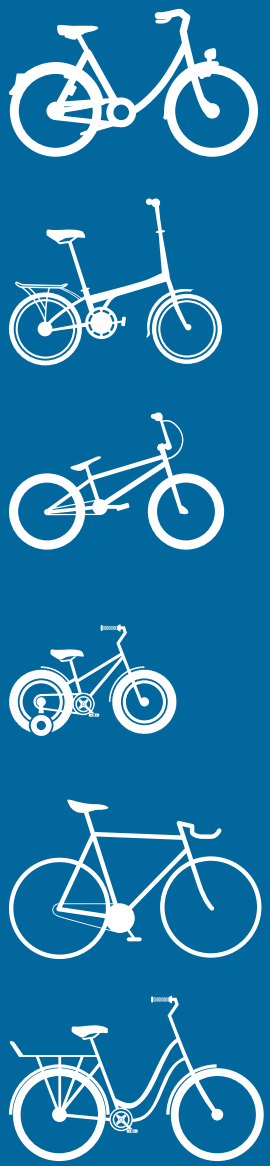
HOUSTON BIKEPLAN





City of Houston
February 2017

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Houston Bike Plan

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Acknowledgments

City of Houston

Sylvester Turner, Mayor

Annise D. Parker, Former Mayor

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The Houston Bike Plan was adopted by City Council and Mayor Sylvester Turner on March 22, 2017 by motion 2017-0161.

Project Funding Partners

City of Houston
BikeHouston
Houston Parks Board
Houston Galveston Area Council
Federal Transit Administration (FTA)
Federal Highway Administration (FHWA)
Texas Department of Transportation (TxDOT)

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HOUSTON BIKE PLAN

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY



INTRODUCTION

Houston is a thriving, diverse, and vibrant city. New residents and businesses continue to move to Houston. New projects continue to be developed, from master-planned communities to higher-density, mixed-use neighborhoods. Much of this growth is driven by the affordable, attractive quality of life that is available in the city. With this growth, more people are moving about the city, and an increasing number are doing so by bicycle.

People bicycling in Houston match the diversity of the city and the types of bicycle trips people take are just as varied. The city and region have made great strides to support people bicycling. The Bayou Greenways Initiative is expanding rapidly to provide attractive, comfortable paths for people of all ages by transforming major bayou corridors in the City and beyond. The bike share system, Houston B-cycle, is in the process of a major expansion to connect more neighborhoods with more destinations. Bike connections on METRO's transit system continue to grow and more people of all backgrounds are riding in events like Tour de Houston and Critical Mass. The city has installed its first separated on-street bikeway on Lamar Street in Downtown and has adopted new context-sensitive infrastructure design approaches to integrate safe, comfortable bikeways into more streets in the City of Houston. PlanHouston, the City's first general plan, was adopted in 2015 and identifies a goal of Connecting People and Places, including the development and maintenance of a citywide bicycle plan.

THE HOUSTON BIKE PLAN

The City and region have made great strides in supporting the growing number of people bicycling, but without some organization and a coordinating framework the efforts risk being disconnected or missing opportunities to complement each other in ways that maximize the return on the investments. 1993 was the last time the City adopted a Comprehensive Bicycle Plan and the City and region have changed significantly in the twenty-three years since.

The 2017 Houston Bike Plan is a multi-year planning effort developed with the Houston community and many partners. The Bike Plan is a master plan similar to other City master plans that outline the City's long range vision, goals and recommendation for policies, programs and projects. It is a component plan required by the City's Complete Streets Executive Order.

The Bike Plan sets out a clear Vision to be a Gold-level Bicycle Friendly City by 2027. This is supported by goals that identify the transformative opportunity the plan represents for the City of Houston and establishes a framework for how to achieve that vision by building on the many successful efforts underway.

A Bicycle Toolbox has been developed detailing bikeway project elements, potential policy changes, and programmatic approaches to help make Houston a more bicycle-friendly city. The plan includes Implementation Strategies to move from plan to action and a Bikeway Network Map (Figure ES.1) has been developed with opportunities for short-term improvements and to achieve the ultimate vision.

The bikeways shown in the Bike Plan are recommendations for future facilities, representing corridors along which bicycle facilities should be considered along the corridor. Having a recommended facility in the Plan on a street does not mean the facility must be built on that street; nor does the Plan prohibit a facility from being built if the facility is not shown on a map in the Plan. The Plan provides a framework for agencies who are improving streets to consider as they develop designs for improvement along a particular corridor. Final decisions on the design and location of bicycle facilities on City streets will only happen after additional analysis and public engagement.

The City of Houston Planning & Development Department, in coordination with the Public Works & Engineering Department and the Parks & Recreation Department, lead the Plan update. The City has greatly benefited from the support of the project funding partners:

- BikeHouston;
- The Houston Parks Board;
- Houston-Galveston Area Council (H-GAC) with the Federal Transit Administration (FTA); Federal Highway Administration (FHWA); and Texas Department of Transportation (TxDOT)

THE OPPORTUNITY

The Houston Bike Plan presents a transformative opportunity for the City and implementation has the potential to create great improvements in mobility and access, health and safety, equity and access to opportunity, and economic development. While many positive elements are working together to make Houston more bicycle-friendly, there are still significant challenges to achieving that outcome across Houston's 640 square miles.

The plan sets out an approach to address the following challenges. These are detailed in **Chapter 2: Existing Conditions & Opportunities** of the Houston Bike Plan.

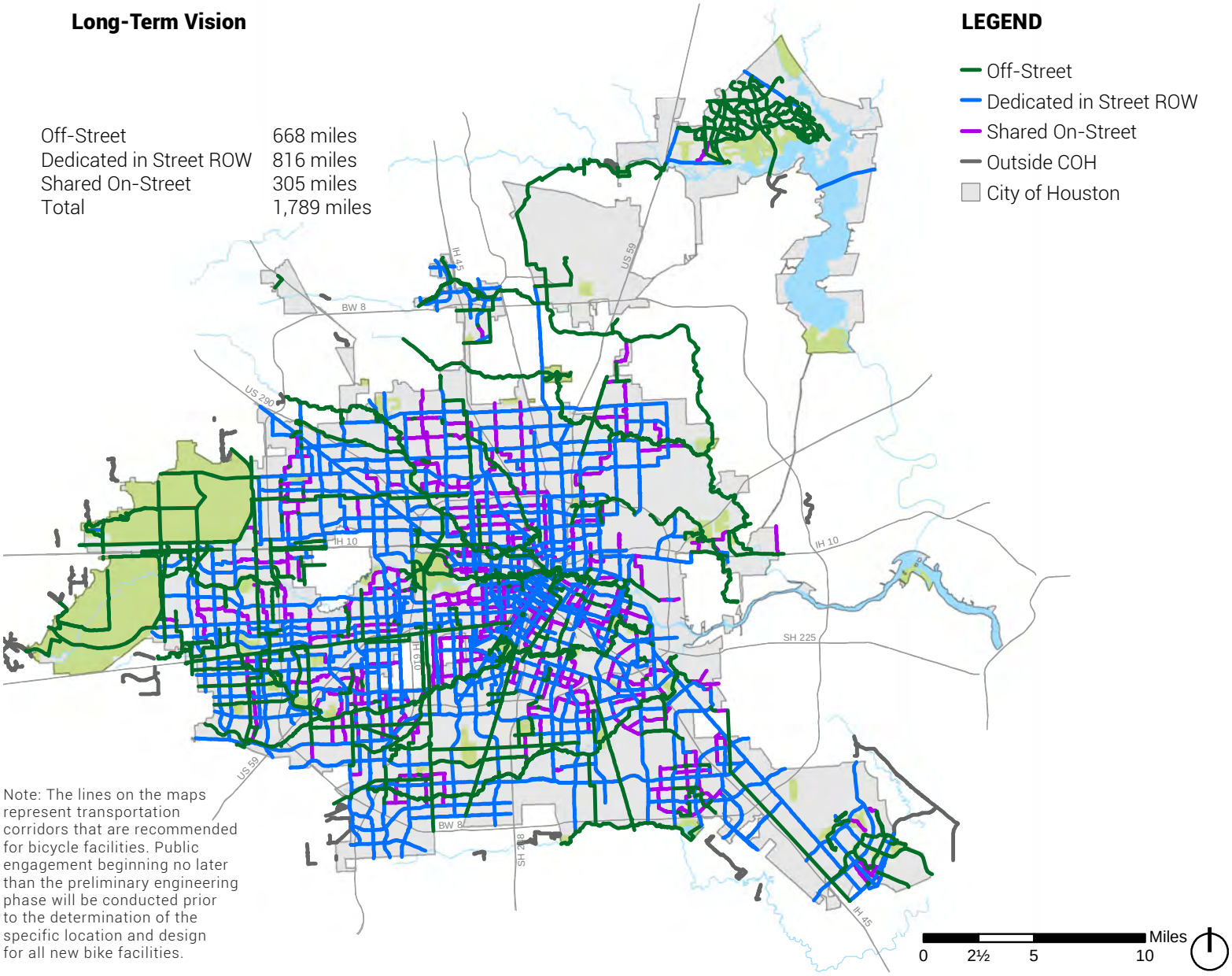
1. **Provide a safer, more comfortable environment for the growing number of people riding bicycles in Houston.**
   - More people are bicycling across Houston. Census data and counts, check outs of bike share bikes, participation in organized rides, and bike boardings on buses all show positive trends in ridership.
   - Over one third of trips by all modes in Houston are under three miles, ideal to be made on a bicycle in under 15 minutes. Even with recent growth, bicycle ridership remains small. Commute mode share is at approximately 0.5%, leading to more vehicles on the road and people getting less exercise. In some section of the City bicycle mode share approaches 4%.
   - The Existing Bikeway Network (Figure ES.2) has nearly 500 miles of designated bikeways, but most are below standard and only half provide a comfort level that is likely to attract anyone besides the most confident riders.
   - There have been 25 bicycle fatalities and over 1,500 reported bicycle crashes over the past 5 years.
2. **Provide affordable access to opportunities.**
   - Bicycles provide a cost-effective mobility alternative for families that cannot afford the annual cost of car ownership (estimated by AAA at over $8,600) or choose not to own a car for every person. This is particularly true when integrated with the region's transit options.
   - The Existing Bikeway Network (Figure ES.2) provides a bikeway within one half mile of 61% of Houston residents and 71% of jobs but many of these are narrow bike lanes or signed routes on arterials with significant traffic volumes and higher speeds. Many neighborhoods do not have existing bikeways.
   - Only 38% of people and 41% of jobs are within one half mile of a higher-comfort bikeway, such as those attractive to a broad range of cyclists.
   - This rate drops to 32-33% when population of color or those that are living in poverty are analyzed.
   - Bikeways connect near many activity

