CHAPTER 4

Network Recommendations




Chapter 4 Citywide Pedestrian and Bicycle Network Recommendations

Creating a Citywide Network

Opportunities to create a citywide network of great walking and bicycle riding facilities abound in Sugar Land. At a neighborhood level, area developments have initiated excellent trails and sidewalks along many tree-lined streets. Parkway areas along some major streets can provide wide corridors for walking and riding. Other opportunities exist along drainage channels, power line corridors, street right-of-ways and along the Brazos River.

The recommended pedestrian and bicycle facilities within the current city limits of Sugar Land total an additional 63 miles of shared use paths (trails), 65 miles of sidepaths, 13 miles of bike lanes, 8 miles of buffered bike lanes, 0.7 mile of cycle track, and 18 miles of shared lane markings. The total mileage for each facility when combining existing and recommended facilities is shown in the chart below. A proposed facilities map is shown in Appendix H.

Many of these potential facilities can be implemented relatively easily and at a moderate cost. Others are more extensive and will take longer to fund and implement. Collectively, these recommendations can transform Sugar Land into one of the most exemplary pedestrian and bicycle networks in the Houston region.

This section summarizes recommendations for each facility type, including:

- Off-street facilities for both pedestrians and bicyclists
  - Shared use paths
  - Sidepaths
- Off-street facilities for pedestrians only
  - Sidewalks
- On-street bicycle facilities
  - Bike lanes
  - Buffered bike lanes and cycle track opportunities

EXISTING FACILITIES IN SUGAR LAND (2013)

- 3 miles of bike lanes
- 51 miles of shared use paths (trails) - many are HOA trails
- 11 miles of sidepaths

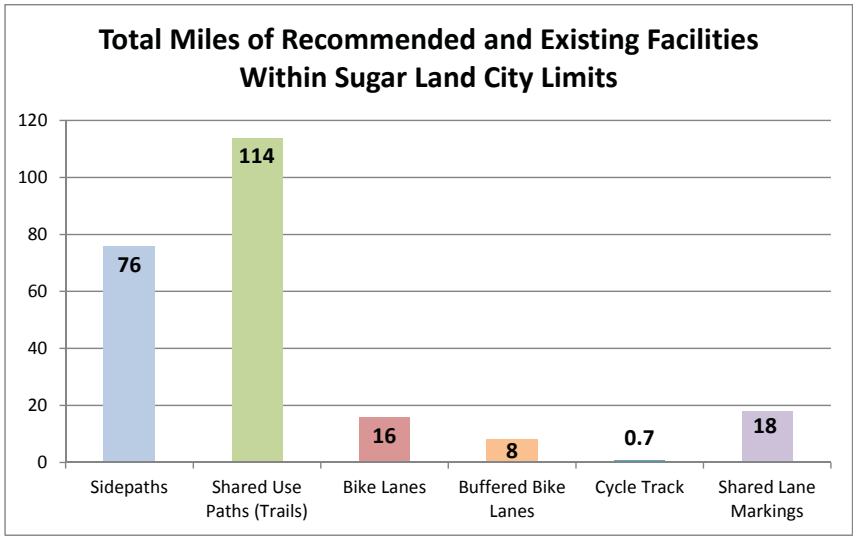
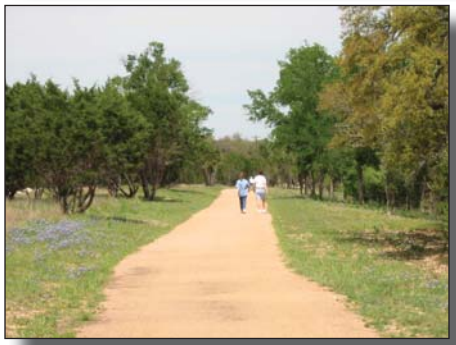


Figure 4-1 Total Miles of Existing, High Priority and Long Term Proposed Facilities within Sugar Land City Limits



- Shared lane markings

This section also address network coordination issues such as:

- Barrier recommendations
- Support facilities and features
- Linking to current and future transit

Off-Street Recommended Facilities

This section describes a citywide network of off-street recommendations, including both sidepaths and shared use paths (often referred to as trails). Shared use paths and sidepaths are largely preferred by many Sugar Land residents because of the perceived benefit of complete separation from vehicular traffic.

Shared Use Paths (Trails)

Sugar Land also has many opportunities to add to its existing network of shared use paths. Drainage and utility corridors are good locations for shared use paths and can help create a network of walking and bicycling facilities connecting all parts of the City.

Considerations used in selecting corridors for shared use paths include:

Availability of the corridor - Is the corridor owned or controlled by the City of Sugar Land or by an entity that would allow its use as a pathway corridor? Is there sufficient space for an adequate pathway width? Might any future additions to the corridor (for example the installation of utilities) impact a trail after it is built?

Access to the corridor - Is the corridor readily accessible from adjacent neighborhoods?

Impact on adjacent private residences - If a pathway is incorporated, can the privacy of adjacent homes be adequately maintained?

A total of approximately 63 miles of shared use paths are recommended. Because of the higher construction costs of shared-use paths, individual segments will have to be developed over time as funding becomes available.

The locations of all recommended shared use paths are shown on the following pages in Figure 4-3 and Table 4.1.

Figure 4-2 Examples of shared use paths (trails)

Proposed Shared Use Paths (Trails)

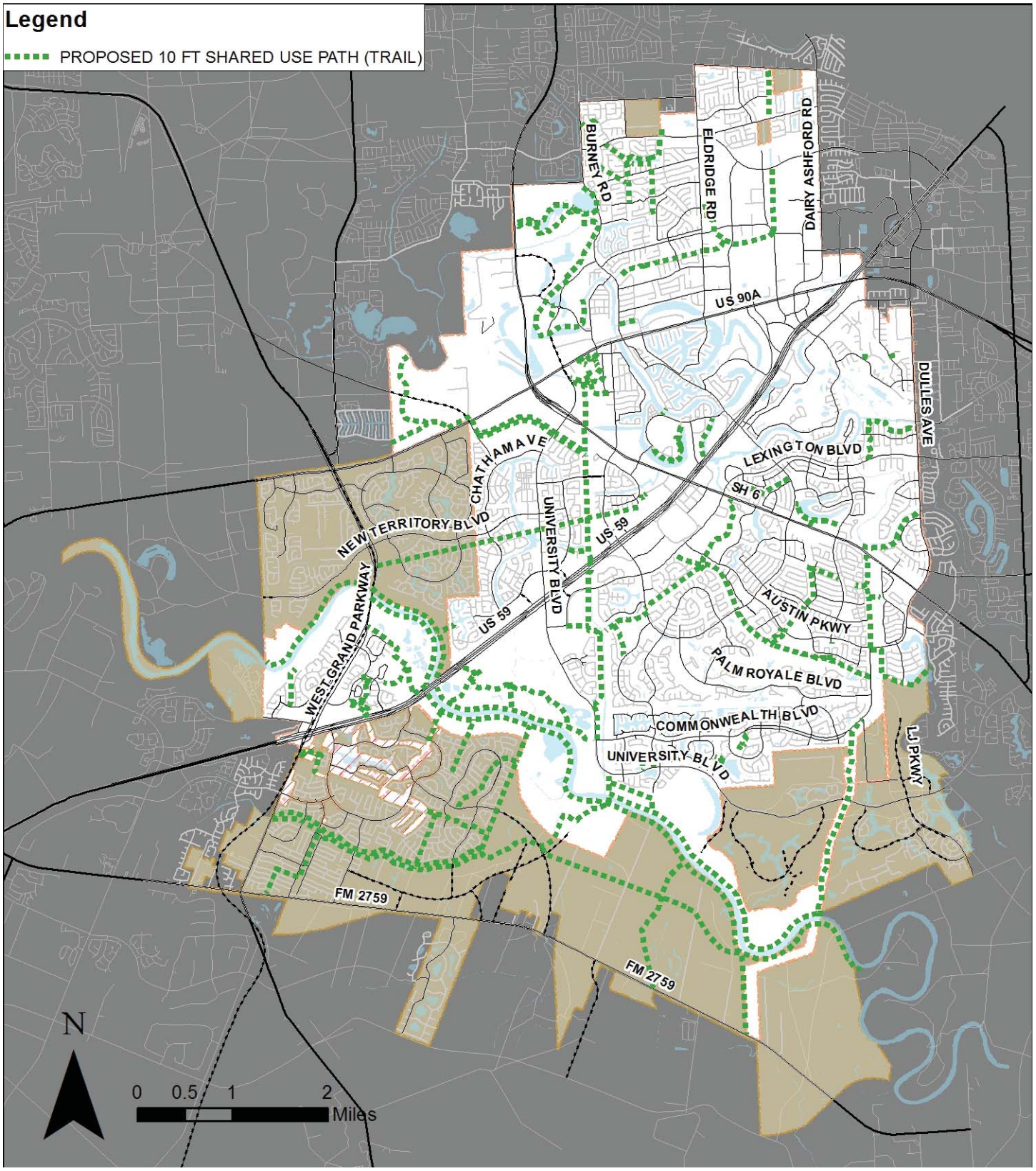


Figure 4-3 Proposed Shared Use Paths

Table 4.1 Proposed Shared Use Paths (Trails) Recommendations - City Limits Only				
Segment	**From**	**To**	**Length (lf +/-)**	**Bridge Need**
BRAZOS LANDING PARK CONNECTION	DITCH H	BRAZOS LANDING PARK ENTRANCE	3,200	
BRAZOS RIVER PARK TRAIL	BRAZOS RIVER	WIMBERLY CANYON DR	2,200	
BRAZOS RIVER TRAIL NORTH	UNIVERSITY BLVD	CITY LIMIT	17,800	
BRAZOS RIVER TRAIL NORTH	CITY LIMIT	US 59	16,600	
BRAZOS RIVER TRAIL NORTH	US 59	SUGAR LAND MEMORIAL PARK	8,100	
BRAZOS RIVER TRAIL SOUTH	US 59	CITY LIMIT	34,700	
BRAZOS RIVER TRAIL SOUTH	BRAZOS RIVER PARK	US 59	7,600	
BRIDGE WATER TO AVALON LAKES	AVALON LAKES TRAIL	BRIDGE WATER TRAIL	700	
BRIDGEWATER PARK	BRIDGEWATER PARK	SIDEWALK	1,400	
CLEMENTS HIGH SCHOOL	DITCH A TRAIL	ELKINS RD	1,900	
CNP EASEMENT TRAIL	FIRST COLONY BLVD	EAST SIDE OF LOWE'S PROPERTY	2,200	
CNP EASEMENT TRAIL	UNIVERSITY BLVD	FIRST COLONY BLVD	3,500	BRIDGE
CNP EASEMENT TRAIL	ETJ LIMIT	UNIVERSITY BLVD	3,700	
COLONY GRANT TRAIL	MESQUITE PARK	SETTLERS WAY BLVD	300	BRIDGE
COLONY GRANT TRAIL ADDITIONS	UTILITY CORRIDOR	AUSTIN PARKWAY	5,900	
DITCH A TRAIL CORRIDOR	AUSTIN PARK	COMMONWEALTH BLVD	3,600	
DITCH A TRAILS	DITCH H	SWEETWATER BLVD	3,100	BRIDGES (2)
DITCH A TRAILS	LONNIE GREEN PARK	SUGAR MILL PARK	3,400	
DITCH A-22 TRAIL	END OF EXISTING TRAILS	CITY PARK	1,500	
DITCH C TRAILS	SH 6	AUSTIN PARKWAY	3,900	BRIDGE
DITCH C TRAILS	DITCH H	TOWN CENTER	4,000	BRIDGE
DITCH H TRAILS	US 59	COMMONWEALTH BLVD	10,600	
DITCH H TRAILS	SH 6	LEVEE 17 TRAIL CORRIDOR	1,400	
DITCH H TRAILS	LEVEE 17 TRAIL CORRIDOR	US 59	6,000	
DITCH H TRAILS	UNIVERSITY BLVD	SH 6	3,100	
DITCH H TRAILS	UNIVERSITY BLVD	IMPERIAL PARK	1,200	
DULLES SCHOOL TRAIL	LONGVIEW DR	DULLES ELEMENTARY	600	
ELDRIDGE PARK CONNECTION	ELDRIDGE PARK	WEST AIRPORT BLVD	400	
FIRST COLONY AREA TRAIL	AUSTIN PARKWAY	DITCH A	1,100	
FIRST COLONY AREA TRAIL	AUSTIN PARKWAY	DITCH A	1,000	




TABLE 4.1 PROPOSED SHARED USE PATHS (TRAILS) RECOMMENDATIONS - CITY LIMITS ONLY

Segment	From	To	Length (lf +/-)	Bridge Need
FIRST COLONY POWERLINE TRAIL	SH 6	AUSTIN PARKWAY	6,600	BRIDGE
FIRST COLONY TRAIL	LEXINGTON BLVD	SWEETWATER BLVD	5,900	BRIDGES (2)
FIRST COLONY TRAIL	SWEETWATER BLVD	AUSTIN PARK	5,200	BRIDGE
FIRST ST	MAIN ST	WOOD ST	1,000	
FORT SETTLEMENT MIDDLE SCHOOL CONNECTION	FORT SETTLEMENT MIDDLE SCHOOL	UNIVERSITY BLVD	800	
GANNOWAY LAKE AREA NATURE TRAILS	GANNOWAY LAKE PARK	SH 6	8,500	
GANNOWAY LAKE AREA NATURE TRAILS	GANNOWAY LAKE PARK	SH 6	3,200	
GLEN LAUREL LAKE TO COVINGTON WEST PARK CONNECTION	GLEN LAUREL LAKE AT BAUMEADOW LN	COVINGTON WEST PARK AT OAKWOOD	2,300	
HIGHLAND AREA NEIGHBORHOOD TRAIL	LEXINGTON BLVD/SH 6	WILLIAMS TRACE BLVD	3,700	
IMPERIAL CANYON LN TRAIL	IMPERIAL CANYON LN	MEADOW VALLEY LN	1,400	
IMPERIAL CANYON LN TRAIL	BURNEY RD	EXISTING TRAIL	700	
IMPERIAL PARK	US 90A	BROOKS ST	2,100	
IMPERIAL PARK	IN IMPERIAL PARK	IN IMPERIAL PARK	2,400	
IMPERIAL PARK	IN IMPERIAL PARK	IN IMPERIAL PARK	2,400	
KENSINGTON TO MEADOW LAKE PARK CONNECTION	KENSINGTON DR	EXISTING TRAIL @ MEADOW LAKE PARK	500	
LAKE POINTE TRAIL	FLUOR DANIEL DR	FLUOR DANIEL DR	2,700	
LAKE POINTE TRAIL	CREEK BEND DR	EXISTING SIDEWALK	1,500	
LAKE POINTE TRAILS EXTENSION	CREEKBEND DR	WHIMBREL DR	500	
LAKE POINTE TRAILS EXTENSION ON OYSTER CREEK	CREEKBEND DR	US 59	2,400	
LAKE TRAIL/MARKET AT FIRST COLONY	WILLIAMS TRACE BLVD	SETTLERS WAY BLVD	3,500	
LID 17 TRAIL CORRIDOR	UNIVERSITY BLVD	DITCH H	1,900	
LID 17 TRAIL CORRIDOR	UNIVERSITY BLVD	DITCH H	2,100	BRIDGE
LID 17 TRAIL CORRIDOR	US 90A	UNIVERSITY BLVD	4,700	
LID 17 TRAIL CORRIDOR	US 90A	UNIVERSITY BLVD	7,200	
MONTCLAIR BLVD TO BENDWOOD DR CONNECTION	MONTCLAIR BLVD	BENDWOOD DR	500	

Table 4.1 Proposed Shared Use Paths (Trails) Recommendations - City Limits Only				
Segment	**From**	**To**	**Length (lf +/-)**	**Bridge Need**
NORTH DETENTION POND CONNECTION	NORTH DETENTION PONDS	VINEHILL DR	2,400	
NORTH DETENTION POND TRAIL	WEST AIRPORT BLVD	RETENTION PONDS IN RESERVE AT GLEN LAUREL	1,600	
NORTH DETENTION POND TRAIL	WEST AIRPORT BLVD	RETENTION PONDS IN RESERVE AT GLEN LAUREL	2,900	
NORTH DETENTION POND TRAIL	WEST AIRPORT BLVD	RETENTION PONDS IN RESERVE AT GLEN LAUREL	500	
NORTH DETENTION POND TRAIL	WEST AIRPORT BLVD	RETENTION PONDS IN RESERVE AT GLEN LAUREL	1,100	
NORTH OYSTER CREEK TRAILS	SH 6	HARMAN ST	4,300	BRIDGE
NORTH OYSTER CREEK TRAILS	GANNOWAY LAKE	BRIDGE	5,000	
NORTH OYSTER CREEK TRAILS	IMPERIAL BLVD	STADIUM DRIVE	800	
NORTH OYSTER CREEK TRAILS	SH 6	HARMAN ST	3,700	
OYSTER CREEK TRIBUTARY TRAIL	OYSTER CREEK	US 90A	6,400	
OYSTER CREEK TRIBUTARY TRAIL	CITY LIMIT	PROPOSED OYSTER CREEK TRIBUTARY TRAIL	2,300	
PLANTATION BEND NEIGHBORHOOD TRAIL	OYSTER CREEK PARK ENTRANCE	DULLES AVE	4,800	
POWERLINE TRAIL CORRIDOR	AUSTIN PARKWAY	LEVEE AT LAKEFIELD	5,300	
POWERLINE TRAIL CORRIDOR	COMMONWEALTH BLVD	BRAZOS RIVER	11,800	
RIVER PARK NEIGHBORHOOD TRAILS	SANDY RIDGE LN	RIVER PARK TRAILS (PROPOSED)	1,900	
RIVER PARK NEIGHBORHOOD TRAILS	SUMMIT CREEK	US 59	5,800	
RIVER PARK TRAIL	GRAND PARKWAY	US 59	6,000	
RIVERBEND NORTH NEIGHBORHOOD TRAILS	DULLES AVE	LEXINGTON BLVD	5,400	
SETTLERS WAY BLVD DITCH TRAIL	MESQUITE DR	DITCH A TRAIL	400	
SETTLERS WAY BLVD DITCH TRAIL	AUSTIN PARKWAY	EXISTING DITCH TRAIL	300	
SL BUSINESS PARK TRAIL	GILLINGHAM LN	WEST AIRPORT BLVD	3,600	
SL BUSINESS PARK TRAIL	ELDRIDGE RD	WEST OF GILLINGHAM LN	2,800	
SL BUSINESS PARK TRAIL	ELDRIDGE RD	WEST OF GILLINGHAM LN	1,500	




Table 4.1 Proposed Shared Use Paths (Trails) Recommendations - City Limits Only				
Segment	**From**	**To**	**Length (lf +/-)**	**Bridge Need**
SL BUSINESS PARK TRAIL	GILLINGHAM LN	WEST AIRPORT BLVD	2,500	
SL BUSINESS PARK TRAIL	ELDRIDGE RD	WEST OF GILLINGHAM LN	600	
SUGAR LAND MEMORIAL PARK TRAILS	US 59	EXISTING TRAIL	9,400	
SUGAR LAND MEMORIAL PARK TRAILS	SUGAR LAND MEMORIAL PARK	BRAZOS RIVER	2,700	
SUGAR LAND MEMORIAL PARK TRAILS	SUGAR LAND MEMORIAL PARK	BRAZOS RIVER	1,800	
SUGAR MILL TO NORTH WETLAND TRAIL CORRIDOR	GREENWAY DR	SUGAR MILL PARK	2,400	
TELFAIR LAKE TRAILS (DITCH H)	WESCOTT AVE	DITCH H	1,100	
TELFAIR PORK CHOP TRAIL CONNECTION	LEXINGTON BLVD	DITCH H TRAIL	1,300	
WEST BELLFORT RD TO ALSTON RD CONNECTION	WEST BELLFORT RD	ALSTON RD	2,700	
ETJ Limits Only				
BRAZOS RIVER TO FM 2759 CONNECTION	BRAZOS RIVER	FM 2759	7,900	
CNP EASEMENT TRAIL	GRAND PARKWAY	ETJ LIMIT @ NEW TERRITORY BOUNDARY	5,700	
CRABB RIVER TO GREATWOOD CONNECTION	CRABB RIVER RD	GREATWOOD PARKWAY	2,500	
GREATWOOD COMMUNITY TRAIL EAST	UTILITY CORRIDOR	RABBS BAYOU	3,300	BRIDGE
GREATWOOD COMMUNITY TRAIL WEST	RABBS BAYOU TRAIL	FM 2759	5,600	BRIDGE
GREATWOOD DITCH TRAIL	LEVEE	GREATWOOD RECREATION CENTER	4,600	
GREATWOOD LEVEE TOE TRAIL	BRAZOS RIVER	RABBS BAYOU	7,800	
GREATWOOD NEIGHBORHOOD TRAIL EAST	BRAZOS RIVER	WOOD DALE DR	3,400	
GREATWOOD NEIGHBORHOOD TRAIL WEST	BRAZOS RIVER	GREATWOOD PARKWAY	2,000	
GREATWOOD UTILITY CORRIDOR TRAIL	GREATWOOD PARKWAY	LEVEE	3,800	
POWERLINE CORRIDOR	RABBS BAYOU	FM 2759	17,600	
RABBS BAYOU TRAIL	CRABB RIVER RD	BRAZOS RIVER	22,200	BRIDGE
RABBS BAYOU TRAIL	CRABB RIVER RD	GREATWOOD LEVEE PROPOSED TRAIL	12,800	

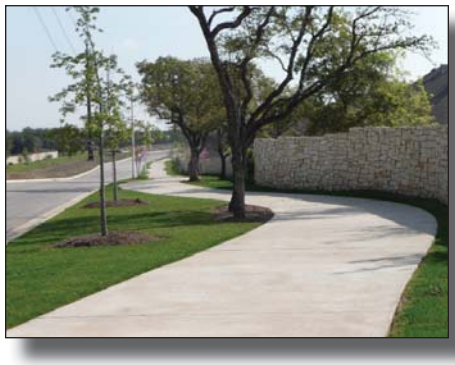


Figure 4-4 Examples of sidepaths

Sidepaths

More so than most communities, Sugar Land has extensive opportunities for sidepaths because of the wide right-of-ways on many streets. Considerations used in evaluating where sidepaths can be considered include:

Number of intersections and/or driveways - Some boulevards throughout the City have infrequent intersections leading into neighborhoods, and even driveways into private businesses are limited, creating less conflict points and thereby making sidepaths safer.

