

# CHAPTER 4

# BICYCLE

# TOOLBOX

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# 04

## BICYCLE TOOLBOX



Achieving the goals for bicycling in Houston outlined in **Chapter 3: Vision & Goals** will take a holistic improvement approach across the City. This chapter of the Houston Bike Plan (HBP) provides a “toolbox” of recommendations for the City of Houston to move forward and capture the opportunities to make Houston a more bicycle friendly city. Sustaining progress will require focus in multiple reinforcing areas and will involve many stakeholders and partners working with the City to implement the plan.

This toolbox contains approaches and recommendations for projects, policies, and programs, that create meaningful opportunities to improve biking in Houston and move the city towards becoming a Gold-Level Bicycle Friendly City. The design and function of bikeway projects greatly impacts the experience of people riding. The tools described here outline project approaches that improve level-of-comfort, which is important for attracting more people and trips to bicycling. Policies can more holistically and seamlessly impact how bicycling is regulated and integrated into the city. Programs can support and educate more people about the benefits and opportunities in bicycling.

Great Bicycle Friendly Cities happen when these are in alignment to support an overall culture of bicycling in a city.

The Bicycle Toolbox is divided into three sections:

**Projects:** This section contains detailed design descriptions and critical elements for the design and development of bikeway projects. This includes bikeway corridors, intersection treatments, end-of-ride amenities, and connections that form the basis for a large part of the experience of riding a bicycle safely and comfortably in Houston.

The tools identified build on and incorporate elements of many other national and international guidelines for the development of bicycle facilities and tailors the recommended approach to the Houston context. Recommendations for the design of bikeway projects have been developed to support the goal of expanding the high comfort bikeway network. As discussed in Chapter 2 and shown in Figure 5.1, Level of Comfort is a rating from 1 (high LoC) to 4 (lower LoC) for each roadway or bicycle facility based upon the exposure of people on bicycles to traffic. These recommendations are focused on creating LoC 1 and LoC 2 facilities for off-street bikeways, as well as dedicated and shared facilities in street right-of-ways.

This section also provides recommended approaches when faced with common design challenges such as the challenge of Houston’s many boulevard roadways with substandard bikeways.

Figure 4.1: General Guideline for Level of Comfort Assessment

	1	2	3	4	
<b>SHARED</b>	<b>1 2 3 4</b>				
	<b>SPEED LIMIT</b> <small>residential</small>	25 MPH	30 MPH	35+ MPH	
	<b>SPEED LIMIT</b> <small>non-residential</small>		25 MPH	30 MPH	35+ MPH
	<b>NUMBER OF LANES</b>	2 LANES	3 LANES	4-5 LANES	6+ LANES
<b>INTERSECTING STREETS</b>	NARROW, CALM	CALM	BUSY	WIDE, BUSY	
<b>DEDICATED BIKE LANES</b>	<b>1 2 3 4</b>				
	<b>SPEED LIMIT</b>	30 MPH <small>or less</small>	30 MPH	35 MPH	40+ MPH
	<b>LANES EACH DIRECTION</b> <small>w/o median</small>	1 LANE	1 LANE	2+ LANES	2+ LANES
	<b>LANES EACH DIRECTION</b> <small>w/ median</small>	1-2 LANES	2 LANES	3+ LANES	3+ LANES
	<b>BIKE LANE WIDTH</b>	6 FEET	5 FEET	4 FEET	3 FEET
	<b>INTERSECTION TREATMENTS</b>	CONTINUOUS	SHARED	SHARED	NONCONTINUOUS
<b>SEPARATION</b>	SEPARATED	SEPARATED	NOT SEPARATED	NOT SEPARATED	
<b>OFF-STREET</b>	<b>1 2 3 4</b>				
	<b>WIDTH</b>	10+ FEET	10 FEET	8-10 FEET	8 FEET <small>or less</small>
	<b>CROSSING FREQUENCY</b>	RARE	INFREQUENT	MODERATE	FREQUENT
<b>TYPE OF CROSSINGS</b>	CONTROLLED, CALM, NARROW	NARROW, CALM	BUSY	WIDE, BUSY	

**Policies:** This section contains recommendations for the regulatory, enforcement and evaluation approaches to bicycling in Houston. Policies are complementary to Projects and Programs in that they can formalize the approach to consistent project development and set a framework for programs to successfully support a bicycle friendly culture. Policies can also define incentives that would improve safety, access, and amenities for people biking.

**Programs:** This section contains recommendations for programs that improve education and encourage the support of more people of all ages, abilities, and backgrounds to bicycle in Houston. Best practices are identified as those that can be employed by the public, non-profit, and private sectors to encourage more bicycling within the community. It also identifies approaches for better data and information gathering to support decision making related to Projects and Policies.

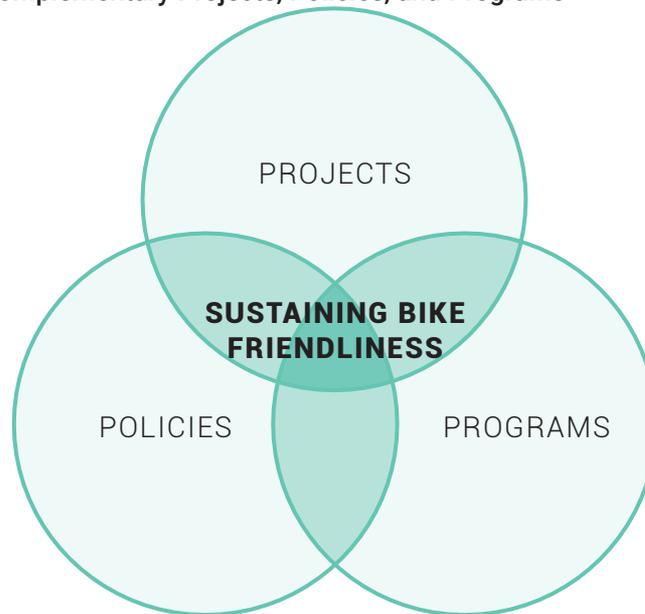
**Sustaining Bicycle Friendliness:** While each of these toolbox areas alone provides benefits for bicycling, transformative community change will occur when these three areas

overlap (Figure 5.2). Projects, policies, and programs are all separate, but have definite areas that overlap in purpose. For example, a Bike Share Program can provide many more people with access to bicycles, but if projects are not developed that give them a comfortable place to ride, the program will not reach its full potential. Great bike lane projects may not make a significant impact in a community if residents in the area do not have access to quality bicycle parking, access to repairs shops, or programs to provide high quality education. It is only when Projects, Policies and Programs are aligned that a community achieves a change in bicycle friendliness.