centers like Downtown, the Texas Medical Center, and Uptown, but last mile connections that would connect people to more jobs and key destinations are often missing.

3. **Improve community health and wellness.**
   - Bicycles provide an opportunity to exercise, improving health outcomes and reducing vehicle emissions that contribute to poor air quality.
   - Only 51.1% of the adult population in Houston gets the recommended amount of weekly aerobic physical activity.
   - Low activity levels contribute to an adult population in which 28.7% are obese, 8.5% are diabetic, and 29.8% have high blood pressure.
   - 32% of children in Houston are obese, a leading indicator of future health issues, and about 50% do not live within one half-mile of a park space.
4. **Compete with peer cities**
   - Quality of life indicators such as access to safe, comfortable opportunities to bicycle are strong factors when people and businesses are making decisions about where to locate.
   - A citywide bikeway network creates opportunities in more neighborhoods creating more choices for where to locate and benefits for more people.
   - Peer city average mode share for bicycling commutes is 1.8%; Houston is at 0.5%. Meeting the average mode share would represent over a 300% increase in bike commuting in Houston.
   - Peer cities have increased mode share for biking by employing a wide variety of strategies including improved bikeway improvements supported by policies and programs to serve a range of residents of various skill levels.
   - Cities with dedicated funds and spending targets for bicycle infrastructure have made significant strides in improving their bikeway networks.
5. **Benefit everyone, not just people who bike.**
   - Studies have shown that bicycle infrastructure investments can reduce commercial vacancy rates and increase retail sale volumes. For retail, people biking spend more overall because, while they spend less in a typical trip, they tend to visit stores more often.
   - Every person biking reduces the number of potential cars on the road. In travel lanes and parking areas, bicycles are more space efficient.
   - Dedicated bikeway facilities on thoroughfares reduce conflicts between people biking and driving.
   - Safe, abundant bicycle access to the bayou and utility corridor trails and transit lines maximizes the return on these significant community investments and allow more people to enjoy them.

Long-Term Vision

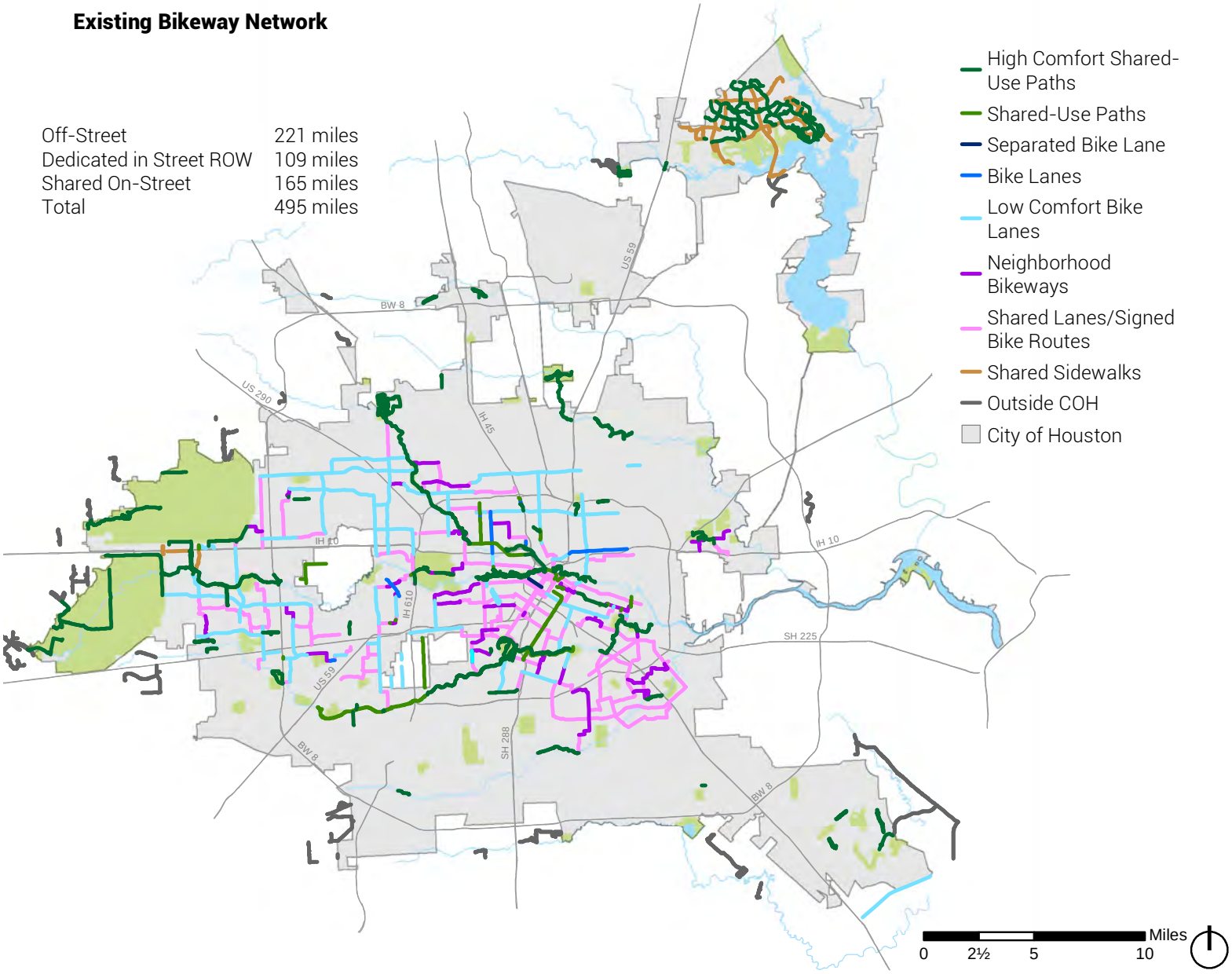
Off-Street	668 miles
Dedicated in Street ROW	816 miles
Shared On-Street	305 miles
Total	1,789 miles



Note: The lines on the maps represent transportation corridors that are recommended for bicycle facilities. Public engagement beginning no later than the preliminary engineering phase will be conducted prior to the determination of the specific location and design for all new bike facilities.

Source: City of Houston; Team Analysis & Site Visits

Figure ES.1: City of Houston Long-Range Bikeway Network Map
(detailed maps available at www.houstonbikeways.org)



Source: City of Houston; Team Analysis & Site Visits

Figure ES.2: Existing City of Houston Bikeways - As of June 2016

The Vision

The development of a vision and goals for the Houston Bike Plan (Figure ES.3) required a set of community conversations to reflect the broad values and expectations of a well-connected, citywide bike plan and the supporting policies and programs that go with it. The Bicycle Advisory Committee for the Houston Bike Plan, made up of a diverse set of community leaders, served as a sounding board and helped guide the direction of the plan. Community meetings, online forums and public surveys provided several thousand comments on both the broad goals for the plan and specific locations in the city where bikeway improvements are desired. There was also significant feedback on the draft of the Houston Bike Plan which was incorporated to develop the final Plan.

As discussed in **Chapter 3: Vision & Goals,** the Houston Bike Plan Vision sets an aspirational outcome for Houston to become a ***Gold Level Bike-Friendly City by 2027***, ten years from the development of this plan. Bike Friendly Communities is a rating system developed by the League of American Bicyclists to assess a community's efforts to encourage and support bicycling. The City of Houston is currently a Bronze-level Bicycle Friendly Community, largely based on the work the City and BikeHouston have done on education and the regional effort to improve the bayou trails. Achieving Gold level would be a significant step forward for the City.

To reach a Gold rating, significant progress will need to be made on a broad range of goals. These have been summarized into the four Houston Bike Plan goals outlined in Figure ES.3. These are focused on ***Increasing Safety, Increasing Access, Growing Ridership, and Developing and Maintaining Facilities***.