Streetscape features which may limit the development of sidepaths - In some cases, mature trees alongside boulevards limit the suitability for sidepaths. Since fully mature trees give Sugar Land a unique character, the use of these streets for sidepaths is not recommended.

Street volume and speed characteristics are unfavorable for on-street bicycle lanes - Sidepaths are considered on streets where higher volumes and speeds preclude the use of an existing travel lane for bicycles.

Areas near schools - In the vicinity of schools, where space is available and where the number of driveways or intersections is limited, sidepaths are considered a possible treatment to increase access to the school. However, not all areas around schools have favorable conditions for sidepaths.

The recommended locations of sidepaths in Sugar Land are shown on the following pages. For locations where there is an existing sidewalk, this Plan recommends expanding the width of the sidewalk to a sidepath width. The more detailed tables in Appendix H, which are organized by facility type and priority level, also show on which side of the street the sidepath is being proposed.

Proposed Sidepaths

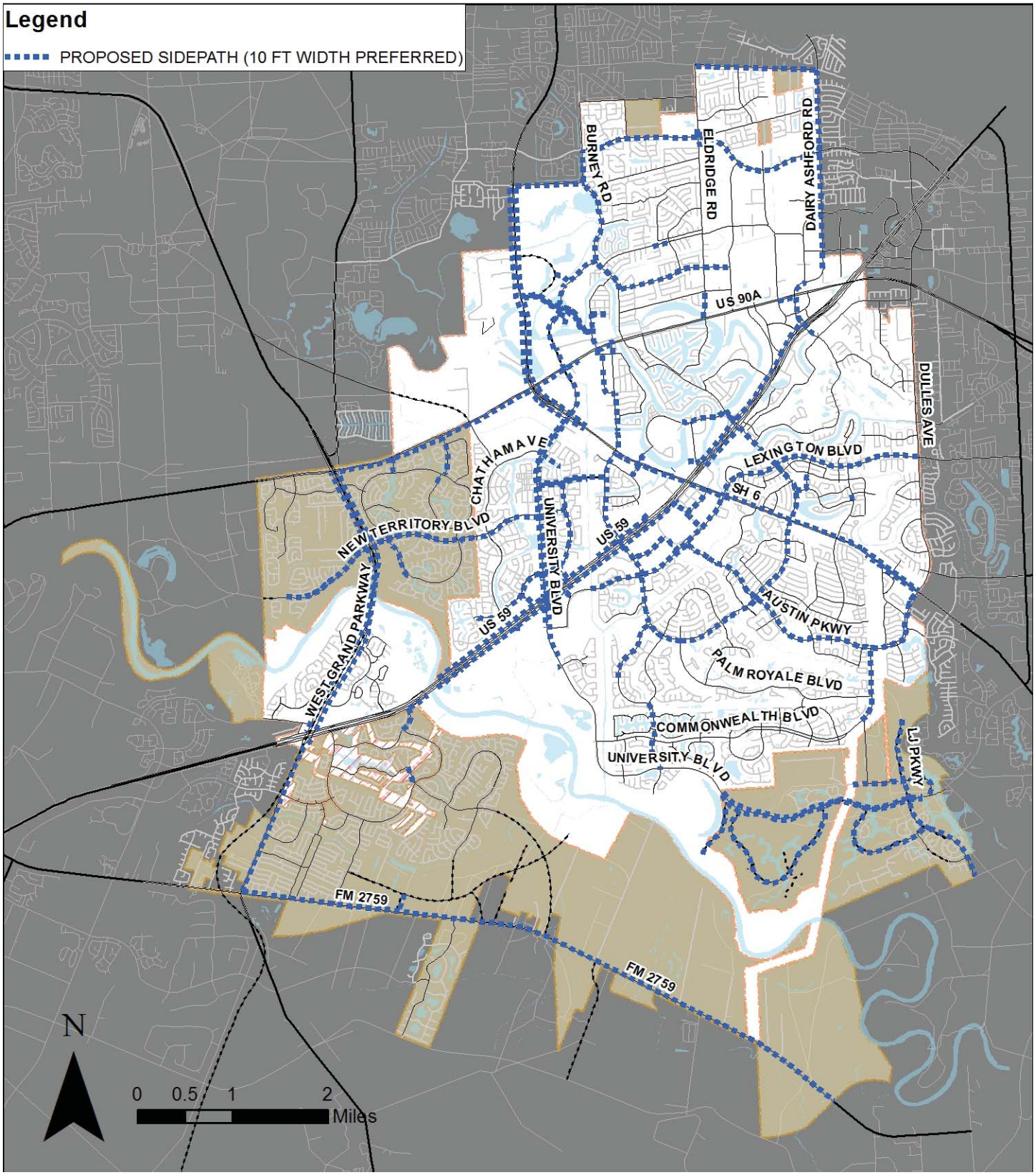


Figure 4-5 Proposed Sidepaths

Table 4.2 Proposed Sidepath Recommendations - City Limits Only				
Segment	**From**	**To**	**Existing Facility**	**Length (lf +/-)**
ADDISON AVE	TELFAIR AVE	US 59		900
AUSTIN PARKWAY	LEXINGTON BLVD	DITCH A	SIDEWALK	1,600
AUSTIN PARKWAY	GRANTS LAKE TRAIL	POWER LINE CORRIDOR TRAIL	SIDEWALK	11,500
AUSTIN PARKWAY	DITCH	SOUTH OF SH 6	SIDEWALK	4,600
AVENUE D	WITHIN HISTORIC DISTRICT	WITHIN HISTORIC DISTRICT		1,100
AVENUE D	WITHIN HISTORIC DISTRICT	WITHIN HISTORIC DISTRICT		1,100
BROOKS ST	AZALEA	BRIDGE		2,200
BROOKS ST	US 90A	GUENTHER	SIDEWALK	800
BROOKS ST	BRIDGE	SH 6		1,100
BURNEY RD	WEST AIRPORT BLVD	SEVENTH ST / MAIN ST	SIDEWALK	8,700
CHATHAM AVE	UNIVERSITY BLVD	WEST OF PICKNEY AVE	SIDEWALK	1,200
COLONIST PARK DR	PECAN POINT DR	EDGEWATER DR	SIDEWALK	1,000
COMMONWEALTH BLVD	AUSTIN PARKWAY	SCENIC RIVERS DR	SIDEWALK	4,100
CREEKBEND DR	OYSTER COVE DR	SUGAR LAKES DR	SIDEWALK	2,600
DAIRY ASHFORD RD	CARDINAL MEADOWS DR	SOUTH OF JULIE RIVERS DR		1,600
DAIRY ASHFORD RD	SOUTH OF JULIE RIVERS DR	KING ARTHUR CT	SIDEWALK	1,700
DAIRY ASHFORD RD	SOUTH OF KING ARTHURS CT	SOUTH OF KING ARTHURS CT	SIDEWALK	200
DAIRY ASHFORD RD	KING ARTHURS CT	SOUTH OF KING ARTHURS CT		400
DAIRY ASHFORD RD	BROOKS MEADOW	AIRPORT BLVD	SIDEWALK	400
DAIRY ASHFORD RD	AIRPORT	CARDINAL MEADOWS DR	SIDEWALK	2,800
DAIRY ASHFORD RD	DORRANCE	BROOKS MEADOW		1,700
DAIRY ASHFORD RD	ALSTON RD	DORRANCE	SIDEWALK	400
DAIRY ASHFORD RD	WEST BELLFORT RD	ALSTON RD		2,000
DAIRY ASHFORD RD	JULIE RIVERS DR	US 90A		1,000
DIARY ASHFORD RD	US 90A	US 59	SIDEWALK	1,500
EAST OF KENSINGTON DR	SH 6	EXISTING TRAIL		400
EDGEWATER DR	WILLIAMS TRACE BLVD	COLONIST PARK DR	SIDEWALK	700
ELDRIDGE RD	LAKEVIEW	US 90A		1,600
ELDRIDGE RD	ELDRIDGE PARK	WEST AIRPORT BLVD		500




TABLE 4.2 PROPOSED SIDEPATH RECOMMENDATIONS - CITY LIMITS ONLY

Segment	From	To	Existing Facility	Length (lf +/-)
ELDRIDGE RD	NORTH OF W AIRPORT BLVD	GREENBRIAR DR	SIDEWALK	1,000
ELKINS RD	SWEETWATER BLVD	COLONY CROSSING DR		3,700
ELKINS RD	ALCORN OAKS DR	UNIVERSITY BLVD	SIDEWALK	4,000
FIRST COLONY BLVD	SH 6	COLONY LAKES DR	SIDEWALK	2,600
FIRST COLONY BLVD	COLONY LAKES DR	US 59	SIDEWALK	2,700
FLUOR DANIEL DR	LAKE POINT TRAIL	SOLDIERS FIELD DR	SIDEWALK	1,500
IMPERIAL BLVD	SH 6	ULRICH ST		9,400
IMPERIAL BRIDGE	IMPERIAL STREET D	STADIUM DRIVE		900
IMPERIAL DEVELOPMENT	IMPERIAL BLVD	NORTH OYSTER CREEK TRAIL		1,000
IMPERIAL DEVELOPMENT	STADIUM DRIVE	IMPERIAL DEVELOPMENT SIDEPATH		600
JESS PIRTLE	EXISTING TRAIL	BOURNEWOOD DR		1,000
LABORWOOD AVE	US 59	LEXINGTON BLVD		500
LAKE POINTE TRAIL TO US 59 CONNECTION	EXISTING TRAIL	US 59		800
LEXINGTON BLVD	SWEETWATER BLVD	SH 6	SIDEWALK	6,700
LEXINGTON BLVD	OXBOW DR	SWEETWATER BLVD	SIDEWALK	2,100
LEXINGTON BLVD	DITCH H	OXBOW DR		1,000
LEXINGTON BLVD	DITCH A	AUSTIN PARKWAY		1,000
LEXINGTON BLVD	WILLIAMS TRACE BLVD	DULLES AVE	SIDEWALK	8,200
LEXINGTON BLVD	SH 6	WILLIAMS TRACE BLVD	SIDEWALK	3,700
LOWE'S CONNECTION	US 59	SOLDIERS FIELD DR		300
MALL RING RD	TOWN CENTER BLVD	LEXINGTON BLVD		1,000
MALL RING RD	US 59	TOWN CENTER BLVD		1,200
MALL RING RD	TOWN CENTER BLVD	LEXINGTON BLVD		1,000
MATLAGE WAY	EXISTING SIDEPATH @ IPRC	BROOKS ST	SIDEWALK	2,000
MATLAGE WAY	GUENTHER	EXISTING SIDEPATH @ IPRC	SIDEWALK	500
MEADOWCROFT BLVD	DITCH H	FIRST COLONY BLVD		1,100
MEADOWCROFT BLVD	UNIVERSITY BLVD	DITCH H	SIDEWALK	2,700
MEADOWCROFT BLVD	UNIVERSITY BLVD	DITCH H	SIDEWALK	2,800
NEW TERRITORY BLVD	HOMEWARD WAY	WESCOTT AVE	SIDEWALK	6,400
NORTH SH 6 PARKWAY TRAIL	VOSS RD	US 90A		22,000
RIVER FALLS DRIVE	WIMBERLY CANYON DR	GRAND PARKWAY		400



Table 4.2 Proposed Sidepath Recommendations - City Limits Only				
Segment	**From**	**To**	**Existing Facility**	**Length (lf +/-)**
S MALL ACCESS RD	MALL RING RD	LEXINGTON BLVD		200
SETTLERS WAY BLVD	LOST CREEK BLVD	EDGEWATER DR		400
SEVENTH ST	ELDRIDGE RD	GILLINGHAM LN		1,500
SEVENTH ST	MAIN ST	ELDRIDGE RD		5,000
STADIUM DRIVE	BURNEY RD	IMPERIAL BRIDGE		2,000
STADIUM DRIVE	IMPERIAL BRIDGE	IMPERIAL BLVD		1,300
STADIUM DRIVE	IMPERIAL BLVD	OLD IMPERIAL BLVD		2,700
STADIUM DRIVE	OLD IMPERIAL BLVD	US 90A		1,300
SH 6	BROOKS ST	US 59	SIDEWALK	4,000
SH 6	US 59	TOWN CENTER BLVD	SIDEWALK	1,000
SH 6	TOWN CENTER BLVD	DITCH E		1,500
SH 6	FLUOR DANIEL DR	COLONY LAKES DR	SIDEWALK	1,300
SH 6	COLONY LAKES	US 59	SIDEWALK	1,400
SH 6	EAST OF LEXINGTON BLVD	OYSTER CREEK PARK ENTRANCE	SIDEWALK	8,200
SH 6	OYSTER CREEK PARK ENTRANCE	DULLES AVE		3,900
SH 6	POWERLINE TRAIL CORRIDOR	DULLES AVE		3,500
SH 6	US 90A	DITCH H		3,500
SH 6	US 90A	DITCH H		3,700
SUGAR CREEK BLVD	US 59	COUNTRY CLUB BLVD		1,100
SUGAR LAKES DR	CREEK BEND DR	US 59	SIDEWALK	800
SUGAR LAKES DR	CREEK BEND DR	US 59	SIDEWALK	800
SWEETWATER BLVD	LEXINGTON BLVD	DITCH A TRAIL	SIDEWALK	2,100
SWEETWATER BLVD	DITCH A TRAIL	PALM ROYALE BLVD	SIDEWALK	2,800
SWEETWATER BLVD	US 59	LEXINGTON BLVD	SIDEWALK	2,400
SWEETWATER BLVD	PALM ROYALE BLVD	AUSTIN PARKWAY	SIDEWALK	4,700
TELFAIR AVE TRAIL	RALSTON BRANCH WAY	UNIVERSITY BLVD	SIDEWALK	4,900
TOWN CENTER BLVD N	SH 6	MALL RING RD	SIDEWALK	1,800
TOWN CENTER BLVD S	SWEETWATER BLVD	MALL RING RD	SIDEWALK	2,200
U OF H CONNECTION	US 59	WEST OF U OF H		300
ULRICH ST	AVENUE A	US 90A		1,300
ULRICH ST	US 90A	GUENTHER		300
ULRICH ST	AVENUE D	AVENUE A	SIDEWALK	900
UNIVERSITY BLVD	US 59	LEXINGTON BLVD		1,700
UNIVERSITY BLVD	US 59	NORTH OF WENTWORTH AVE		3,500




Table 4.2 Proposed Sidepath Recommendations - City Limits Only

Segment	From	To	Existing Facility	Length (lf +/-)
UNIVERSITY BLVD	SH 6	US 59	SIDEWALK	9,400
UNIVERSITY BLVD	US 90A	US 59	SIDEWALK	9,700
UNIVERSITY BLVD	US 90A	SH 6	SIDEWALK	2,800
UNIVERSITY BLVD RAMP	EXISTING SIDEWALK	EXISTING BIKE LANE		420
UNIVERSITY BLVD RAMP	EXISTING SIDEWALK	EXISTING BIKE LANE		680
US 59	TOWN CENTER DR	WILLIAMS TRACE BLVD		2,900
US 59	LAKE POINTE PKWY	SUGAR LAKES DR		3,000
US 59	COMMERCE GREEN BLVD	DAIRY ASHFORD RD		2,100
US 59	BRAZOS RIVER	BRAZOS RIVER PARK		1,800
US 59	DITCH H	MALL RING RD		5,700
US 59	FIRST COLONY BLVD	LOWE'S		2,100
US 59	BRAZOS RIVER PARK	UNIVERSITY BLVD		5,800
US 59	DITCH H	FIRST COLONY BLVD		1,600
US 59	BRAZOS RIVER	DITCH H		10,000
US 59	UNIVERSITY BLVD	DITCH H		2,700
US 59	RIVERBROOK DR	BRAZOS RIVER		1,300
US 59	WEST OF DITCH H	EAST OF DITCH H	SIDEWALK	1,000
US 59	SUGAR LAKES DR	COMMERCE GREEN BLVD		4,600
US 90A	EASTON AVE	SH 6		3,900
US 90A	SH 6	IMPERIAL PARK		2,800
US 90A	ULRICH ST	BROOKS ST		800
US 90A	CENTURY SQUARE BLVD	DAIRY ASHFORD RD		1,100
VOSS RD	SH 6	BURNEY RD		3,900
WALLINGFORD AVE	WESCOTT AVE	US 59		1,000
WENTWORTH AVE	U OF H PROPERTY	UNIVERSITY BLVD		300
WESCOTT AVE	PRESTWICK AVE	UNIVERSITY BLVD	SIDEWALK	2,400
WESCOTT AVE	MEADOWCROFT BLVD	PRESTWICK AVE	SIDEWALK	3,400
WEST AIRPORT BLVD	GILLINGHAM LN	DAIRY ASHFORD RD	SIDEWALK	5,000
WEST AIRPORT BLVD	HOLLY GLADE LN	ELDRIDGE RD	SIDEWALK	5,500
WEST AIRPORT BLVD	ELDRIDGE RD	GILLINGHAM LN	SIDEWALK	2,700
WEST AIRPORT BLVD	BURNEY RD	HOLLY GLADE LN	SIDEWALK	1,200
WEST BELLFORT RD	ELDRIDGE RD	DAIRY ASHFORD RD		6,800
WILLIAMS TRACE BLVD	FERRY LANDING	SH 6	SIDEWALK	2,400
WILLIAMS TRACE BLVD	US 59	LEXINGTON BLVD		2,900
WILLIAMS TRACE BLVD	LEXINGTON BLVD	FERRY LANDING		1,200
WILLIAMS TRACE BLVD	SH 6	AUSTIN PARKWAY	SIDEWALK	5,000

Table 4.2 Proposed Sidepath Recommendations - ETJ Limits				
Segment	**From**	**To**	**Existing Facility**	**Length (lf +/-)**
CABRERA DR	POWERLINE TRAIL	UNIVERSITY BLVD		5,200
CRABB RIVER RD	US 59	FM 2759		9,600
ELLIS CREEK BLVD	US 90A	HOMEWARD WAY		2,200
FM 2759	CRABB RIVER RD	ETJ LIMIT		35,600
GATEWAY BLVD	US 90A	HOMEWARD WAY		900
GRAND PARKWAY	US 90A	US 59		15,600
GRAND PARKWAY	US 90A	US 59		15,900
HOMEWARD WAY	NEW TERRITORY BLVD	SARTARTIA MIDDLE SCHOOL	SIDEWALK	2,400
LJ PARKWAY	COMMONWEALTH BLVD	VINTAGE TRAIL LN		6,700
LJ PARKWAY	VINTAGE TRAIL LN	ETJ LIMIT		4,000
MACEK RD	RABBS BAYOU TRAIL	FM 2759		1,100
MINOR COLLECTOR WEST	UNIVERSITY BLVD	UNIVERSITY BLVD		10,700
NEW TERRITORY BLVD	NEW TERRITORY BASEBALL FIELD	GRAND PARKWAY	SIDEWALK	5,600
NEW TERRITORY BLVD TRAIL	GRAND PARKWAY	HOMEWARD WAY	SIDEWALK	4,800
PUBLIC COLLECTOR	UNIVERSITY BLVD	BRAZOS RIVER		3,300
RIVERBROOK DR	US 59	GREATWOOD PARKWAY		1,400
SHADOW BEND DR	GREATWOOD LAKE DR	GREATWOOD PARKWAY	SIDEWALK	1,100
UNIVERSITY BLVD EXTENSION	CITY LIMIT	ETJ LIMIT		12,000
UNIVERSITY BLVD EXTENSION	CITY LIMIT	ETJ LIMIT		11,800
US 90A	GRAND PARKWAY	EASTON AVE		7,800
WALKER SCHOOL RD	HOMEWARD WAY	WALKER STATION ELEMENTARY		600
WINDING WATERS LN	UNIVERSITY BLVD	LJ PARKWAY		6,500




Sidewalks

Sidewalks are an important component of the overall plan to improve walkability. Sidewalks invite walking, and wider sidewalks tell pedestrians that the sidewalks can accommodate a larger volume of walkers. Similarly, streets without sidewalks can convey the message "do not walk here." Finally, sidewalks provide safe routes for children to travel from their home to their school.

The recommended locations for sidewalks in Sugar Land are shown on the following pages. The more detailed tables in Appendix H, which are organized by facility type and priority level, also show on which side of the street the sidewalk is being proposed.