While projects typically have the greatest influence on the experience people have when bicycling, policies and programs also play an important role in providing a high comfort city-wide network. Policies can influence things like speed limits and traffic signals, both of which influence the comfort and safety of people biking. Policies regarding transit integration or cut-through areas can also have an impact as they can create a greater level of connectivity.

Programs can facilitate safer bicycling through bicycle trainings or provide education and enhance awareness for drivers. Some programs focus on creating bicycle groups for school children or commuter buddies so that people can easily bike together, which increases the feeling of safety and comfort.

**Figure 4.2: Sustaining Bicycle Friendliness:  
Complementary Projects, Policies, and Programs**



The toolbox provided in this chapter leverages best practices and proven approaches that will independently improve the level of comfort for people biking in Houston, and, when utilized together, will elevate Houston to a Gold-Level Bicycle Friendly City as defined by the League of American Bicyclists.

### Existing City of Houston Toolbox

It is important to recognize that the City of Houston already supports many of the items outlined in this toolbox. The 2015 update to the City's Infrastructure Design Manual is very explicit about requiring context sensitive design and consideration of all roadway users. The following guidelines are called out and contain more detail on many of the tools outlined in this document.

- ITE Recommended Practice: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach
- Texas Manual on Uniform Traffic Control Devices (TMUTCD), Texas Department of Transportation
- Guide for the Development of Bicycle Facilities, AASHTO
- Urban Street Design Guide, National Association of City Transportation Officials (NACTO)
- Urban Bikeway Design Guide, National Association of City Transportation Officials

Additional guidelines and best practices such as FHWA's Separated Bike Lane Planning and Design Guide, the CROW Design Manual from the Netherlands, Boston Complete Streets, Portland Bicycle Plan for 2030, and San Diego Bicycle Design Guidelines were also useful references.

This toolbox compiles many of the tools into one place for reference and builds upon these guides to address issues identified as part of the HBP process. The approaches described here are tools and approaches and should be applied using sound judgment for where they are appropriate and in close consultation with City of Houston staff as new projects are developed.

# Projects - Bikeways

## Bike Facility Comfort Level Symbols

- ① ① ① Higher Comfort
- ② ② ②
- ③ ③ ③ Less Comfort

### OFF-STREET

4.1 Off-Street Bike Path .....4-23

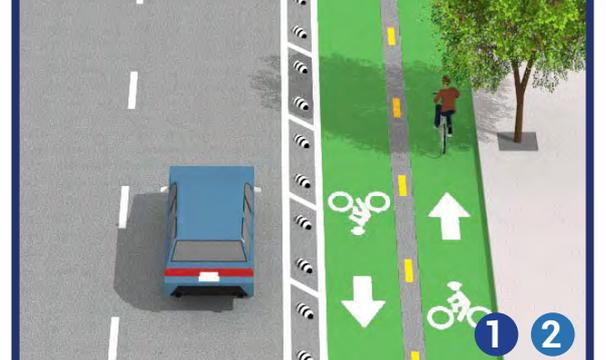


4.2 Side Path .....4-25



### DEDICATED IN STREET RIGHT-OF-WAY

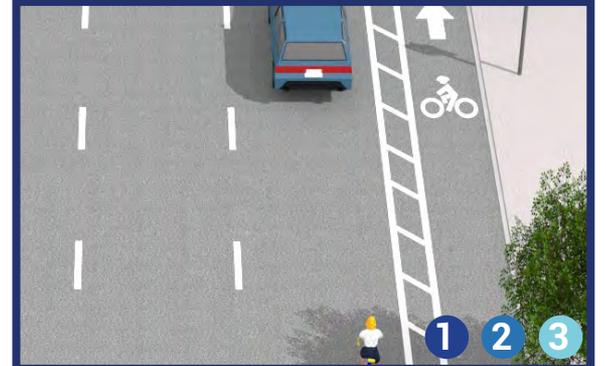
4.3 Separated Bike Lane .....4-9



4.2 Side Path .....4-25



4.4 Bike Lane .....4-13



**Important Note:** Where blue line segments are shown on the bikeway maps for future bikeways, they indicate Dedicated in Street Right-of-Way (R.O.W.) facilities. Since the specific design of these is not developed as part of this Plan, these may be implemented as Separated Bike Lanes, regular Bike Lanes or Side Paths. Implemented bikeways will be determined through final design and engineering for the corridor.

Figure 4.3: Bikeway Typologies

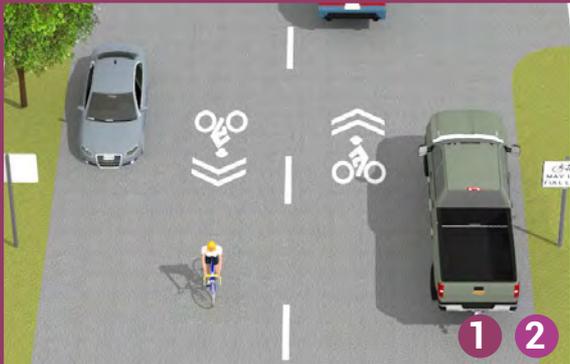
SHARED ON-STREET

4.5 Neighborhood Bikeway .....4-17



1

4.6 Neighborhood Shared Street ...4-19



1

2

4.7 Shared Lane .....4-21



3

Recommended Bikeway Projects

Recommended bikeways should be planned to expand the high comfort bicycle network in the City of Houston. Detailed assessment of a particular corridor should determine the final implementation of a bikeway. This includes both new bikeways and retrofits to corridors that have low comfort facilities or could be improved. Streets without bikeways may still be appropriate for people bicycling, either because they are low speed, low volume neighborhood streets or the person bicycling is comfortable sharing the road with existing traffic.

