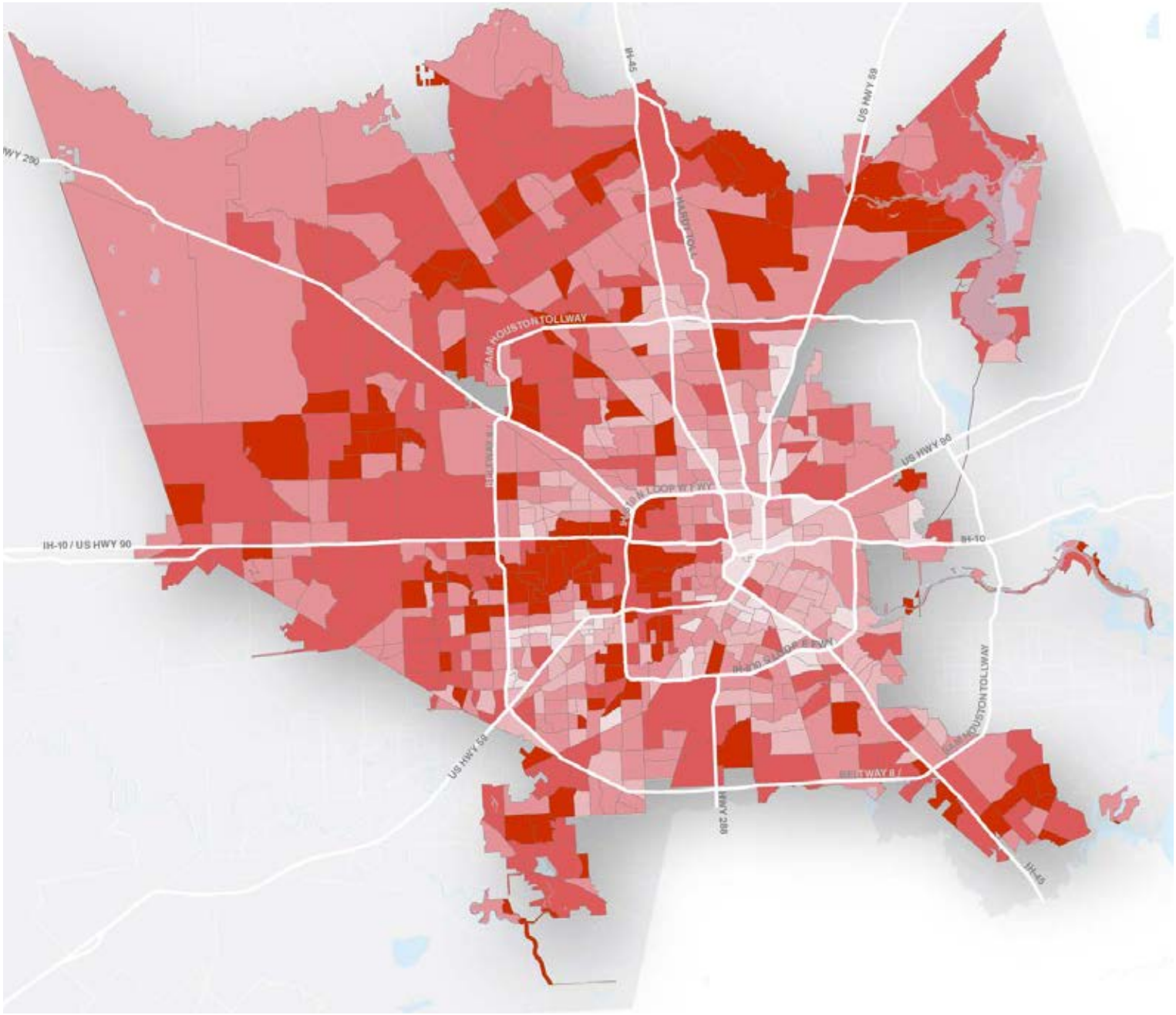
DISTRICT NAME

Addicks UD
Aldine MUD
Aldine PUD
Baker Road MUD
Bammel UD
Barker - Cypress MUD
Baybrook MUD
Bayfield MUD
Bear Creek UD
Beechnut MUD
Bilma UD
Bissonnet MUD
Blue Ridge West MUD
Braes UD
Bridgestone MUD
CLCWA
CNP UD
Carnfield MUD
Castlewood MUD
Charterwood MUD
Chelford City MUD
Chelford One MUD
Chimney Hill MUD
Cimmaron MUD
Cinco MUD 3, 5-9
Clay Road MUD
Cornerstone MUD
Cy-Champ PUD
Cypress Creek UD
Cypress Forest PUD
Cypress Hill MUD 1 & 2
Cypress - Klein UD
Cypresswood UD
Dove Meadows MUD
Dowell PUD
Emerald Forest UD
Encanto Real UD
Enchanted Valley PUD
FBC MUD 2, 24
FBC WCID 2
Fallbrook UD
Faulkey Gully MUD
Forest Cove MUD
Forest Hills MUD
Forest Hills MUD
Forest Point MUD
Forests Edge MUD
Fountainhead MUD
Friendswood, City of
Fry Road MUD
Grant Road PUD
Green Trails MUD
Green Valley MUD
Greens Parkway MUD
Gulfway UD
H-FBC MUD 1, 3-5
HC FWSD 45, 52, 58, 61
HC MUD (197 total)
HC UD (15 total)
HC WCID (21 total)
Heatherloch MUD
Horsepen Bayou MUD
Houston, City of
Houston FWSD 17
Huffsmith Road PUD
Humble, City of
Hunter's Glen MUD
Hunterwood MUD
Interstate MUD
Interwood MUD
Inverness Forest ID
Jackrabbite PUD
Kingsbridge MUD
Kingwood Place South MUD
Kirkmont MUD
Klein PUD
Kleinwood MUD
Kukendahl Road PUD 1 & 2
Lake Forest Plt. Adv. Council
Langham Creek UD
Longhorn Town UD
Louetta North PUD
Louetta Road UD
MC MUD (6 total)
Malcomson Road UD
Mason Creek UD
Mayde Creek MUD
Memorial Hills UD
Memorial MUD
Mills Road MUD
Mission Bend MUD 1 & 2
Morton Road MUD
Mossey Oaks UD
Mount Houston Road MUD
NE HC MUD 1
NW HC MUD (27 total)
North Belt UD
North Forest MUD
North Green MUD
North Park MUD
Northampton MUD
Northgate Crossing MUD 1-3
Northway MUD
Northwest Freeway MUD
Nottingham County MUD
Oakmont PUD
Park Ten MUD
Pasadena, City of
Pearland, City of
Pecan Park MUD
Pine Village PUD
Ponderosa Forest PUD
Post Oak Road MUD
Prestonwood Forest UD
Rankin Road West MUD
Reid Road MUD 1 & 2
Remington MUD 1 - 3
Renn Road MUD
Ricewood MUD
Richey Road MUD
River club Estate MUD
Rolling Creek UD
Rolling Fork PUD
S MC MUD
Sage Meadow UD
Seabrook, City of
Sequoia ID
Shasla PUD
Spencer Road PUD
Spring Creek Forest PUD
Spring Cypress Road MUD
Spring PUD
Spring West MUD
TCF Asset Management Corp
Tattor Road MUD
Terranova West MUD
The Woodlands MUD 2
Three Lakes MUD 1
Tidwell Timbers MUD
Timber Lane UD
Timberlake ID
Tower Oaks Plaza MUD
W HC MUD (13 total)
Waller, City of
WCID 86 & 87
WHC MUD 6
West HC MUD 10 & 11
West Memorial MUD
West Park MUD
Westador MUD
West Park MUD
Westador MUD
Westgreen Point MUD
Westlake MUD 1
Weston MUD
Westway UD
White Oak Bend MUD
White Oak / 1960 MUD
Willow Chase MUD
Windfern Forest UD
Wood-Forest North UD
Woodcreek MUD