Figure 4-6 Examples of existing sidewalks in Sugar Land

Proposed Sidewalks

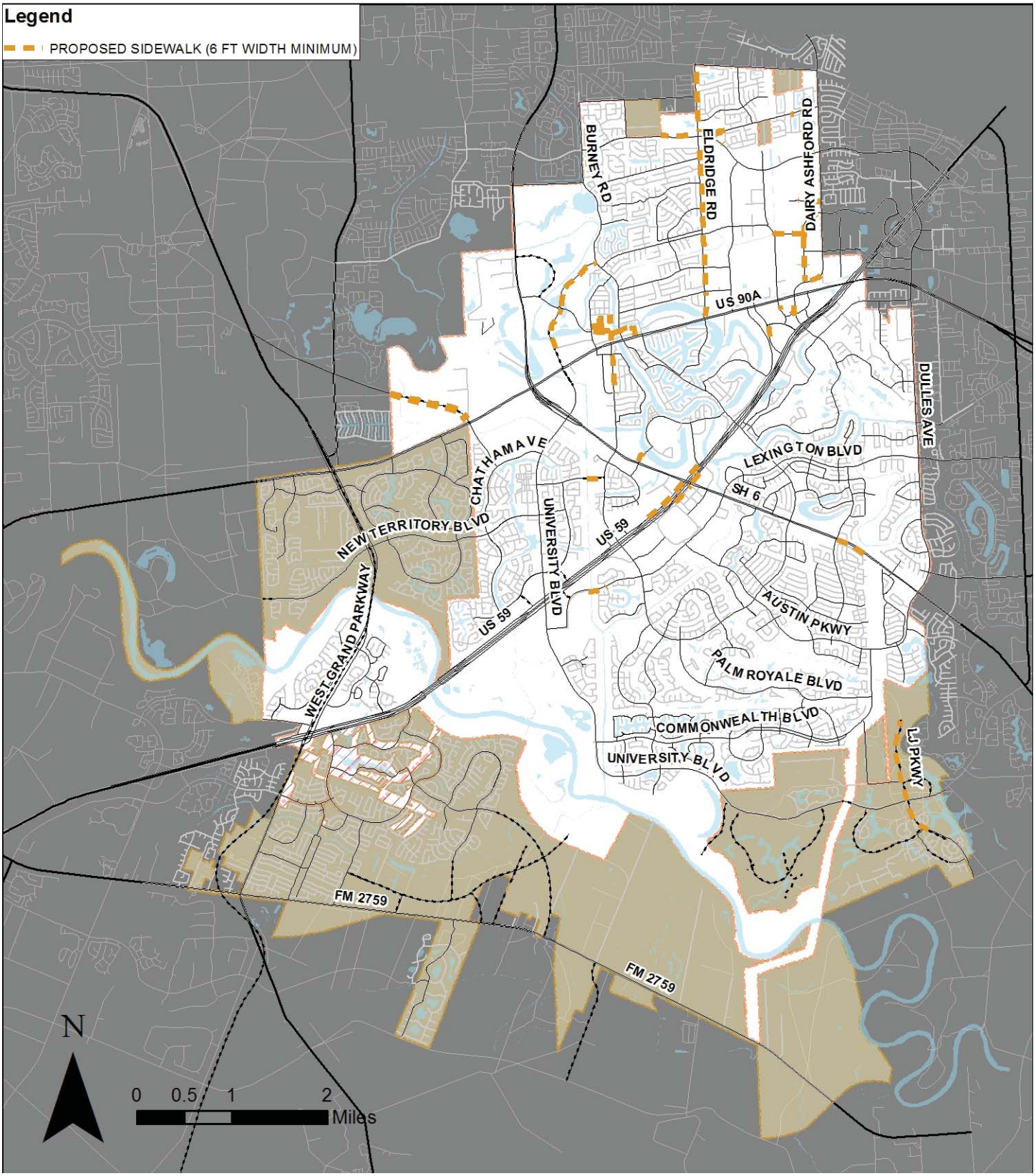


Figure 4-7 Proposed Sidewalks




TABLE 4.3 PROPOSED SIDEWALK RECOMMENDATIONS

Segment	From	To	Length (lf +/-)
ALSTON RD	WEST AIRPORT BLVD	SUMMERFIELD PL	700
ALSTON RD	WEST AIRPORT BLVD	SUMMERFIELD PL	1,000
ALSTON RD	ASHFORD HAVEN	WEST OF DAIRY ASHFORD RD	1,300
BROOKS ST	GUENTHER ST	AZALEA	2,200
BROOKS ST EXT	IMPERIAL BLVD	US 90A	800
BROOKS ST NORTH EXT	AVENUE D	IMPERIAL BLVD	1,100
BROOKS ST NORTH EXT	AVENUE D	IMPERIAL BLVD	900
CARDINAL MEADOWS DR	CARDINAL MEADOWS DR	DAIRY ASHFORD RD	400
CARDINAL MEADOWS DR	CARDINAL MEADOWS DR	DAIRY ASHFORD RD	600
CENTURY SQUARE BLVD	EXISTING SIDEWALK	EXISTING SIDEWALK	300
COMMERCE GREEN BLVD	SUGAR CREEK CENTER BLVD	EXISTING SIDEWALK	600
DAIRY ASHFORD RD	US 90A	PARKLANE BLVD	1,100
DAIRY ASHFORD RD	US 90A	SOUTH OF KING ARTHURS CT	1,100
ELDRIDGE RD	ROYAL LAKE DR	ELDRIDGE PARK	3,400
ELDRIDGE RD	LINDEN	US 90A	600
ELDRIDGE RD	LINDEN	US 90A	2,700
ELDRIDGE RD	LINDEN	US 90A	4,500
ELDRIDGE RD	LINDEN	US 90A	600
ELLEA LN	CARDINAL MEADOWS DR	DAIRY ASHFORD RD	500
FLUOR DANIEL DR	STATE HWY 6	LAKE POINT TRAIL	600
HISTORIC DISTRICT NORTH	ULRICH ST	BROOK ST NORTH EXT	1,100
HISTORIC DISTRICT SOUTH	ULRICH ST	BROOK ST NORTH EXT	1,100
IMPERIAL BLVD EXT	ULRICH ST	WOOD ST	2,500
IMPERIAL BLVD EXT	ULRICH ST	WOOD ST	2,400
JULIE RIVERS DR	REED RD	DAIRY ASHFORD RD	1,900
JULIE RIVERS DR	REED RD	US 90A	2,500
LEXINGTON BLVD	DITCH H	OXBOW DR	1,100
LIVE OAK ST EXT	AVENUE D	IMPERIAL BLVD	900
LIVE OAK ST EXT	AVENUE D	IMPERIAL BLVD	900
MEADOWCROFT BLVD	DITCH H	FIRST COLONY BLVD	1,100
OWENS RD EXT	CITY LIMITS	US 90A	4,700
OWENS RD EXT	CITY LIMITS	US 90A	4,600
REED RD	INDUSTRIAL BLVD	JULIE RIVERS DR	1,900
STADIUM DRIVE	BURNEY RD	IMPERIAL BLVD	3,400
STADIUM DRIVE	IMPERIAL BLVD	OLD IMPERIAL BLVD	2,400
STATE HWY 6	SETTLERS WAY BLVD	POWERLINE TRAIL CORRIDOR	1,900

Table 4.3 Proposed Sidewalk Recommendations			
Segment	**From**	**To**	**Length (lf +/-)**
US 59	STATE HWY 6	TOWN CENTER BLVD	1,100
US 59	STATE HWY 6	LAKE POINTE PARKWAY	1,100
US 59	MALL RING RD	STATE HWY 6	1,300
US 59	LOWE'S	STATE HWY 6	2,900
WEST AIRPORT BLVD	DRAINAGE	WEST OF ELDRIDGE RD	1,600
WEST AIRPORT BLVD	SIDEWALK	DAIRY ASHFORD RD	700
WEST AIRPORT BLVD	EAST OF ELDRIDGE RD	STANCLIFF OAKS	1,200
WOOD ST	IMPERIAL BLVD	US 90A	600
WOOD ST	IMPERIAL BLVD	US 90A	500
ETJ Limits Only			
LJ PARKWAY	COMMONWEALTH BLVD	VINTAGE TRAIL LN	6,700

On-Street Bicycle Facility Recommendations

In general, on-street bicycle facilities offer significant advantages as part of a citywide network. The existing street network is often the most direct way to get to destinations throughout Sugar Land. Connecting all major destinations by paths is often challenging, and therefore on-street facilities as part of an overall system ensure that all parts of a city are accessible.

On-street bicycle facilities are cost-effective to implement, often only a tenth or less of what a shared use path (or trail) might cost. This can accelerate the implementation of a citywide network by addressing funding limitations.

Recommendations for on-street bicycle lanes or markings for both existing and future streets in Sugar Land are shown on the following pages.

Bicycle Lanes

Considerations for Evaluation of Streets in Sugar Land for Bicycle Lanes - Factors used in evaluating whether existing streets should be considered as candidates for bicycle lanes include:

Key route - Consideration was given to streets that are key routes linking destinations to neighborhoods or other destinations.

Traffic volumes - Both 24-hour traffic volumes as well as well as peak hour volumes were considered. In general, streets with lower traffic volumes (average daily traffic volumes below 10,000 cars per day) were considered. Streets with these volumes tend to be secondary arterials or local collector streets. No actions are proposed that will reduce the vehicular level of service to a grade lower than a level of service "C."

Average motor vehicle operating speeds - The posted speed limit operating speed was considered when evaluating candidate streets for inclusion of bicycle facilities. Higher speeds can have a negative impact on risk and comfort. Typically in this plan, on-street facilities (with the exception of shoulders used as bicycle facilities along rural sections of SH 6 and US 90A) with posted speeds above 45 miles per hour are not recommended to have on-street bicycle facilities. As more detailed design takes place, data on actual speeds should be taken into consideration since these may vary from posted speeds.

Beneficial reduction in traffic volumes - Some neighborhoods also expressed a desire to reduce traffic volumes by making a street less attractive for "cut through" traffic.

"BICYCLE FRIENDLY" MEANS

- Education and encouragement programs that teach motorists to share the road with cyclists and cyclists to ride with motorists.
- Evaluation and modification of roadway treatments for effectiveness in promoting cycling.
- Evaluation and modification of roadway crossings to make them safer, especially at key intersections.
- Bicycle route signage that indicates distances to major destinations.
- Varying bicycle facilities per land use characteristics, right-of-way, traffic volume, speed and composition, on-street parking, and roadway grade.
- Design for level of experience: off-road multi-purpose trails or neighborhood streets for new/young riders and on-road facilities for experienced riders.
- A network of bicycle facilities on designated arterial streets.
- Employee bicycle parking in a garage or other covered, safe area. Short-term bicycle parking located close to the front door.
- End-use facilities for cyclists such as changing facilities and showers.
- Management of buildings and campuses in a style which promotes bicycling.

(Adapted from Mixed Use Matters, Envision Central Texas Oct. 2008, Page 18)

Figure 4-8

Figure 4-9 Examples of bike lanes

Available pavement cross-section - Streets with under-utilized pavement widths generally fall into two categories. Some streets have wide lanes, some as wide as 18 to 20 feet. Other streets are designed as four lane boulevards, but current and potential future demand indicates that two lanes could more than adequately handle future traffic needs at an acceptable level of service.

Driveways and intersections - Sugar Land has excelled at controlling driveway locations along its streets and boulevards, and the City currently requires distance separation between driveways and nearby intersections. Busier streets in Sugar Land with high volumes of turning movements are generally considered less desirable candidates for on-street bicycle facilities.

Type of Street - Streets should at a minimum connect multiple neighborhoods to be considered candidates for bicycle lanes. Within neighborhoods, most streets have low traffic volumes, and are therefore appropriate for bicycle riding under existing conditions and generally are not candidates for bicycle lanes.

The presence of on-street parking - Typically, a street is not appropriate for bicycle lanes if on-street parking is allowed and is frequently used. In some cases, pavement widths provide enough space for an on-street bicycle lane as well as on-street parking spaces, and in those cases a bicycle lane may be recommended.

Parkway area constraints - The parkway area does not have enough width to consider an off-street option such as a sidepath.

Figure 4-10 and Table 4.4 on the following pages summarize roadways in Sugar Land where on-street bicycle lanes are recommended.

Proposed Bicycle Lanes

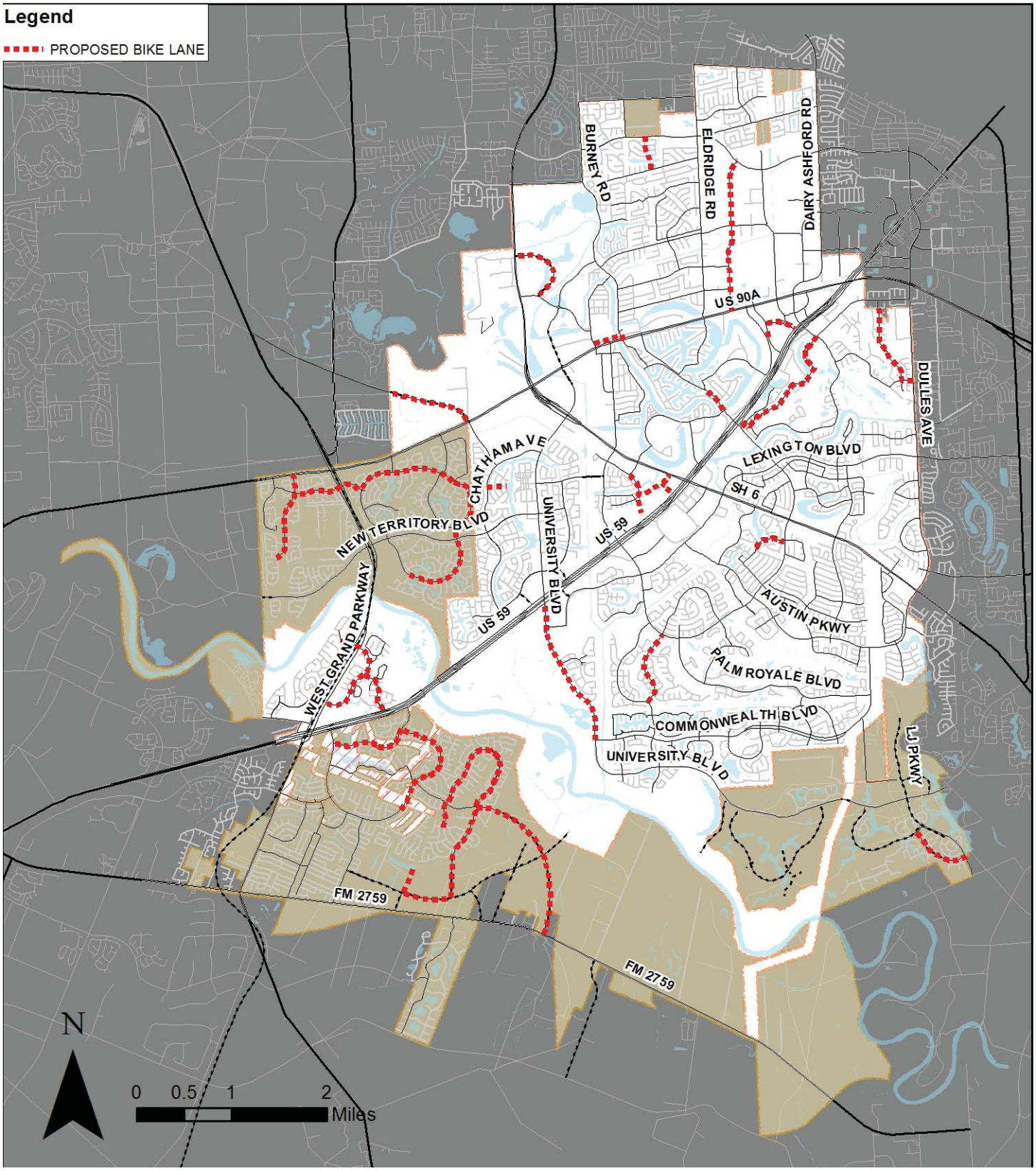


Figure 4-10 Proposed Bicycle Lanes

Table 4.4 Proposed Bike Lanes Recommendations - City Limits Only				
Segment	**From**	**To**	**Length (lf +/-)**	**Further Action Needed**
ALCORN OAKS DR	SWEETWATER BLVD	ELKINS RD	4,400	LANE DIET
COMMERCE GREEN BLVD	FORT BEND CHAMBER OF COMMERCE	FORT BEND CHAMBER OF COMMERCE	400	ROAD DIET
COTTONWOOD CT	WEST AIRPORT BLVD	GREENWAY DR	1,900	LANE DIET
COUNTRY CLUB BLVD	SUGAR CREEK BLVD	S PARKWAY BLVD	7,500	LANE DIET
EAST RIVERPARK DR	GRAND PARKWAY	WALGREENS AT WEST GRAND PKWY AND EAST RIVERPARK	5,300	LANE DIET
GILLINGHAM LN	WEST AIRPORT BLVD	US 90A	8,600	LANE DIET
HETHERINGTON AVE	CHATHAM AVE	TELFAIR LAKES	1,100	LANE DIET
IMPERIAL STREET D	SH 6	IMPERIAL BLVD	4,000	NOT YET CONSTRUCTED
KEMPNER	ULRICH ST	MAIN ST	1,600	LANE DIET
KENSINGTON DR	SH 6	CUL-DE-SAC	1,800	LANE DIET
LAKESIDE PLAZA DR	KENSINGTON DR	US 59 / SOUTHWEST FREEWAY	800	LANE DIET
LONGVIEW DR	AMESBURY CT	DULLES AVE	5,100	LANE DIET
MAIN ST	IMPERIAL BLVD	US 90A	600	LANE DIET
PARKWAY BLVD	DAVID SEARLES DR	WILLIAMS TRACE BLVD	400	LANE DIET
OWENS RD EXTENSION	CITY LIMITS	US 90A	4,800	NOT YET CONSTRUCTED
SOLDIERS FIELD	FLUOR DANIEL DR	SOLDIERS FIELD CT CUL-DE-SAC	2,400	LANE DIET
SUGAR CREEK CENTER BLVD	COMMERCE GREEN BLVD	US 59	1,700	LANE DIET
SUGAR LAKES DR	SANDPIPER DR	CREEKBEND DR	1,600	ROAD DIET
SUMMIT CREEK	EAST RIVERPARK DR	US 59	2,600	LANE DIET
UNIVERSITY BLVD	US 59	COMMONWEALTH BLVD	8,300	SHIFT SHOULDER TO OUTSIDE LANE
WEST RIVERPARK DR	WIMBERLY CANYON DR	GRAND PARKWAY	800	LANE DIET
WILLIAMS GRANT	NORTH OF SUGAR MILL DR	WILLIAMS TRACE BLVD	1,800	LANE DIET




Table 4.4 Proposed Bike Lanes Recommendations - ETJ Limits Only

Segment	From	To	Length (lf +/-)	Further Action Needed
CUNNINGHAM CREEK BLVD	US 90A	EVANDALE LN	5,100	LANE DIET
GREATWOOD PARKWAY	FOREST WOODS	RIVERBROOK DR	6,900	LANE DIET
HOMEWARD WAY	SCARLET MAPLE DR	WALKER SCHOOL RD	3,500	LANE DIET
HOMEWARD WAY	SAND HILL DR	SCARLET MAPLE DR	5,800	LANE DIET
HOMEWARD WAY	SARTARTIA MIDDLE SCHOOL	WALKER SCHOOL RD	5,400	LANE DIET
LAKE RIVERSTONE DR	WINDING WATERS LN	LJ PARKWAY	3,500	LANE DIET
MACEK RD	RABBS CROSSING	WINDING BROOKS FUTURE EXT	1,500	ROAD RECON-STRUCTION
RIVERBROOK DR	GREATWOOD PARKWAY	FIELDING DR	2,500	NOT YET CONSTRUCTED
RIVERBROOK DR	FIELDING DR	GREATWOOD PARKWAY	2,000	LANE DIET
SAND HILL DR	CUNNINGHAM CREEK BLVD	HOMEWARD WAY	4,000	LANE DIET
SHADOW BEND DR	WINDING BROOK EAST DR	FM 2759	9,400	NOT YET CONSTRUCTED
WINDING BROOK DR	BIG BEND DR	SHADOW BEND DR	9,400	LANE DIET
WINDING BROOK EAST DR	SHADOW BEND DR	TERRACE VIEW DR	2,800	LANE DIET
WINDING BROOK EAST DR	TERRACE VIEW DR	MACEK RD	5,300	NOT YET CONSTRUCTED

Figure 4-11 Example of a buffered bike lane

Figure 4-12 Example of a cycle track with a curb separation

Buffered or "Comfort" Bicycle Lanes and Cycle Tracks

As noted in the public input section of this study and following national trends, the majority of residents of Sugar Land indicated they would likely ride more frequently if they were separated from vehicular traffic. Two solutions included in the toolbox of potential facility types in Chapter 3 that address this preference are buffered bicycle lanes and cycle tracks.

Buffered bicycle lanes - To allay concerns expressed by many Sugar Land residents about riding on streets with vehicular traffic, the use of buffered or "comfort" bicycle lanes is preferred over a standard bicycle lane where roadway conditions allow it. As shown in Figure 4-11, buffered lanes provide an area of separation from adjacent vehicular lanes, and riders generally feel more comfortable riding on a street with this lane configuration. The "buffer" area may be delineated with solid white pavement lines and in some cases is further emphasized with raised buttons, truncated domes or poles.

Buffered lanes can be provided on streets that have a wide pavement cross-section or on streets that can be reduced from four vehicular lanes (two in each direction) to two vehicular lanes (one lane in each direction), known as a road diet. Similar to traditional striped bicycle lanes, buffered lanes are far lower in cost than off street paths.

Cycle tracks - Cycle tracks are a completely separate facility for bicycles and are not shared with either pedestrians or motor vehicles. An example is shown in Figure 4-12. The separation from vehicles is provided by a curb, raised curb median, or even parked cars. Cycle tracks can be either one way or two way.

A section of Creekbend between Fluor Daniel Drive and Prudential Circle is proposed for a two-way cycle track configuration. This section of roadway has five (5) lanes and can operate well with four (4) lanes. The outside travel lane can be separated from the two inside lanes with a raised curb and designated for bicycle use only. This segment is approximately 3,500 feet in length and would provide a unique bicycle facility. As this area matures, the availability of bicycle infrastructure around it can make it an attractive redevelopment candidate. It should be noted that cycle tracks are used in many other cities in the United States and in other countries. This facility may be one of the first in the greater Houston area.

Considerations for selecting buffered bicycle lane or cycle track locations - Considerations in selecting locations for buffered bicycle lanes or cycle tracks include those mentioned previously for bicycle lanes, with special attention paid to the volumes of traffic utilizing the roadway. It is important to note that adequate motor vehicular capacity will be maintained where buffered bike lanes and cycle tracks are implemented. For the roadways selected, the goal is to maintain a motor vehicle level of service "C." In many cases, there is adequate pavement width to accommodate the buffered lane or the cycle track without affecting the vehicular level of service. In addition, all of the roadways proposed for buffered lanes or cycle tracks are in areas that are largely developed or where land uses have been established, and therefore no significant increase in traffic volumes is anticipated.