The bikeway tools are color-coded to align with the City of Houston Long Range Bikeways Map detailed in Chapter 5.

Some corridors may be shown on the map in blue indicating a plan for a dedicated bikeway along a particular street corridor, but through detailed planning and engineering of the corridor a side path may be determined as a more appropriate tool. This is why Side Paths are shown in both the Off-Street (Green) and the Dedicated in Street R.O.W. (Blue) columns of facilities. If constructed the bikeway would be shown in green on bikeway map.

When developing new bikeway facilities, those assessed at Level of Comfort 1 and 2 are considered part of the high comfort bike network. New bikeways that do not at least meet criteria for Level of Comfort 3 are not recommended.

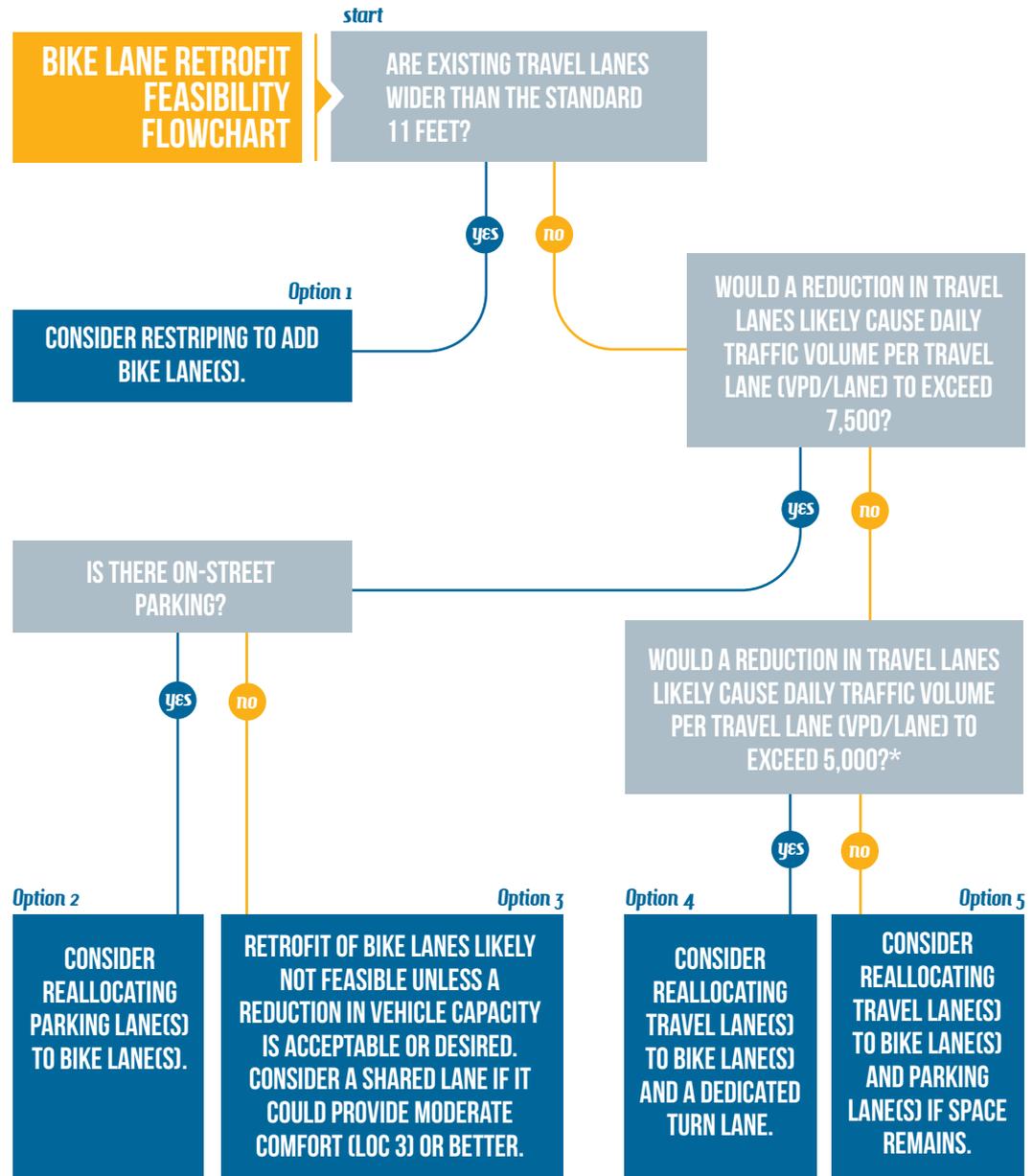
# Criteria for Selecting a Bikeway Facility

These charts provide a guideline and thought process for determining what kind of facility to use. Of course, individual contexts will vary, and no rule is absolute.

The left chart shows criteria for determining where an existing roadway can accommodate a bike facility without reconstruction.