APPENDIX II: METRO SERVICE AREA DEMOGRAPHIC ANALYSIS

Percent Commute by Driving Alone Per Census Tract

METRO Service Area



PERCENT COMMUTE BY DRIVING ALONE

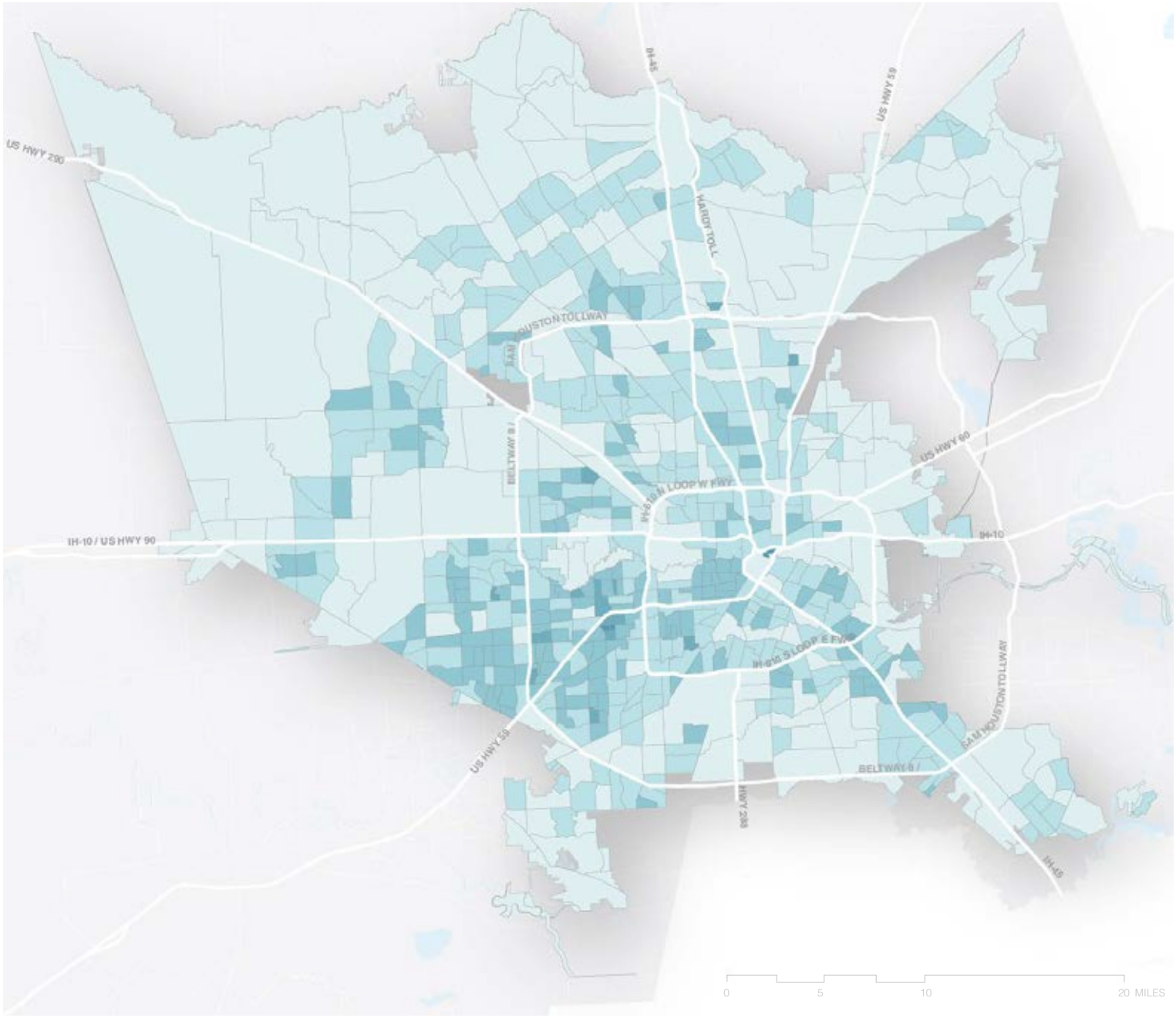
Workers 16 & Up Per Census Tract

- 5.3 - 55%
- 55 - 70%
- 70 - 80%
- 80 - 85%
- 85 - 100%

0 5 10 20 MILES

Source: 2010 American Community Survey 5 year Estimates

Population Density, People per Acre
METRO Service Area

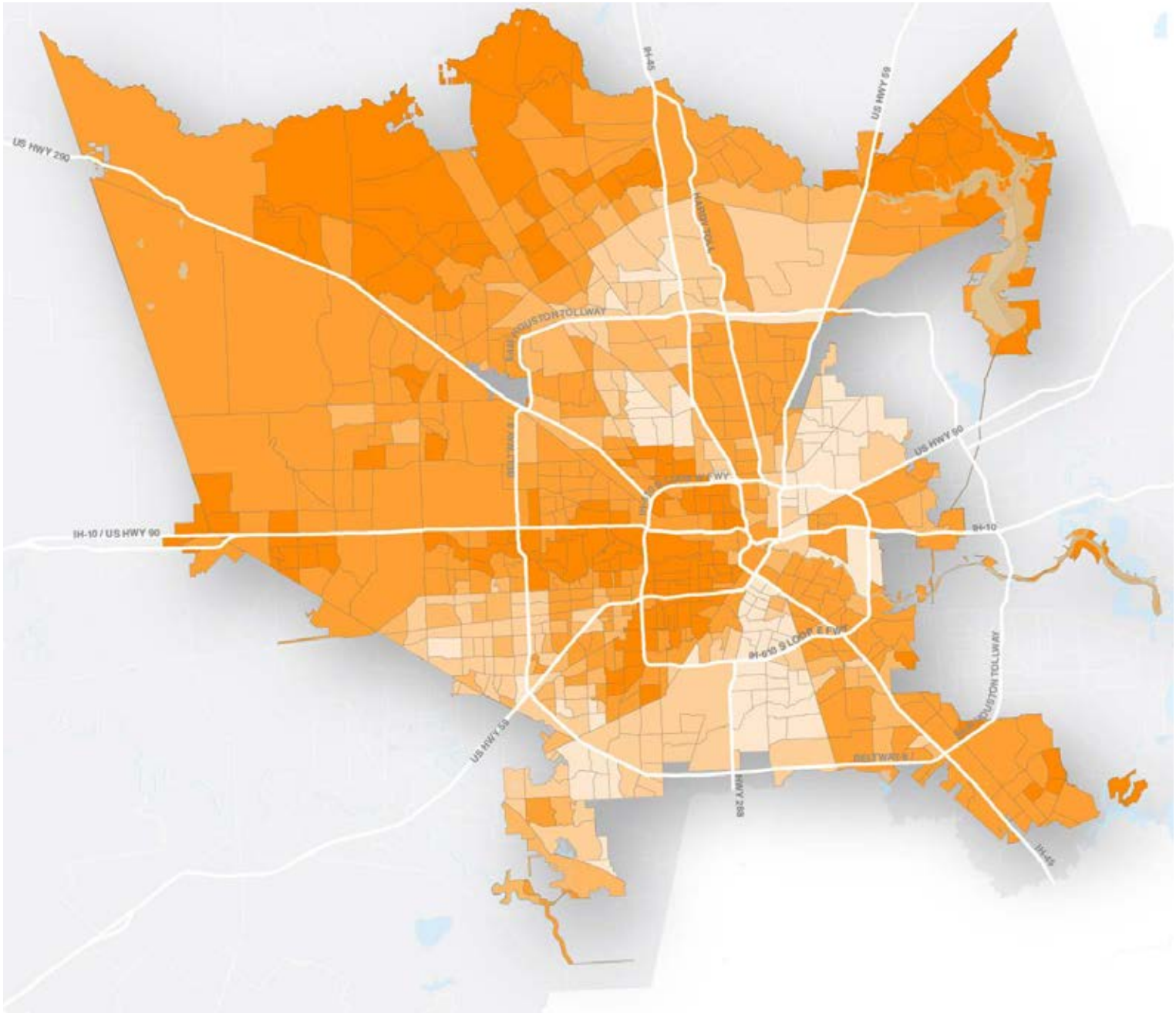


POPULATION DENSITY
People per Acre

- 0-5 people/acre
- 5-10
- 10-20
- 20-40
- 40-90

Source: 2010 Census

Percent White (One Race) Per Census Tract
METRO Service Area



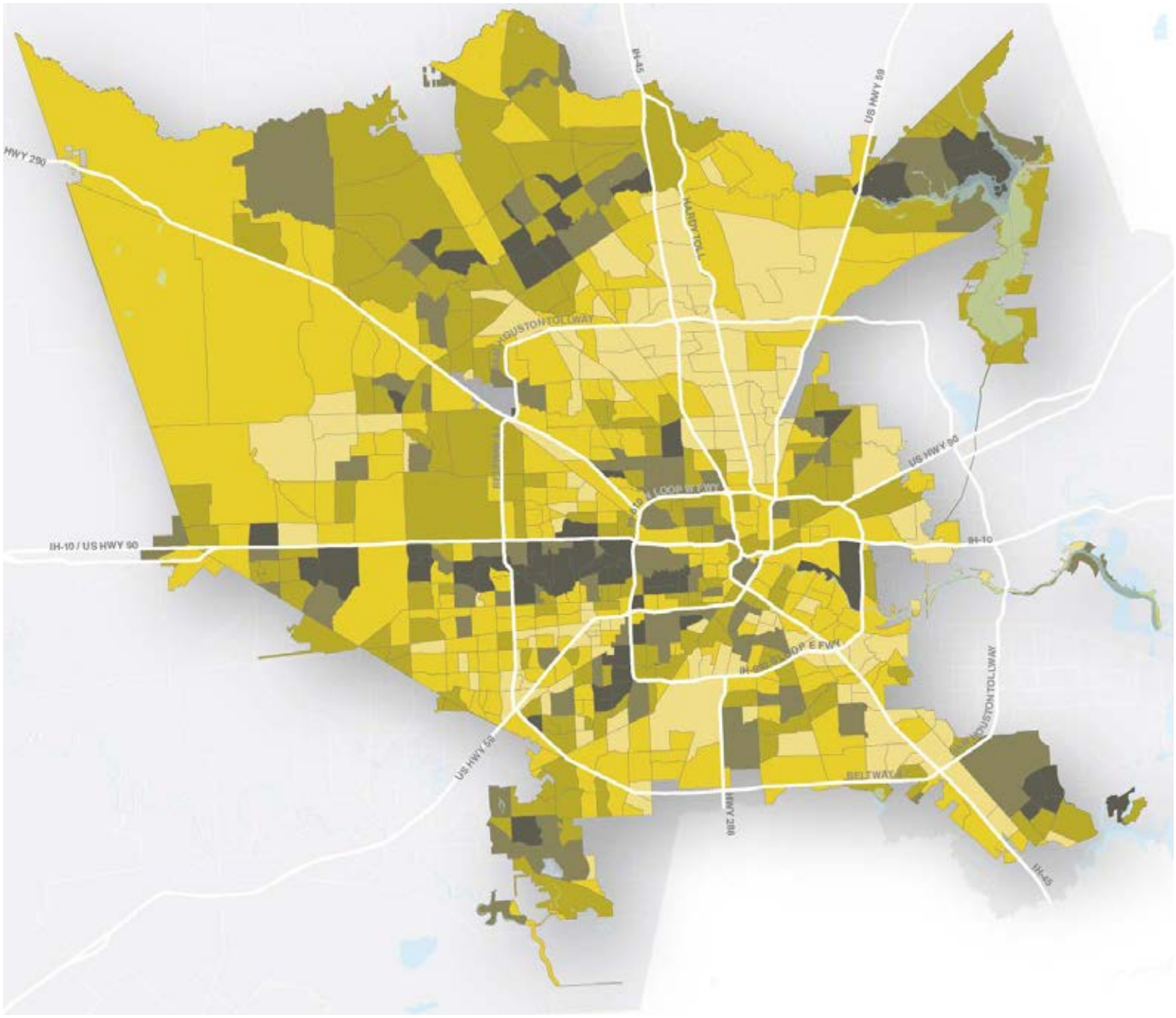
PERCENT WHITE (ONE RACE)
Per Census Tract

- 0 - 20%
- 20 - 40%
- 40 - 50%
- 50 - 75%
- 75 - 100%

0 5 10 20 MILES

Source: 2010 Census

Median Age Per Census Tract
METRO Service Area



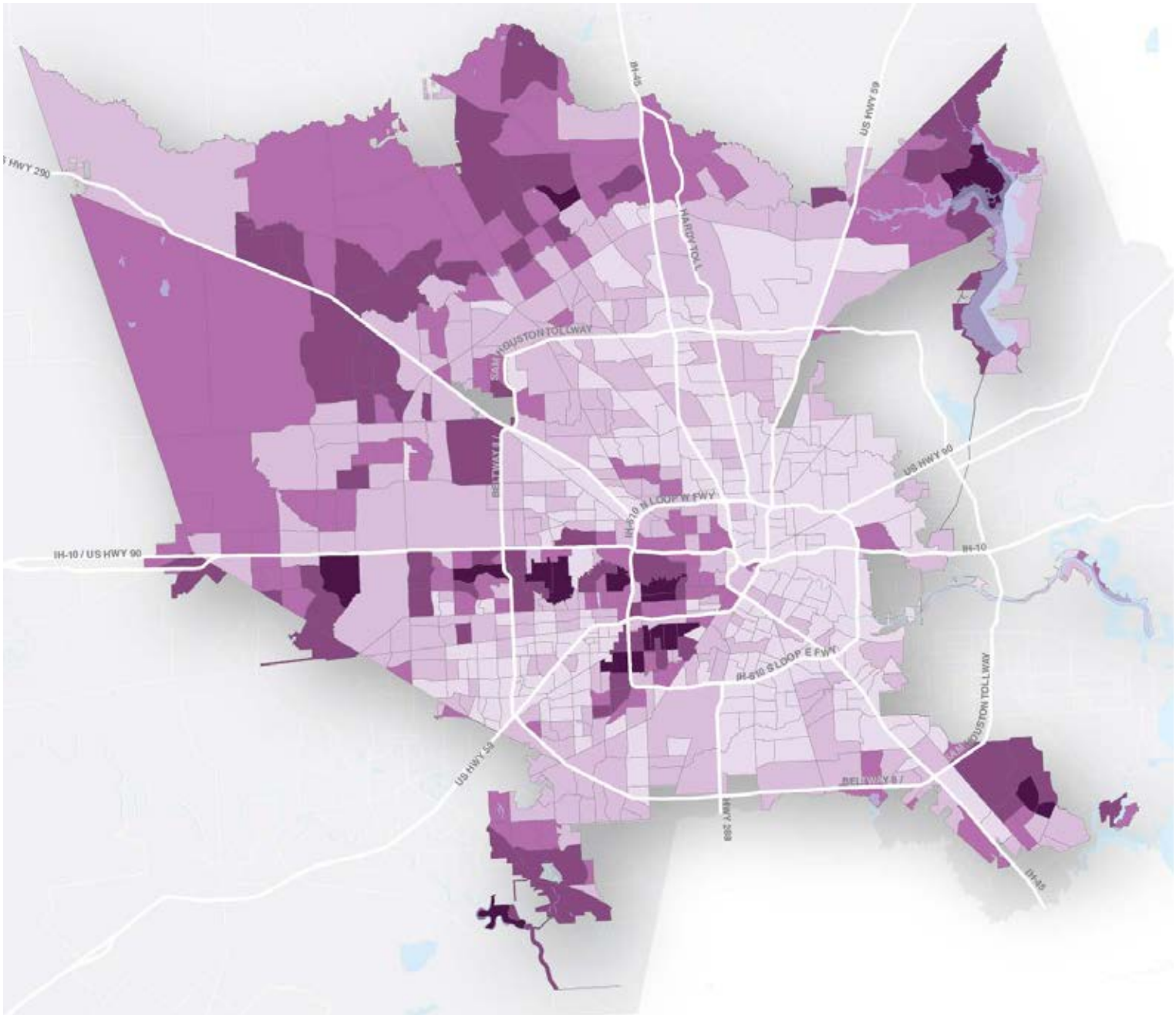
MEDIAN AGE
Per Census Tract

- 20.6 - 29
- 29 - 33
- 33 - 38
- 38 - 43
- 43 - 55.5

0 5 10 20 MILES

Source: 2010 American Community Survey 5 year Estimates

Median Annual Income Per Census Tract
METRO Service Area



MEDIAN ANNUAL INCOME
Per Census Tract

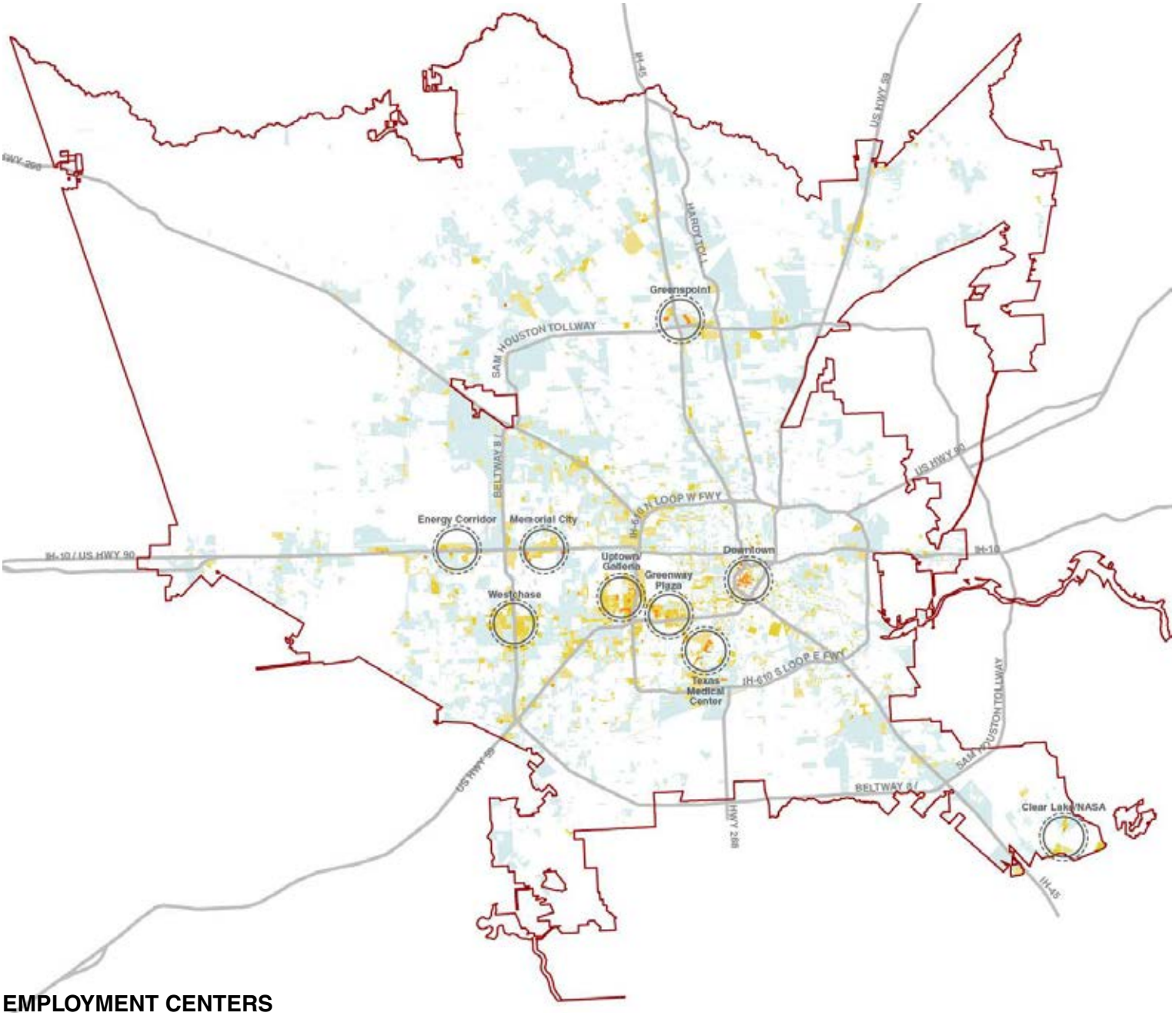
- $145,000-215,000
- $100,000-145,000
- $65,000-100,000
- $40,000-65,000
- Under $40,000