Roadways where buffered bicycle lanes and cycle tracks are recommended are shown on the following pages.

Proposed Buffered Bicycle Lanes

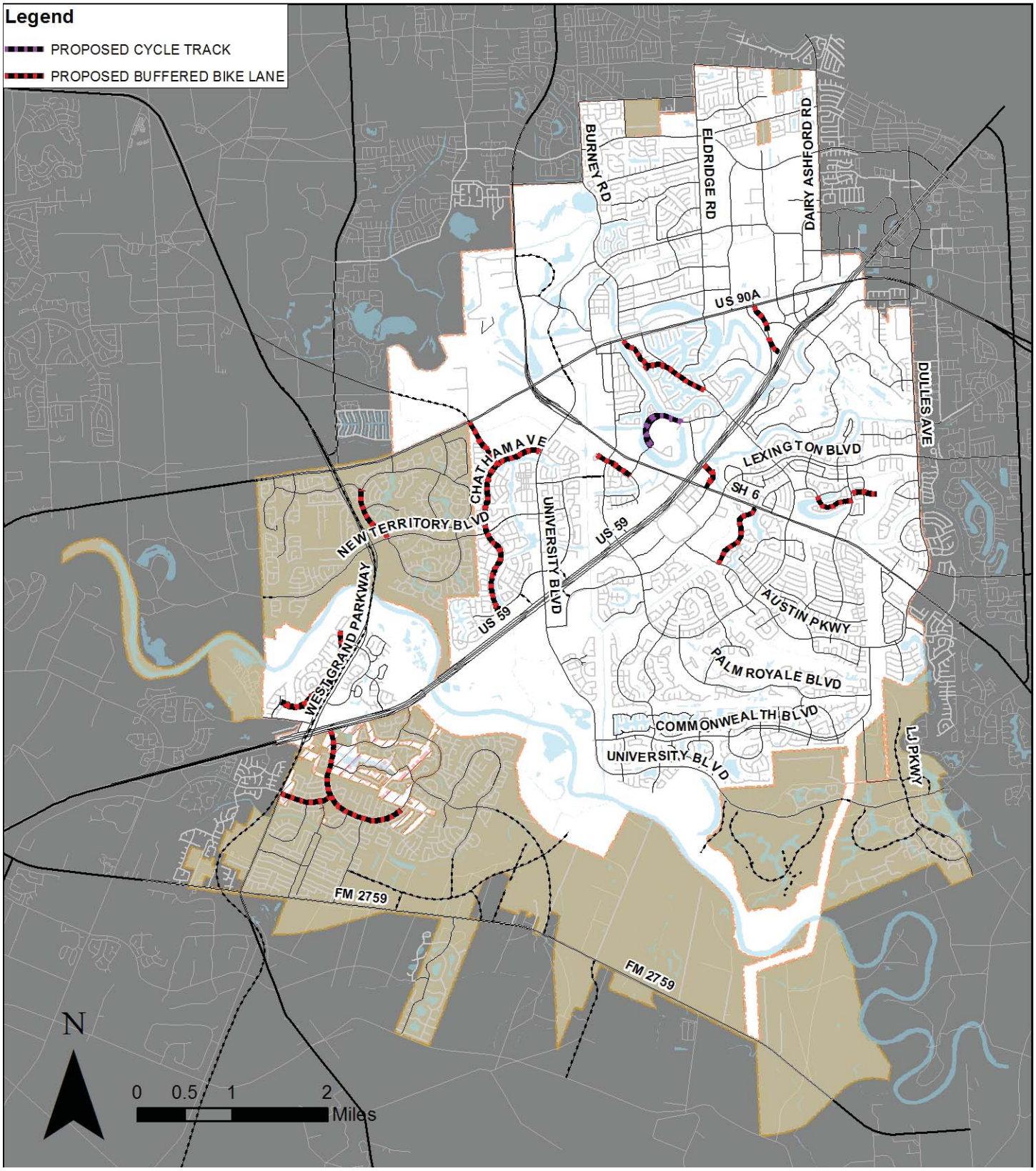


Figure 4-13 Proposed Buffered Bicycle Lanes

Table 4.5 Proposed Buffered Bike Lanes Recommendations				
Segment	**From**	**To**	**Length (lf +/-)**	**Further Action Needed**
City Limits Only				
BAYVIEW DR	US 90A	SUGAR LAKES DR	2,100	ROAD DIET
CHATHAM AVE	EASTON AVE	UNIVERSITY BLVD	2,400	LANE DIET
CHATHAM AVE	EASTON AVE	TELFAIR AVE	9,100	LANE DIET
COMMERCE GREEN BLVD	US 90A	SOUTH OF SUGAR CREEK CENTER BLVD	1,600	ROAD DIET
COMMERCE GREEN BLVD	SOUTH OF SUGAR CREEK CENTER BLVD	US 59	1,000	ROAD DIET
CREEKBEND DRIVE*	FLUOR DANIEL DR	PRUDENTIAL CIR	3,500	ROAD DIET
EASTON AVE	US 90A	CHATHAM AVE	2,900	LANE DIET
EDGEWATER DR	WATERS WAY DR	SETTLERS WAY BLVD	2,400	ROAD DIET
GRANTS LAKE BLVD	SH 6	AUSTIN PARKWAY	4,200	LANE DIET
LOST CREEK BLVD	SETTLERS WAY BLVD	OYSTER CREEK PARK	1,400	ROAD DIET
SOLDIERS FIELD	FIRST COLONY BLVD	FLUOR DANIEL DR	2,200	LANE DIET
SUGAR LAKES DR	OYSTER CREEK DR	SANDPIPER DR	3,800	ROAD DIET
TOWN CENTER BLVD N	SH 6	US 59	1,600	LANE DIET
WIMBERLY CANYON DR	THISTLEROCK LN	BRAZOS SPRINGS DR	3,200	LANE DIET
WIMBERLY CANYON DR	BRAZOS SPRINGS DR	INDIGO RIVER LN	3,200	ROAD DIET
ETJ Limits Only				
GREATWOOD PARKWAY	US 59	SANSBURY BLVD	3,800	ROAD DIET
GREATWOOD PARKWAY	SANSBURY BLVD	FOREST WOODS	4,500	ROAD DIET
HOMEWARD WAY	SAND HILL DR	NEW TERRITORY BLVD	3,300	ROAD DIET
SANSBURY BLVD	CRABB RIVER RD	GREATWOOD PARKWAY	2,900	ROAD DIET
**Recommended facility is Cycle Track*				

Shared Lane Markings

As noted in Chapter 3, shared lane markings provide a way of highlighting that a street may be frequently used by bicycles, and alerting both drivers and bicyclists to share the road. This Plan includes 18 miles of shared lane markings. Considerations for selecting streets for shared lane markings typically include:

Type of roadway classification - Typically, only smaller arterials and collectors are considered as candidates for shared lane markings. In certain cases in Sugar Land, some streets may incorporate shared lane markings as an interim facility, and could transition into bicycle lanes in the future after further evaluation of traffic volumes, actual speeds and the level of bicycle activity in the area.

Figure 4-14 Example of a shared lane marking

TABLE 4.6 PROPOSED SHARED LANE MARKINGS RECOMMENDATIONS

Segment	From	To	Length (lf +/-)
ALSTON RD	WEST AIRPORT BLVD	DAIRY ASHFORD RD	6,200
BRANFORD PLACE	UNIVERSITY BLVD	WESCOTT AVE	1,500
BROOKS ST	GUENTHER	AZALEA/MATLAGE WAY	2,200
COLONIST PARK DR	LEXINGTON BLVD	EDGEWATER DR	1,700
COMMONWEALTH BLVD	UNIVERSITY BLVD	SCENIC RIVERS DR	21,500
DAVID SEARLES DR	COUNTRY CLUB BLVD	SUGAR CREEK BLVD	800
EDGEWATER DR	WILLIAMS TRACE BLVD	WATERS WAY DR	1,500
FLUOR DANIEL DR	CREEKBEND DR	OYSTER CREEK DR	1,800
GREAT OAK LN	RED BUD LN	GRAY BIRCH DR	1,500
GREEN FIELDS DR	PECAN RIDGE DR	SETTLERS WAY BLVD	2,400
GREENWAY DR	HANBURY CT	ELDRIDGE RD	5,200
GUENTHER	ULRICH ST	BROOKS ST	900
JULIE RIVERS DR	REED RD	DAIRY ASHFORD RD	2,500
KNIGHTSBRIDGE BLVD	PALM ROYALE BLVD	COMMONWEALTH BLVD	2,500
LAKEVIEW DR	MAIN ST	GILLINGHAM LN	6,300
NANTUCKET DR	ELDRIDGE RD	RON SLOCKETT MEMORIAL PARK	4,300
PALM ROYALE BLVD	SWEETWATER BLVD	COMMONWEALTH BLVD	12,800
PECAN RIDGE DR	PLANTERS ST	GREEN FIELDS DR	400
PLANTERS ST	WILLIAMS GRANT	PECAN RIDGE DR	4,000
REED RD	INDUSTRIAL BLVD	JULIE RIVERS DR	1,800
SUGAR CREEK BLVD	COUNTRY CLUB BLVD	DAVID SEARLES DR	10,300
SUGAR MILL DR	WILLIAMS GRANT	WILLIAMS TRACE BLVD	1,700
WILLIAMS GRANT	NORTH OF SUGAR MILL DR	PLANTERS ST	1,200
ETJ LIMITS ONLY			
WALKER SCHOOL RD	WALKER STATION ELEM.	HOMEWARD WAY	3,700

Proposed Shared Lane Marking

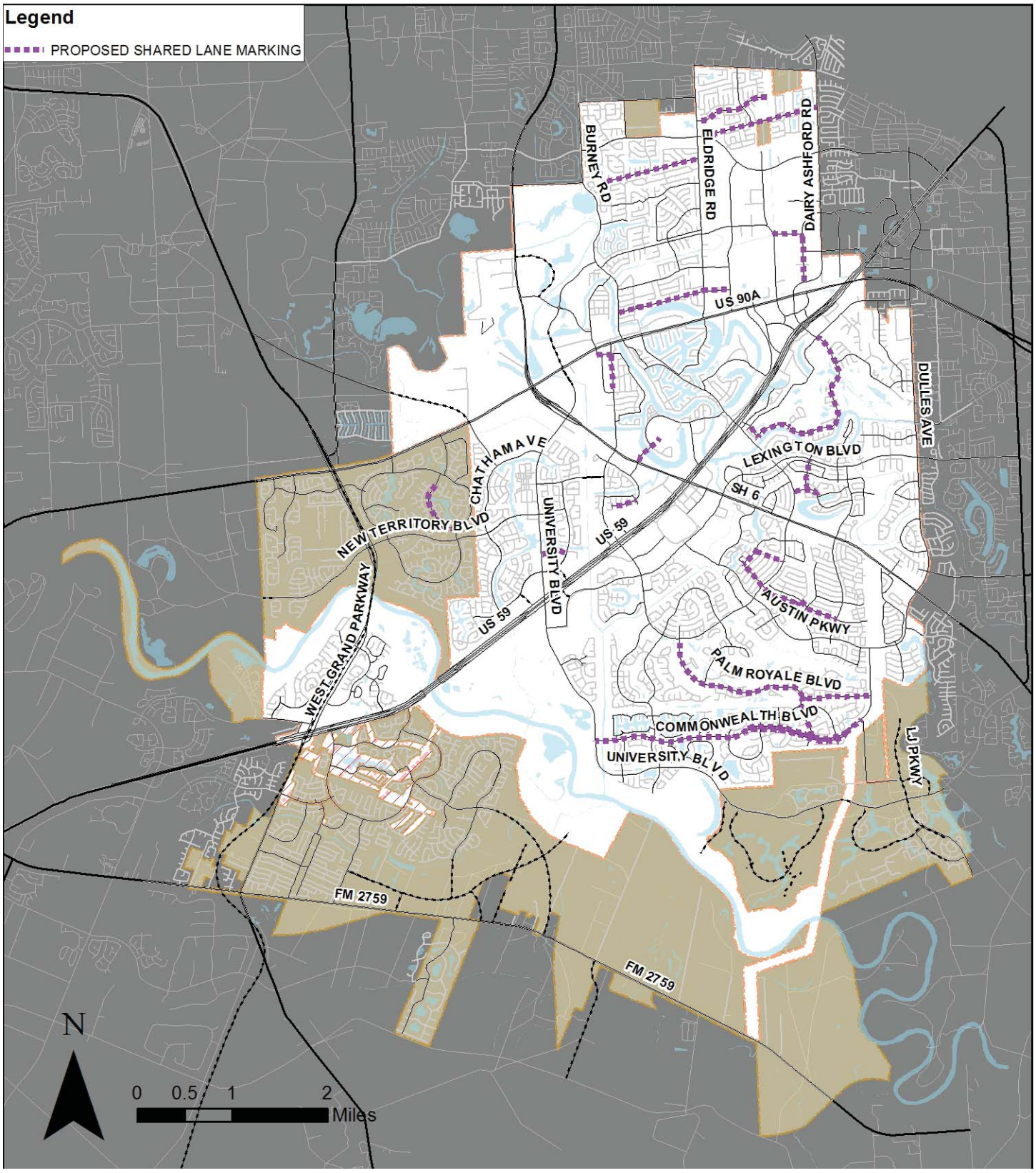


Figure 4-15 Proposed Shared Lane Markings

Barrier Recommendations

Sugar Land residents have noted that area highways, railroads and the Brazos River remain significant obstacles to connectivity and to increasing walking and bicycle riding in the City. The City's Comprehensive Mobility Plan identified addressing barriers as one of the key needs to promote alternative transportation in Sugar Land and recommended that the possibility of grade separated crossings be considered. Citizen input generated by this Plan confirmed a high level of concern for addressing barriers.

Key Barriers in Sugar Land

Major barriers in Sugar Land are shown in Figure 4-16, and are generally clustered along area highways and the Brazos River. They include:

- US 59, with a total of eight potential pedestrian and bicycle crossing opportunities;
- SH 6, with a total of nine potential for pedestrian and bicycle crossings;
- US 90A and the Union Pacific Railroad corridor, with seven potential pedestrian and bicycle crossings;
- Grand Parkway, with a total of five potential pedestrian and bicycle crossing opportunities; and
- The Brazos River, with a total of three potential pedestrian and bicycle crossing opportunities.

Issues and recommendations associated with each of these barriers are discussed on the following pages. These recommendations incorporate the guidance for typical solutions found in Chapter 3. The recommendations to resolve barriers shown in this section are at a master planning level, are not necessarily a complete list of all possible solutions at each intersection, and require detailed engineering to address the specific conditions at each intersection. Table 4.7 on page 113 summarizes barrier related recommendations and priorities.

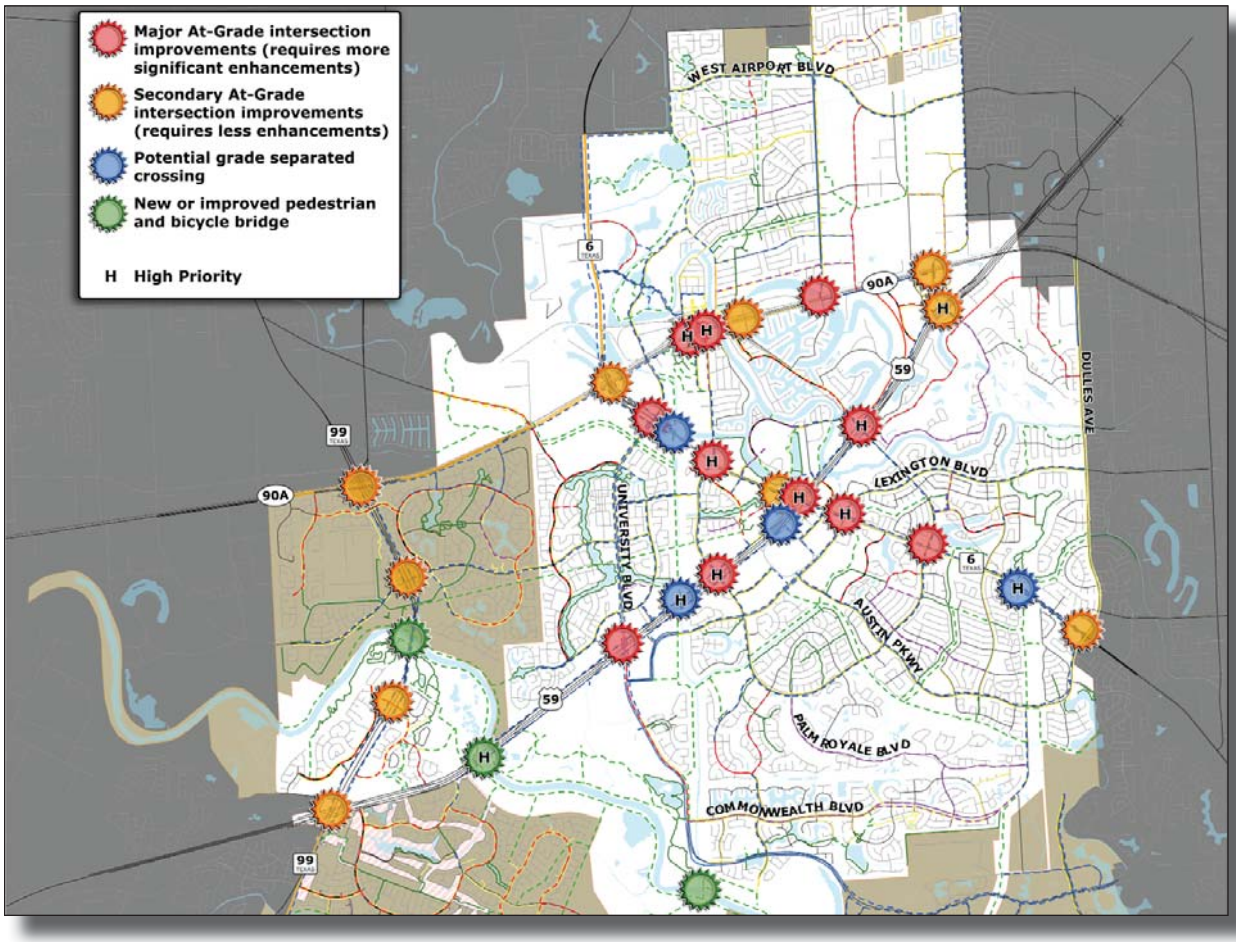


Figure 4-16 Barrier Locations in Sugar Land

Figure 4-17 Existing pedestrian crossing at US 59 illustrates the difficulty of incorporating pedestrian-friendly facilities in intersections designed to facilitate the movement of high volumes of vehicular traffic

Improvements to Cross US 59

The more than 400-foot wide swath of US 59 cuts through the center of the City, and separates the City's highest concentrations of commercial and office uses. When combined with SH 6, the Town Center area is effectively cut into four quadrants with the majority of movement between them currently being by vehicle. As the City continues to grow and mature, creating a more walkable and bikable activity center will become increasingly important.

Along the six-mile stretch of US 59 between the Grand Parkway and the northeastern corner of the City at US 59 and US 90A, there are only seven intersections or drainage underpasses that allow for a crossing of the highway. Because there are so few opportunities to cross US 59, each of these crossings needs to be improved for pedestrian and bicycle movement. They must go above meeting the technical minimums for pedestrian and bicycle facilities and should make crossing at these points more comfortable and convenient for walkers and bicyclists.

Figure 4-18 Example of freeway underpass lighting used to draw attention to a freeway underpass crossing

All of the crossings of US 59 are at-grade, with the main freeway travel lanes overhead and pedestrians crossing under the freeway. Figure 4-19 shows a recently completed bridge near Austin that illustrates an improved treatment for pedestrian facilities. The use of pavers to create a clearly defined pedestrian route under the freeway should be adapted to Sugar Land. Other techniques to create a more interesting pedestrian environment at freeway underpass crossings include nighttime illumination in unique color schemes (as shown in Figure 4-18) and installing pedestrian scale lighting.

Figure 4-19 Example of a TxDOT highway underpass with an enhanced pedestrian path

All reconfigured pedestrian areas should meet the requirements of the most recent Texas Accessibility standards. In addition, each underpass should be evaluated to determine if treatments such as netting, spikes or noise generators are necessary to reduce bird concerns. Specific recommendations for each of the crossings under US 59 are discussed on the following pages.

US 59 at SH 6

This intersection is a key crossing connecting the north and south portions of the Sugar Land Town Center area. Crosswalks are available, but the area for pedestrians under the bridge is narrow and needs to be widened to provide more space for pedestrians and bicyclists (who will be asked to dismount and cross as pedestrians).

Recommendations:

- Move the existing west U-turn further westward to create a sixteen foot (16') wide space (twelve feet (12') of walkway with two foot (2') wide paved buffer area on either side) for a pedestrian crossing zone. Figure 4-20 illustrates this concept. The existing roadway geometry should be maintained as the U-turn is shifted westward;
- Replace the existing concrete walkway under the bridge with pavers to create a defined and attractive walking area;
- Adjust bridge column colors to create an enhanced pedestrian atmosphere;
- Add enhanced illumination for pedestrians;
- Investigate the use of barrier walls adjacent to the traffic lanes at the U-turn to create the feeling of greater protection for pedestrians. The barrier wall must be crash rated and meet TxDOT standards;
- Add sidewalks at the northwest corner of the intersection along the feeder road, and extend these north along SH 6 and west along the frontage road;
- Replace existing crosswalks with ladder or continental style crosswalks;
- Adjust the location of existing signal control boxes and signs if necessary;
- Widen existing ramps to match the width of the enhanced pedestrian walking areas;
- Ensure that crosswalk timing provides adequate time for pedestrians to safely cross; and
- As a future phase, adjust the east U-turn in a similar manner to improve the pedestrian crossing on the east side of the intersection.