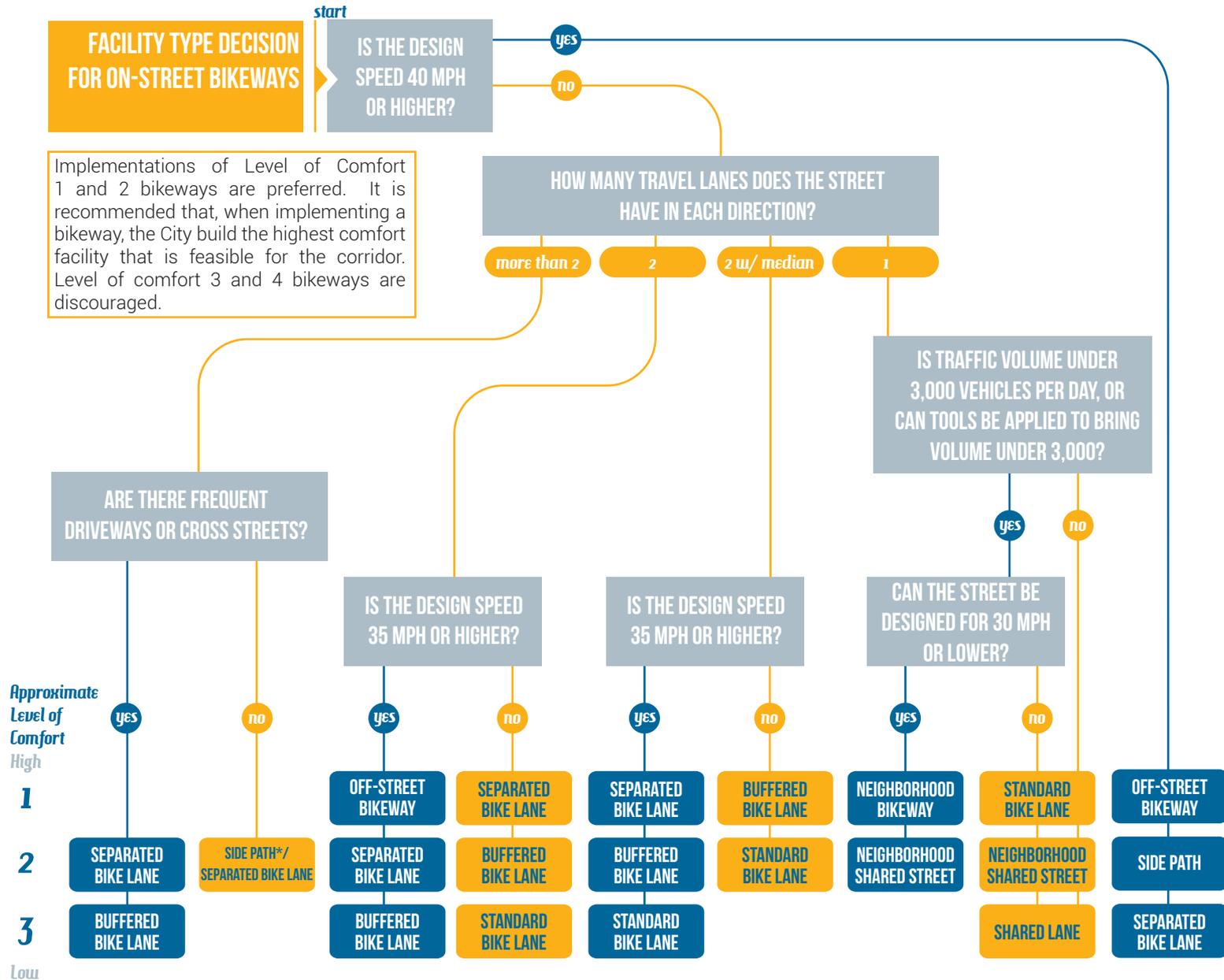
The right chart shows criteria for determining what facility type is appropriate on any roadway. Level of comfort 1 and 2 bikeways are preferred. While Level of Comfort 3 facilities are shown here, they will not expand the high level of comfort network.

Figure 4.4: Bike Lane Retrofit Feasibility Flowchart



\* Assessment may also consider projected future traffic volumes in determining whether retrofit is feasible.

Figure 4.5: Facility Decision Tree For Street Right-of-way Bikeways Flowchart



\* Consideration should be given to designating side paths as one-way bikeways and providing them on both sides of a street corridor.  
 Note: Current and projected vehicular demand is taken into consideration as a part of any comprehensive design changes to the roadway.

*Dedicated in Street Right-of-Way*

## 4.3 One-Way Separated Bike Lane



*Salt Lake City, UT*

1  
2

### DESCRIPTION

Dedicated street space for bikes separated from traffic with physical raised delineators.

This is typically the highest quality on-street facility for most people bicycling.

Referred to in NACTO as "One Way Protected Cycle Track".

Detailed in FHWA's Separated Bike Lane Planning and Design Guide.

### BENEFITS

Provides high level of comfort.

Perception of safety for cyclists.

Clear definition of street space for cars.

Separation of people bicycling and people walking.

### APPLICATION

Streets with multiple lanes, high traffic volumes, high parking turnover, or congested conditions.

Along streets with high bicycle volumes and/or high traffic speeds.

May be used with or without adjacent parking.

On-streets with available pavement space or right-of-way, regardless of traffic conditions.

**ELEMENTS**

- 1 The lane is clearly marked with pavement markings and signs.
- 2 The desirable one-way cycle track width is 6 feet or greater. Minimum width in constrained locations is 5 feet. In areas with high traffic, wider lanes may be appropriate.
- 3 The minimum buffer width is 2'. If parking is located alongside the lane, the buffer must be at least 3' so that car doors do not swing into the bike lane.
- 4 Alternate#1: The lane may be separated from traffic by a painted buffer with "armadillo" cycle lane delineators.
- 5 Alternate #2: The lane may be separated from traffic by a continuous curb if a maintenance plan is in place to sweep the lane.
- 6 The lane is separated from the sidewalk by a standard curb.