0 5 10 20 MILES

Source: 2010 American Community Survey 5 year Estimates

Job Density (Jobs per Acre)

METRO Service Area



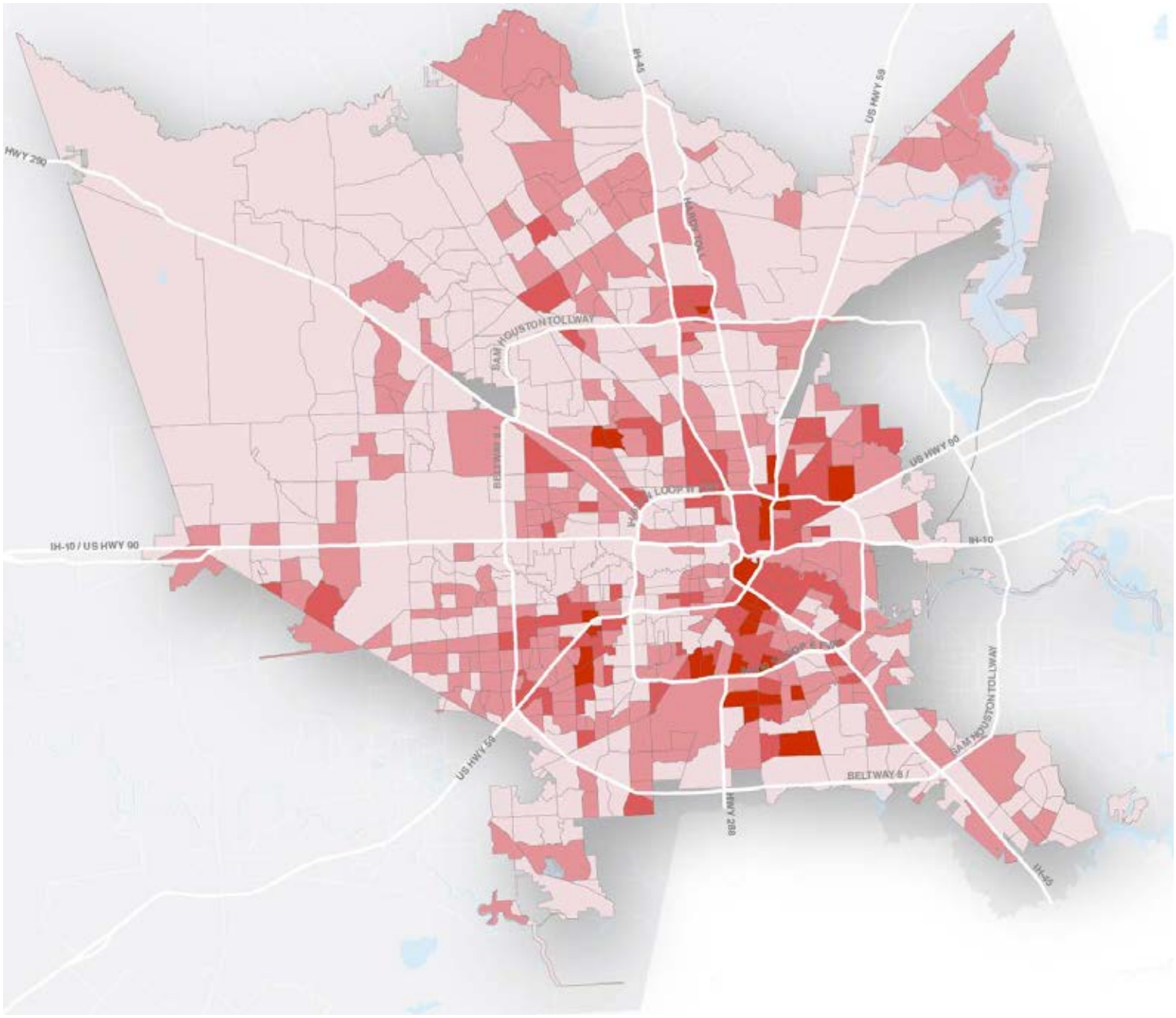
EMPLOYMENT CENTERS

JOBS PER ACRE

- 1 - 10
- 10 - 20
- 20 - 100
- 100 - 1000
- 1000 - 5000
- 5000 - 68,600
- Job Centers

Source: U.S. Bureau of Labor Statistics, 2010

Percent Commute by Public Transit Per Census Tract
METRO Service Area



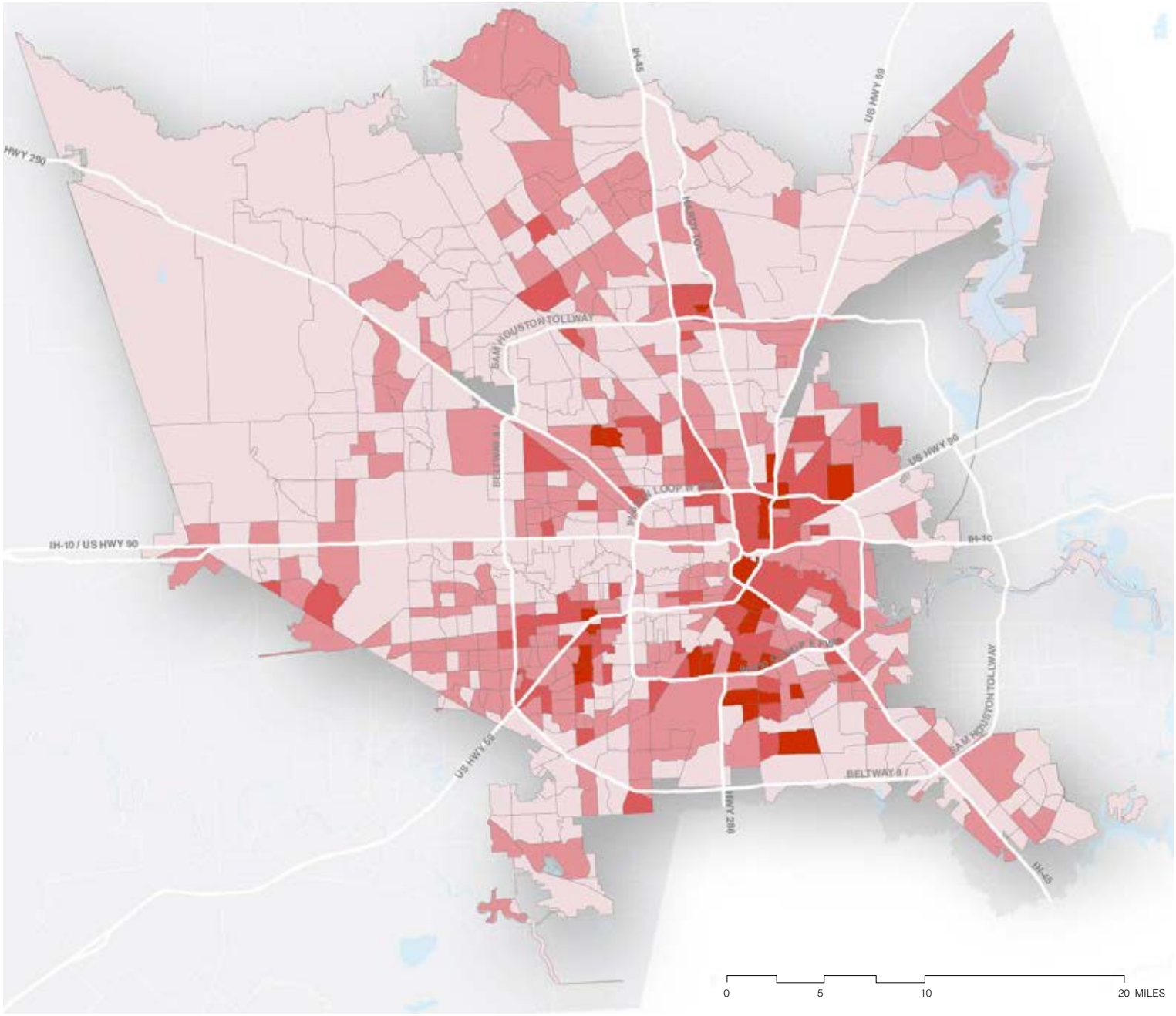
PERCENT COMMUTE BY PUBLIC TRANSIT
Workers 16 & Up Per Census Tract

- 0 - 2.5%
- 2.5 - 7%
- 7 - 15%
- 15 - 35.3%

0 5 10 20 MILES

Source: 2010 American Community Survey 5 year Estimates

Percent Commute by Walking Per Census Tract
METRO Service Area



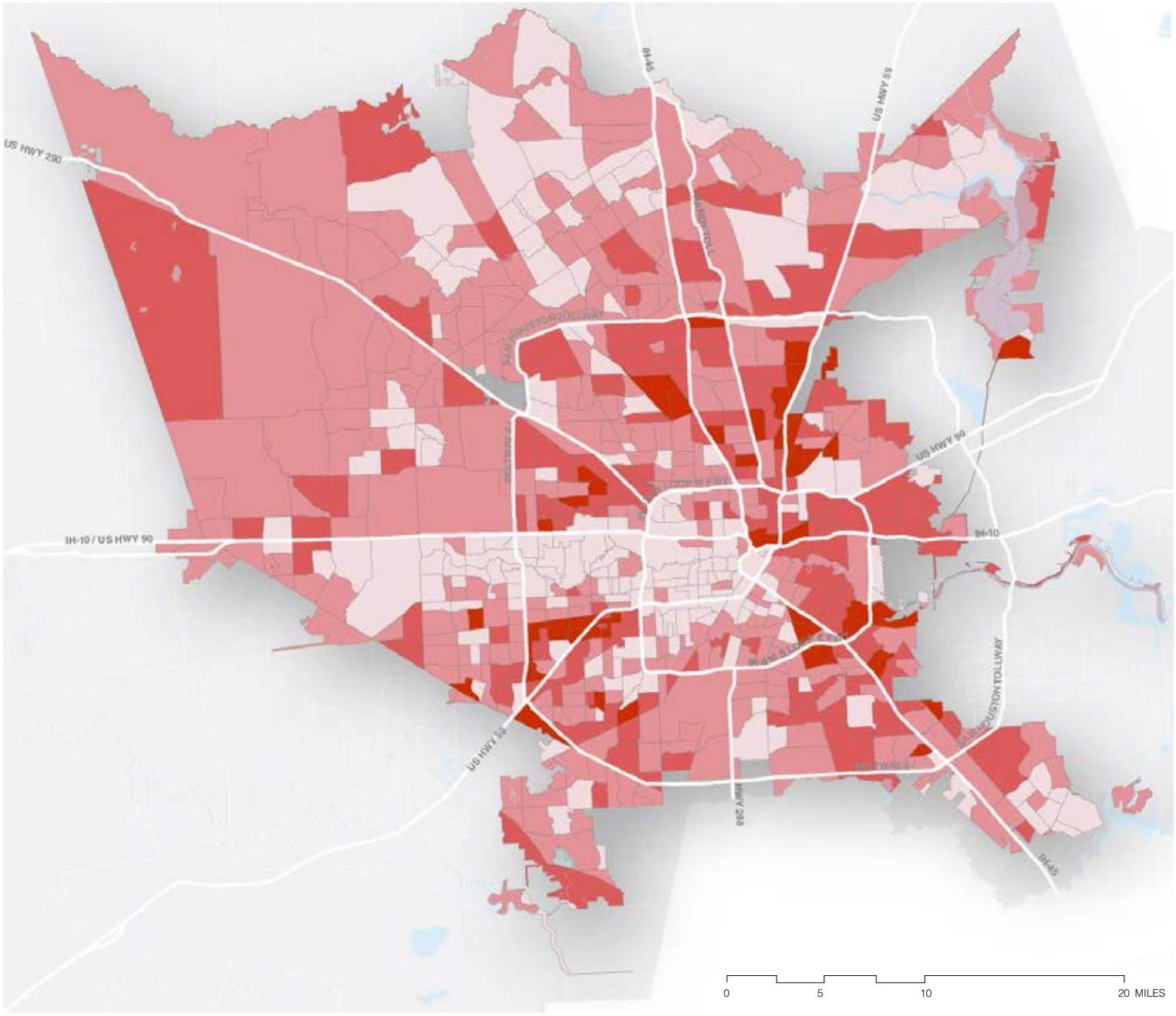
PERCENT COMMUTE BY WALKING
Workers 16 & Up Per Census Tract

- 0 - 2%
- 2 - 6%
- 6 - 24%
- 24 - 77.5%

Commute by walking is relatively common in the Houston Area. Perhaps owing to Houston's unique status as an "unzoned" city, mixed land-uses may contribute to a greater amount of jobs in close proximity to residential properties. As a number of communities in Houston lack even the most basic infrastructure for walking, these numbers could likely be significantly improved in the future.