To achieve these goals, the Plan sets out a comprehensive plan to improve the environment for biking in Houston, and to make it inclusive to people of all ages, abilities, and backgrounds. It also sets out a set of ***performance metrics*** to assess how the City is performing against its goals (Figure ES.4).

To grow ridership, the plan focuses on improving opportunities for both people currently riding and also the 50-60% of the population that is "Interested but Concerned" about bicycling. This involves getting the right ***policies and programs*** in place to support access to bicycles, education of how to ride safely, end of trip facilities, and enforcement of regulations. The expansion of the ***high comfort bikeway network*** is critical to reach many more people and jobs across the city.

By 2027 Houston will be a Safer, More Accessible, Gold Level Bike-Friendly City

Goals

Improve Safety



To provide a safer bicycle network for people of all ages and abilities through improved facilities, education, and enforcement

Increase Access



To create a highly accessible, citywide network of comfortable bike facilities that connects neighborhoods to transit, jobs, and activity centers, including schools, universities, parks, and libraries

Grow Ridership



To exceed average ridership levels in peer cities by implementing policies and programs that enable more people to ride bicycles and encourage healthy, active transportation choice

Develop & Maintain Facilities



To develop and sustain a high-quality bicycle network, including both bikeways and end-of-trip facilities

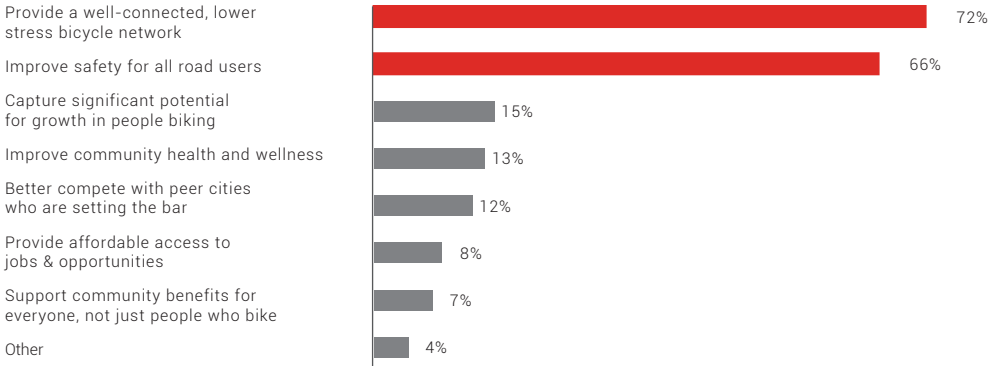
Figure ES.3 Houston Bike Plan Vision

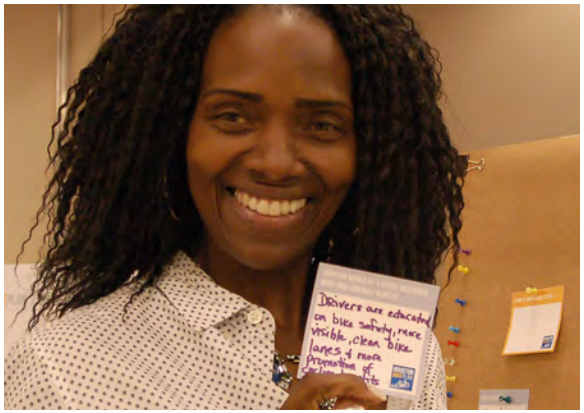
Vision: By 2027 Houston will be a Safer, More Accessible, Gold Level Bike-Friendly City

Goal Area	*BFA Rating Areas*						*Performance Metrics*	*Current Performance*	*Performance Trend (+ - or neutral)*	*Data Source*
	Enforcement	Education	Engineering	Evaluation	Encouragement	Key Outcomes				
Improve Safety 						✓	# of bicycle related crashes reported	361	-	H-GAC
						✓	# of bicycle fatalities per 10,000 commuters	7.4	+	H-GAC, US Census
				✓			Disparity in bicycle mode share versus fatalities	3.80	+	H-GAC, US Census
		✓					# of people who complete an approved bicycle education program	TBD	N/A	TBD
					✓		# of "Bicycle Friendly Businesses"	4	Neutral	League of American Bicyclists
Increase Access 			✓				% jobs within 1/o mile of a high-comfort bike facility	46%	+	US Census
			✓				% population within 1/o mile of a high-comfort bike facility			
							• Overall population	38%	+	US Census
							• Minority population	32%	+	US Census
							• Low income population	32%	+	US Census
			✓				% of facilities within ¼ mile of a high-comfort bike facility:			
							• Transit nodes (transit centers, Park & Rides, and light rail stations)	37%	+	METRO/City of Houston
							• Schools and libraries	23%	+	City of Houston
							• Community and multi-service centers	33%	+	City of Houston
			✓		✓		% population with comfortable access to greenways system (bayous and other trails)	21%	+	US Census
Increase Ridership 						✓	Commute mode share	0.5%	-	US Census
				✓			# of permanent count stations	2	Neutral	H-GAC
				✓		✓	% growth in bicyclists observed through permanent count stations	TBD	N/A	H-GAC
				✓			# of bike boardings on Metro per year	258,094	+	METRO
				✓			# of bike share checkouts per year	98,449	+	Houston Bike Share
					✓		Annual City events that support increased ridership (e.g., Sunday Streets, Tour de Houston, Bicycle Advisory Committee meetings)	11	Neutral	City of Houston
Develop and Maintain Facilities 			✓				Miles of high comfort bikeways per capita (per 10,000 people)	1.17	+	City of Houston/Census
			✓				% of bikeways in good or better condition	TBD	N/A	City of Houston
					✓		Population within ¼ mile of a bike share station	27,900	+	Houston Bike Share
					✓		Jobs within ¼ mile of a bike share station	155,600	+	Houston Bike Share
			✓				% of major transit nodes[1] with secured bike parking	4%	Neutral	METRO
				✓			Dedicated city staff (FTE) for bikeway program	1	Neutral	City of Houston

Figure ES.4: Performance Metrics for the Houston Bike Plan Goals

Figure ES.5 Priority Goals For Online Survey Responses







Participants at public meeting providing Goal and Map Feedback





A High-Comfort Bikeway Network

One of the key elements to improve bicycling in Houston is the expansion of safe, connected bikeways that minimize people's interaction with high volume, high speed traffic. This is one of the key barriers that keeps more people from riding. Cities that have made investments in expanding their network of comfortable bikeways have seen increases in overall ridership.

The City of Houston has approximately 500 miles of designated bikeways including off-street trails, dedicated bike lanes, and shared on-street bike routes. The study team assessed the existing bikeway network against the framework in Figure ES.6 to determine which of the existing facilities meet the standard of a high-comfort facility. The criteria include factors such as roadway width, travel lanes, travel speed, and traffic volumes. High-comfort facilities were those that rated a 1 or 2 on the scale and are the desirable outcome for bikeways in the proposed bikeway network. Level of comfort 3 and 4 bikeways are discouraged.

Figure ES.6 Bicycle Facility Level of Comfort Assessment

		MORE COMFORTABLE			LESS COMFORTABLE
		1	2	3	4
SHARED ON-STREET	SPEED LIMIT residential	25 MPH or less	30 MPH	30 MPH	35+ MPH
	SPEED LIMIT non-residential		25 MPH or less	30 MPH	35+ MPH
	NUMBER OF LANES	2 LANES	2-3 LANES	2-3 LANES	4+ LANES
	INTERSECTING STREETS	NARROW, CALM	CALM	BUSY	WIDE, BUSY
		1	2	3	4
DEDICATED BIKE LANES	SPEED LIMIT	30 MPH or less	30 MPH	35 MPH	40+ MPH
	LANES EACH DIRECTION without median	1 LANE	1 LANE	2+ LANES	2+ LANES
	LANES EACH DIRECTION with median	1-2 LANES	2 LANES	3+ LANES	3+ LANES
	BIKE LANE WIDTH	6 FEET	5-6 FEET	5 FEET	<5 FEET
	INTERSECTION TREATMENTS	CONTINUOUS	SHARED	SHARED	NONCONTINUOUS
	SEPARATION	SEPARATION MOVES A FACILITY ONE COMFORT LEVEL TO THE LEFT			
		1	2	3	4
OFF-STREET	CROSSING FREQUENCY	RARE	INFREQUENT	MODERATE	FREQUENT
	TYPE OF CROSSINGS	CALM & NARROW OR CONTROLLED	UNCONTROLLED BUT NARROW	UNCONTROLLED WIDE OR FAST	UNCONTROLLED WIDE & FAST

Level of Comfort Criteria based on the Mineta Transportation Institute report "Low-Stress Bicycling and Network Connectivity" published in 2015

Bikeways were classified into three color-coded categories:

- **On-Street Shared:** Locations where bicyclists share the travel way with vehicles. Most appropriate for low-volume, low-speed streets.
- **Dedicated in Street Right-of-Way**: Represent dedicated bicycle facilities within the public street right-of-way. A sidepath within the right-of-way could be implemented where appropriate, based on context, design considerations, and community input.
- **Off-Street Bikeway:** Dedicated path or trail, often shared with people walking or jogging, that is completely separated form parallel traffic.