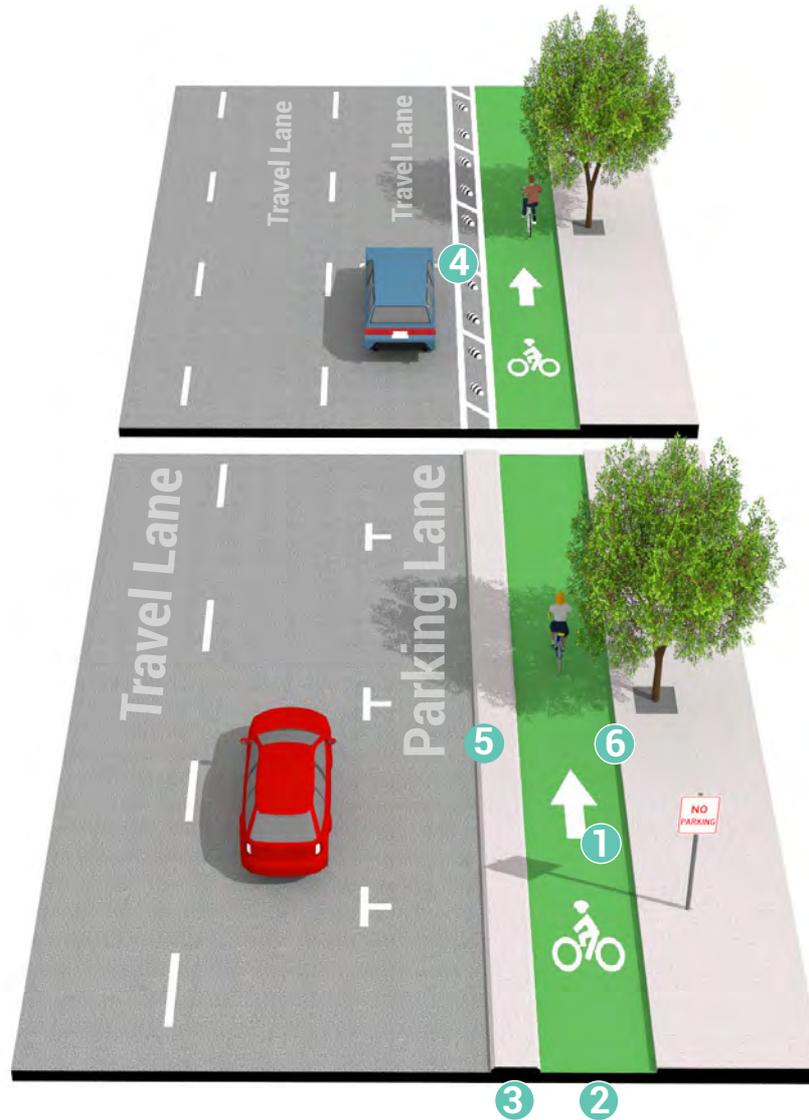
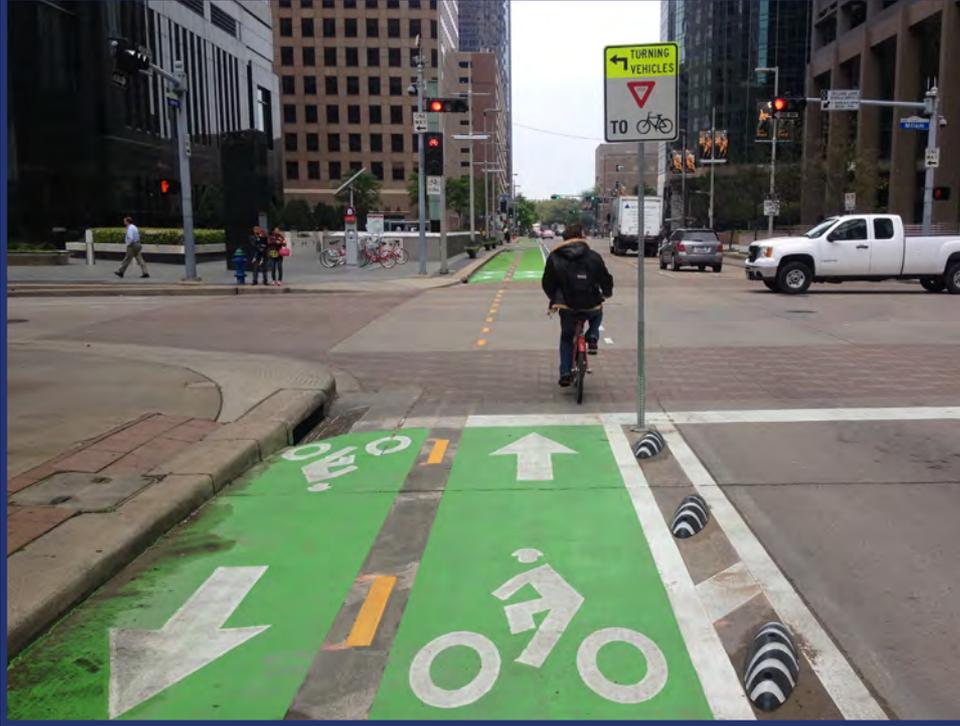


Figure 4.6: One-Way Separated Bike Lane

*Dedicated in Street Right-of-Way*

## 4.3 Two-Way Separated Bike Lane



*Houston, TX*

1  
2

### DESCRIPTION

Dedicated street space for bikes separated from traffic with physical delineators.

Referred to in NACTO as a "Two Way Cycle Track."

### BENEFITS

Provides high level of comfort.

Perception of safety for cyclists.

Clear definition of street space for cars and bicycles.

Separation of bicycle and people walking.

### APPLICATION

One-way streets where 2-way bike traffic is desired for connectivity.

Two-way streets where bike destinations or connecting trails are primarily on one side of the street.

Streets with multiple lanes, high traffic volumes, high parking turnover, or congested conditions.

Along streets with high bicycle volumes.

May be used with or without parking.

On streets with available pavement space or right-of-way, regardless of traffic conditions.