Source: 2010 American Community Survey 5-year Estimates

Percent Commute by Carpooling Per Census Tract
METRO Service Area



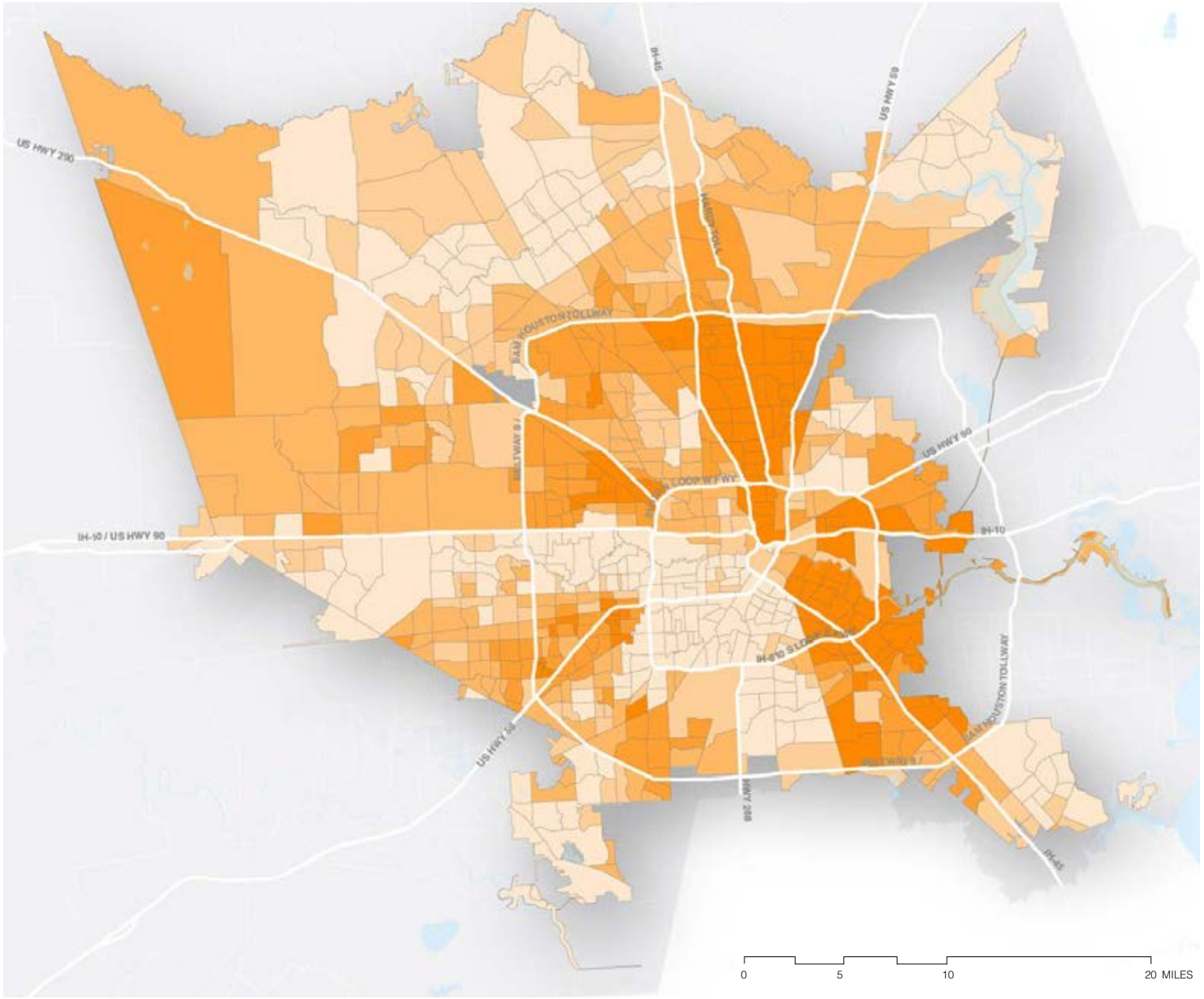
PERCENT COMMUTE BY CARPOOLING
Workers 16 & Up Per Census Tract

- 0 - 8%
- 8 - 15%
- 15 - 25%
- 25 - 51.2%

Carpooling is an attractive commute option for many residents outside of the 610 loop and in the outlying areas of the Service Area.

Percent Hispanic or Latino Ethnicity Per Census Tract

METRO Service Area



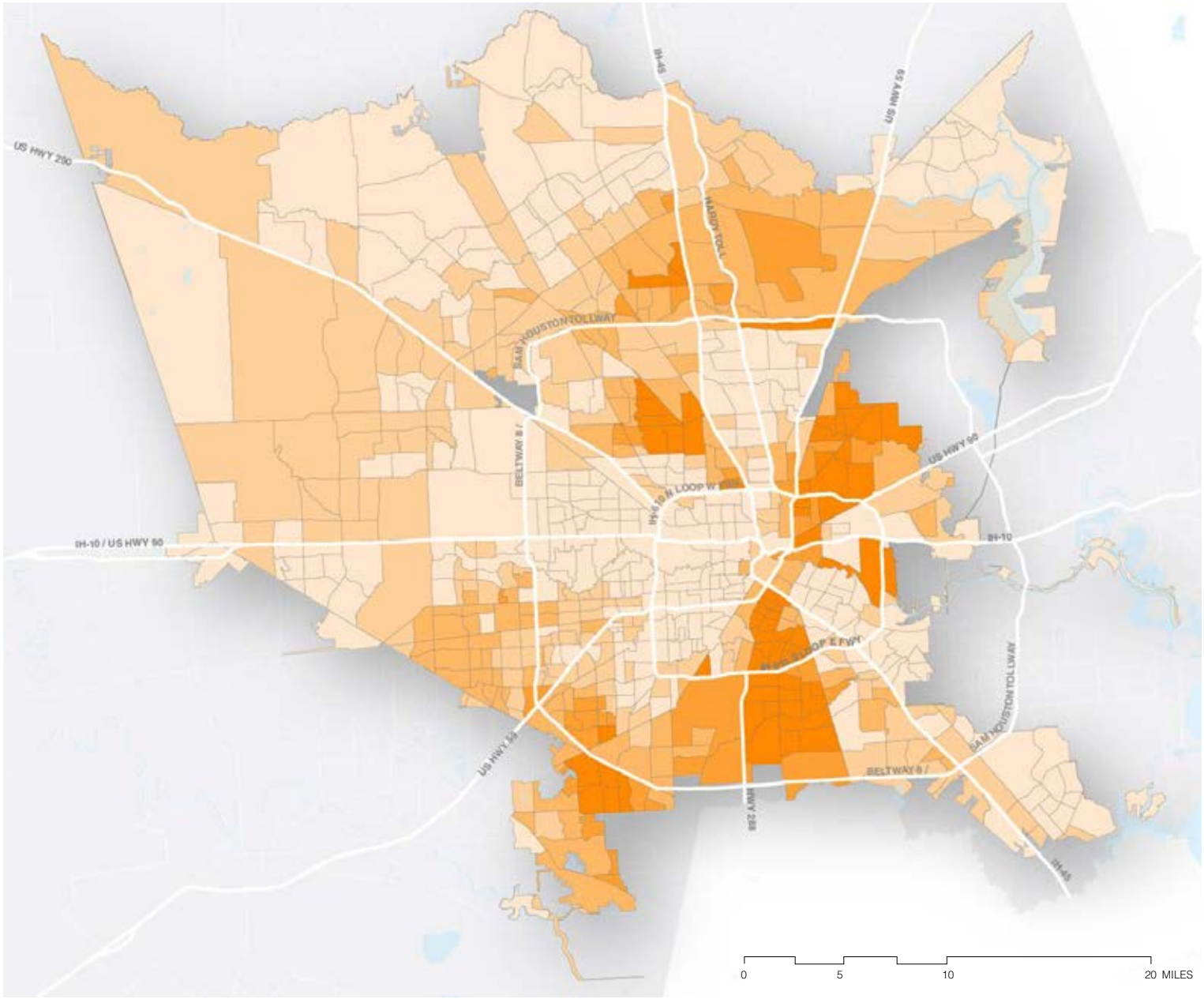
PERCENT HISPANIC OR LATINO ETHNICITY

Per Census Tract

- 0 - 20%
- 20 - 30%
- 30 - 50%
- 50 - 70%
- 70 - 100%

Source: 2010 Census

Percent Black / African American (One Race) Per Census Tract
METRO Service Area

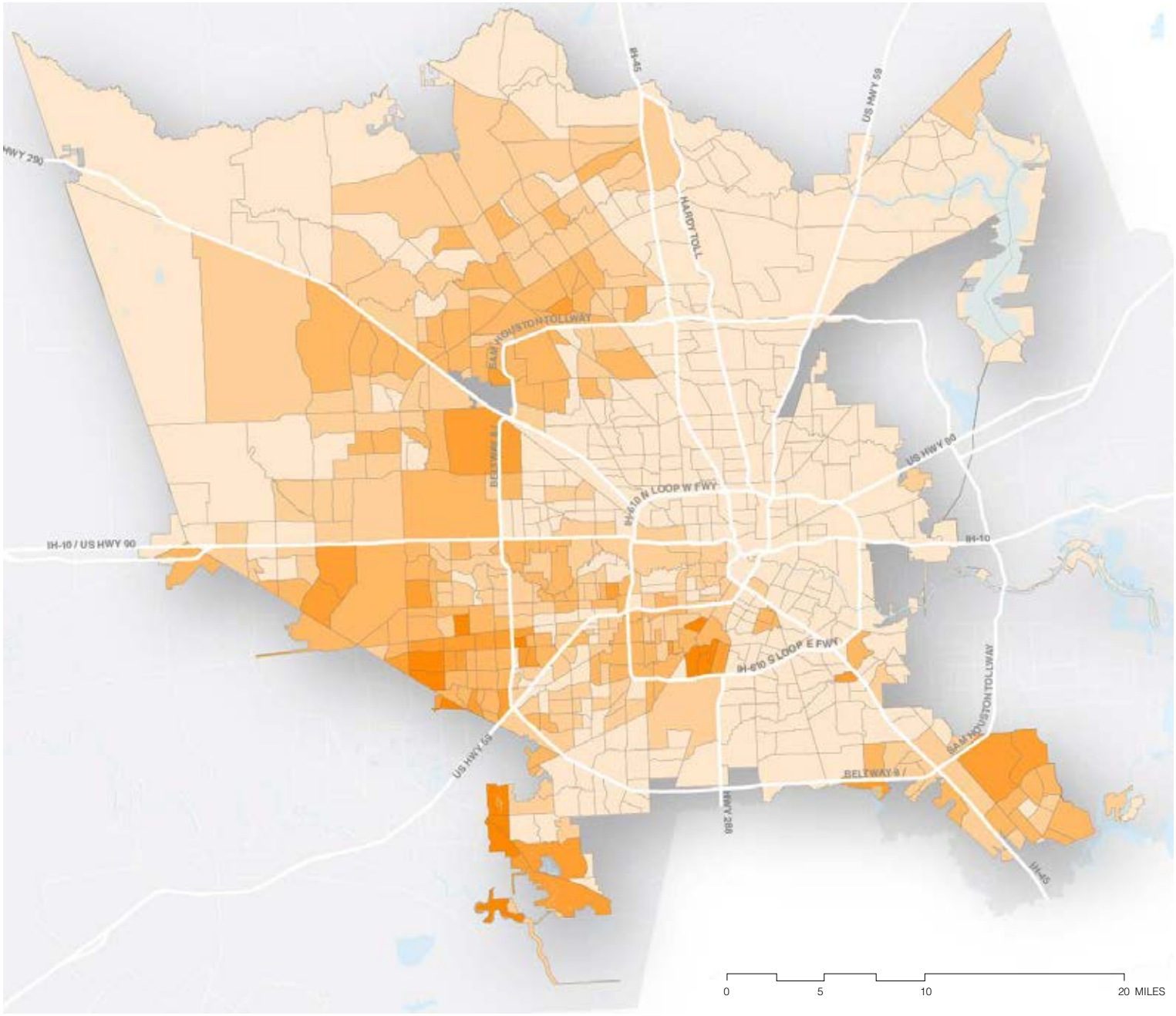


PERCENT BLACK / AFRICAN AMERICAN (ONE RACE)
Per Census Tract

- 0 - 10%
- 10 - 25%
- 25 - 45%
- 45 - 65%
- 65 - 100%

Source: 2010 Census

Percent Asian (One Race) Per Census Tract
METRO Service Area



PERCENT ASIAN (ONE RACE)
Per Census Tract

- 0 - 5%
- 5 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 50%

Source: 2010 Census

APPENDIX III
Regression Analysis

TYPE	ROUTE #	ROUTE	BIKE BOARDINGS	Aug 2012 WD Rev Miles	Aug 2012 WD Rev Hours	Aug 2012 Sat Rev Miles	Aug 2012 Sat Rev Hours	Aug 2012 Sun Rev Miles	Aug 2012 Sun Rev Hours	Annualized Rev Miles	Annualized Rev Hours
EXPRESS	102	BUSH IAH LTD	782	2243	116	1653	74	1653	73	754268	37651
EXPRESS	108	VETERANS MEMO-RIAL LTD	1141	2016	99					510048	25047
EXPRESS	131	MEMORIAL LTD	1408	1740	92	925	43			490170	25598
EXPRESS	132	HARWIN LTD	1461	1732	105	719	37			477022	28563
EXPRESS	137	NORTHSHORE LTD	4640	1618	89	970	50	820	42	510114	27695
EXPRESS	163	FONDREN LTD	3388	2743	211	1972	153	1749	131	903658	69374