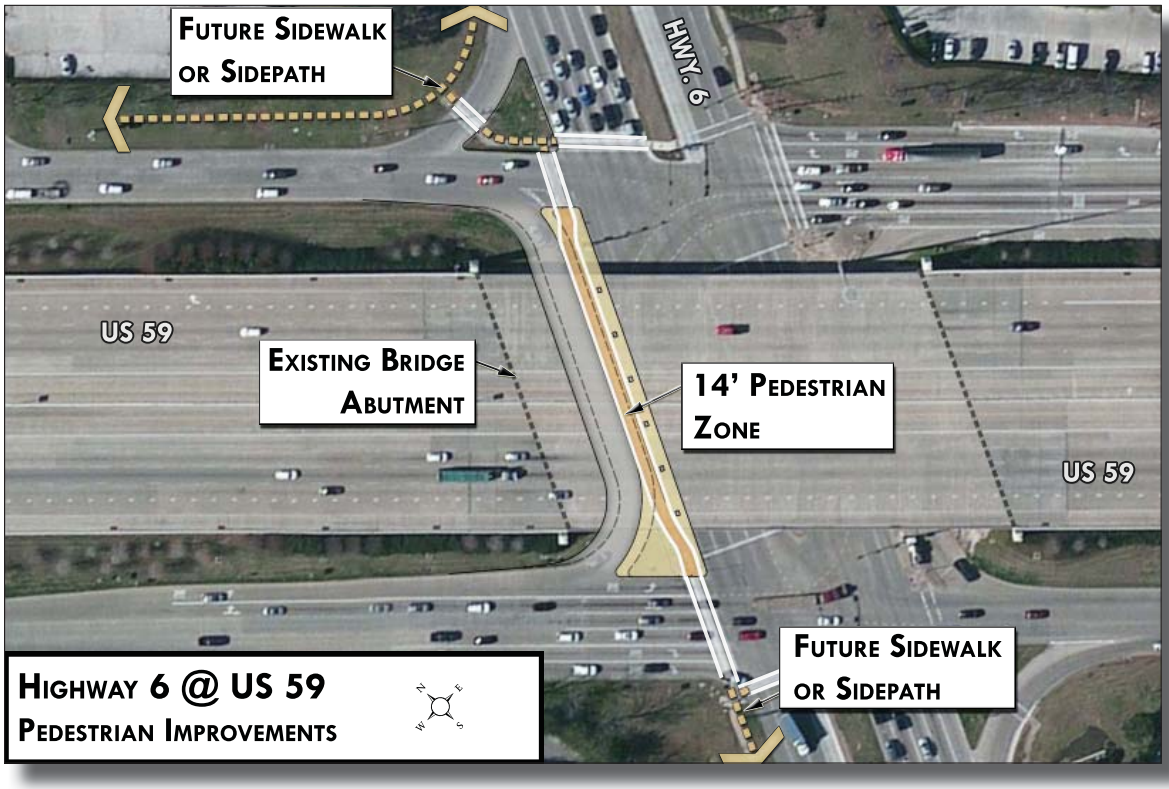


Figure 4-20 Concept realignment of U-turn lane at US 59 and Highway 6 to allow for a wider pedestrian crossing.



Figure 4-21 Existing pedestrian corridor at US 59 and Sweetwater/First Colony Boulevard, looking towards the southeast corner of that intersection

US 59 at First Colony/Sweetwater

Over time, this crossing is intended to become a second major connection between the Town Center areas north and south of US 59. As is the case at SH 6, the pedestrian zone under the bridge is uninviting.

Recommendations:

- The pedestrian zone adjacent to the U-turn on either side is approximately eight feet (8') wide. This area on both sides of the intersection should be enhanced with decorative paving to create a defined pedestrian route;
- Replace existing painted crosswalks with ladder or continental style crosswalk painting;
- Add themed lighting for the underside of the bridge, following the pattern developed for the SH 6 underpass;
- Given the high volumes of vehicular traffic at the intersection, signs should be included that direct bicyclists to dismount and cross as pedestrians; and
- When major future roadway improvements are planned in the area, evaluate the need to relocate the existing U-turns to create a wider area for pedestrians on both the east and west sides of the intersection.

Figure 4-22 Existing pedestrian corridor at US 59 and University Boulevard, looking north

US 59 at University Boulevard

This crossing is a key access route to the University of Houston, Memorial Park, and areas south of the Brazos River. The University Boulevard underpass already incorporates bicycle lanes under the freeway. However, these lanes will more than likely only be used by experienced riders.

Recommendations:

Replace the existing concrete walkway under the bridge with decorative pavement to create a defined and attractive walking area;

- Given the proximity to the Sugar Land Performing Arts Center and the University of Houston, consider the use of enhanced lighting similar to that proposed at SH 6 and Sweetwater;
- Replace existing crosswalks with ladder or continental style crosswalks;
- Widen existing ramps to match the width of the enhanced pedestrian walking areas;

- Ensure that crosswalk timing provides adequate time for pedestrians to safely cross;
- Longer term, relocate the east U-turn to create a wider pedestrian corridor under the freeway bridge. The current pedestrian zone width of five to six feet (5' - 6') should be widened to twelve to fourteen feet (12' - 14'); and
- As a future phase, adjust the west U-turn in a similar manner to improve the pedestrian crossing on the east side of the intersection.

Figure 4-23 Unused pavement area at Williams Trace under US 59 that can be physically separated from vehicular traffic to create an enhanced bicycling facility (image source: Google Streetview 2011)

US 59 at Williams Trace

The crossing of Williams Trace under US 59 is a significant route linking the First Colony area and eastern neighborhoods of the City to the northern areas of the City. The existing pedestrian accommodations are uninviting, and there currently are no distinct facilities for bicycles. It is anticipated that this crossing could serve as a major bicycle corridor if bicycle facilities were added at the intersection.

Recommendations:

- Utilize the unused travel lane area along the southbound lanes (shown in Figure 4-23) to create a separated corridor for bicycles. Since a sidepath is recommended north and south of US 59, consider making the bicycle facility under US 59 two way as well. Extend the existing curbed area into the unused lane as shown in Figure 4-24. An alternative option may be to install a barrier curb and treat the area as a two-way cycle track if sufficient width is available. The utilization of the unused travel lane should be contingent on confirming that the currently unused travel lane is not needed for a future widening of Williams Trace to six lanes under the bridge;

Figure 4-24 Potential use of un-utilized lane area to create an enhanced crossing area (background image: Google Streetview 2011)

- Replace the existing concrete walkway under the bridge with decorative pavement to create a defined and attractive walking area;
- Add themed lighting for the underside of the bridge, following the pattern developed for the SH 6 underpass; and
- Replace existing crosswalks with ladder or continental style crosswalks.

Figure 4-25 Existing unused vehicular lane space under US 59 at Dairy Ashford that could be converted into a separated bicycle lanes

US 59 at Dairy Ashford

This crossing links the Sugar Creek area to the Sugar Land Business Park, Schlumberger, and business and office destinations north of US 59. No other crossing exists within a mile of this location, making this a vital long-term link.

Recommendations:

- Similar to the Williams Trace crossing strategy shown in Figure 4-24, unused vehicular lane space can be converted into a sidepath crossing under the freeway and connecting to proposed sidepaths north and south of US 59;
- Focus initially on improving the west side of the intersection;
- Pedestrian crossings should be enhanced with decorative walking surfaces and brighter down-lighting on pedestrian walkways; and
- Replace existing crosswalks with ladder or continental style crosswalks.

US 59 at Ditch H Trail

The proposed Ditch H trail will provide a completely separate underpass crossing under both the main lanes and frontage roads of US 59. This crossing is ideally suited for north-to-south trips on the western side of the City. It is somewhat removed from the Town Center area and will compliment, but not replace the need to provide better crossings at First Colony, SH 6, and Williams Trace.

Recommendations:

- Ensure that the shared use path under US 59 includes trail connections so it can be accessed from east and west bound frontage road sidewalks;
- Maintain clear lines of sight under the bridge for trail users as they approach the bridge; and
- Provide security lighting so that evening users feel secure, and so that quick visual inspections by police forces are possible.




US 59 Frontage Road U-Turns at the Brazos River

The area under US 59 at the Brazos River provides access to the Brazos River. Shared use paths and a future pedestrian bridge will connect this area to nearby residential areas as well as Memorial Park and the Brazos River Park.

Recommendations:

- Provide wayfinding and directional signage for pedestrian and bicycle users;
- Develop water trail access features such as canoe launch facilities and parking; and
- Incorporate other trailhead features such as drinking fountains, benches for resting and trash cans.

Figure 4-26 Pathway route under US 59 at the Grand Parkway looking southward. Widening of the pathway area is recommended to create a more user friendly route

US 59 at Grand Parkway (SH 99)

The intersection of US 59 and the Grand Parkway is the only crossing of US 59 in the western area of the City. A two-way sidepath is proposed along the northbound frontage road of the Grand Parkway as it crosses under US 59, and it will link the Greatwood development to Riverpark and other developments north of the freeway.

Recommendations:

- Use pavers or decorative paving to define the pathway between the U-turn lane and the Grand Parkway northbound frontage road, and at the US 59 to northbound Grand Parkway right turn island;
- Increase lighting levels under the bridge;
- Install ladder or continental style crosswalks;
- Longer term, relocate the existing US 59 frontage road southbound to northbound U-turn to provide a sixteen feet (16') wide pedestrian corridor that parallels the northbound Grand Parkway frontage road; and
- Longer term, create a similar pedestrian route on the northbound to southbound US 59 U-turn.

Improving Crossings of State Highway (SH) 6

Traffic volumes on SH 6 are also high and present a significant barrier to pedestrian and bicycle movement in Sugar Land. Nine locations have been identified as potential enhanced crossing locations along SH 6. Pedestrian facilities exist at all but one of these crossings, but these have been severely hampered by recent improvements to expedite vehicular capacity. For example, median tips have been cut back to allow for dual left turn lanes, resulting in very long crosswalks without a median refuge (a daunting challenge for a slower walker).

The recommendations for SH 6 mainly address improving existing crossings. Because SH 6 is a State operated roadway, all facility improvements should be developed with TxDOT staff.

SH 6 at Town Center Blvd.

A sidepath on the north side of Town Center Blvd. will cross SH 6 at this intersection. Efforts should focus on the crosswalks parallel to SH 6 as well as the north crossing of SH 6.

Recommendations:

- Replace all existing crosswalks with a ladder or continental style crosswalk;
- Replace existing ramps with individual larger ramps that are perpendicular to the direction of traffic;
- Relocate crosswalk signal location in the median to allow for a wider median refuge;
- Install a wider median refuge with additional holding space; and
- Review and if necessary adjust crosswalk timing to ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

Figure 4-27 Intersection of SH 6 and Lexington Boulevard, looking eastward. The heavy volume of traffic and the high number of lanes makes SH 6 challenging to cross on foot or by bicycle (image source: Google Streetview)

SH 6 at Lexington Boulevard

This intersection provides a key connection between Ditch C trails proposed east of SH 6 and the proposed priority sidepath along Lexington Boulevard adjacent to the Sugar Land Town Center. As those paths are developed, a significantly higher volume of pedestrians and especially bicyclists will be crossing and moving towards the Sugar Land Town Center area.

Recommendations:

- Replace all existing crosswalks with a ladder or continental style crosswalk;
- Replace existing ramps with individual larger ramps that are perpendicular to the direction of traffic;
- Increase the size of the waiting space at each corner;
- Relocate crosswalk signal location in the median to allow for a wider median refuge;
- Install a wider median refuge with additional holding space; and
- Review and if necessary adjust crosswalk timing to ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

SH 6 at Williams Trace

A sidepath is planned for Williams Trace, but limited right of way and parkway space requires the deferral of the sidepath until additional space can be secured. In the interim, improvements to facilitate pedestrian crossings are needed. The intersection already has continental style crosswalks, but lacks median refuge spaces and reconfigured ramps. With a crossing distance of almost one-hundred twenty feet (120'), refuge areas would greatly improve the crossings for slower walkers.

Recommendations:

- Adjust stop bar locations and crosswalk locations closer to the median to allow for placement of a median refuge, or extend the median end outward to create space for a median refuge (will require adjusting left turn radii striping);
- Reconfigure ramps from one single ramp to dual ramps at each corner that are more perpendicular to the direction of traffic;
- Increase the size of the landing area at each corner;
- Relocate signs, poles and signal boxes at corners to increase pedestrian landing area; and
- Review and if necessary adjust crosswalk timing to

Figure 4-28 Intersection of SH 6 and Williams Trace Boulevard. Note existing ladder style crosswalk markings (Image source: City of Sugar Land)

ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

SH 6 at Oyster Creek Park

No at grade crossing opportunity currently exists where the proposed power line corridor trail crosses SH 6 to connect to the existing Oyster Creek Park trails. A grade separated pedestrian bridge is recommended at this location. Consideration was given to installing pedestrian activated traffic signals at this location, but the disruption to the flow of heavy traffic volumes along SH 6 may make this option unattractive. The grade separated bridge is a vital pedestrian crossing over SH 6 for much of the eastern half of Sugar Land, and is discussed in detail on page 112.

SH 6 at Dulles/Austin Parkway

Future sidepaths along Dulles and Austin Parkway will provide connections on the eastern edge of the City. The intersection has been adjusted recently to increase vehicular capacity, but to further improve pedestrian crossings, expanded landings and median refuge spaces are needed.

Recommendations:

- Adjust stop bar locations and crosswalk locations closer to the median to allow for placement of a median refuge;
- Increase the size of the waiting space at each corner; and
- Review and if necessary adjust crosswalk timing to ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

SH 6 at Kensington

This intersection should accommodate bicyclists and pedestrians wanting to access the Whole Foods area and Lake Pointe trails. The intersection has existing crosswalks, but needs minor improvements to create a more attractive crossing environment. Changes to lane striping at this intersection should also be installed to accommodate on-street bicycle crossings.

Recommendations:

- As part of the Kensington Street bicycle lane project, install dashed bicycle lane with chevrons to indicate preferred track for bicycles across the intersection (see Figure 4-29 on page 100);
- Relocate the crosswalk to allow for the installation of a median refuge for the crossings of SH 6;
- Replace all existing crosswalks with a ladder or continental style crosswalk;
- Replace existing ramps with individual larger ramps that are




perpendicular to the direction of traffic;

- Adjust push button locations so that they are adjacent to the ramp locations;
- Increase the size of the waiting space at each corner;
- Review and if necessary adjust crosswalk timing to ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

SH 6 at Fluor Daniel

This intersection has been targeted as the key bicycle crossing along SH 6 between Brooks and US 59. Improvements to the crosswalk striping and landings are recommended to accommodate a proposed two-way sidepath on the east side of Fluor Daniel Drive.

Recommendations:

- Reduce the southeast and northeast corner curve radii to twenty-five feet (25') to reduce the pedestrian and bicycle crossing distance;
- Replace all existing crosswalks with a ladder or continental style crosswalk;
- Replace existing ramps with individual larger ramps that are perpendicular to the direction of traffic;
- Increase the size of the waiting space at each corner;
- Relocate crosswalk signal location in the median to allow for a wider median refuge;
- Evaluate feasibility of adjusting lane widths and adjust stop bar location to be able to install median refuge spaces with a minimum eight feet (8') crossing depth;
- Install signage to indicate that this is a significant bicycle and pedestrian crossing location; and
- Review and if necessary adjust crosswalk timing to ensure that it provides sufficient crossing time for pedestrians. If appropriate, consider a periodic longer cycle for pedestrians when activated by push button.

SH 6 at Ditch H

A proposed grade separated crossing under SH 6 has been proposed as part of the Ditch H shared-use path preliminary engineering report and will provide a completely separated crossing for pedestrians and bicyclists. This crossing will be useful for longer north/south trips, but does not eliminate the need for at-grade improvements closer to US 59 and at University. Connections to pedestrian facilities along SH 6 on both sides should be added as sidewalks are extended in this area.

SH 6 at University

As University Boulevard is extended to US 90A and beyond into the Imperial development, it will become a major route for both vehicular and bicycle and pedestrian access. Sidepaths along University will provide connectivity in the area. As in the crossings under US 59, the area between the main lanes and the U-turn of University needs to be widened and improved to create a more attractive pedestrian corridor.

Recommendations:

- Install decorative pavement to clearly designate the pedestrian and bicycle travel zone;
- Replace all existing crosswalks with a ladder or continental style crosswalk;
- Adjust existing ramps locations with individual larger ramps that are perpendicular to the direction of traffic;
- Increase the size of the waiting space at each corner; and
- Longer term, adjust the location of the south/east U-turn to create a sixteen feet (16') wide pedestrian zone adjacent to the U-turn.

US 90A

With up to four travel lanes in each direction and posted speeds at 50 miles per hour, US 90A also represents a significant barrier to north/south walking and bicycle riding in Sugar Land. Eight potential crossing locations have been identified, and over time all should be improved. Recommended improvements at each intersection going from west to east are as follows.

Figure 4-29 Use of chevrons and dashed striping to continue bicycle lane across a major intersection (image source: Halff Associates Inc.)

US 90A at Easton/future extension into Tract 2

This crossing will be the only route to cross US 90A between SH 6 and the Grand Parkway, a stretch of almost 2.3 miles. The intersection will be improved as new industrial/business park development occurs, and pedestrian and bicycle facilities should be incorporated as a component of those improvements.

Recommendations:

- For bicyclists, use dashed lines and chevrons (as illustrated in Figure 4-29) to indicate track for continuation of travel across the intersection;
- Install ladder or continental style crosswalks;
- Install individual pedestrian ramps that are perpendicular to the direction of traffic; and
- Add pedestrian crossing signals and ensure that timing is appropriate.

US 90A at future University Boulevard

An extension of University Blvd. over Ditch H is under construction and will complete the connection between SH 6 and US 90A. This construction includes signalizing the intersection of US 90A at

University Boulevard. There is long term potential for University Blvd to extend across US 90A to connect northward into the Imperial development, pending coordination required to cross the railroad tracks along the north side of US 90A. This extension is expected to include an at-grade intersection at US 90A and University Boulevard, and a University Boulevard overpass over the northern Nalco rail spur and Oyster Creek. Intersection enhancements at US 90A at University Boulevard for pedestrian and bicycle safety should be completed at the time the intersection is modified for the northward extension.

Recommendations:

- Evaluate the use of smaller corner radii to reduce the pedestrian crossing distance;
- Include median refuge areas with push button actuators;
- Include ladder or continental style crosswalks for higher visibility;
- Include a ten foot (10') wide paved crossing over the existing railroad tracks.

US 90A at Ulrich and Brooks

The Ulrich crossing of US 90A is planned to be a major connection point between north and central Sugar Land. This intersection will include a planned sidepath on the east side of Ulrich. A wide median refuge, high-visibility crosswalk markings, improved landing ramps, and a pedestrian/bicycle facility over the Union Pacific railroad tracks is needed. The City should consider using colored pavers to further highlight and emphasize this crossing as a key pedestrian and bicycle route. As the volume of pedestrians and bicycle riders wanting to cross at this intersection grows,

Figure 4-30 Proposed major sidepath crossing at US 90A & Ulrich and US 90A & Brooks

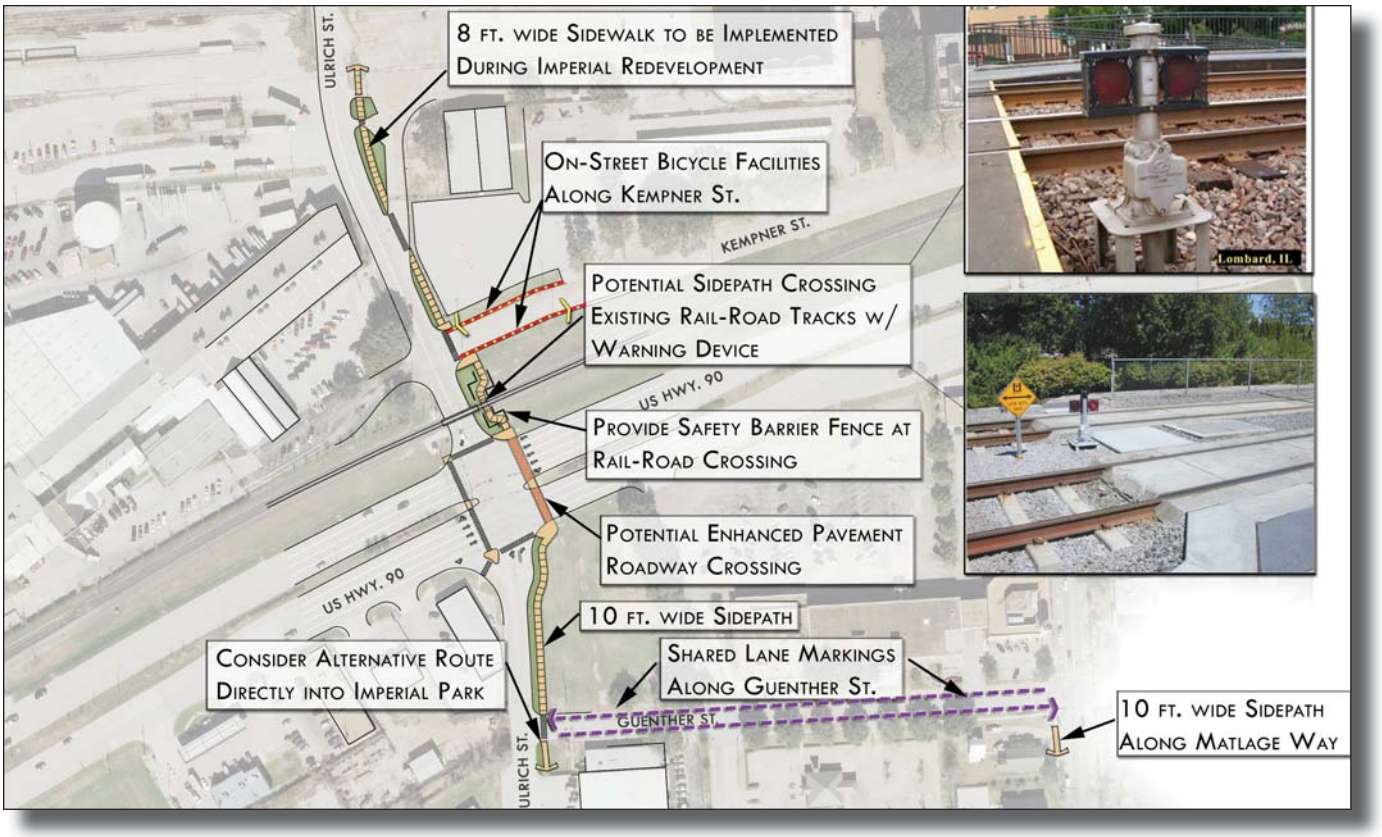


Figure 4-31 Recommendations for crossing US 90A at Ulrich

consider prohibiting right turn on red from northbound Ulrich traffic to US 90A. This can reduce the potential for conflicts between crossing pedestrians and motorists who are trying to turn right at the same time. Figure 4-31 illustrates the recommendations for this crossing.