**ELEMENTS**

- 1 The lane is clearly marked with pavement markings and signs. Green paint is optional for use where visibility is important.
- 2 The desirable two-way cycle track width is 12 feet. Minimum width in constrained locations is 8 feet. In areas with high traffic, wider lanes may be appropriate.
- 3 The minimum buffer width is 2'. If parking is located alongside the lane, the buffer must be at least 3' so that car doors do not swing into the bike lane.
- 4 Alternate#1: The lane may be separated from traffic by a painted buffer with "armadillo" cycle lane delineators.
- 5 Alternate #2: The lane may be separated from traffic by a continuous curb if a maintenance plan is in place to sweep the lane.
- 6 The lane is separated from the sidewalk by a standard curb.

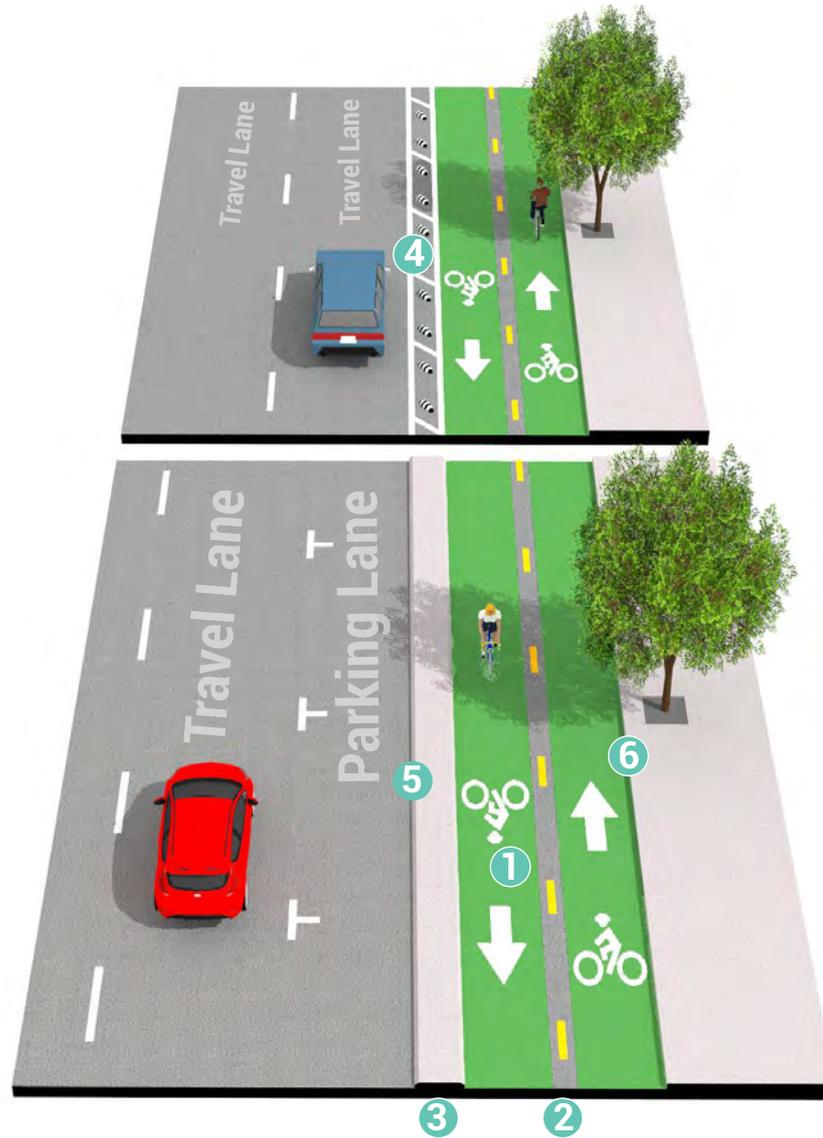
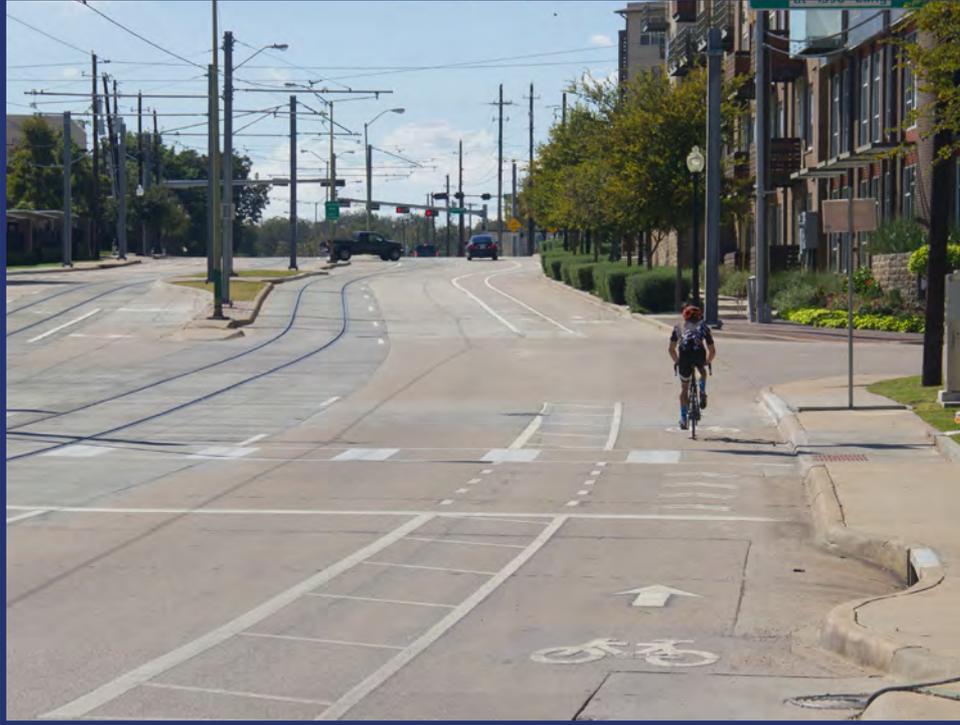


Figure 4.7: Two-Way Separated Bike Lane

*Dedicated in Street Right-of-Way*

## 4.4 Bike Lane



*Portland, OR*

- 1
- 2
- 3

### DESCRIPTION

Dedicated street space for bikes separated from traffic with striping.