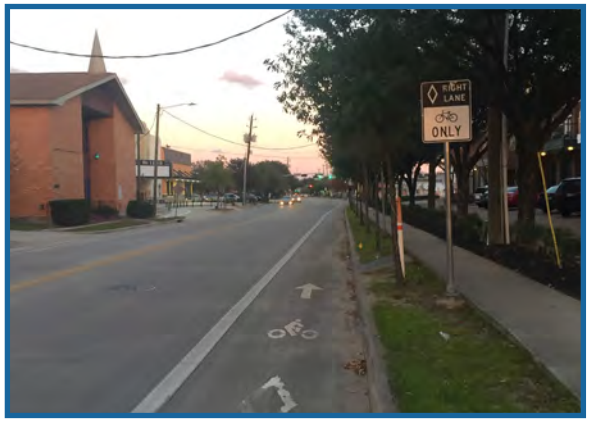
Based on this assessment, of the 500 miles in the existing bikeway network, only about 270 miles (50%) are high-comfort bikeways. The map of these facilities is shown in Figure ES.9. It shows that while there are some comfortable, long segments, they are discontinuous and do not form a connected network. As a result, for most longer trips a person bicycling is likely to experience at least one segment of low-comfort riding. This can often be enough to keep people from riding.

The existing high-comfort network forms the baseline that the recommendations of the Plan build upon. Future recommended bikeways were developed through a collaborative approach with the study team, key City of Houston staff, and community



On-Street Shared

Bike Route in Southgate Neighborhood (Dryden Street)



Dedicated in Street Right-of-Way

Standard Bike Lane in Fifth Ward Neighborhood (Lyons Avenue)



Off-Street Trail or Walk/Bike Path

Buffalo Bayou Trails in Houston's East End (Tony Marron Park)

Figure ES.7 Bikeway Types

stakeholders. This process is detailed in **Chapter 5: Network Plan & Maps.** The recommended bikeways reflect public feedback collected throughout the plan and have been categorized based on the following potential implementation phases.

- **Programmed Projects** are those in the pipeline with dedicated funding that will expand the bikeway network. These include Bayou Greenways, City CIP and TxDOT projects, and partner projects such as those being completed by management districts and TIRZs.
- **Potential Short-Term Opportunities** are relatively low-cost implementation opportunities that appear feasible within the existing street pavement. This includes painted lanes, low capital cost projects and shared routes, and may require reallocation of travel lanes or parking. These have the highest potential to significantly expand the high-comfort bikeway network in near term.
- **Key Connections** are potential capital projects that would link neighborhood areas into a network that crosses the city. These are recommended as higher priorities among longer-term projects.
- **Long-Term Houston Bikeway Vision** includes all other bikeways in the plan, including new off-street segments and new dedicated bike lanes. Many of these projects are likely to be capital-intensive or require street reconstruction to implement. Resource requirements and the need to reconstruct streets will likely make these longer-term projects.

Full build-out of the proposed bikeway network includes over 1,780 miles of bikeways, more than triple the existing mileage and six times the existing high-comfort mileage.

Figures ES.9-ES.23 show how these networks build upon one another. The maps on each page show the potential bike network assuming completion of the projects in the category and all prior categories. These maps reflect recommendations as of June 2016.

The graphs show how the recommendations change outcomes related to the Houston Bike Plan goal of increasing access to the bikeway network. They show the percent of the City's population and jobs that would be served within one-half mile by the bikeway network. These access metrics all start in the 30-40% range for the existing high-comfort network and steadily grow to over 70% access with programmed, short-term potential opportunities, and key connections. Full completion of the bikeway network will put comfortable bikeways within reach of over 95% of people and jobs in the city.

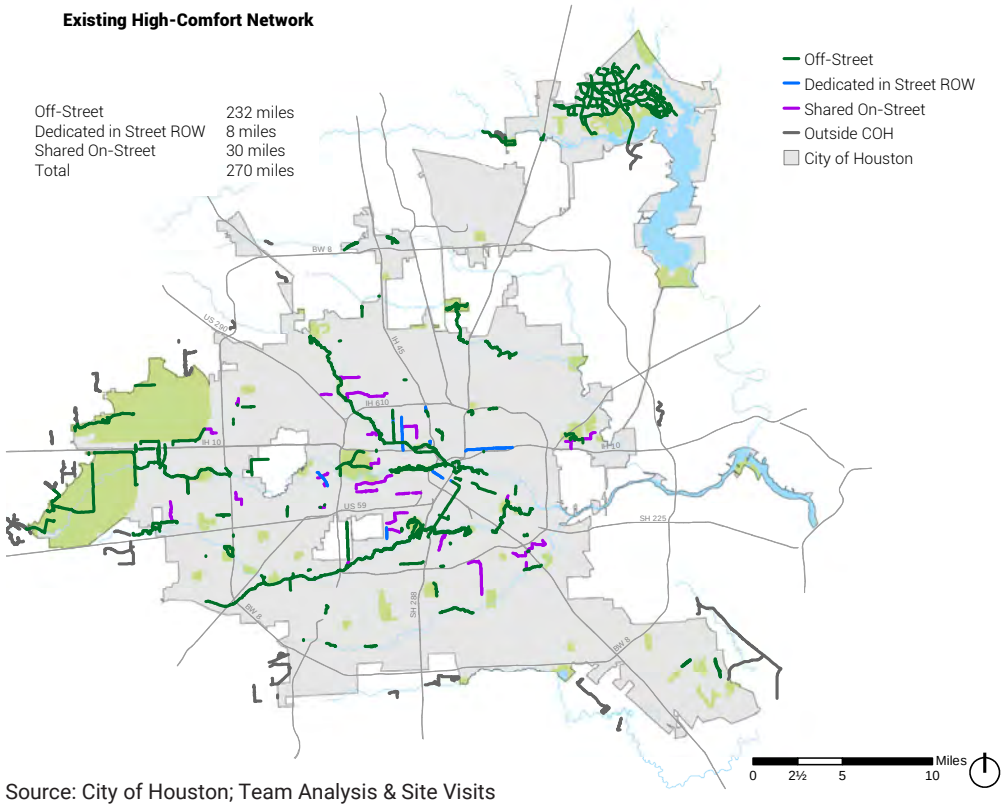
The graphs also show quarter-mile access to key civic institutions like schools, libraries, and community centers. These key destinations across the city would experience similar improvements in access as the network grows.

EXISTING HIGH-COMFORT BIKEWAYS

While the existing Houston Bikeway Program map includes approximately 500 miles of bikeway facilities, only about half of those provide adequate separation from traffic to feel comfortable for most adults who are interested in bicycling. These are shown on Figure ES.8.

The vast majority of existing high-comfort bikeways are bayou and rail-trails. Some existing bikeways on neighborhood streets meet the definition of high comfort, but relatively existing few bike lanes meet this standard.

For more details on Level of Comfort, see **Chapter 2: Existing Conditions & Opportunities.**