Recommendations:

- Incorporate a median refuge area into the median of US 90A with crosswalk signal push buttons. Given the 140'+ to cross the entire roadway, evaluate the need for a staged crossing;
- Install ladder or continental style crosswalks. As an alternative, consider using decorative paving to further emphasize the crosswalk area;
- Install a twelve feet (12') wide paved crossing over the railroad tracks, including paved planking between rails;
- In coordination with the railroad line owner, consider installing pedestrian level warning signals, fencing to channel pedestrians to the crossing area, and automatic pedestrian scale barrier gates;
- Consider prohibiting a right turn on red from northbound Ulrich traffic to eastbound US 90A;
- Reduce corner curve radii to reduce the pedestrian crossing distance; and
- Widen existing sidewalks along Guenther.




US 90A at Main/Bayview

At the Main Street intersection, bicyclists will be on street and no separate railroad crossing for bicycles is required. Pedestrian crosswalks and ramps are already in place at 90A, but no pedestrian crossing over the railroad tracks is currently available.

Recommendations:

- Use dashes to indicate bicycle route across the intersection;
- Until bicycle lanes can be developed, utilize shared lane markings to link bicycle lanes in the area; and
- Longer term, extend sidewalks along Main across the railroad tracks to the intersection with 90A.

US 90A at Wood/Savoy

Improvements to this crossing were requested by citizens during the public input process to connect the Venetian Estates area to the Imperial area. However, because there are currently no pedestrian or bicycle facilities along Wood Street and Savoy Street, any improvements to this intersection are considered long term.

Recommendations:

- Replace existing crosswalks with a ladder or continental style crosswalk;
- Review pedestrian signal timing and adjust as necessary; and
- Adjust existing ramps locations with individual larger ramps that are perpendicular to the direction of traffic.

US 90A at Eldridge Road

This intersection is not planned as a primary route for bicycles, and currently includes pedestrian crossing facilities.

Recommendations:

- In the near term, replace the current crosswalk markings over US 90A with ladder or continental style markings; and
- Extend sidewalks along Eldridge across the railroad tracks to the intersection with 90A.

US 90A at Gillingham Lane

Gillingham Lane is intended as an on-street bicycle corridor and a location for bicyclists to cross US 90A. The intersection requires improvements that facilitate the movement of bicycles through the intersection. This intersection requires pavement widening north of US 90A to accommodate bicycle lanes. Ramps for the transition of bicycles from on-street condition along Gillingham to the existing sidepath along US 90A are also required.

Recommendations:

- Widen Gillingham north of US 90A to fit on-street bicycle lanes;
- Add dashed pavement markings as discussed earlier in this chapter to

guide bicycles across the intersection (see Figure 4-29);

- Replace crosswalk markings with ladder or continental style markings;
- Install ramps to permit the transition to the existing sidepath along the south right of way of US 90A; and
- Review pedestrian signal timing and adjust as necessary.

US 90A at Dairy Ashford Road

This intersection supports access to the eastern side of the Business Park, and also provides access to the Sugar Land Business Park area. Intended as a sidepath crossing, the existing crosswalk striping needs to be strengthened with ladder style crosswalk markings as well as ramp and landing improvements.

Recommendations:

- Complete sidewalk connections along the west right of way of Dairy Ashford north of US 90A to their current ending point;
- Replace all existing crosswalks with a ladder or continental style crosswalk; and
- Replace existing ramps with ramps that are perpendicular to the flow of traffic and that provide a more straight line crossing for the pedestrian.

Grand Parkway (SH 99)

Between US 90A and US 59, only three intersections (Sandhill Drive, New Territory Boulevard and East/West Riverpark Drives) currently allow an at-grade crossing of the Grand Parkway. These crossings are critical to allow bicycle and pedestrian movement but will have to compete with area vehicular traffic, which will also be funneled to these crossings. An additional trail pathway already exists south of New Territory Boulevard and will continue to serve as the main bicycle and pedestrian crossing.

Grand Parkway at US 90A

No pedestrian facilities are currently in place at this intersection. As the area grows, walking and bicycling connections between New Territory neighborhoods east and west of the Grand Parkway and south of US 90A will become increasingly important.

Recommendations:

- Install wide pedestrian corridors that can accommodate both pedestrians and bicyclists. Ensure that new bridge columns leave adequate space for pedestrians and bicyclists.
- Longer term, Install a sidepath along the northbound frontage road of the Grand Parkway to connect to pathways north of US 90A.

Grand Parkway at Sandhill Road

Either on-street bicycle lanes or a sidepath are planned for Sandhill Road,




and the median area between the U-turn and the through lanes should be improved to be wide enough to accommodate a ten feet (10') wide sidepath.

Recommendations:

- Install ladder or continental style crosswalks;
- Adjust the U-turn location to create a wider crossing area in the median area between the U-turn and the main lanes;
- Utilize decorative pavement in the median area between the U-turn and the main lanes to clearly denote the pedestrian route; and
- Install bicycle lanes in underpass area under the Grand Parkway.

Grand Parkway at New Territory Boulevard

Long term, a shared-use path is envisioned connecting development on both sides of the freeway. As the intersection is improved in the future, a wider sidepath area should be added. The U-turn zone should be located to allow for a wider median area between the U-turn and the through lanes.

Recommendations:

- Install ladder or continental style crosswalks;
- Adjust the U-turn location to create a wider crossing area in the median area between the U-turn and the main lanes; and
- Use decorative paving to clearly denote the pedestrian route.

Grand Parkway at East/West Riverpark Dr.

This intersection currently has pedestrian crosswalks and pedestrian signals, but as the Grand Parkway overpass is constructed, columns will make the pedestrian area much narrower.

Recommendations:

- Install ladder or continental style crosswalks;
- Adjust the U-turn location to create a wider crossing area in the median area between the U-turn and the main lanes;
- Utilize decorative pavement in the median area between the U-turn and the main lanes to clearly denote the pedestrian route; and
- Install bicycle lanes in the underpass area under the Grand Parkway.

Shared Use Path crossings under the Grand Parkway

An existing shared use path that crosses under the Grand Parkway bridge at the Brazos River should be widened to at least ten feet (10') to serve as a major link between both sides of the Grand Parkway. Additional trails are planned along both sides of the Brazos River corridor, and should be linked to area neighborhoods to help reduce the barrier effect of the new freeway. These trails should also be at least ten feet (10') wide to accommodate higher usage in the future.

Figure 4-32 Brazos River through Sugar Land

Brazos River

US 59 and the Grand Parkway are the only two crossings over Sugar Land's seven-mile length of the Brazos River, and neither includes pedestrian or bicycle facilities. Effectively, the entire western portion of Sugar Land is not accessible from the eastern portion via walking or bicycling. Recommendations to add pedestrian and bicycle crossings are as follows.

US 59 at the Brazos River - The frontage roads are continuous both east and westbound but currently do not accommodate either pedestrians or bicyclists. A connection in this area would help create a strong link between the large Greatwood and Riverpark developments west of the Brazos River and the Telfair, University of Houston, and Town Center areas of Sugar Land. Three options were explored to create a connection between the areas. These options are a suspended ped/bike bridge beneath US 59 (Option A, Figure 4-33), a freestanding ped/bike bridge adjacent to US 59 (Option B, Figure 4-35), and either a cycle track or wide shoulder along the frontage road of US 59 for bicyclists and distressed vehicles only (Option C, not illustrated). The City should conduct a preliminary engineering study to determine which option is best. At the conceptual level of analysis contained in this report, Option A appears to have advantages over Option B, and Option C is not optimal.

Option A - Suspended bridge under the US 59 Main Lanes - In conjunction with TxDOT, this option proposes attaching a fourteen to sixteen foot (14' - 16') wide lightweight pedestrian/bicycle bridge from the main lane or frontage road columns and bents. The pedestrian bridge would have to clear at least the 100-year peak water surface elevation of the river, and would require ramps to return to grade on either side of the river. The advantages of this option are that it may not require as much or any new support piers, it is shaded year round, the high bank areas are already suitable for relatively simple connections to the proposed bridge, and the area underneath the bridge is relatively quiet and removed from traffic noise. Because the bridge could require less new support columns, it may be more affordable than other options.

This option would require pedestrian and bicycle bridge options with TxDOT consultation and agreement. A May 2013 field review of these options with TxDOT pedestrian/bicycle and bridge design staff noted that this may be the most feasible option. The existing US 59 bridges would need to be evaluated for their ability to structurally support the additional weight of the proposed pedestrian bridge. An attachment location for the new pedestrian bridge would also have to be identified where it does not impact floodwaters during major flooding events.

The projected cost of this option ranges from $3,000,000 to $4,500,000. A concept illustration is shown in Figure 4-34.

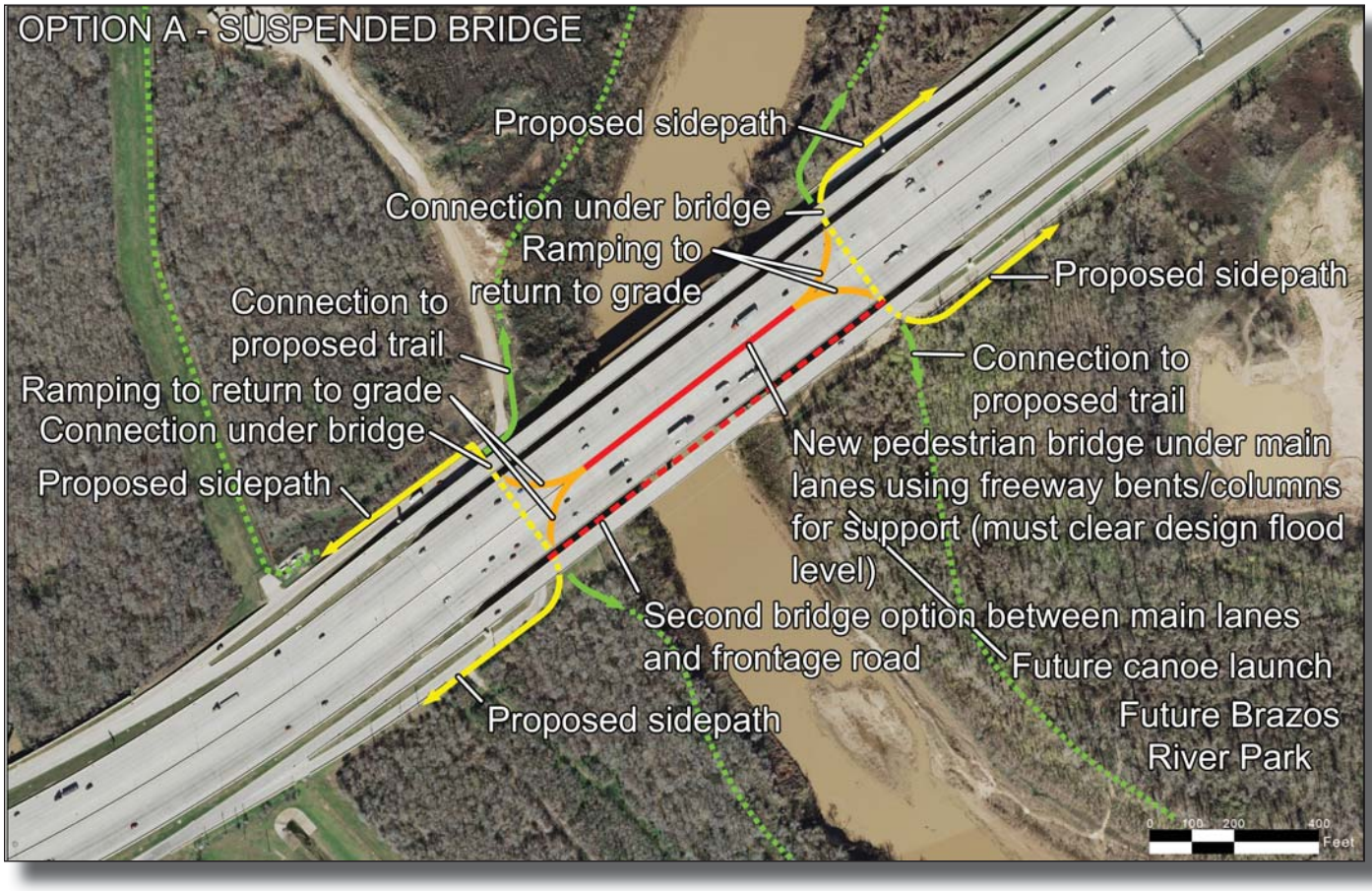


Figure 4-33 Option A Suspended Bridge under US 59 main lanes or frontage road

Figure 4-34 Before/after concept of a ped/bike bridge under US 59

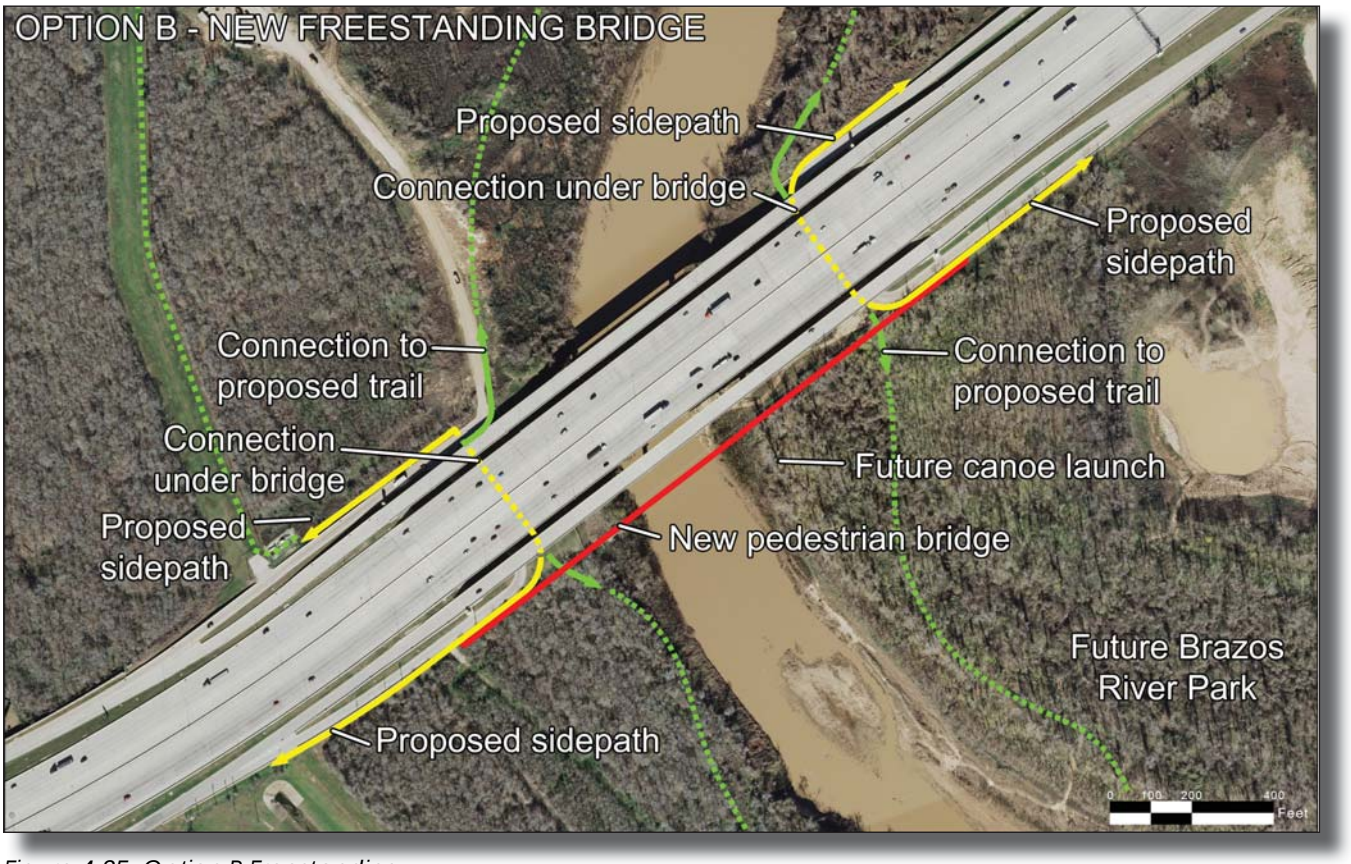


Figure 4-35 Option B Freestanding bridge over the Brazos River

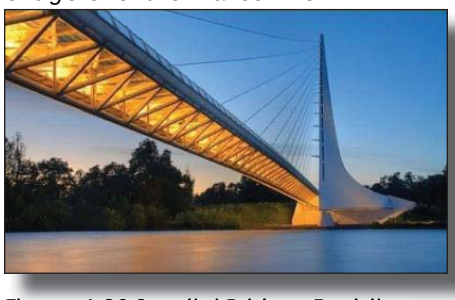


Figure 4-36 Sundial Bridge, Redding California (Image source: violinduett.files.wordpress.com/2011/08/sundial-bridge-reddingcalifornia.jpg)

Figure 4-37 Pedestrian suspension bridge in North Carolina (Image source: Stewartinc.com)

Option B - Build separate freestanding bridge over the Brazos River between US 59 and Memorial Park - Develop a 900' long bridge that extends across the Brazos. The advantages of this option are that the bridge could be built at an optimal point along the Brazos and could link the future Brazos River Park to greenbelt areas and other future developments in the ETJ area south of the river. The new bridge could also link to canoe launch facilities planned for the area.

This bridge could be iconic in nature, using a cable stayed or suspension bridge structural system. Examples of other iconic pedestrian bridges are shown on this page. The projected cost of this option ranges from $3,000,000 to $10,000,000. A concept illustration is shown in Figure 4-35.

Option C - Utilize shoulder areas along US 59 Frontage Roads for both distressed vehicles and bicycles - Consideration was given to using the existing US 59 frontage road shoulder areas over the Brazos River as bicycle facilities. The existing shoulder would be signed and pavement markings would be added to indicate that it could be used by bicyclists. However, because TxDOT requires that shoulder areas remain available for use by distressed vehicles, and because pedestrians would still not be able to cross the river, this option was found to be less optimal than the other options and is not recommended.

Grand Parkway at the Brazos River - The existing bridge has no pedestrian component, and no pedestrian or bicycle facilities are planned for this area as part of the Grand Parkway. Therefore, in the long term, a freestanding pedestrian bridge is recommended in this area on either side of the Grand Parkway. To minimize impacts to the Brazos River floodplain in this area, the length of the bridge would range from 550 to 700 feet. A fourteen to sixteen foot (14'- 16') width is recommended, and an iconic suspension or cable stayed structure should be considered (see Figures 4-36 and 4-37). The bridge should also facilitate connections to the Brazos River Trail system. The projected cost of this bridge ranges from $3,000,000 to $10,000,000, and it is considered a long term priority.

Brazos River at Memorial Park - Long term, as areas in Sugar Land's ETJ south of the Brazos River develop, an additional pedestrian connection near Memorial Park (University Blvd. at Commonwealth) should be considered. This bridge could be limited to use by pedestrians and bicyclists only, or could be combined with a future vehicular bridge (although none are currently contemplated in this area). The bridge would range in length from 600 to 800 feet depending on where it is located.

Grade Separated Solutions at Key Barriers

At certain key locations, the need to move higher volumes of pedestrian and bicycle traffic with increased safety, comfort and convenience may warrant alternative grade separated solutions.

Major pedestrian and bike bridges are becoming more common. In the Houston area, the bridge over Buffalo Bayou near Montrose is an excellent example of how a bridge can link major path routes and increase the amount of use of those paths. In many cities such as Denver, Austin, Dallas and San Antonio, major non-vehicular bridges are incorporated as a key feature that makes areas of those cities more attractive as destinations. In all of those cities, those bridges are treated as signature iconic elements, with designs that are functional but that attract attention as well. Sugar Land may also use bridges as signature features or gateways to help brand the City.

Figure 4-38 Example of a ped/bike bridge that crosses a major barrier. A similar style bridge is proposed for over US 59

Convenience is a significant determinant of how much a bridge or underpass is used. In general, if a user perceives that taking a grade separated route will take longer than taking a non-grade separated route, the overpass may be perceived as inconvenient and will not be used (walkinginfo.org). Incorporating as direct a route as possible to and from the crossing and minimizing the use of elaborate ramps will increase the likelihood that it is used.

Because of their significant cost, locations of major bridge-over-roadway barriers should be carefully considered. Conditions that are favorable to the use of a bridge include the absence of other safe and convenient pedestrian and bicycle at-grade options, and a significant amount of potential use. Two locations were identified as follows:

US 59 in the Town Center area - The Town Center area was consistently mentioned as the most desired destination to be accessed by walking or biking. US 59 also is the most challenging barrier to north/south movement in Sugar Land. In the vicinity of the Town Center area, only the SH 6 and First Colony/Sweetwater crossings under US 59 allow for the possibility of some degree of pedestrian and bicycle movement. Because of wide intersection configurations and high volumes of vehicles, neither intersection currently encourages pedestrian or bicycle movement.