### BENEFITS

- Higher level of comfort than mixed traffic.
- Creates separation between people biking and automobiles.
- Perception of safety for cyclists.
- Clear definition of street space for cars and bicycles.
- Separation of bicycles and people walking.

### APPLICATION

- The minimum recommended on-street facility for streets with  $\geq 3,000$  motor vehicle average daily traffic or travel speeds  $\geq 25$  mph.
- May be used on local streets in some specific situations.

## ELEMENTS (BUFFERED BIKE LANE)

- 1 The lane is clearly marked with pavement markings and signs.
- 2 The desirable lane width is 6 feet. Minimum width in constrained locations is 5 feet. In areas with high traffic, wider lanes may be appropriate. The recommended minimum rideable surface adjacent to a gutter or longitudinal joint is 4 feet.
- 3 The minimum buffer width is 2'. The buffer consists of painted lines only.

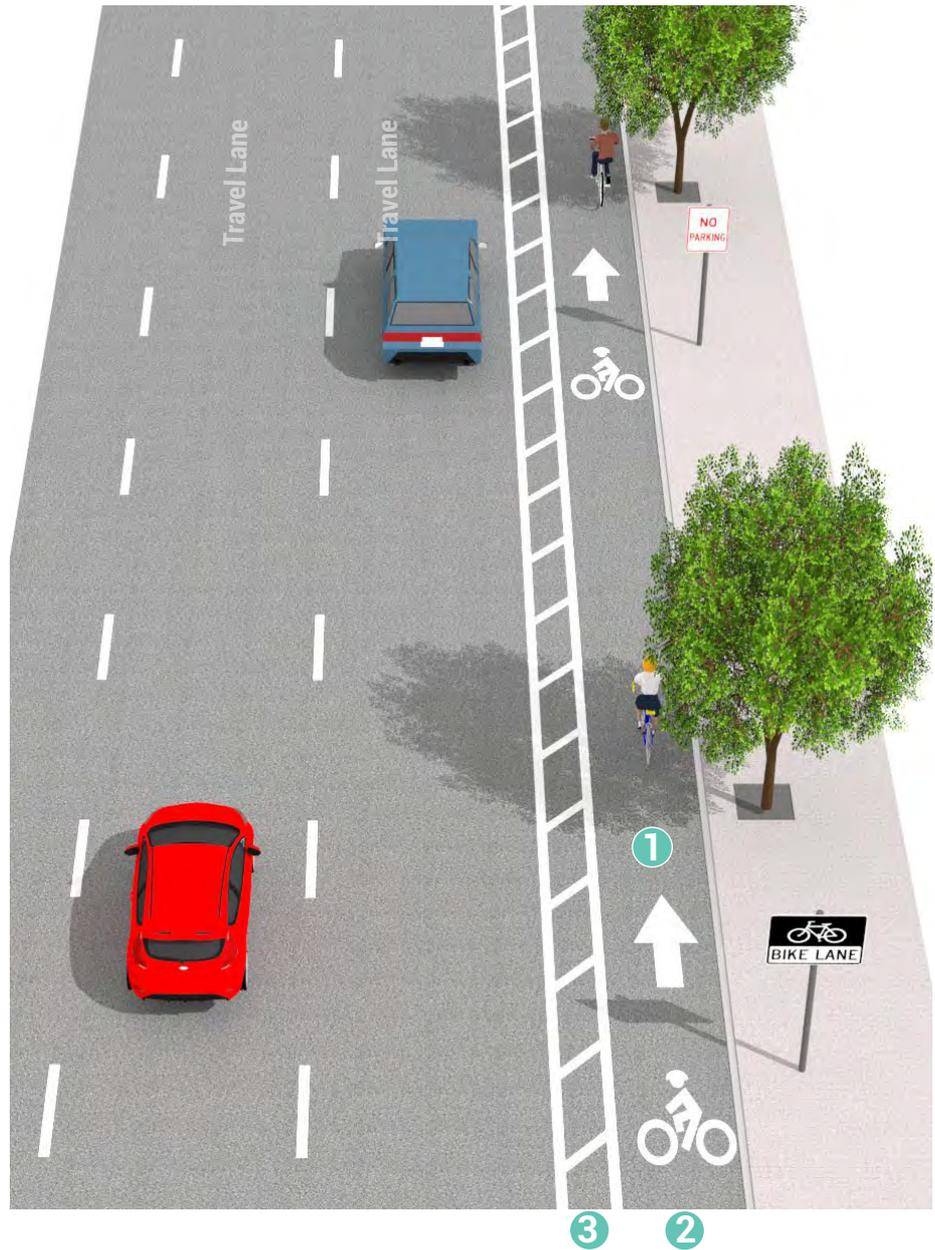


Figure 4.8: Bike Lane

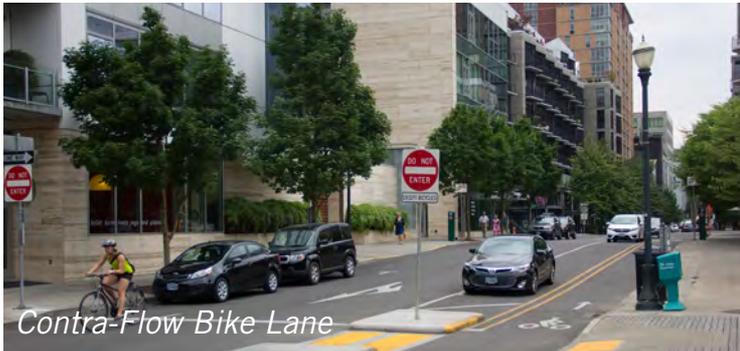
Dedicated in Street Right-of-Way

## 4.4 Bike Lane Variations



*Bike Lane Without Buffer*

Grand Rapids, MI



*Contra-Flow Bike Lane*

Portland, OR



*Left-Side Bike Lane*

Portland, OR

### ELEMENTS (BIKE LANE WITHOUT BUFFER)

Lanes without buffers are recommended where there is not enough width for a buffered or separated bike lane. If used adjacent to a parking lane, sufficient width should be provided for people biking to avoid having to ride in the door zone.