Source: City of Houston; Team Analysis & Site Visits

Figure ES.8: Existing City of Houston Bikeways - As of June 2016

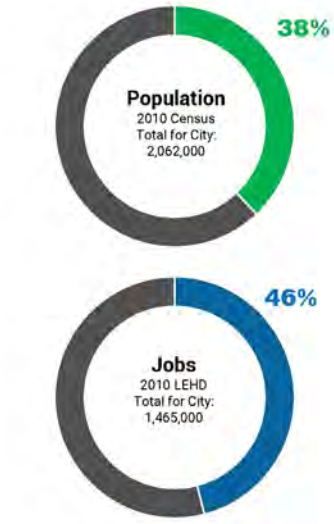


Figure ES.9: Half-Mile Access for People & Jobs

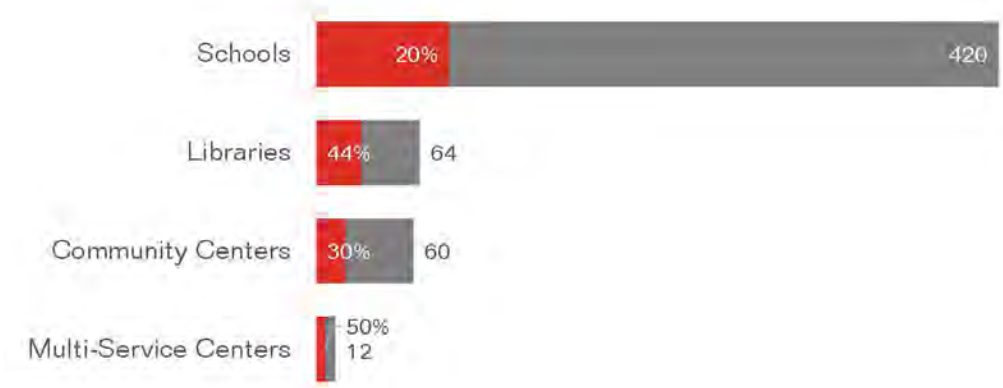
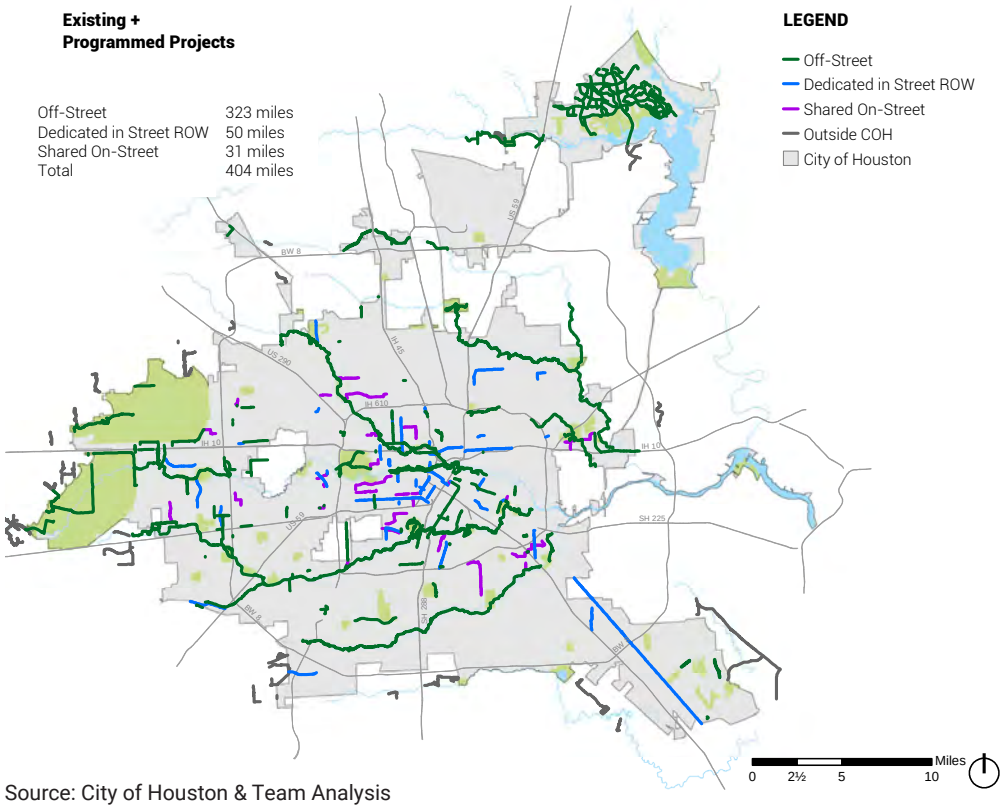


Figure ES.10: Quarter-Mile Access to Civic Destinations



Source: City of Houston & Team Analysis

Figure ES.11: Existing High-Comfort Bikeways and Programmed Projects

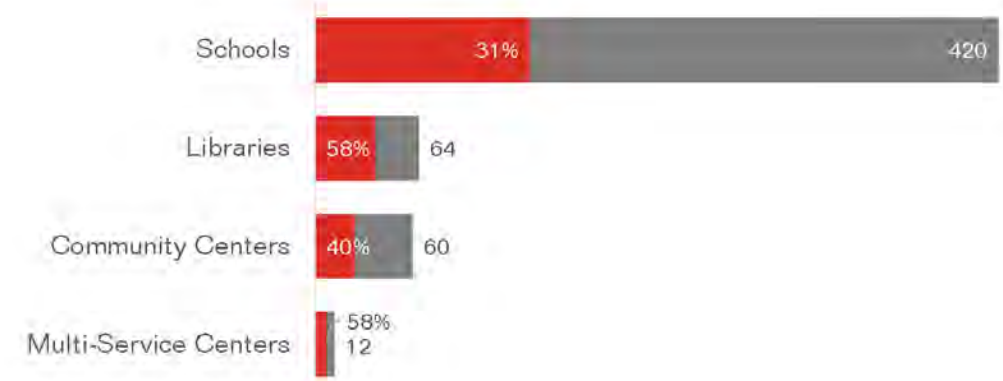


Figure ES.12: Quarter-Mile Access to Civic Destinations

PROGRAMMED PROJECTS

Projects that will create additional high-comfort bikeways are already in development by the City of Houston, TxDOT, Houston Parks Board, management districts, and others.

These projects will largely complete the major bayou corridors and add certain on-street connections.

This map shows funded projects that include high-comfort bikeways and are expected to be completed in the next five years, by 2021.

Programmed New Bikeway Mileage:

Off-Street:	91 mi.
Dedicated in Street ROW:	42 mi.
On-Street Shared:	1 mi.

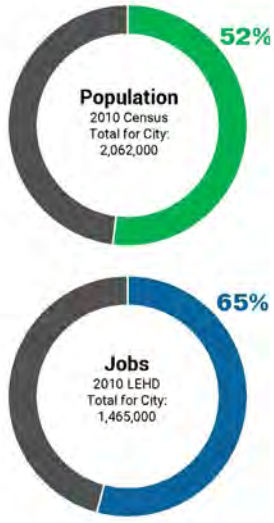


Figure ES.13: Half-Mile Access for People & Jobs

POTENTIAL SHORT-TERM OPPORTUNITIES

In some cases, high-comfort bikeways can be created with relatively modest investments in signs and striping. This can involve reallocating pavement space on streets with excessively wide lanes or excess capacity, or by designating shared routes on low-speed, low-volume streets.

This map shows bikeways that appear to be feasible to implement using these retrofit strategies. Further study and design may be required to confirm.

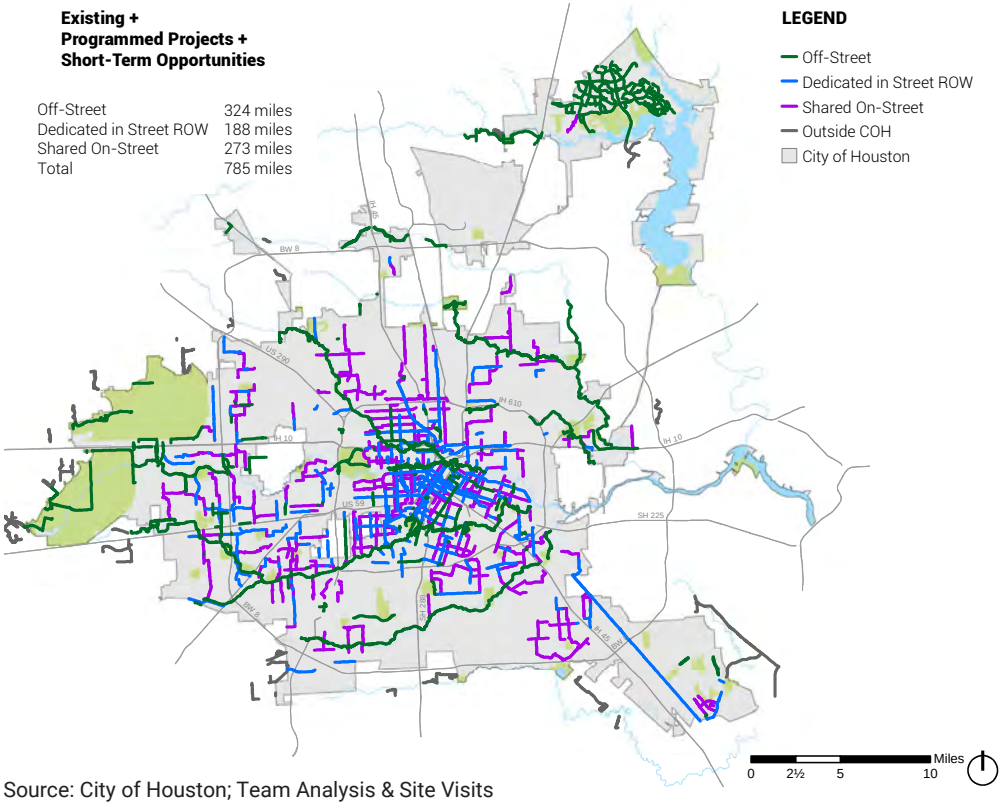
Potential Retrofit Opportunity Mileage:

Dedicated in Street ROW: 138 mi.

On-Street Shared: 242 mi.