In the short term, intersection improvements to encourage pedestrian and bicycle movement at the First Colony and SH 6 intersections under US 59 are recommended (as discussed on page 91). Longer term, the mall and strip center retail uses in all four quadrants of the Town Center area may evolve and become denser. As part of this transition, a "signature" pedestrian and bicycle bridge that crosses US 59 should be considered as increases in pedestrian and bicycle traffic in the area warrant. A tunnel was considered but deemed unattractive because of security and drainage concerns over the more than 400-foot length. The bridge must be designed in consultation with TxDOT.

Three alternative locations have been considered and are shown in Figure 4-39. All locations require further review and confirmation with TxDOT and area property owners, and are shown here only to illustrate potential connection locations. However, this preliminary analysis and feedback from the Pedestrian and Bicycle Task Force and citizens suggests that Option B may be the optimal location. Additionally, the few elevated obstructions in that location make it preferable over Option A and Option C.

Each bridge configuration requires approach ramps that are approximately 300 feet in length

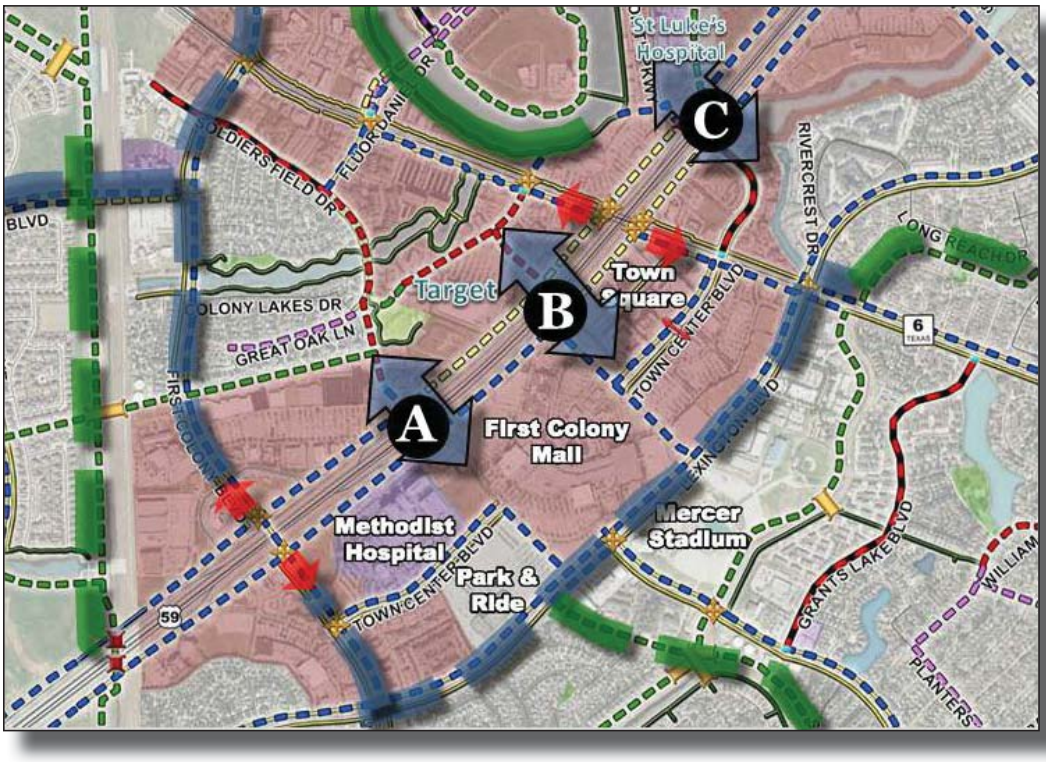


Figure 4-39 Key potential locations for a pedestrian/ bicycle bridge crossing US 59

A - From the boundary between Methodist Hospital and First Colony Mall to a point adjacent to the City-owned water plant.

B - From a landscaped area near the north Mall Ring Road to a landscape area adjacent to Lakeside Plaza Drive.

C - From an area near the intersection of Town Center Boulevard and the northbound frontage road to a landscaped area at the intersection of Lake Pointe Parkway and the southbound frontage road.

to provide ADA access and to meet the minimum vertical height clearance of US 59. Therefore, a circular ramping configuration is recommended to occupy less space. Steps with bicycle tire "slots" are also recommended for users who want to access the bridge faster (see Figure 4-40).

The bridge supports must span the main lanes in each direction (approximately 200 feet +/- each direction), with a support column in the middle of the freeway. A design that can be placed quickly so as to minimize impacts to traffic along US 59 is recommended.

The bridge railings should have barriers that prevent debris from being thrown on the highway travel lanes.

A schematic illustration of the potential bridge arrangement is shown in Figure 4-41. A stand-alone pedestrian bridge of this size is projected to range in cost from $5,000,000 to $10,000,000. The bridge is a long term priority and should be considered as ped/bike traffic across US 59 increases making the bridge warranted.

Option B could also be a combined vehicular/pedestrian bridge, which would improve connectivity across US 59, and could relieve congestion at the US 59/SH 6 intersection. The added congestion

Figure 4-40 Bike friendly stairs. Image source: Steven Vance, www.reconnectingamerica.org

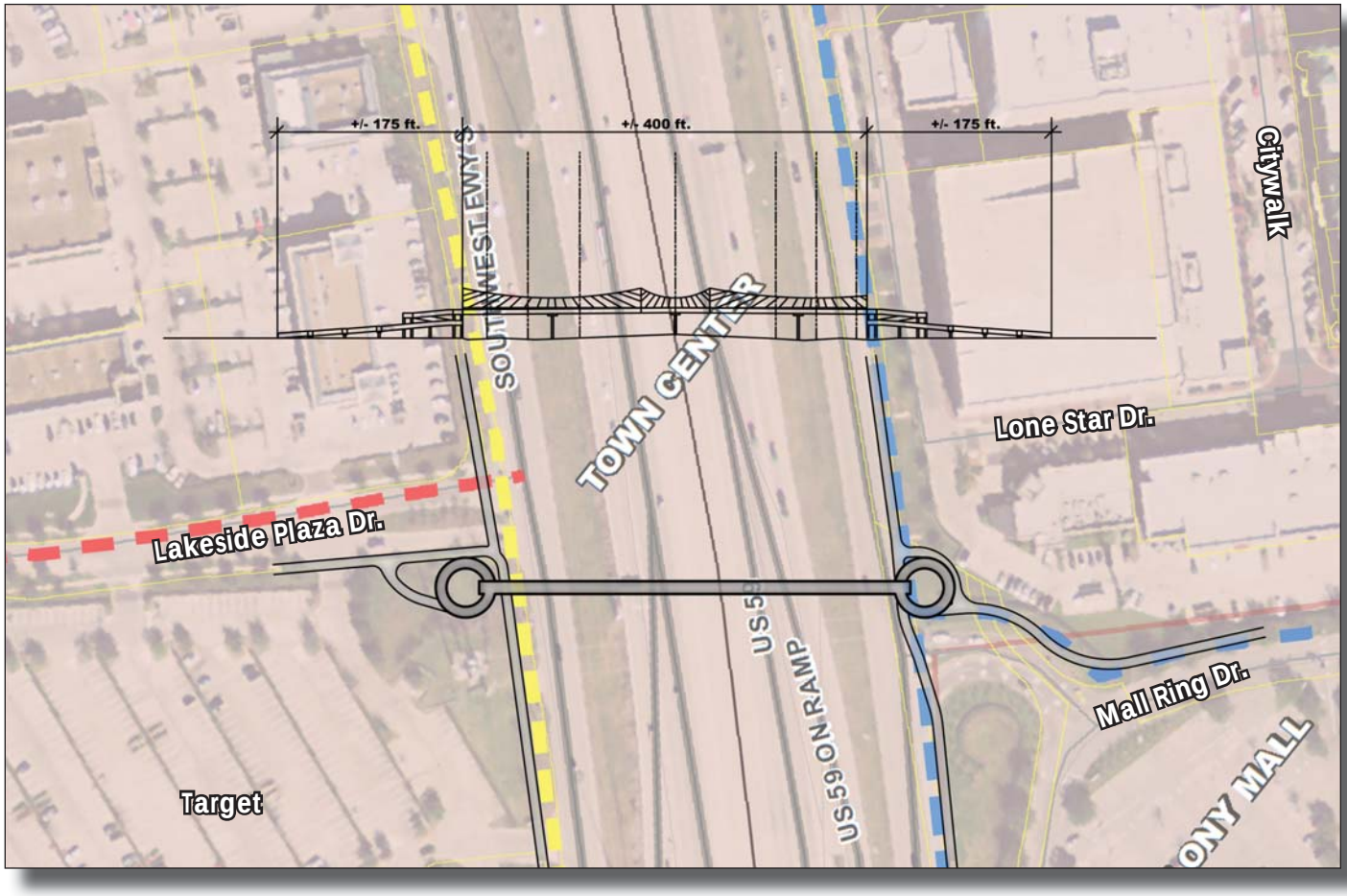


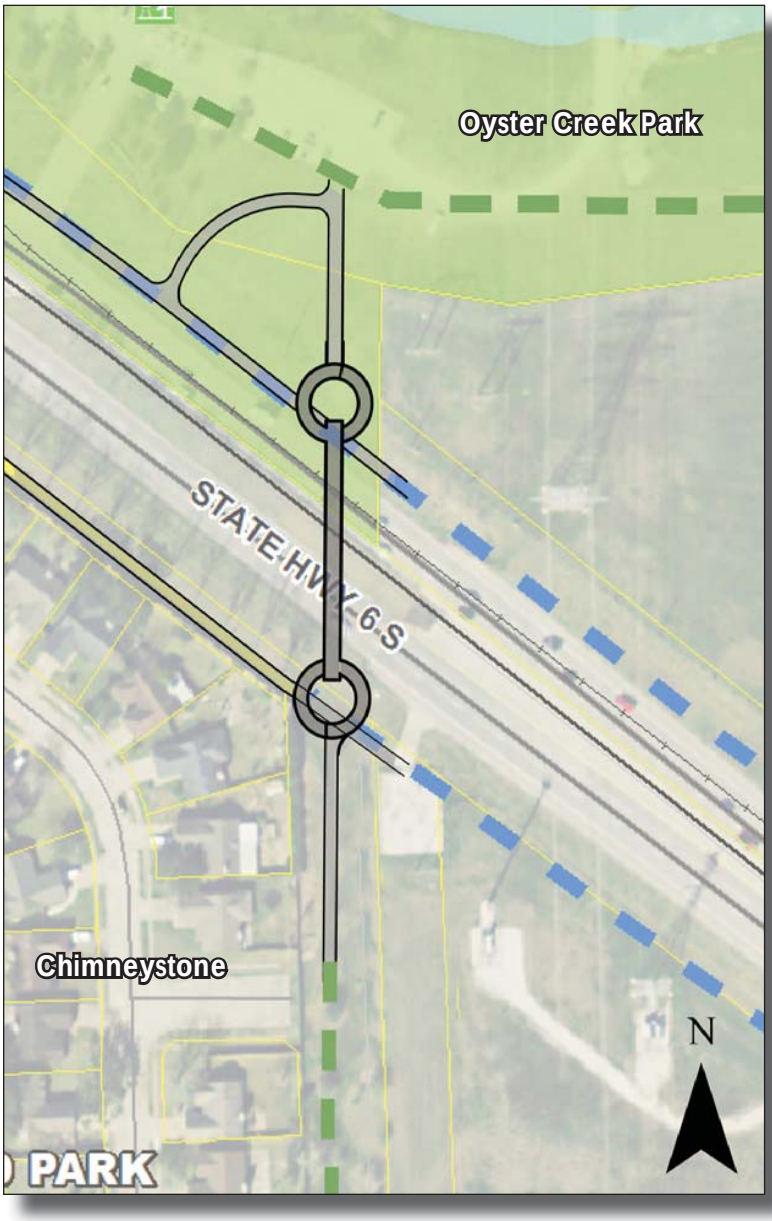
Figure 4-41 Preliminary schematic of pedestrian/bicycle bridge crossing US 59

Figure 4-42 Potential bridge location along SH 6 (beyond the power transmission lines shown in this photograph).

relief benefits may make a combined bridge more feasible than a pedestrian/bicycle bridge only.

State Highway 6 at Oyster Creek Park - A second recommended grade separated pedestrian bridge will connect Oyster Creek Park to shared use paths located south of SH 6. The lack of a signalized intersection near this crossing, the speed and volume of traffic along SH 6, and the potential high use of the trails in this area make this location ideal for a bridge for users of the planned pathway to get to the trails and pathways within Oyster Creek Park.

The bridge will require a 150 to 175 foot span and should have a minimum clearance of seventeen to twenty feet (17' - 20') over the SH 6 lanes to meet TxDOT requirements. As in the case of the US 59 pedestrian bridge, barriers to limit throwing debris from the bridge onto traffic are desirable, as well as steps to bypass the ramping system if desired.



This bridge location is near the eastern entrance to the City from Missouri City and provides an ideal location for a signature type of bridge crossing. The bridge could incorporate brick features and other treatments that are similar to the iconic signature elements along US 59 in the Town Center area. Nighttime illumination should be included to allow the bridge to be used at night and to emphasize its iconic nature.

The cost of this bridge is estimated to range from $1,700,000 to $2,500,000. The bridge should be included as a component of the planned shared-use pathway that parallels the power transmission line corridor south of SH 6.

Summary of Barrier Recommendations

Table 4.7 on the following pages summarizes key barrier recommendations throughout Sugar Land.

Figure 4-43 Preliminary schematic of pedestrian/ bicycle bridge crossing SH 6 at Oyster Creek Park




Table 4.7 Enhancements to Resolve Barriers

Facility Location	Recommended Improvements	Projected Cost Range +/-	Priority
US 59			
Ditch H Trail at US 59	Security lighting, trail connections to east and west bound frontage road	Included in Ditch H project	Immediate
SH 6 at US 59 (west side)	Relocate U-turn to provide 12' wide pedestrian zone with pavers, protective wall, enhanced lighting, landing and sidewalks on north side	$400,000 to $500,000	Near term
Sweetwater/First Colony at US 59 (west side)	Enhanced pedestrian area with pavers, lighting, landing and ramp widening	$150,000 to $300,000	Near term
University at US 59 (both sides)	Ramp widening, paver walking areas, long term relocate U-turn	$150,000	Near term
Williams Trace at US 59 (west side)	Widen pedestrian zone on SB side of Williams Trace under bridge, add paver walkways, enhance lighting, widen ramps	$150,000 to $200,000	Near to mid term
Dairy Ashford at US 59 (west side)	Widen pedestrian zone on SB side of Dairy Ashford under bridge, add paver walkways, enhanced lighting, widen ramps	$150,000 to $200,000	Near to mid term
SH 6			
SH 6 Pedestrian Bridge at Oyster Creek Park	Near Oyster Creek Park, 250' span + approach ramps	$1,700,000 to $2,500,000	Near term
SH 6 at Town Center Blvd.	Replace crosswalks and ramps, widen median refuge, relocate crosswalk signal location in median	$50,000	Near term
SH 6 at Lexington	Replace crosswalks and ramps; increase size of waiting space at each corner, relocate crosswalk signal location in median, install wider median refuge	$50,000	Near term
SH 6 at Fluor Daniel	Reduce curve radii to reduce ped/bike crossing distance, replace crosswalks and ramps, increase size of waiting space, relocate median crosswalk signal location	$50,000	Near term
SH 6 at Williams Trace	Extend median to create refuge, replace ramps and increase size of landing area at each corner	$50,000	Near to mid term
SH 6 at Kensington	Install dashed bicycle lane chevrons, relocate crosswalk to allow for median refuge, replace crosswalks and ramps, increase waiting space size, adjust push button locations	$50,000	Near to mid term
SH 6 at University Blvd.	Adjust location of south/east U-turn to create wider pedestrian zone, install decorative pavement, replace existing crosswalks and ramps, increase waiting area size	$50,000 to $200,000	Mid term
SH 6 at Dulles/Austin Parkway	Adjust stop bar locations and crosswalk locations to allow for refuge, increase size of waiting space	$50,000	Long term
Grand Parkway at US 59	Relocate existing westbound U-turn to widen pedestrian corridor; use pavers to define pathway; increase lighting	$300,000	Long term



Table 4.7 Enhancements to Resolve Barriers

Facility Location	Recommended Improvements	Projected Cost Range +/-	Priority
US 90A			
Enhanced Crossing at Ulrich/US 90A	Enhanced pavement crosswalk, sidepath w/ diverter fencing & pedestrian level RR warning signals	$200,000 to $300,000	Near term
US 90A at Main/ Bayview	Use dashes to indicate bicycle route across the intersection	$50,000	Near term
US 90A at University Blvd.	Use smaller corner radii to reduce the pedestrian crossing distance, include median refuge with push button actuators, include crosswalks, include ten foot (10') wide paved crossing over the existing railroad tracks.	New road/ intersection construction	Near to mid term
US 90A at Gillingham	Widen pavement to accommodate bicycle lanes	$50,000	Mid term
US 90A at Dairy Ashford	Complete sidewalk connections, replace crosswalks and ramps	$50,000	Mid term
US 90A at Wood/ Savoy	Replace crosswalks and ramps	$50,000	Long term
US 90A at Easton	Use dashed lines and chevrons for bicyclists, install crosswalk, install ramps that are perpendicular to the direction of traffic	$50,000	Long term
US 90A at Eldridge	Replace crosswalk, extend sidewalks across railroad tracks	$50,000	Long term
Grand Parkway			
Grand Parkway at Sandhill Road	Install crosswalks, adjust U-turn location to create a wider crossing area, use decorative paving for pedestrian route, install bicycle lanes in underpass area	$250,000	Long term
Grand Parkway at New Territory Blvd.	Install crosswalks, adjust U-turn location to create a wider crossing area, use decorative paving for pedestrian route	$250,000	Long term
Grand Parkway at East/West Riverpark Dr.	Install crosswalks, adjust U-turn location to create a wider crossing area, use decorative paving for pedestrian route, install bicycle lanes in underpass area	$250,000	Long term
Brazos River Crossings			
Pedestrian Bridge over Brazos River at US 59	At US 59 – span length approximately 800 to 900' +/- assumes use of US 59 bridge as supports for pedestrian bridge, include minor U-turn area improvements	Option A - $3,000,000 to $4,500,000	Near to mid term
Grand Parkway at Brazos River	Freestanding pedestrian/bicycle bridge spanning 550 to 700 feet	$3,000,000 to $10,000,000	Long term
Brazos River at Memorial Park	Pedestrian/bicycle bridge or future vehicular bridge spanning 600 to 800 feet	$3,000,000 to $10,000,000	Long term
Town Center Area Over US 59			
US 59 at the Town Center	Signature pedestrian/bicycle bridge	$5,000,000 to $10,000,000	Long term

Crossing Types for Future Improvements

The map in Appendix H at the end of this Plan shows different crossing types. It is important that each intersection be evaluated and designed individually for future enhancements that can be completed to improve pedestrian and bicycle mobility. However, some of the general improvements that could be considered for each crossing type are as follows:

- **Mid-Block Crossing** - This type of crossing occurs in the middle of a block instead of at an intersection. There is one mid-block crossing being proposed in the Town Center area. These types of crossings can be enhanced with paved crosswalks, raised crosswalks, HAWK signals, or pedestrian crossing warning signs;
- **Bridge Crossing** - Bridge crossings occur when access is needed over a barrier such as a drainage channel or roadway. These crossings are typically enhanced with pedestrian and bicycle bridges. Bridges are discussed in more detail on page 52;
- **At-Grade Crossing** - This type of crossing occurs at intersections where the pedestrian or bicyclist is crossing at-grade with vehicles. These crossings usually have crosswalks and pedestrian crossing signals. They can also include pedestrian median refuges, raised crosswalks, vehicle stop bars located farther back from the intersection, or pedestrians receiving a crossing signal before vehicle traffic receives a green light;
- **Below-Grade Crossing** - Below-grade crossings occur when a trail or pathway can adequately cross under an existing barrier such as roadway. These crossings can be enhanced with pedestrian scale lighting and a minimum height clearance of at least ten feet (10'). Below-grade crossings and underpasses are discussed on page 53;
- **Potential Alternative Overpass Locations for US 59** - These alternatives are discussed in detail on page 110; and
- **Transition from on-street to off-street facility** - When a bicyclist transitions from an on-street facility to an off-street facility, the transition can be enhance with the use a curb ramp, warning signs, and painted directional arrows on the pavement if necessary.

Detailed explanations of these enhancements can be found on page 49 in the *Intersection and Roadway Crossings* section of this Plan.

Figure 4-44 Crossing types legend shown in Appendix H

Network Support Facilities and Features

In order for the pedestrian and bicycle system to be successful, the network must appeal to a wide variety of users. To achieve this, the system should be designed to provide a high level of user amenities. Paths and routes to connect various destinations are not enough. Other key requirements include:

- End of trip facilities (such as secure bicycle parking, equipment storage, and changing facilities); and
- Wayfinding and bicycle system branding

Figure 4-45 A large number of children ride their bicycles to school in Sugar Land

End of Trip Facilities

Recreation trips on a bicycle may be relatively short in duration and start and stop at the user's residence. For purposeful trips such as commuting to work or school or trips to specific destinations, end of trip facilities are critical. These include:

Short term bicycle parking - Readily available and secure bicycle parking is a key requirement to making Sugar Land's bicycle network fully functional.

The customary bicycle parking facility today is an inverted "U" rack that allows both wheels or a minimum of two points on a bicycle to be secured. A variety of different styles are available, and the City should adopt a standard model for use throughout the City. Criteria that may be used for selection of a standard bike rack include ease of use, appearance (i.e. modern vs. traditional), cost and durability. In some areas, bicycle racks that double as public art can be considered (as discussed on the following page).