TYPE	ROUTE #	ROUTE	BOARDING/ / 1000 MILE	BOARDING / 100 HOURS	DRIVE ALONE COMMUTE (%)	ALTERNATIVE COMMUTE MODE (%)	POPULATION DENSITY	PERCENT WHITE	MEDIAN INCOME	Weekday Miles	Weekend Miles	Weekday Miles	JOBS PER ACRE	PERCENT MINORITY	MEDIAN AGE
EXPRESS	102	BUSH IAH LTD	1.037	2.077	69.456	30.544	8.583	49.524	39069.833	2243	3306	2243	17.450	50.476	31.174
EXPRESS	108	VETERANS MEMORIAL LTD	2.237	4.555	72.922	27.078	8.627	46.859	43368.229	2016	0	2016	15.525	53.141	31.973
EXPRESS	131	MEMORIAL LTD	2.872	5.500	76.154	23.846	8.488	67.796	69313.675	1740	925	1740	19.147	32.204	37.164
EXPRESS	132	HARWIN LTD	3.063	5.115	72.028	27.972	13.525	53.037	56011.500	1732	719	1732	21.565	46.963	33.704
EXPRESS	137	NORTHSHORE LTD	9.096	16.754	67.766	32.234	8.455	51.079	40142.273	1618	1790	1618	21.489	48.921	32.289
EXPRESS	163	FONDREN LTD	3.749	4.884	71.362	28.638	12.972	57.999	60286.557	2743	3721	2743	22.185	42.001	34.666

TYPE	ROUTE #	ROUTE	BIKE BOARDINGS	Peak Head-way	Aug 2012 WD Rev Miles	Aug 2012 WD Rev Hours	Aug 2012 Sat Rev Miles	Aug 2012 Sat Rev Hours	Aug 2012 Sun Rev Miles	Aug 2012 Sun Rev Hours	Annualized Rev Miles	Annualized Rev Hours
LOCAL	1	HOSPITAL	3493	15	2333	196	1229	88	883	70	708712	58470
LOCAL	2	BELLAIRE	3495	11	2524	227	2064	173	1405	106	832923	73027
LOCAL	3	LANGLEY_WEST GRAY	1700	19	1457	112	757	56	689	51	450150	34369
LOCAL	4	BEECHNUT	2569	16	2098	154	1430	91	1267	77	682767	48419
LOCAL	5	KASHMERE_SOUTHMORE	3189	15	2521	202	1855	134	1592	115	831911	65127
LOCAL	8	SOUTH MAIN	2139	21	1430	108	765	57	564	34	436376	32408
LOCAL	10	WILLOWBEND	306	28	657	52	483	36	333	19	211950	16221
LOCAL	11	NANCE_ALMEDA	1849	33	1312	100	1248	92	664	44	438504	32864
LOCAL	14	HIRAM CLARKE	1036	12	1303	103	835	56	705	55	416344	32328
LOCAL	15	FULTON	1313	12	932	91	750	72	607	54	312109	30097
LOCAL	19	WILCREST	728	20	703	52	457	29			202537	14722
LOCAL	20	CANAL_LONG POINT	4394	16	2268	165	1834	114	1494	94	760986	53447
LOCAL	23	CROSSTIMBERS	2309	25	957	69	420	29	384	27	287457	20616
LOCAL	24	NORTHLINE	1968	18	812	83	695	69	610	53	278956	27852
LOCAL	25	RICHMOND	4454	12	2235	199	1395	115	878	70	692587	60687
LOCAL	26	OUTER LOOP	1626	21	1115	96	577	42	455	33	340098	28503
LOCAL	27	INNER LOOP	1914	20	1138	98	602	44	481	35	348801	29235
LOCAL	29	TSU_UH_HIRSCH CROSSTOWN	1028	23	930	78	628	47			269202	22272
LOCAL	30	CULLEN_CLINTON	1975	20	1945	147	1531	102	1531	102	665088	48717
LOCAL	32	RENWICH	264	21	61	49	632	49			49561	15043
LOCAL	33	POST OAK CROSSTOWN	2580	13	1988	174	822	63	823	63	595909	51141
LOCAL	34	MONTROSE CROSSTOWN	368	33	472	38					119416	9614
LOCAL	36	LAWNDALE_KEMPWOOD	2489	14	2043	150	1106	75	583	43	611000	44537
LOCAL	40	TELEPHONE_PECORE	5133	11	2899	223	1843	143	1719	128	934390	71693
LOCAL	42	HOLMAN CROSSTOWN	705	19	696	84	541	53	181	20	215981	25294
LOCAL	44	ACRES HOMES LTD	4617	22	2106	130	1584	86	1406	73	701308	41841
LOCAL	45	TIDWELL CROSSTOWN	2472	25	1507	99	824	51	824	51	474383	30810
LOCAL	46	GESSNER CROSSTOWN	5018	16	1540	127	957	75	581	41	475577	38600
LOCAL	47	HILLCROFT CROSSTOWN	511	30	405	39	530	45	316	25	149729	13772
LOCAL	48	NAVIGATION_W DALLAS	676	38	645	48	251	16	241	16	190958	13952
LOCAL	49	CHIMNEY ROCK CROSSTOWN	205	41	409	36	354	25			122593	10458
LOCAL	50	HEIGHTS HARRISBURG	7607	11	3583	290	2329	162	1621	110	1127904	88608
LOCAL	52	HIRSCH SCOTT	5302	10	3578	299	2589	195	2073	99	1167347	92018
LOCAL	53	BRIAR FOREST LTD	2740	15	2271	179	1069	76	978	70	689991	53521
LOCAL	56	AIRLINE LTD	6375	14	2333	165	1799	123	1700	118	787695	55349
LOCAL	59	ALDINE_MAIL CROSSTOWN	116	30	327	20					82731	5060
LOCAL	60	HARDY_S MACGREGOR	273	30	594	55	434	37	313	26	192185	17447
LOCAL	65	BISSONNET	3758	13	2279	193	1609	122	1381	99	744952	61258
LOCAL	66	YALE	2235	24	1316	111	1244	102	775	59	445849	37072
LOCAL	67	DAIRY ASHFORD CROSSTOWN	538	36	357	32					90321	8096
LOCAL	68	BRAYS BAYOU CROSSTOWN	1501	15	2103	169	1081	80	860	65	641173	50912
LOCAL	70	MEMORIAL	222	35	694	39					175582	9867
LOCAL	72	WESTVIEW CIRCULATOR	523	25	615	43	438	33	384	29	201903	14372
LOCAL	73	BELLFORT CROSSTOWN	2916	10	2293	184	1369	102	675	46	693880	54774
LOCAL	75	ENERGY CORRIDOR CONNECTOR	102	20	535	40					135355	10120
LOCAL	77	MLKING LTD_LIBERTY	4621	10	3327	255	2268	160	1888	130	1075595	80825
LOCAL	79	WEST LITTLE YORK	953	35	808	55	654	45			239740	16345
LOCAL	80	DOWLING_LYONS	1432	20	960	89	909	75	693	59	332853	30048
LOCAL	81	WESTHEIMER SHARPSTOWN	3212	16	1733	175	1200	115	1076	87	566733	55618
LOCAL	82	WESTHEIMER WEST OAKS	5914	18	2028	189	1481	129	1283	98	668755	60565
LOCAL	85	ANTOINE LTD	5097	13	2561	167	1430	94	1258	83	799375	52224
LOCAL	86	FM1960 CROSSTOWN	4503	16	1680	118	1196	67	953	52	545851	36540
LOCAL	87	SUNNYSIDE_PLAZA DEL ORO TMC	451	20	1363	111	956	71	770	56	441893	35221
LOCAL	88	HOBBY AIRPORT	2547	27	1504	101	1438	92			458164	30521
LOCAL	97	SETTEGAST SHUTTLE	86	60	307	16					77671	4048

TYPE	ROUTE #	ROUTE	BOARDING/ / 1000 MILE	BOARDING / 100 HOURS	DRIVE ALONE COMMUTE (%)	ALTERNATIVE COMMUTE MODE (%)	POPULATION DENSITY	PERCENT WHITE	MEDIAN INCOME
LOCAL	1	HOSPITAL	4.929	5.974	66.991	33.009	8.269	43.831	42103.209
LOCAL	2	BELLAIRE	4.196	4.786	71.602	28.398	14.262	50.354	56639.833
LOCAL	3	LANGLEY_WEST GRAY	3.777	4.946	68.632	31.368	8.439	47.420	42808.409
LOCAL	4	BEECHNUT	3.763	5.306	72.389	27.611	12.093	48.216	57304.907
LOCAL	5	KASHMERE_SOUTHMORE	3.833	4.897	67.406	32.594	8.670	35.898	35206.149
LOCAL	8	SOUTH MAIN	4.902	6.600	72.852	27.148	10.648	51.803	62123.000
LOCAL	10	WILLOWBEND	1.444	1.886	72.967	27.033	10.214	56.622	66540.238
LOCAL	11	NANCE_ALMEDA	4.217	5.626	66.882	33.118	8.579	40.307	40691.895
LOCAL	14	HIRAM CLARKE	2.488	3.205	71.693	28.307	8.333	50.172	61590.700
LOCAL	15	FULTON	4.207	4.363	65.430	34.570	9.725	52.896	40825.150
LOCAL	19	WILCREST	3.594	4.945	76.571	23.429	11.333	48.492	54081.896
LOCAL	20	CANAL_LONG POINT	5.774	8.221	71.386	28.614	8.934	64.073	51799.487
LOCAL	23	CROSSTIMBERS	8.033	11.200	73.902	26.098	16.178	66.378	61387.600
LOCAL	24	NORTHLINE	7.055	7.066	66.222	33.778	9.756	55.720	42756.439
LOCAL	25	RICHMOND	6.431	7.339	73.403	26.597	12.721	55.461	57667.154
LOCAL	26	OUTER LOOP	4.781	5.705	70.466	29.534	8.792	54.648	49706.875
LOCAL	27	INNER LOOP	5.487	6.547	70.466	29.534	8.792	54.648	49706.875
LOCAL	29	TSU_UH_HIRSCH CROSSTOWN	3.819	4.616	64.320	35.680	7.800	30.553	30717.700
LOCAL	30	CULLEN_CLINTON	2.970	4.054	66.878	33.122	7.846	37.589	35357.179
LOCAL	32	RENWICH	5.327	1.755	73.902	26.098	16.178	66.378	61387.600
LOCAL	33	POST OAK CROSSTOWN	4.330	5.045	75.942	24.058	11.887	62.286	66072.873
LOCAL	34	MONTROSE CROSSTOWN	3.082	3.828	71.951	28.049	9.891	64.824	59050.709
LOCAL	36	LAWNDALE_KEMPWOOD	4.074	5.589	69.222	30.778	9.108	60.781	46152.386
LOCAL	40	TELEPHONE_PECORE	5.493	7.160	70.450	29.550	8.848	57.135	44482.038
LOCAL	42	HOLMAN CROSSTOWN	3.264	2.787	65.524	34.476	9.100	49.404	39629.460
LOCAL	44	ACRES HOMES LTD	6.583	11.035	71.826	28.174	8.315	49.280	45030.685
LOCAL	45	TIDWELL CROSSTOWN	5.211	8.023	72.129	27.871	6.036	42.143	35944.589
LOCAL	46	GESSNER CROSSTOWN	10.551	13.000	73.544	26.456	10.327	50.953	55236.364
LOCAL	47	HILLCROFT CROSSTOWN	3.413	3.710	70.298	29.702	16.083	52.442	48910.229
LOCAL	48	NAVIGATION_W DALLAS	3.540	4.845	67.426	32.574	8.882	55.855	40979.029
LOCAL	49	CHIMNEY ROCK CROSSTOWN	1.672	1.960	76.149	23.851	13.673	67.513	71232.982
LOCAL	50	HEIGHTS HARRISBURG	6.744	8.585	71.350	28.650	8.451	58.731	43680.991
LOCAL	52	HIRSCH SCOTT	4.542	5.762	67.538	32.462	7.770	32.226	35076.299
LOCAL	53	BRIAR FOREST LTD	3.971	5.119	76.392	23.608	11.697	64.606	70808.030
LOCAL	56	AIRLINE LTD	8.093	11.518	69.736	30.264	8.861	49.981	40539.431
LOCAL	59	ALDINE_MAIL CROSSTOWN	1.402	2.292	69.967	30.033	6.292	50.642	37235.333
LOCAL	60	HARDY_S MACGREGOR	1.421	1.565	66.841	33.159	9.696	39.817	44183.174
LOCAL	65	BISSONNET	5.045	6.135	71.796	28.204	13.082	52.687	58526.859
LOCAL	66	YALE	5.013	6.029	69.823	30.177	8.984	55.033	45332.082
LOCAL	67	DAIRY ASHFORD CROSSTOWN	5.957	6.645	80.987	19.013	10.077	47.039	61094.615
LOCAL	68	BRAYS BAYOU CROSSTOWN	2.341	2.948	70.860	29.140	10.289	47.307	55320.835
LOCAL	70	MEMORIAL	1.264	2.250	80.658	19.342	8.788	73.679	74349.077
LOCAL	72	WESTVIEW CIRCULATOR	2.590	3.639	77.622	22.378	7.250	71.562	69851.944
LOCAL	73	BELLFORT CROSSTOWN	4.202	5.324	74.175	25.825	9.225	54.345	59936.750
LOCAL	75	ENERGY CORRIDOR CONNECTOR	0.754	1.008	81.880	18.120	8.720	49.898	63568.240
LOCAL	77	MLKING LTD_LIBERTY	4.296	5.717	67.663	32.337	7.253	33.679	34058.474
LOCAL	79	WEST LITTLE YORK	3.975	5.831	69.775	30.225	8.815	48.869	41900.015
LOCAL	80	DOWLING_LYONS	4.302	4.766	63.763	36.237	8.796	39.382	36688.245
LOCAL	81	WESTHEIMER SHARPSTOWN	5.668	5.775	71.010	28.990	14.577	63.204	56565.115
LOCAL	82	WESTHEIMER WEST OAKS	8.843	9.765	76.456	23.544	12.022	62.137	63733.444
LOCAL	85	ANTOINE LTD	6.376	9.760	74.313	25.687	8.609	53.990	50252.655
LOCAL	86	FM1960 CROSSTOWN	8.250	12.323	77.300	22.700	6.591	47.899	49619.795
LOCAL	87	SUNNYSIDE_PLAZA DEL ORO TMC	1.021	1.280	70.416	29.584	7.884	30.709	45414.605
LOCAL	88	HOBBY AIRPORT	5.559	8.345	68.375	31.625	9.562	51.534	41241.959
LOCAL	97	SETTEGAST SHUTTLE	1.107	2.125	74.813	25.187	3.133	37.844	36381.067