Estimated Cost to Complete:

$27 - $51 million



Source: City of Houston; Team Analysis & Site Visits

Figure ES.14: Existing High-Comfort Bikeways, Programmed Projects, and Short-Term Implementation Opportunities

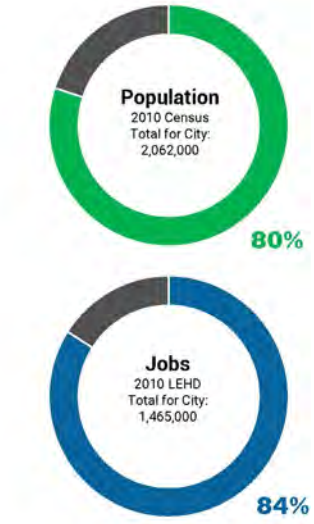


Figure ES.15: Half-Mile Access for People & Jobs

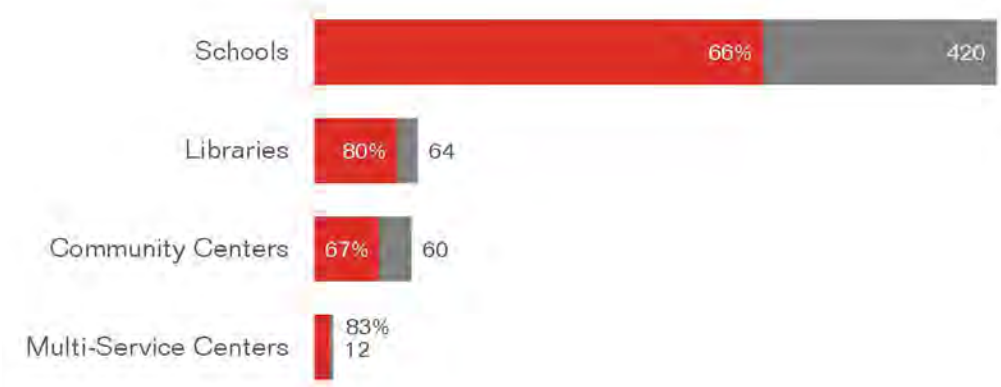
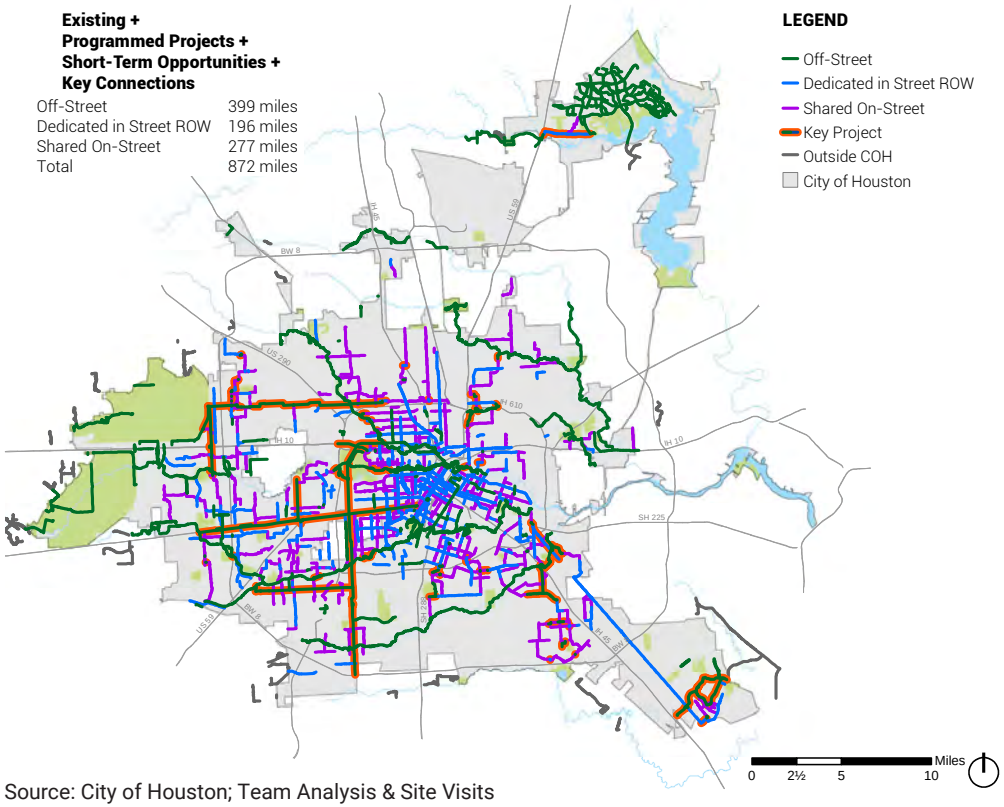


Figure ES.16: Quarter-Mile Access to Civic Destinations



Source: City of Houston; Team Analysis & Site Visits

Figure ES.17: Existing High-Comfort Bikeways, Programmed Projects, Potential Short-Term Projects, and Key Connections

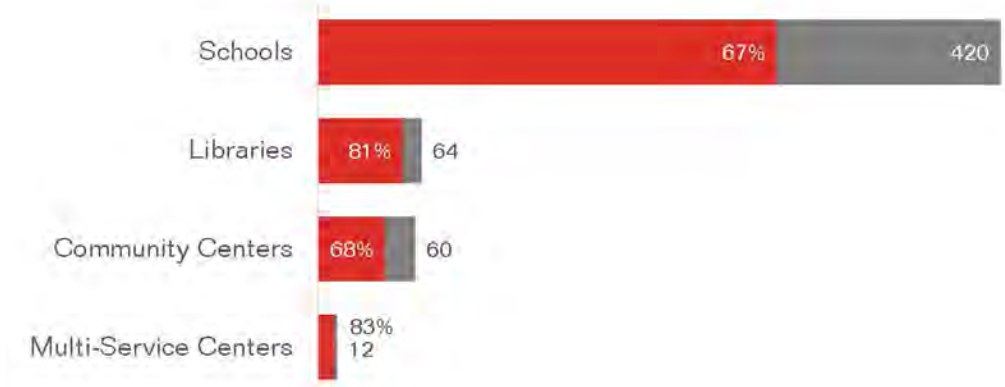


Figure ES.18: Quarter-Mile Access to Civic Destinations

KEY CONNECTIONS

The short-term retrofit opportunities can create high-comfort bikeway networks in individual areas of the city, but connecting neighborhoods into a true citywide network will require investing in certain higher-cost connections. More detail on these Key Connection Projects is available in **Chapter 6: Implementation Strategies.**

Key Connections Mileage:

Off-Street:	76 mi.
Dedicated in Street ROW:	8 mi.
On-Street Shared:	4 mi.

Estimated Cost to Complete:

$73 - $119 million

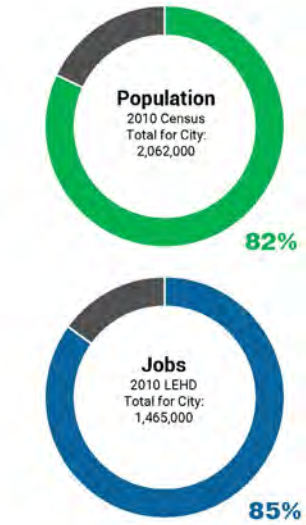


Figure ES.19: Half-Mile Access for People & Jobs

LONG-TERM VISION

This map shows the long-term vision for the Houston Bikeway Network. In many cases, installing high-comfort bikeway facilities on major streets will require reconstruction of the street. Systematically implementing these bikeways as streets come up for reconstruction will eventually create a comprehensive network that serves nearly all Houstonians and connects them to many destinations.

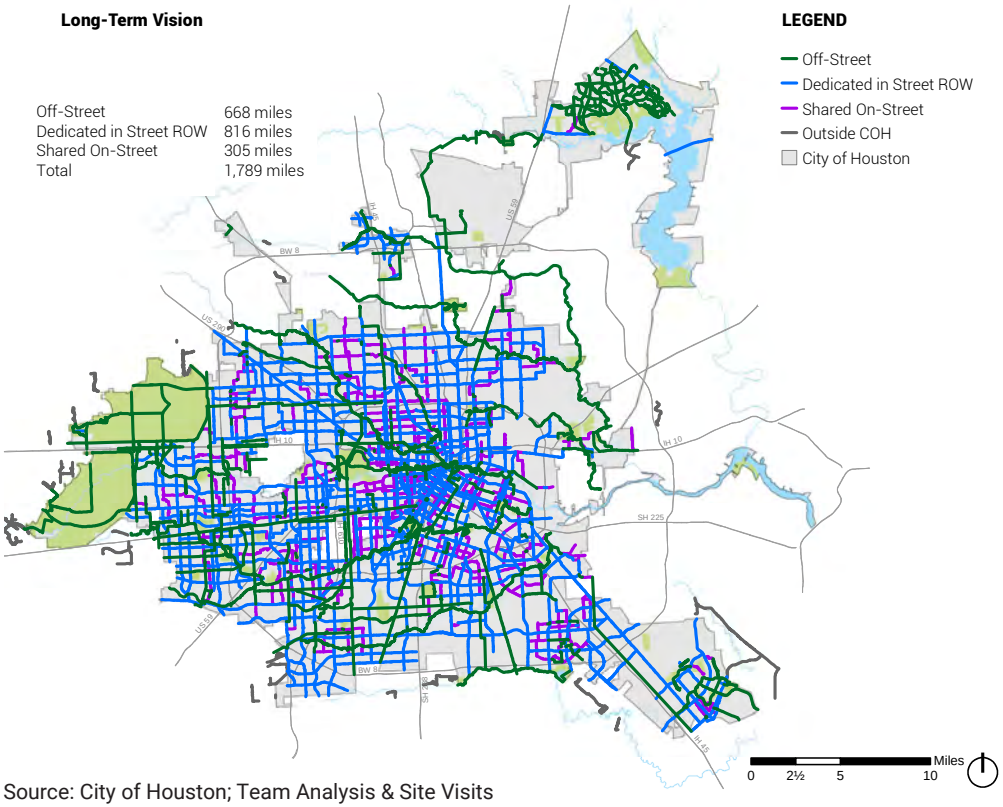
Additional Future Bikeway Mileage:

Off-Street:	269 mi.
Dedicated in Street ROW:	620 mi.
On-Street Shared:	28 mi.