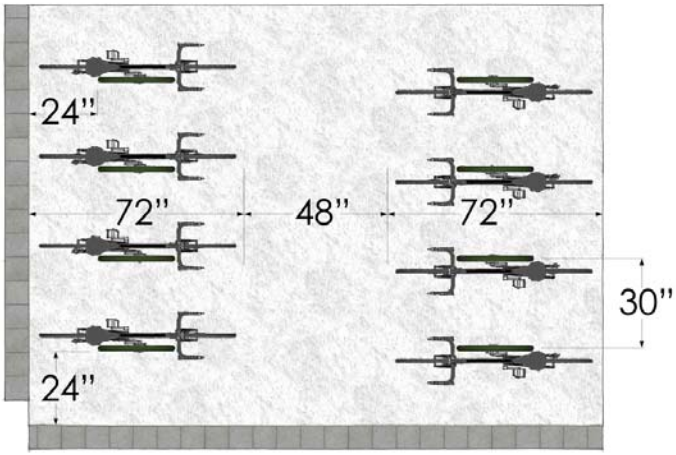


Figure 4-46 Bicycle Parking Area Dimensions

Bicycle parking areas should be designed to allow for maneuvering space and adequate clearance from nearby walls or obstructions. The Association of Professional Bicycle Planners (APBP) has developed guidance documents that can be adopted by the City of Sugar Land as part of bicycle parking development standards. An example of the dimensions suggested by APBP is shown in Figure 4-46 on this page.

In some locations the available bicycle parking may be difficult to see (such as in the Town Center area), and signage directing bicyclists to where bicycle parking is located may be necessary (as shown in Figure 4-47).

For new development, Sugar Land's Development Code could be amended to require the inclusion of some bicycle parking spaces. Bicycle parking should be in a visible location near the building's primary entrance(s) or along the length of a facade in developments with multiple tenants (such as a linear shopping center). In parking structures, some provision for bicycle parking spaces within the structure should be included. In areas with a higher

Figure 4-47 Bicycle Parking Sign (Colorado Department of Transportation)




development density, consideration can be given to reducing the number of vehicular parking spaces in exchange for increased bicycle parking. Cities throughout the United States and Texas, such as Austin and San Antonio, have adopted bicycle parking requirements.

The majority of Sugar Land is already developed, but few existing developments have bicycle racks. Cities throughout the United States, including Austin and San Antonio, have allocated funds to purchase bulk quantities of bicycle racks and then sell them at cost to existing businesses and property owners. In key locations such as the Town Center area and at civic facilities such as libraries, Sugar Land should target a similar program. Bike parking requirements should also be applied to businesses that remodel. Many cities establish a redevelopment threshold to ensure that this provision is reasonably applied (for example for remodeling that exceeds $25,000 to $50,000 in value).

Sugar Land already has a high percentage of primary and secondary school students riding bicycles to school (see Figure 4-45). The City should work with area school districts to ensure that every school has adequate secure parking and that existing older racks are replaced over time with racks that allow more secure parking.

Longer term bicycle storage or secured parking - In some locations, such as where bicycle commuting is encouraged or where bicycles will be left for an entire day or even overnight, more secure bicycle parking may be desired. The availability of a secure storage locker for a relatively expensive bicycle can be a determining factor for whether a commuter chooses to bicycle to work or not. The Planned Community Development (PCD) parking structures in the Town Square area are a good example of an appropriate location for bicycle lockers. They provide a secure area and protection from weather. Areas such as corners where cars cannot park can readily be adapted to hold bicycle lockers. Other locations include adjacent to buildings or in internal working areas. The type of bicycle locker chosen should be coordinated with law enforcement to alleviate concerns about the placement of dangerous items such as explosives in places where they cannot be seen or readily retrieved. Secure bicycle storage should be considered if and where Sugar Land residents highlight a need. Examples are shown in Figures 4-48 and 4-49.

Bicycle parking as public art - Many cities are encouraging bicycle racks to be viewed as locations for public art. These serve to highlight the bicycle rack and encourage residents and visitors to ride more. Sugar Land should consider implementing a bicycle rack public art program for installation throughout the Town Center or possibly other areas. Examples are shown in Figure 4-50.

Equipment storage - Lockers or storage areas for helmets, baskets, bags and other equipment may be needed at schools or in places

Figure 4-48 Bicycle lockers. Image source: Rob Rae, www.pedbikeimages.org

Figure 4-49 Covered bicycle parking. Image source: Laura Sandt, www.pedbikeinfo.org

Figure 4-50 Example of bicycle parking as public art. Image source: Dan Burden, www.pedbikeimages.org

where employees do not have access to individual spaces. The City of Sugar Land can help inform businesses, schools and other entities as to the need for equipment storage areas.

Changing facilities and showers - Contrary to a commonly held belief, bicycle riding is popular even in hot or humid climates (e.g. New York in the summer, Mexico City, Tucson and Phoenix). However, to encourage greater use of bicycles for transportation to schools and work, the City of Sugar Land should explore ways to encourage destinations to provide facilities in which to clean up after a hot bicycle trip. These facilities can also serve fitness-minded employees who choose to ride, walk or run for exercise during lunch or breaks. Methods used by public agencies and private developments to incorporate showers and changing facilities include the following:

- **Incentives as part of the development code** - Many cities are exploring incentives to encourage developments and businesses to provide changing facilities. These include reducing the number of parking spaces, providing extra development bonuses such as higher building densities, or by simply requiring the provision of these facilities for buildings that exceed a certain threshold. The City of Sugar Land has established itself as an example by offering locker rooms with showers in City Hall.
- **Incentives for existing businesses** - Area businesses that proactively install changing facilities can be rewarded by the City of Sugar Land with discounted memberships to city facilities such as the Recreation Center, given recognition by the City, or even supported through a City grant program that provides small matching grants to businesses that are considering adding changing facilities.
- **Developing "bike stations" that provide changing facilities** - As bicycle ridership increases, bike stations can be developed in key locations. These are commonly developed in high density locations such as the Town Center area, and provide bicycle storage, changing facilities, snacks, sales of equipment, and even maintenance services and bicycle rentals. The Town Center area would be an ideal location in the future as area bicycling increases.

Figure 4-51 Excerpt from the Sugar Land 2011 Comprehensive Wayfinding Sign Program. Source: City of Sugar Land

Wayfinding Improvements

Wayfinding consists of signs, pavement markings, or materials that help pedestrians and bicyclists find their way around a city. Route or destination signage can help bicyclists navigate throughout the City when the bicycle route deviates from one street to another.

Use of gateway features and signs to make the bicycle and pedestrian network more visible - Wayfinding signs should also serve to "brand" the City's growing network of pathways and on-street bicycle facilities. The City should use designs already developed as part of




Figure 4-52 Standard bike route sign (follows MUTCD guidance)

the City's 2011 Comprehensive Wayfinding Sign Program, providing an attractive and uniform system of signs and gateway markers throughout the City and at key access points to the pedestrian and bicycle to celebrate it and promote use of the system (see Figure 4-51).

At a neighborhood level, route signs generated by the City can be used to guide residents to routes that lead out of the neighborhood (see Figure 4-52). These signs should follow standard Manual of Uniform Traffic Control Devices (MUTCD) designs. Also, custom pavement markings to enhance wayfinding can be used, such as the "bike dot" pioneered by the City of Seattle shown in Figure 4-53.

Figure 4-53 Bike dot markings. Source: Seattle Department of Transportation

Finally, the City of Sugar Land should develop easy-to-read maps and routing applications that can be used via computer or smartphone. Such a map would show possible routes to key destinations and the ease of use of each facility (e.g. routes best suited for experienced riders). These projects should be implemented in the immediate to near term and are shown in the list of recommended projects in Chapter 6. An example of a map prepared by the City of Chula Vista in California illustrates the desired map clarity, ease of use and supplemental information that can be provided in such a map (see Figure 4-54).

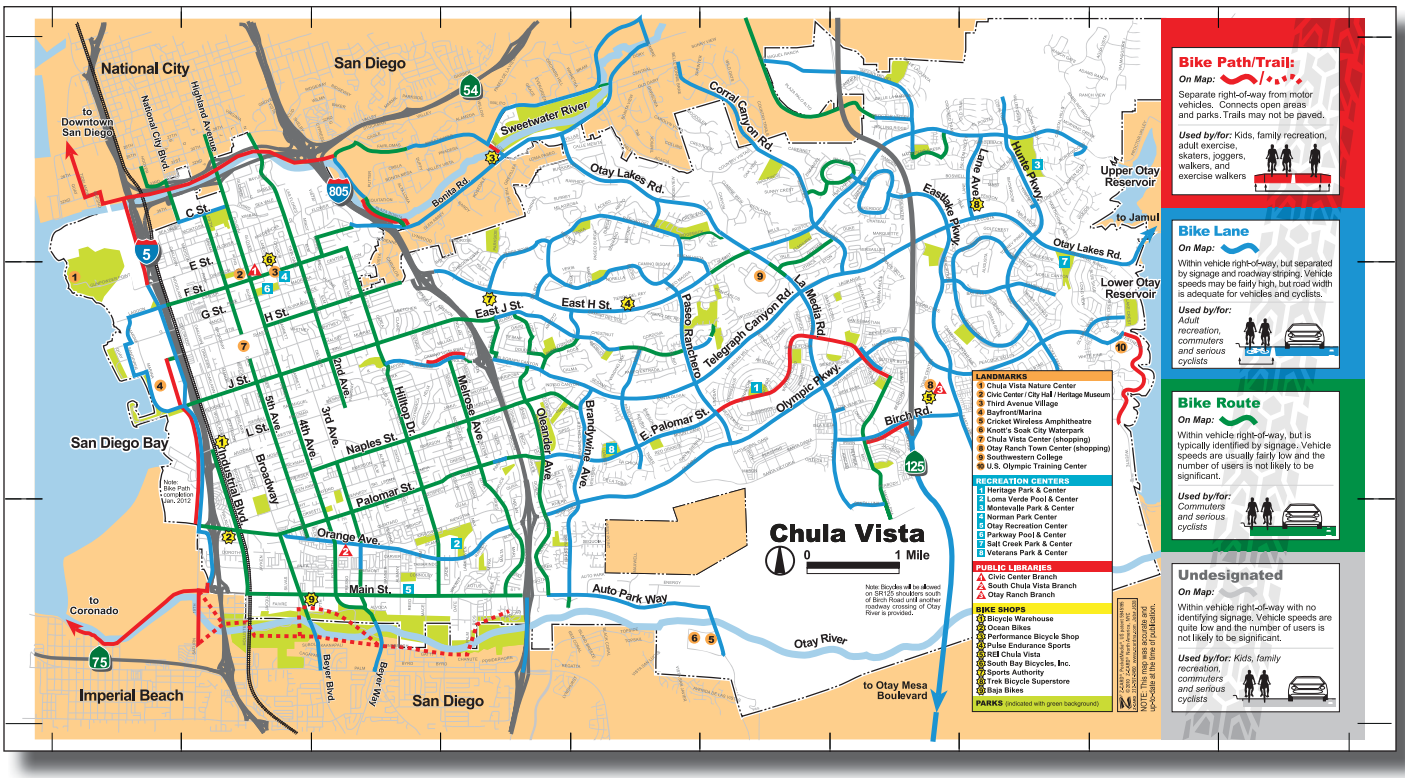


Figure 4-54 Example of a route map by City of Chula Vista, CA

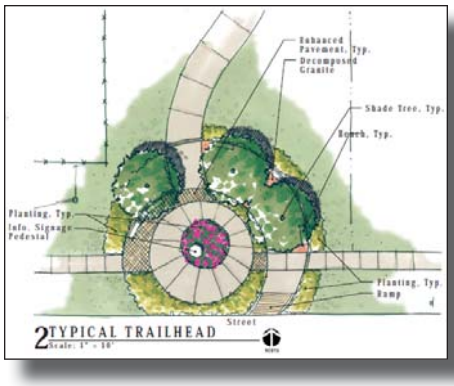


Figure 4-55 First Colony trailhead concept. Source: City of Sugar Land

Lighting

Cooler nighttime temperatures and busy schedules may contribute to walking and bicycle riding after sunset. Many pedestrian and bicycle facilities in Sugar Land may be used in the evening hours, and an adequate amount of lighting should be factored into the design of each facility. However, in recognition of funding limitations, only key citywide routes or facilities in areas with demonstrated evening use should receive enhanced lighting.

AASHTO guidelines call for general lighting levels between 0.5 and 2.0 footcandles, but specific levels should be set for each location. Higher lighting levels may be appropriate in some locations to enhance personal safety.

Sugar Land residents also noted that many street trees tend to obscure area street lights and that tree lined boulevards seem to be darker. Pedestrian-scale lighting may be appropriate along some streets and boulevards where higher levels of nighttime use are anticipated, such as Sweetwater, Austin Parkway, Lexington, Edgewater and other major streets. Individual lighting measurements and field observation should be conducted to determine where these lighting treatments are needed.

As noted in the barrier recommendations earlier in this chapter, increased lighting should also be considered at intersections where shared use paths and sidepaths cross roadways to increase the visibility of users of those facilities.

Figure 4-56 Example of an existing Sugar Land trailhead. Photos source: City of Sugar Land

Trailheads and Other Trail Amenities

The walking and bicycling system should be accessible and highly visible, so that visitors and residents in Sugar Land know that a first class network is available and inviting. In conjunction with the gateway markers, a series of trailheads should be developed throughout the City.

Trailheads should provide entrance features, some shade, drinking fountains, bicycle parking, benches for resting, and kiosks with maps and other information. In some cases, trailheads should also provide limited parking so that residents can drive to the trailhead, but ideally they should be located so that residents can walk or bike to the trailhead.

Kiosks at key locations such as libraries, University of Houston, City Hall, Town Square, and Lake Pointe should be incorporated to provide a comprehensive map of all area facilities. Major bicycle parking locations can also be shown on these maps. (See Figure 4-55 for a concept design of kiosks and trailheads). Figure 4-56 shows an existing trailhead in Sugar Land.

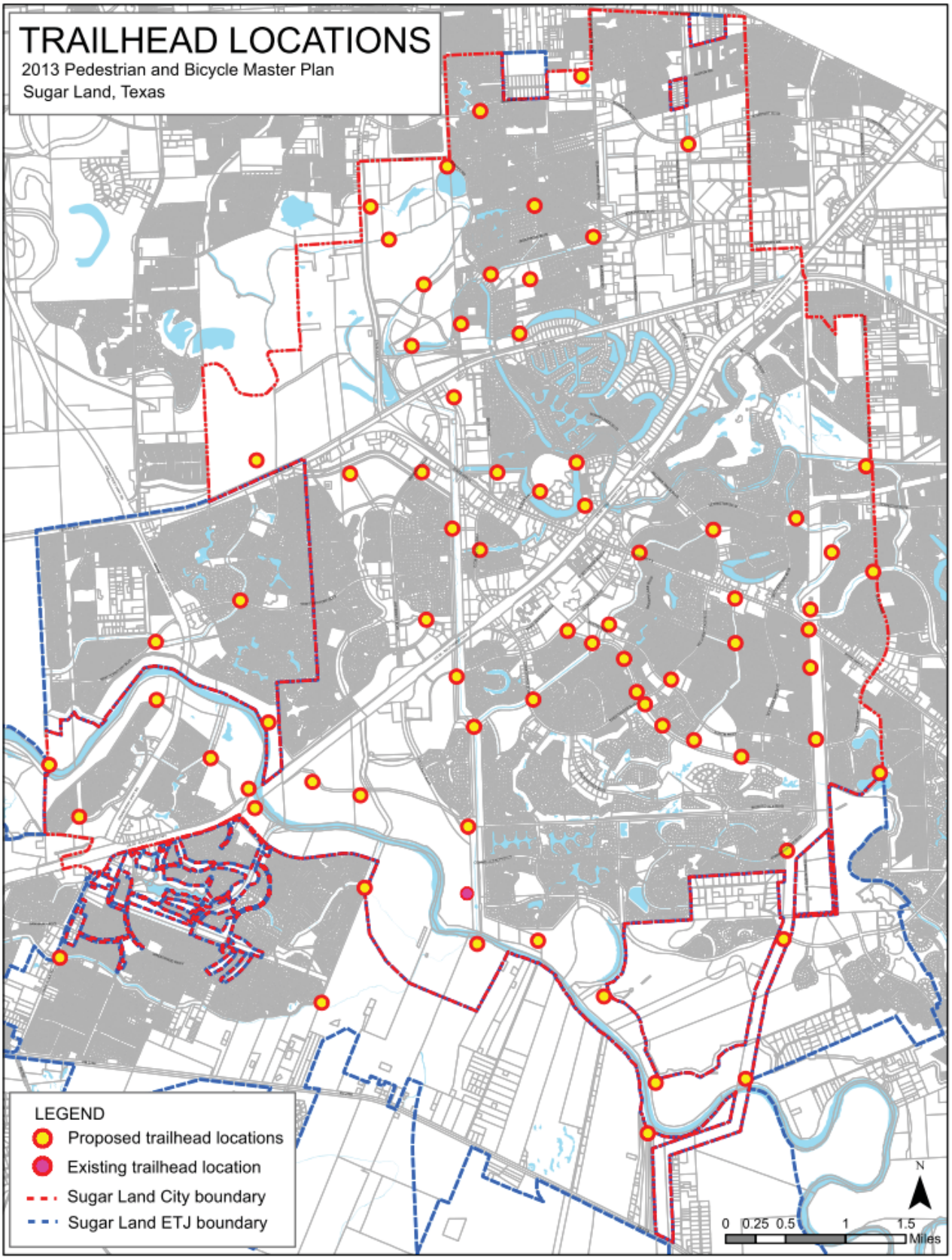


Figure 4-57 City's proposed trailhead locations. Source: City of Sugar Land

Figure 4-58 Trail benches and lighting

Figure 4-59 Trail sign

Figure 4-60 Public art along a trail

Trailheads throughout the City should be included where appropriate with major trail construction projects. Trailhead locations along a route should be identified with signs, and shown on any future pedestrian/ bicycle facility map developed by the City. Trailheads should be placed at the start or terminus of a trail, at intersections with other trails, or at key access points from area neighborhoods. Access points should be as little as 1/8th of a mile apart for neighborhood trails, and typically no more than a 1/4 mile to a 1/2 mile for all other trail types. Figure 4-57 shows the proposed locations for trailheads identified by the City of Sugar Land.

Other features may include:

Benches at key rest areas and viewpoints (see Figure 4-58) encourages people of all ages to use the trail by ensuring that they have a place to rest along the way. Benches can be simple (e.g. wood slats) or more ornate (e.g. stone, wrought iron, concrete).

Milepost markers - Mileposts can increase use of the trail by joggers and cyclists looking for set workout distances. Milepost marker signage should be consistent with other trail signage. 1/4 mile and 1/2 mile increments can be used to add further interest (see Figure 4-59).

Trash cans and dog waste pickup bag dispensers should be included at trailheads and key neighborhood access points along the route. Signs should be placed periodically along the trail notifying dog owners to pick up after their dogs.

Restrooms can be included where available in parks or at major trailheads. Restroom locations should be coordinated with park locations and the Parks and Recreation Department.

Pedestrian-scale lighting improves safety and enables the trail to be used year-round especially after daylight savings time ends. It also enhances the beauty of the trail. Lighting fixtures should be consistent with other light fixtures in the City, possibly emulating a historic theme on some trails.

Art Installations

Local artists can be commissioned to provide art for key locations along the trail system, making it unique. Many trail art installations are functional as well as aesthetic, as they can provide places on which to sit and play (see Figure 4-60).




Linking to Current and Future Transit

Transit and bicycling are complementary transportation modes. One of the most common barriers to bicycle commuting is distance, even among experienced cyclists. Transit can encourage bicycle use by giving bicyclists an option to ease an otherwise long bike trip, avoid undesirable portions of their trip such as crossing barriers, or respond to weather changes and equipment failures. Bicycling can help address the "last mile" component of transit, helping to simplify getting to and from the transit facility at both origin and destination ends of the trip.

Bicycles can already be seen parked at the City's two existing park and ride facilities, and Fort Bend County Public Transportation has responded by installing bike racks at each facility in May of 2013.

Figure 4-61 Bicycle racks on public transit buses

Figure 4-62 Bicycle parking at a Park and Ride in Reston, Virginia source: fabb-bikes.blogspot.com

Policy statements made by federal transportation agencies provide further justification for bicycle facilities near transit. The U.S. Department of Transportation has supporting the development of fully integrated active transportation networks, recognizing that "the establishment of well-connected walking and bicycling networks is an important component for livable communities" and that "their design should be a part of Federal-aid project developments."[1] In addition, the Federal Transit Administration (FTA) has developed policies that would extend the eligibility of Federal transit funds to include pedestrian and bicycle improvements. The proposed policy designated a 3-mile "catchment" area around transit stops where bicycle facilities are considered to have "a de facto functional relationship to public transportation."[1] These policies promote bicycle facilities as an integral component of the transportation network and make additional funds available for improvements.

Strategies for integrating bicycles and transit include:

Bicycle Access to Transit

Bicycling offers affordable, healthy choices and can increase access to transit. According to bicyclinginfo.org, people will generally bicycle three to four times as far as they will walk, which could extend the catchment area of a bus stop or transit station from a half mile to two miles (although the FTA has identified the catchment area as being a 3-mile radius around a stop). In developing the bicycle network for this Plan, transit stations were considered as a major regional destination when prioritizing and identifying near-term projects.

Bicycle Access on Transit

A three-bike capacity rack is available for transit vehicles. However, transit agencies that have it in use have experienced mixed results, as there are safety concerns with its loading and unloading and blocking the bus headlights. Therefore, most public transit providers throughout

1 U.S. DOT, DOT Livability, http://www.dot.gov/livability/accomplishments.html

the State only offer racks that hold two bicycles. In the near term, the City of Sugar Land should encourage area transit providers to ensure that adequate accommodations are made for bicyclists on buses. This may include a bicycle rack that can accommodate two bicycles on Fort Bend Express commuter buses.

Bicycle Parking at Area Park and Rides

A small amount of bicycle parking at the two current park and ride facilities in Sugar Land is available, and should be expanded as demand grows. Longer term, bike lockers or other facilities that provide additional security and protection from the elements should be considered. These may require the removal of parking spaces, or the bicycle lockers may be placed in landscape areas or as part of a commuter station/comfort station with restrooms, bike lockers, shade, vending machines, etc. The installation of these facilities should be done when warranted by demand.