TYPE	ROUTE #	ROUTE	Peak Headway	Weekday Miles	Weekend Miles	Weekday Miles	JOBS PER ACRE	PERC MINORITY	MEDIAN AGE	Predicted Boardings/Mile	Predicted-Actual	More than 1/2 Std Dev below Expexcted	More than 1/2 Std Dev above Expexcted
LOCAL	1	HOSPITAL	15	2333	2112	2333	35.186104	56.168921	33.947761	4.086802165	-0.84185715		
LOCAL	2	BELLAIRE	11	2524	3469	2524	27.934761	49.646004	33.016667	5.503364311	1.307298168	Yes	
LOCAL	3	LANGLEY_WEST GRAY	19	1457	1446	1457	17.665664	52.580382	34.324242	4.451668324	0.675149386		
LOCAL	4	BEECHNUT	16	2098	2697	2098	29.845444	51.784207	33.222667	4.266701147	0.504070557		
LOCAL	5	KASHMERE_SOUTHMORE	15	2521	3447	2521	13.059995	64.102316	33.288298	4.931264947	1.097922197	Yes	
LOCAL	8	SOUTH MAIN	21	1430	1329	1430	32.028369	48.197479	35.088732	2.881553636	-2.020182481		Yes
LOCAL	10	WILLOWBEND	28	657	816	657	50.522169	43.377688	35.383333	1.696154801	0.25241807		
LOCAL	11	NANCE_ALMEDA	33	1312	1912	1312	35.245453	59.692815	33.4	2.334787416	-1.881821783		Yes
LOCAL	14	HIRAM CLARKE	12	1303	1540	1303	58.23612	49.828208	32.923333	2.650204738	0.161877778		
LOCAL	15	FULTON	12	932	1357	932	23.587772	47.104082	32.955	5.443968199	1.237104571	Yes	
LOCAL	19	WILCREST	20	703	457	703	8.705715	51.508091	33.772917	5.579492183	1.98508721	Yes	
LOCAL	20	CANAL_LONG POINT	16	2268	3328	2268	16.726581	35.926679	33.936842	5.556789393	-0.217298435		
LOCAL	23	CROSSTIMBERS	25	957	804	957	7.947904	33.622319	35.742222	6.008357189	-2.024148542		Yes
LOCAL	24	NORTHLINE	18	812	1305	812	22.391924	44.279728	33.641463	5.00087952	-2.053996518		Yes
LOCAL	25	RICHMOND	12	2235	2273	2235	16.404029	44.53887	34.244231	5.769105931	-0.66185509		
LOCAL	26	OUTER LOOP	21	1115	1032	1115	18.0607	45.352252	34.308333	4.264633763	-0.516341133		
LOCAL	27	INNER LOOP	20	1138	1083	1138	17.918463	45.352252	34.308333	4.362208843	-1.125160746		Yes
LOCAL	29	TSU_UH_HIRSCH CROSSTOWN	23	930	628	930	3.421879	69.447014	33.364	3.309470167	-0.509223602		
LOCAL	30	CULLEN_CLINTON	20	1945	3062	1945	13.76537	62.41099	33.125641	4.160161147	1.190629295	Yes	
LOCAL	32	RENWICH	21	61	632	61	7.947904	33.622319	35.742222	6.398657509	1.071888477	Yes	
LOCAL	33	POST OAK CROSSTOWN	13	1988	1645	1988	8.501092	37.714242	35.609859	5.204232359	0.874712248		
LOCAL	34	MONTROSE CROSSTOWN	33	472	0	472	32.3067	35.175934	35.430909	3.024117597	-0.057546502		
LOCAL	36	LAWNDALE_KEMPWOOD	14	2043	1689	2043	15.360011	39.218842	32.978313	5.92945553	1.855805776	Yes	
LOCAL	40	TELEPHONE_PECORE	11	2899	3562	2899	13.601648	42.865252	33.084762	6.501322961	1.007899444		
LOCAL	42	HOLMAN CROSSTOWN	19	696	722	696	9.072847	50.595883	33.576	4.50386125	1.239685235	Yes	
LOCAL	44	ACRES HOMES LTD	22	2106	2990	2106	16.893505	50.719912	33.346575	4.843538907	-1.739873802		Yes
LOCAL	45	TIDWELL CROSSTOWN	25	1507	1648	1507	3.612232	57.856784	33.351786	5.044918284	-0.166061031		
LOCAL	46	GESSNER CROSSTOWN	16	1540	1538	1540	8.304899	49.047405	34.001818	4.742174993	-5.809218367		Yes
LOCAL	47	HILLCROFT CROSSTOWN	30	405	846	405	5.94625	47.557676	33.01875	5.501882532	2.089050014	Yes	
LOCAL	48	NAVIGATION_W DALLAS	38	645	492	645	23.839967	44.144874	32.808824	3.510834592	-0.029210863		
LOCAL	49	CHIMNEY ROCK CROSSTOWN	41	409	354	409	11.814687	32.48714	36.823636	2.567329945	0.895130064		
LOCAL	50	HEIGHTS HARRISBURG	11	3583	3950	3583	12.562464	41.268534	33.514159	6.962338414	0.217970099		
LOCAL	52	HIRSCH SCOTT	10	3578	4662	3578	13.422084	67.77436	33.467816	4.865814455	0.323891616		
LOCAL	53	BRIAR FOREST LTD	15	2271	2047	2271	25.312767	35.393588	36.383838	4.386959502	0.415893213		
LOCAL	56	AIRLINE LTD	14	2333	3499	2333	17.856748	50.019488	31.143056	6.087957823	-2.005276234		Yes
LOCAL	59	ALDINE_MAIL CROSSTOWN	30	327	0	327	2.151193	49.358021	28.3	4.51958438	3.117449751	Yes	
LOCAL	60	HARDY_S MACGREGOR	30	594	747	594	24.320951	60.182684	33.580435	2.23036864	0.809862357		
LOCAL	65	BISSONNET	13	2279	2990	2279	31.709146	47.313077	33.918824	4.861221884	-0.183398441		
LOCAL	66	YALE	24	1316	2019	1316	18.475667	44.967044	33.267213	4.719494579	-0.293413378		
LOCAL	67	DAIRY ASHFORD CROSSTOWN	36	357	0	357	5.198814	52.961285	34.846154	3.490992071	-2.46554074		Yes
LOCAL	68	BRAYS BAYOU CROSSTOWN	15	2103	1941	2103	21.847325	52.693313	34.041237	3.6461232	1.305101354	Yes	
LOCAL	70	MEMORIAL	35	694	0	694	8.979429	26.320619	37.994231	3.022553957	1.75818745	Yes	
LOCAL	72	WESTVIEW CIRCULATOR	25	615	822	615	9.364033	28.438173	37.286111	3.274181375	0.683828582		
LOCAL	73	BELLFORT CROSSTOWN	10	2293	2044	2293	37.799343	45.654703	34.6625	4.591137662	0.388681906		
LOCAL	75	ENERGY CORRIDOR CONNECTOR	20	535	0	535	5.806163	50.102018	34.596	4.700939347	3.947365412		
LOCAL	77	MLKING LTD_LIBERTY	10	3327	4156	3327	12.430157	66.320552	33.311579	5.081056285	0.784829545		
LOCAL	79	WEST LITTLE YORK	35	808	654	808	18.169781	51.130756	33.275385	3.668245316	-0.306894419		
LOCAL	80	DOWLING_LYONS	20	960	1602	960	19.051079	60.617929	33.759184	3.403866795	-0.898332674		
LOCAL	81	WESTHEIMER SHARPSTOWN	16	1733	2276	1733	30.270761	36.796163	34.707692	6.151415276	0.483843421		
LOCAL	82	WESTHEIMER WEST OAKS	18	2028	2764	2028	27.551522	37.863022	35.708889	5.355401774	-3.487896593		Yes
LOCAL	85	ANTOINE LTD	13	2561	2688	2561	17.814421	46.010452	33.608046	6.001463064	-0.374768367		
LOCAL	86	FM1960 CROSSTOWN	16	1680	2149	1680	6.671373	52.101098	31.097727	5.561326955	-2.68817703		Yes
LOCAL	87	SUNNYSIDE_PLAZA DEL ORO TMC	20	1363	1726	1363	37.88106	69.290682	33.65814	2.65600887	1.635399808	Yes	
LOCAL	88	HOBBY AIRPORT	27	1504	1438	1504	17.948238	48.466478	31.571233	4.624808446	-0.934336314		
LOCAL	97	SETTEGAST SHUTTLE	60	307	0	307	0.979318	62.155903	32.253333	1.081031591	-0.026202769		

TYPE	ROUTE #	ROUTE	BIKE BOARDINGS	Peak Head-way	Aug 2012 WD Rev Miles	Aug 2012 WD Rev Hours	Aug 2012 Sat Rev Miles	Aug 2012 Sat Rev Hours	Aug 2012 Sun Rev Miles	Aug 2012 Sun Rev Hours	Annualized Rev Miles	Annualized Rev Hours
Mini	6	JENSEN_TANGLEWOOD	2806		1916	135	1331	94	900	70	609722	43361
Mini	9	NORTH MAIN_GULFTON	1251		1675	130	1177	87	492	45	516361	40243
Mini	18	KIRBY LIMITED	311		676	64	400	28			192628	17704
Mini	37	EL SOL CROSSTOWN	296		535	46	512	44	512	44	193211	16610
Mini	58	HAMMERLY	646		775	61	620	45			229555	17863
MIni	64	LINCOLN CITY CIRCULATOR	104		391	30					98923	7590
Mini	78	ALABAMA_IRVINGTON	878		899	78	566	45	407	28	282024	23816
Mini	83	LEE ROAD	1572		717	42	559	31	516	28	242031	13952
Mini	98	BRIARGATE CIRCULATOR	384		644	48	232	14			175460	12900