Estimated Cost to Complete:

$235 - $382 million*

*Cost does not include 620 miles of on-street bikeways that would likely be incorporated during future street reconstruction



Source: City of Houston; Team Analysis & Site Visits

Figure ES.20: Long-Term Vision of the Bicycle Master Plan

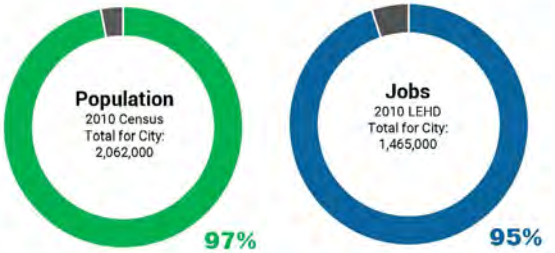


Figure ES.21: Half-Mile Access for People & Jobs

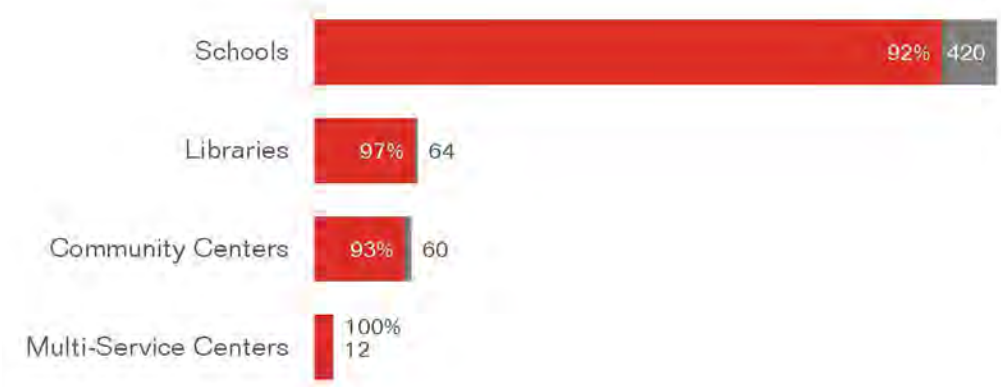


Figure ES.22: Quarter-Mile Access to Civic Destinations

For each of the project categories, planning-level cost estimates were developed. These were based on past project costs and the 2014 H-GAC Regional Pedestrian and Bicycle Plan. The estimated miles of bikeway by type, (shared, dedicated, or off-street) are shown in Figure ES.23. These were developed to size the relative funding needs required to implement the recommendations of the plan.

These estimated costs will need more detailed refinement based on specific corridor selection, bikeway types, and engineering of specific bikeways. Longer-term recommendations of the plan tend to be more capital-intensive and therefore higher cost. Short-term opportunities focus on utilization of existing streets by reallocation of space to striped dedicated bike lanes, low capital cost projects, or by signing and striping improvements that designate a shared bike route.

Based on the relative challenge of implementation, potential short-term opportunities have been identified to add 380 miles with an estimated cost of $27 - $51 million. This would nearly double the existing and programmed bikeway network and connect many more neighborhoods and destinations. Some of these projects may also be implementable through regular maintenance and street striping programs, mitigating the costs.

Key connections, which are typically more challenging capital projects, would add 86 miles of comfortable bikeways to the network. But because they tend to require trail construction or, in several locations, bridges, they are estimated to cost $73 - $119 million to complete.

Strategies for funding and project implementation are detailed in **Chapter 6: Implementation Strategies.**

Implementation Category	Miles of Bikeway			Average Cost per Mile* Low-High Range ($Thousands)			Planning Level Cost Range ($Millions)
	Dedicated in Street ROW	On-Street Shared	Off-Street	Dedicated in Street ROW	On-Street Shared	Off-Street	
Existing High-Comfort Bikeway Network	8	30	232	-			-
Programmed Projects	42	1	91	-			-
Short Term Potential	138	242	-	$90-210	$10-140	n/a	$27 - $51
Key Connections	8	4	75	$90-210	$10-140	$600-1,700	$73 - $119
Full Bikeway Network	620	28	269	n/a**	$10-140	$600-1,700	$235 - $382
Total Network	816	305	668				$335 - $552

Figure ES.23 Planning Level Cost Summary for Bikeway Network Implementation

* Cost per mile estimates are based on data from the 2014 H-GAC Regional Bikeway Plan, general planning estimates from comparable projects. Total cost estimates assume a 75%-25% and 25%-75% mix of low and high cost projects to develop range. Cost per miles estimates also include 20% to 40% for contingency, survey, engineering, and project management.

** On street bikeways will clearly have a cost as part of the full network build out but these would be included in the cost of street reconstruction and therefore are not included here.

Bicycle Toolbox

While the bikeway network map defines the corridors to be prioritized for expansion of the bikeway network, final project design will be critical to developing quality bikeways that serve the broad range of people riding in the City of Houston. Bikeway projects alone are not enough to build and sustain a bicycle-friendly city. Doing so requires a complementary set of infrastructure projects, a bicycle-supportive policy framework, and a foundation of programs to help educate and encourage more people to ride.

To support this, **Chapter 4: Bicycle Toolbox** outlines a set of recommendations for the city to move forward across these three categories.

Projects: detailed design elements to help inform the design of higher comfort bikeway projects. This includes bikeway corridor alternatives, intersection treatments, and connections that form the basis for a large part of the experience of riding a bicycle safely and comfortably in Houston. It also includes wayfinding and end-of-ride amenities that are critical to consider for the entirety of a person's trip. Examples of project design elements are shown in Figure ES.24 and ES.25.

Policies: recommendations for the regulatory, enforcement, and evaluation approaches to bicycling in Houston. Policies are complementary to Projects and Programs in that they can formalize the approach to

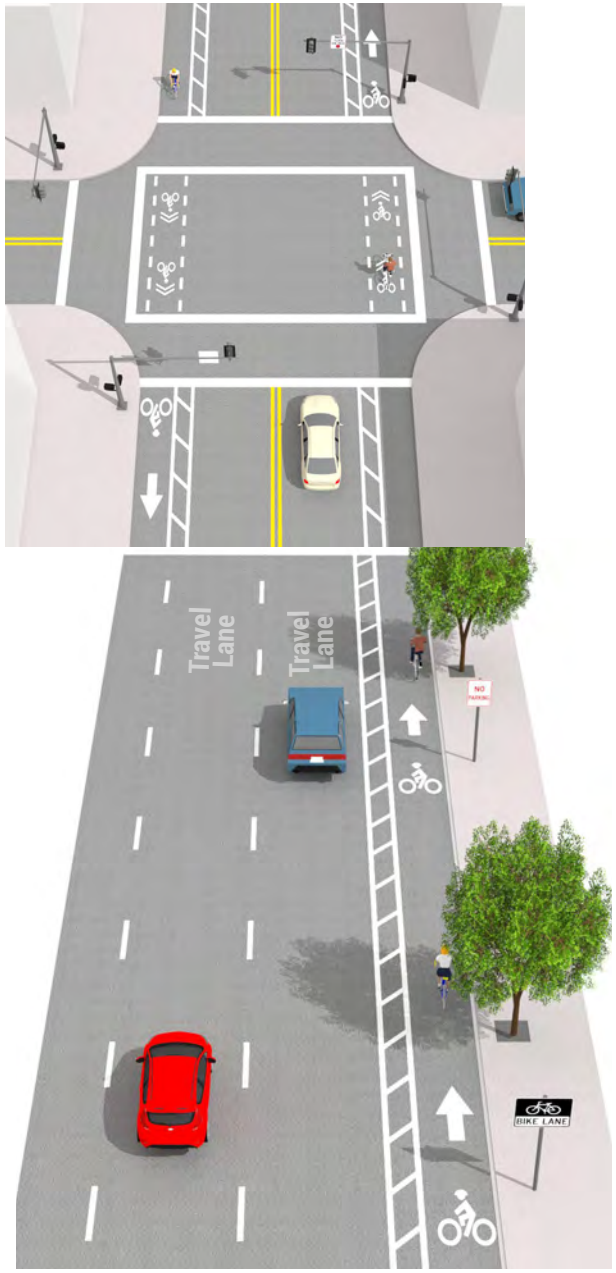


Figure ES.24: Toolbox Examples: Intersection Treatment and Buffered Bike Lane

Bicycle Advisory Committee (BAC):

The BAC will be critical to the ongoing implementation of the Bike Plan. The role of the BAC is recommended to include but not be limited to: working with the City in achieving the ten-year vision and any interim goals and targets; development of an annual report; and working with the City to develop recommendations to address the issue of long-term maintenance of bikeways, both off and on street.

consistent project development and set a framework for programs to successfully support a bicycle friendly culture. Policies can also define incentives that would improve safety, access, and amenities for people biking. Figure ES.26 shows how the lack of a standard policy for prohibiting parking in a bike lane unless "No Parking" signage exists can create challenging situations for people cycling. A new policy supported by ordinance would eliminate the need to install signs everywhere and create a consistent expectation for people cycling as well as parking. The development of a Bicycle Advisory Committee (BAC) to help support the implementation of the Plan is also recommended as an important Policy as part of a broader agency and stakeholder coordination strategy.

Programs: recommendations for programs that improve education and encouragement to support more people of all ages, abilities, and backgrounds to bicycle in Houston and help meet the Bike Plan's goal of Increased Ridership. Best practices are identified that can be employed by the public, non-profit, and private sectors to encourage more bicycling within the community. This section also identifies approaches for better data and information gathering to support decision-making related to Projects and Policies. Sunday Streets, Houston's Open Street program, (Figure ES.27) is a great example of encouraging more people to be get out and be active on Houston streets.