TYPE	ROUTE #	ROUTE	BOARDING/ / 1000 MILE	BOARDING / 100 HOURS	DRIVE ALONE COMMUTE (%)	ALTERNATIVE COMMUTE MODE (%)	POPULATION DENSITY	PERCENT WHITE	MEDIAN IN-COME	Weekday Miles	Weekend Miles	Weekday Miles	JOBS PER ACRE	PERCENT MINORITY	MEDIAN AGE
Mini	6	JENSEN_TANGLEWOOD	4.602	6.471	72.613	27.387	9.098	58.090	52285.446	1916	2231	1916	16.504	41.910	34.25
Mini	9	NORTH MAIN_GULFTON	2.423	3.109	69.812	30.188	11.752	59.575	55681.812	1675	1669	1675	18.743	40.425	33.963
Mini	18	KIRBY LIMITED	1.615	1.757	72.770	27.230	10.415	66.091	70280.943	676	400	676	25.993	33.909	35.517
Mini	37	EL SOL CROSSTOWN	1.532	1.782	66.587	33.413	9.632	55.792	41260.263	535	1024	535	19.387	44.208	33.189
Mini	58	HAMMERLY	2.814	3.616	74.343	25.657	8.432	65.976	52303.270	775	620	775	6.173	34.024	33.368
MIni	64	LINCOLN CITY CIRCULATOR	1.051	1.370	75.743	24.257	6.609	39.676	39316.435	391	0	391	1.334	60.324	33.026
Mini	78	ALABAMA_IRVINGTON	3.113	3.687	71.325	28.675	9.768	61.538	57624.159	899	973	899	24.099	38.462	34.694
Mini	83	LEE ROAD	6.495	11.267	68.998	31.002	5.442	37.595	32529.837	717	1075	717	1.852	62.405	30.658
Mini	98	BRIARGATE CIRCULATOR	2.189	2.977	77.517	22.483	5.583	25.002	46377.417	644	232	644	0.312	74.998	31.713

SUMMARY OUTPUT

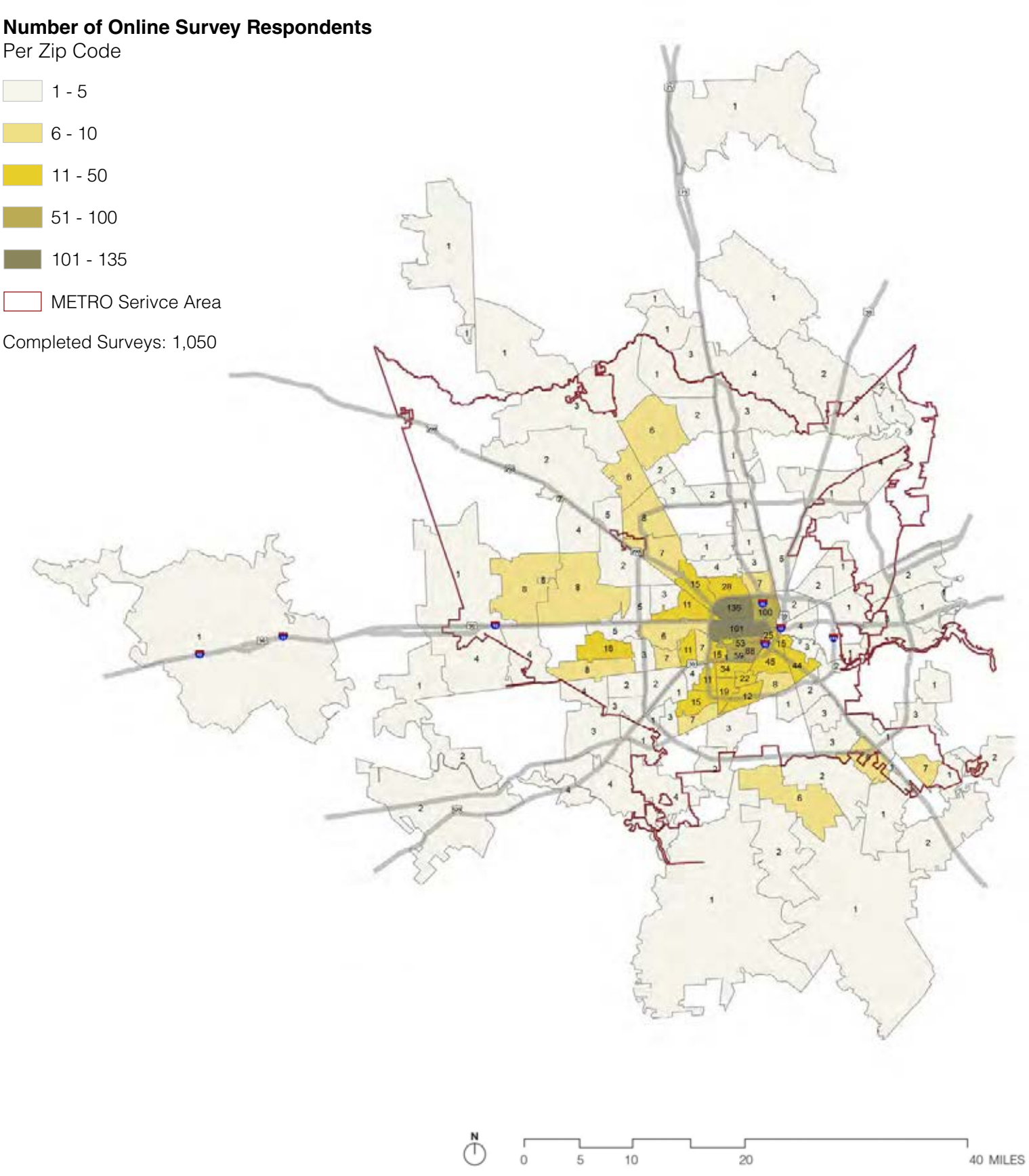
REGRESSION STATISTICS	
MULTIPLE R	0.619551285
R SQUARE	0.383843795
ADJUSTED R SQUARE	0.320970712
STANDARD ERROR	1.727067562
OBSERVATIONS	55

ANOVA

	DF	SS	MS	F	SIGNIFICANCE F
REGRESSION	5	91.04968167	18.20993633	6.105057702	0.000180478
RESIDUAL	49	146.1553558	2.982762362		
TOTAL	54	237.2050374			

	COEFFICIENTS	STANDARD ERROR	T STAT	P-VALUE	LOWER 95%	UPPER 95%	LOWER 95.0%	UPPER 95.0%	
INTERCEPT	17.2191	4.5556	3.7798	0.0004	8.0643	26.3740	8.0643	26.3740	
X VARIABLE 1	-0.3066	0.1046	-2.9329	0.0051	-0.5167	-0.0965	-0.5167	-0.0965	ALTERNATIVE COMMUTE MODE
X VARIABLE 2	0.3044	0.1221	2.4928	0.0161	0.0590	0.5497	0.0590	0.5497	POPULTION DENSITY
X VARIABLE 3	0.0939	0.0344	2.7338	0.0087	0.0249	0.1630	0.0249	0.1630	WHITE (RACE)
X VARIABLE 4	-0.0002	0.0000	-3.8913	0.0003	-0.0003	-0.0001	-0.0003	-0.0001	MEDIAN INCOME
X VARIABLE 5	-0.0976	0.0256	-3.8113	0.0004	-0.1490	-0.0461	-0.1490	-0.0461	WEEKDAY HEADWAYS

APPENDIX IV
METRO Bike & Ride Online Survey
Respondents per Zip Code



Number of Online Survey Respondents
Per Zip Code

ZIP CODE	RESPONDENTS
77002	25
77003	15
77004	45
77005	34
77006	88
77007	101
77008	135
77009	100
77011	3
77012	2
77013	1
77015	3
77018	28
77019	53
77020	4
77021	8
77022	7
77023	44
77024	6
77025	19
77026	2
77027	15
77028	2
77030	22
77031	1
77033	1
77034	1
77034	1
77035	7
77036	2
77037	1
77040	7
77040	7
77041	2
77042	3
77043	5
77045	3
77046	1
77049	2
77053	2
77054	12
77055	11
77056	7
77057	11
77058	1
77060	1
77061	3
77062	7
77063	7
77064	8
77065	5
77066	3
77067	2
77069	2
77070	6
77071	3
77072	2
77073	1
77074	1
77075	3
77076	3
77077	18
77078	1
77079	5
77080	3
77081	4
77082	8
77083	4
77084	8
77084	8
77087	2
77088	1
77089	6
77091	4
77092	15
77093	5
77095	4
77096	15
77098	59
77099	3
77302	1
77339	4
77345	1
77345	1
77346	4
77355	1
77355	1
77363	1
77365	2
77365	2
77373	3
77375	3
77378	1
77379	6
77380	3
77381	1
77382	1
77386	4
77388	2
77389	1
77396	1
77401	11
77429	2
77441	1
77449	8
77450	4
77459	4
77471	2
77471	2
77474	1
77477	1
77478	3
77479	4
77479	4
77493	1
77494	4
77505	3
77511	1
77530	1
77530	1
77536	1
77546	1
77547	1
77573	2
77578	2
77581	2
77583	1
77584	6
77586	2

APPENDIX V
METRO Bike & Ride Online Survey
Bike Facility Descriptions by Type

SHARED-USE PATH OR TRAIL: A trail that permits more than one type of user, such as a trail designated for use by both pedestrians and bicyclists. (Description from http://www.fhwa.dot.gov).

BIKE LANE: Bicycle lanes are designated by a white stripe, a bicycle symbol, and signage that alerts all road users that a portion of the roadway is for exclusive use by bicyclists. Bike lanes enable bicyclists to travel at their preferred speed and facilitate predictable behavior and movements between bicyclists and motorists. A bike lane is located adjacent to motor vehicle travel lanes or parking lanes, and flows in the same direction as motor vehicle traffic. Sometimes bike lanes are marked on the left side of a one-way street such as on streets where there are a high number of transit stops or vehicles on the right side, significantly more driveways, or where the majority of destinations are on the left side of the street. (Description from http://www.pedbikeinfo.org).

CYCLE TRACK: A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used for bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks. In situations where on-street parking is allowed cycle tracks are located to the curb-side of the parking (in contrast to bike lanes). (Description from NACTO Urban Bikeway Design Guide).

SHARED ROADWAY / SHARROW: Shared roadways (with “sharrows”, arrow indicating to bicyclists and drivers to share the roadway) are a bicycle route within an automobile traffic lane that should be wider than a typical lane, 14 to 16 feet wide. The arrow of the sharrow symbol identifies the safe line of motion for a bicyclist, toward the left side of the lane, away from the doors of parked vehicles.

RESIDENTIAL STREET WITH NO BICYCLE FACILITY: Residential streets often offer low-traffic route options for bicyclists with lower speed limits. A lack of bicycle facilities on these streets would mean that there aren’t route signs or pavement markings.

MIXED USE / COMMERCIAL STREET WITH NO BICYCLE FACILITY: Mixed use / commercial streets often have destinations that bicyclists may be traveling to, but due to higher traffic volumes and speeds, may not be the safest option. A lack of bicycle facilities on these streets would mean that there aren’t route signs or pavement markings.

APPENDIX VI
City of Houston Code of Ordinances
Sec. 26-503. Reduced parking space requirement for transit-oriented developments.

Sec. 26-503. Reduced parking space requirement for transit-oriented developments.

The total number of parking spaces required by this article for a use classification shall be reduced by 20 percent if:

(1) The building complies with the optional performance standards provided in article IV of chapter 42 of this Code;

(2) In addition to the minimum number of bicycle spaces required by section 26-496 of this Code, the applicant provides enough bicycle parking spaces to qualify for a five percent reduction in the number of required parking spaces under section 26-497 of this Code;

(3) The reduction in the number of required parking spaces is not for a class 2 use classification under section 26-492 of this Code, except for a hotel or motel; and

(4) The applicant does not receive an additional reduction in the total number of required parking spaces as provided for by section 26-497 or 26-498 of this Code.

Section 26-497: Reduced parking space requirement for additional bicycle spaces.

(a) An applicant who provides bicycle spaces in addition to the minimum number of bicycle spaces required by section 26-496 of this Code shall receive a reduction of one parking space for every four additional bicycle spaces to the number of parking spaces require by section 26-494 of this Code.

(b) The maximum reduction in the number of parking psaces under this section shall be 10 percent of the number of parking spaces required by section 26-492 of this Code.

(c) A reduction of parking spaces under this section is available for all use classidications except single-family residential.

(d) Each additional bicycle space shall conform to the standards of section 26-583 of this Code.

Section 26-583: Design standards for bicycle spaces and bicycle racks.

(a) A bicycle space required by this article shall:

(1) Be located on the same tract as the building or tract it is being provided for, excewpt when an application for an encroachment permit has been approved by the director of the public works and engineering department of the city or his or her designee to locate the bicycle spaces within the public right-of-way adjacent to the tract;

(2) Not obstruct access to parking spaces, othe bicycle space, loading berths, or pedestrian walkways such as sidewalks and ramps;

(b) Each bicycle space required by this article shall contain a bicycle rack that is:

(1) Constructed of durable materials that can withstand permanent exposure to the elements and vandalism such as powdered-coated metal or stainless steel;

(2) Designed to permit the locking of the bicycle fram by a standard sized “U lock” containing locking points between one foot and three feet from the ground, provide a gap for pedal clearance, and allow for the locking of at least one wheel to the bicycle rack;

(3) Designed to accommodate the typical range of bicycle sizes;

(4) Securely anchored to the ground or building;

(5) Spaced with sufficient clearance from other bicycle racks to allow access to the bicycle spaces, and;

(6) Properly maintained by the applicant or responsible party.

APPENDIX VII

Regional Transportation District (RTD) Park-n-Ride Parking Availability Chart

http://www.rtd-denver.com/AlphabeticalList.shtml

RTD SCHEDULES SERVICES RIDER TOOLS FARES & PASSES FASTRACKS

With over 70 Park-n-Rides throughout the metro area, there's sure to be one near you. Park and ride RTD everywhere! Browse through the Park-n-Rides below to find one nearest you.

Home Services Park-n-Ride

Note that parking fees apply at select locations. View the **parking fee legend** and corresponding fee colors to determine daily parking fees.

8th and Coffman PnR
Formerly Roosevelt Park PnR
Address: 775 Coffman Street, Longmont
Location: 8th Avenue and Coffman Longmont
Parking Spaces: 97
Bike Racks: 6
Bike Lockers: 0
Bus Routes: 323, 324, 326, 327, BOLT, J, L/LX/LNX/LSX, YL
SportsRides: BroncosRide, BuffRide and RockiesRide
Call-n-Ride: Longmont

27th Way and Broadway PnR
Address: 500 Broadway, Boulder
Location: 27th Way & Broadway
Parking Spaces: 59
Bike Racks: 2
Bike Lockers: 10
Bus Routes: AB, BV/BMX/BX, DD, DM, GS, J, BOUND, DASH, SKIP

30th Avenue and Downing Station
Address: 2999 Downing Street, Denver
Location: Downing Street and California Street
Parking Spaces: 27
Bike Racks: 10
Bike Lockers: 8
Bus Routes: 12, 28, 38, 43
Light Rail Lines: D

39th Street and Table Mesa PnR
Address: 3900 Table Mesa Drive, Boulder
Location: Table Mesa Drive & Broadway
Parking Spaces: 40
Bike Racks: 4
Bike Lockers: 0
Bus Routes: 204, 206, AB, BV/BMX/BX, DD, DM, J, DASH, SKIP

70th Avenue and Broadway PnR
Address: 7077 Broadway, Denver
Location: West 70th and Broadway
Parking Spaces: 308
Bike Racks: 0
Bike Lockers: 4
Bus Routes: 8, 31X, 72, DD, T
SportsRides: BroncosRide

104th Avenue and Revere PnR
Address: 12340 East 104th Avenue, Commerce City
Location: East 104th Avenue and Revere
Parking Spaces: 90
Bike Racks: 0
Bike Lockers: 0
Bus Routes: AA, 104X

104th Avenue and Washington PnR
This Park-n-Ride will be closed as of July 1, 2013
Address: 10275 Washington Street, Thornton
Parking Spaces: 73
Bike Racks: 0
Bike Lockers: 0
Bus Routes: 12, 40X, AA

Airport Boulevard and 40th Avenue PnR
Address: 3900 North Salida Street, Aurora
Location: 40th and Airport Blvd
Parking Spaces: 1079
Bike Racks: 16
Bike Lockers: 10
Bus Routes: 43, 44, 45, 47X, 153, ABA, AF, AT

Alameda and Havana PnR
Address: 200 South Havana Street, Aurora Location: Alameda and Havana
Parking Spaces: 128
Bike Racks: 6
Bike Lockers: 0
Bus Routes: 3, 3L, 105
SportsRides: BroncosRide

Alameda Station
Address: 425 South Cherokee Street, Denver
Location: Cherokee Streetand Alaska Pl
Parking Spaces: 302
Bike Racks: 12
Bike Lockers: 8
Bus Routes: 3, 34, 52
Light Rail Lines: C, D, E, F, H

Arapahoe at Village Center Station
Address: 8600 East Caley Avenue, Greenwood Village
Location: Caley and Yosemite
Parking Spaces: 817
Bike Racks: 22
Bike Lockers: 10
Bus Routes: 65, 66, 73, AT, T
Light Rail Lines: E, F
Call-n-Ride: Arapahoe

Aspen Park PnR
Address: 26137 Conifer Rd., Conifer
Location: SH 285 in Conifer
Parking Spaces: 162
Bike Racks: 2
Bike Lockers: 8
Bus Routes: CV/CS/CX, ES

APPENDIX VIII

Proposed Implementation by Timeframe

Transit Node Implementation: Short-, Medium- and Long-Term

Transit Node Implementation: Short-Term						
Node	**Priority Quartiles**	**Recomm-endation Type**	**Label**	**Project Description**	**Ease of Implementation (1-easy to 4-hard)**	**Capital Costs Total***
Addicks	1	Wayfinding	W1	Trail map of surrounding trail network	1	$900.00
Addicks	1	Parking	P1	Relocate bike racks to covered area	1	$1,000.00
Addicks	1	Wayfinding	W2	Terry Hershey Trail/Energy Corridor signage	1	$900.00
Downtown	1	Parking	P1	Covered Parking	1	$20,000.00
Quitman	1	Parking	P1	Covered Parking	1	$20,000.00
Theater District	1	Parking	P1	Bike Rack	1	$1,000.00
Theater District	1	Parking	P2	Bike Share Station	2	N/A
Theater District	1	Wayfinding	W1	Wayfinding	1	$900.00
TMC	1	Connectivity	C2	Shared-Use Path	2	$13,600.00
TMC	1	Parking	P1	Covered Bike Rack	1	$1,000.00
TMC	1	Wayfinding	W1	Wayfinding	1	$900.00
UH-Downtown	1	Wayfinding	W1	Wayfinding	1	$450.00
West Bellfort	1	Parking	P1	Covered Bike Rack	1	$1,000.00
West Loop	1	Parking	P1	Relocate bike racks to covered area	1	$1,000.00
Westchase	1	Parking	P1	Covered Bike Rack	1	$1,000.00
Wheeler	1	Parking	P1	Covered Bike Rack	1	$1,500.00
Wheeler	1	Parking	P2	Bike Parking Station/Cage	2	$20,000.00
Wheeler	1	Parking	P3	Bike Share Station	2	N/A
Bellaire	2	Wayfinding	W1	Waydfinding, coordinate with City of Bellaire Ad-Hoc Wayfinding Commitee	1	$900
Eado/Stadium	2	Connectivity	C1	Two-Way Bike Lane/Shared-Use Path	1	$139,950.00
Eado/Stadium	2	Connectivity	C2	Shared-Use Path	1	$123,040.00
Eado/Stadium	2	Parking	P1	Covered Parking	2	$20,000.00
Eado/Stadium	2	Wayfinding	W1	Wayfinding from Columbia-Tap	1	$900.00
Hillcroft	2	Connectivity	C1	Shared-Use Path	2	$139,350.00
Hillcroft	2	Parking	P1	Covered Parking	1	$500.00
Hillcroft	2	Wayfinding	W1	Wayfinding	1	$900.00
MacGregor Park	2	Wayfinding	W1	Wayfinding	1	$450.00
MacGregor Park	2	Parking	P1	Covered Bike Rack	1	$1,000.00
Central Station	3	Parking	P1	Bike Rack	2	$2,000.00
Bay Area	3	Connectivity	C2	Support signed bike route on Feather Craft	1	N/A
Bay Area	3	Connectivity	C1	Support signed bike route on Sea Liner	1	N/A
Bay Area	3	Parking	P1	Covered Parking	1	$20,000.00
Burnett	3	Parking	P1	Covered Parking	1	$20,000.00
Central Station	3	Parking	P1	Bike Rack	2	$2,000.00
Greenspoint	3	Parking	P1	Covered Parking	2	$20,000.00
Northline	3	Parking	P1	Covered Parking	1	$20,000.00
Palm Center	3	Parking	P1	Covered Parking	1	$20,000.00
Fifth Ward/Den-ver Harbor	4	Wayfinding	W1	Wayfinding from Lyons Ave to Transit Center	1	$900.00
Kingwood	4	Connectivity	C1	Wheel Stops	1	N/A
Northwest St. P&R	4	Parking	P1	Covered Bike Rack	1	$1,000.00

Transit Node Implementation: Medium-Term						
Node	**Priority Quartiles**	**Recomm-endation Type**	**Label**	**Project Description**	**Ease of Implementation (1-easy to 4-hard)**	**Capital Costs Total***
Addicks	1	Connectivity	C2	Sidewalk connection to existing trail on Park Row	2	$6,880.00
Addicks	1	Connectivity	C3	Trail Connection	2	$100,350.00
Addicks	1	Parking	P2	Refrofit existing building for secure bike parking	2	$5,000.00
Addicks	1	Connectivity	C1	Opening in fence for trail access	1	N/A
Quitman	1	Parking	P2	Bike Share Station	2	N/A
Quitman	1	Wayfinding	W1	Wayfinding	1	$900.00
TMC	1	Connectivity	C1	Shared-Use Path	3	$103,730.00
UH Downtown	1	Connectivity	C1	Use existing elevator for trail access	3	N/A
UH-Downtown	1	Parking	P1	Bike Share Station	2	N/A
West Bellfort	1	Wayfinding	W1	Wayfinding	1	$900.00
Westchase	1	Connectivity	C1	Bike lanes across parking lot connecting to future trail	1	$8,450.00
Westchase	1	Wayfinding	W1	Wayfinding	1	$900.00
Wheeler	1	Connectivity	C1	Bike Lanes	3	$84,190.00
Wheeler	1	Wayfinding	W1	Wayfinding	1	$900.00
West Loop	1	Connectivity	C1	Install ped/bike bayou crossing with new bridge or modification of existing	3	$110,000
West Loop	1	Wayfinding	W1	Wayfinding	1	$900
Eastwood	2	Parking	P1	Bike Share Station	2	N/A
Bay Area	3	Connectivity	C3	Shared-Use Path	2	$137,920.00
Bay Area	3	Wayfinding	W1	Wayfinding in Area	1	$1,800.00
Burnett	3	Parking	P2	Bike Share Station	2	N/A
Burnett	3	Wayfinding	W1	Wayfinding	1	$900.00
Northline	3	Connectivity	C1	Signed Bike Route	1	$2,814.45
Northline	3	Wayfinding	W1	Wayfinding	1	$900.00
Palm Center	3	Connectivity	C1	Signed Bike Route	1	N/A
Palm Center	3	Connectivity	C2	Bike Lanes	1	N/A
Palm Center	3	Wayfinding	W1	Wayfinding	1	$900.00
Acres Homes	4	Parking	P1	Covered Parking	1	$20,000.00
Fifth Ward/Den-ver Harbor	4	Parking	P1	Covered Parking	2	$20,000.00
Hiram Clarke	4	Parking	P1	Covered Parking	1	$20,000.00
Kingwood	4	Parking	P1	Covered Parking	1	$20,000.00
Kingwood	4	Wayfinding	W1	Wayfinding	1	$900.00
Northwest TC	4	Connectivity	C1	Shared-Use Path	2	$32,040.00
Northwest TC	4	Parking	P1	Covered Parking	1	$20,000.00
Northwest PR	4	Wayinding	W1	Wayfinding	1	$900
Southeast	4	Parking	P1	Covered Bike Rack	1	$1,000

Transit Node Implementation: Long-Term						
Node	**Priority Quartiles**	**Recommendation Type**	**Label**	**Project Description**	**Ease of Implementation (1-easy to 4-hard)**	**Capital Costs Total***
Downtown	1	Connectivity	C1	Bike connections to be explored	4	N/A
Theater District	1	Connectivity	C2	Two-way buffered bike connections from Buffalo Bayou		
West Bellfort	1	Connectivity	C1	Shared-Use Path	3	$500,000.00
Bellaire	2	Connectivity	C1	Support Bike Lanes on South Rice	3	N/A
Eastwood	2	Connectivity	C1	Shared-Use Path	3	$270,120.00
Eastwood	2	Wayfinding	W1	Wayfinding	1	$900.00
Hillcroft	2	Connectivity	C2	Shared-Use Path	3	$468,360.00
Hillcroft	2	Connectivity	C3	Signed Bike Route	1	$1,926.18
Burnett	3	Connectivity	C1	Bike lanes along Burnett	1	$12,090.00
Burnett	3	Connectivity	C2	Direct connection to White Oak Bayou via bike lanes on Trentham	1	N/A
Burnett	3	Connectivity	C3	Develop Hardy Yards with good bicycle connectivity	3	N/A
Central Station	3	Connectivity	C1	Explore cycle track along Lamar connecting Buffalo Bayou to Discovery Green	4	N/A
Greenspoint	3	Connectivity	C1	Shared-Use Path	3	$188,160.00
Greenspoint	3	Wayfinding	W1	Wayfinding	1	$900.00
Kashmere	3	Connectivity	C1	Bike Lanes	2	$120,320.00
Kashmere	3	Connectivity	C2	Shared-Use Path	3	$750,900.00
Kashmere	3	Wayfinding	W1	Wayfinding	1	$900.00
Mesa	3	Parking	P1	Covered Bike Rack	1	$1,000.00
Mesa	3	Connectivity	C1	Shared-Use Path	2	N/A
Mesa	3	Wayfinding	W1	Wayfinding	1	$900.00
Fifth Ward/Denver Harbor	4	Connectivity	C1	Connection across I-10	4	N/A
Hiram Clarke	4	Connectivity	C1	Shared-Use Path	2	$69,870.00
Hiram Clarke	4	Connectivity	C2	Signed Bike Route	1	$1,500.75
Hiram Clarke	4	Wayfinding	W1	Wayfinding	1	$900.00
Kingwood	4	Connectivity	C2	Connection west of W Lake Houston Pkwy	4	N/A
Northwest TC	4	Connectivity	C2	Shared-Use Path	3	$389,520.00
Northwest St. PR	4	Connectivity	C1	Bike Lanes	2	N/A
Southeast	4	Connectivity	C1	Signed Bike Route	2	N/A
Southeast	4	Wayfinding	W1	Wayfinding	1	$900.00

METRO BIKE & RIDE

communicate • integrate • connect • implement

asakura robinson company LLC
Planning Urban Design Landscape Architecture