Figure ES.25: End of Trip Facilities
Bike Station



Figure ES.26: Policies
No Parking in Bike Lanes Ordinance



Figure ES.27: Programs
Sunday Streets/Open Streets Programs

Implementation Strategies

Success in achieving the Vision for the Houston Bike Plan will only be realized through effective implementation. An effective approach builds on the recommendations of the plan to identify strategies that capture the identified opportunities, supports ongoing execution, manages progress against plan goals, and allocates resources where they can have the greatest impact. **Chapter 6: Implementation Strategies** outlines eight key implementation strategies and supporting recommendations to help the City of Houston to move the Houston Bike Plan forward and improve opportunities for people bicycling in Houston.

Various departments within the City will need to lead many of the initiatives to move them forward and key partnerships have been identified within each strategy, where appropriate, to help leverage the resources available to the City.

The Houston region has made meaningful strides in implementing projects and adopting policies to become more bike-friendly. Even with the positive momentum, the implementation environment will be challenging for the City of Houston over the next several years.

Challenges

While a significant number of projects, such as Roadway CIP and Bayou Greenways, have dedicated funding identified for implementation over the next five years, there will be challenges in identifying additional resources, either in personnel, capital, or operations and maintenance, to advance many additional components of the plan forward in the near term.

The City's significant infrastructure needs create strong competition for resources for new projects meaning capturing opportunities to integrate improved bikeways into all projects will be critical. Many of the Plan's recommendations, particularly those related to policy and programmatic changes, may require changes to the current regulatory environment. Successfully implementing any of these will require political support to enact and will likely take time to advance.

From Plan to Action

The nine implementation strategies for the Houston Bike Plan are shown in Figure ES.28 on the following page. They outline steps that the City and other partners can take to implement key components of the Bike Plan. These strategies include strategies to move programs and policies forward, prioritization and funding strategies to implement projects to expand the bikeway network, and a performance management approach to measure progress. The Plan also identifies several strategies to create positive change and show examples of what is possible to build momentum for implementing the plan. These include conceptual pilot projects showing key components of the Bicycle Toolbox as well as an approach to communicate plan at the neighborhood level.

Figure ES.28 Implementation Strategies and Key Recommendations for the Houston Bike Plan:

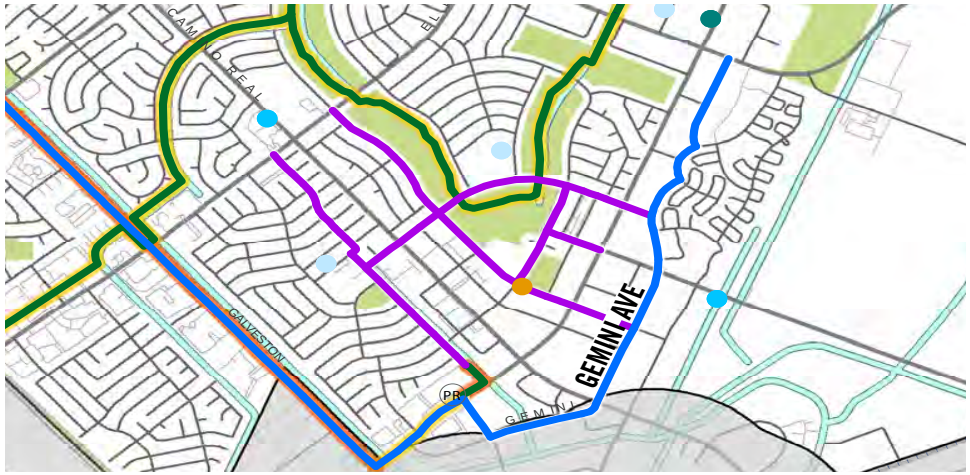
1. **Manage Performance Against Goals**
   - 1.1 Develop and present an annual Houston Bikeways Program Strategic Report.
   - 1.2 Develop approach to capture data to assess performance on a regular basis and develop performance targets.
2. **Prioritize and Collaborate on Policies and Programs**
   - 2.1 Develop agreed-upon roles with city departments including Houston Bikeways Program staff and partners for implementation of policies and programs identified in the Bike Plan.
   - 2.2 Develop prioritization approach for tackling policies and programs considering resources, staffing levels, and partnership opportunities.
3. **Project Development and Implementation**
   - 3.1 Develop packages of short-term bikeway projects that can be implemented within existing street rights-of-way and seek funding to implement.
   - 3.2 Prepare key connection recommendations as a package of projects detailing benefits and costs. This package should be utilized to recruit funding partners and apply for grants as opportunities become available.
4. **Develop Resource and Staffing Needs**
   - 4.1 Increase Houston Bikeways Program staff in appropriate departments in the City.
   - 4.2 Establish the Bicycle Advisory Committee as a regular standing committee that works with City staff to implement the Bike Plan.
5. **Leverage Funding Opportunities**
   - 5.1 Create a spending target with dedicated funds from the City's budget for bikeway projects and programs.
   - 5.2 Identify and pursue funding partnerships and support from other local agencies, City departments, and private entities to leverage funds.
   - 5.3 Pursue funding for short-term and key connection projects.
   - 5.4 Develop bicycle facility maintenance prioritization criteria and incorporate bicycle facility maintenance as part of roadway maintenance activity as possible.
6. **Build Momentum Through Pilot Projects**
   - 6.1 Create conceptual plans for specific bikeway treatments across the city.
   - 6.2 Implement and celebrate bikeway projects to build momentum to implement the Plan.
7. **Connect to Major Bicycle Thoroughfares (e.g., Bayous and other Greenway Trails)**
   - 7.1 Develop specific plans and policies for access to major greenway corridors to ensure safe access to these "bicycle highways" from neighborhoods and activity centers.
   - 7.2 Coordinate with adjacent jurisdictions to provide a connected network across city lines.
8. **Engage Neighborhoods to Translate Plan to a Local Level**
   - 8.1 Incorporate and refine the provided approach and tools for neighborhood level planning to connect to citywide bikeway network, in future planning projects.
   - 8.2 Identify opportunities to apply specific policies or programs at the neighborhood level to support the growth of safe, healthy opportunities to bicycle.
   - 8.3 Continue proactive outreach to neighborhoods and other civic groups on the Bike Plan.
9. **Continue to Engage the Public in the Development of Bicycle Facilities.**
   - 9.1 Incorporate public engagement on bikeway projects beginning no later than preliminary engineering i.e. the design phase of the project.

Pilot Projects

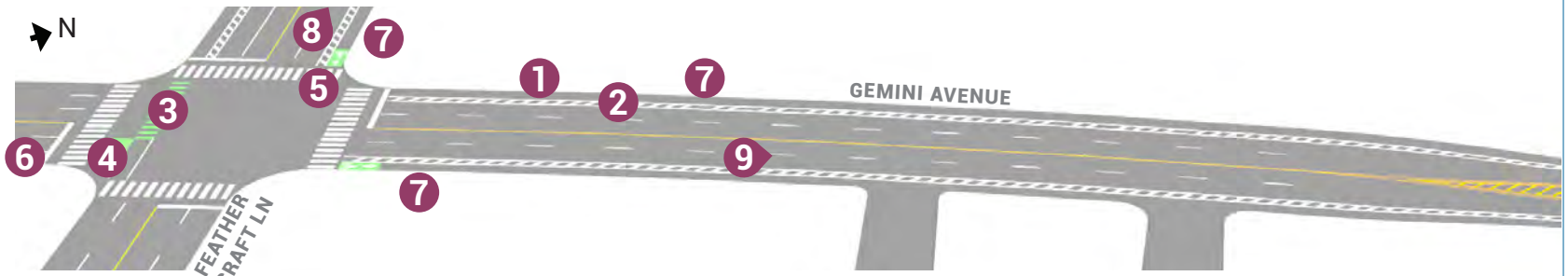
Pilot projects not only build momentum for implementation, but can also provide opportunities to showcase best practices and build partnerships. The pilot projects showcased in **Chapter 6: Implementation Strategies** include a variety of project types that will provide the City with additional, key near-term improvement opportunities. These include:

1. Intersection Improvements – Polk Street at Scott Street
2. ROW Reallocation – Kelley Street Hirsch to LBJ Hospital
3. ROW Reallocation – Gemini Avenue– Bay Area Park & Ride to Saturn Lane
4. Neighborhood Bikeways – Gulfton-Sharpstown neighborhood plan area.
5. Bike Station – Downtown Houston

The pilot project for Gemini Avenue in Clear Lake connection the Bay Area Park & Ride to the Johnson Space Center (NASA) is shown here and on the following page.



1. Existing travel lane conversion to 7' Bike Lane
2. 3' Buffer from travel lane
3. Pavement treatment to increase driver awareness of bicycle presence
4. Bike box to accommodate common turning movement from Feather Craft to Gemini
5. Pavement treatments to guide bicyclists as bike route turns
6. Right turn only lane allows bike lane to begin
7. Bike Lane and No Parking Signage
8. Access to Bay Area Park & Ride
9. Access to jobs, housing, and NASA



Proposed Pilot Project- Gemini Avenue