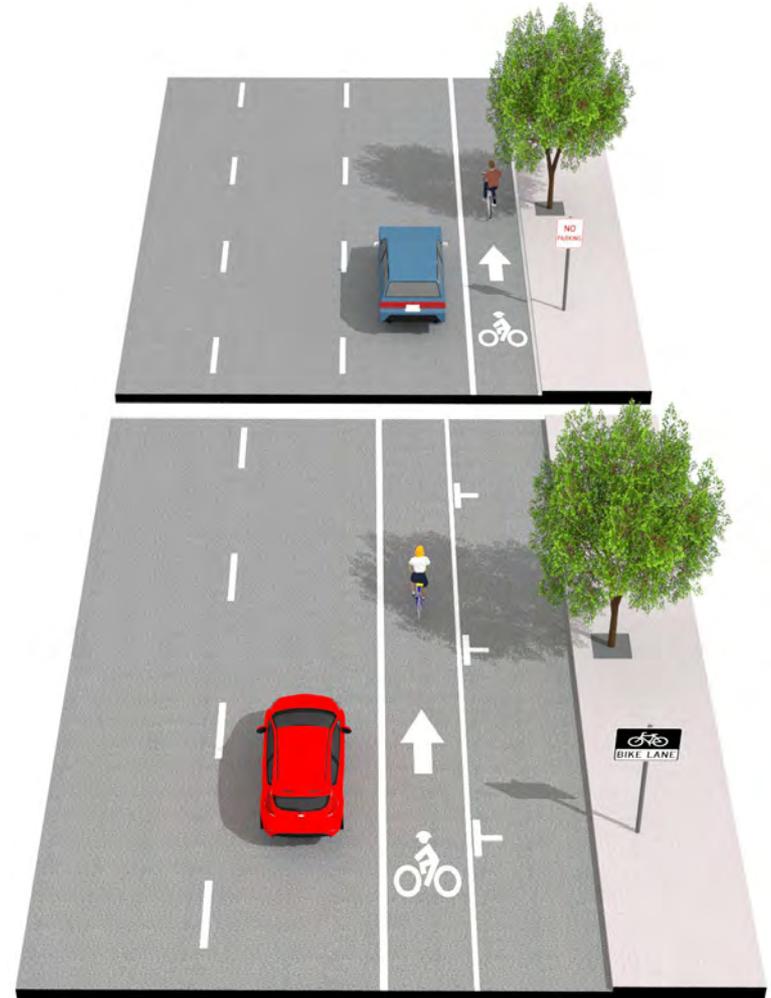


Figure 4.9: Bike Lane Without Buffer

**ELEMENTS (CONTRA-FLOW BIKE LANE)**

Contra-flow bicycle lanes allow people biking to ride in the opposite direction of motor vehicle traffic. Thus, the street is two-way with bikes and cars in one direction and only bikes in the other.

Use where the contraflow path closes an important gap in the network and other alternatives are not feasible. This is often evidenced by people biking riding the wrong way on the street or riding on the sidewalk.

Where speeds exceed 35 mph or traffic volumes are high, a separated bike lane is desirable for this condition.

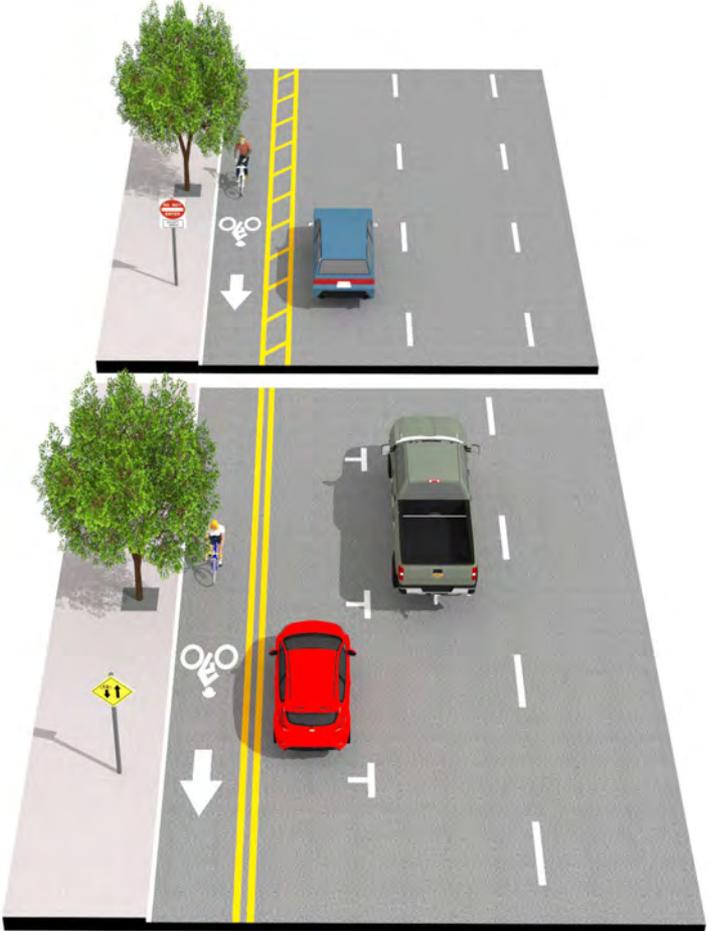


Figure 4.10: Contra-Flow Bike Lane

**ELEMENTS (LEFT-SIDE BIKE LANE)**

A left-side bike lane is identical to a standard bike lane but is located on the left side of a one-way street.

Use where there is heavy transit or loading activity in the right lane, on streets with a high volume of right turns, or where a left side lane better connects to other bike facilities or the majority of destinations.

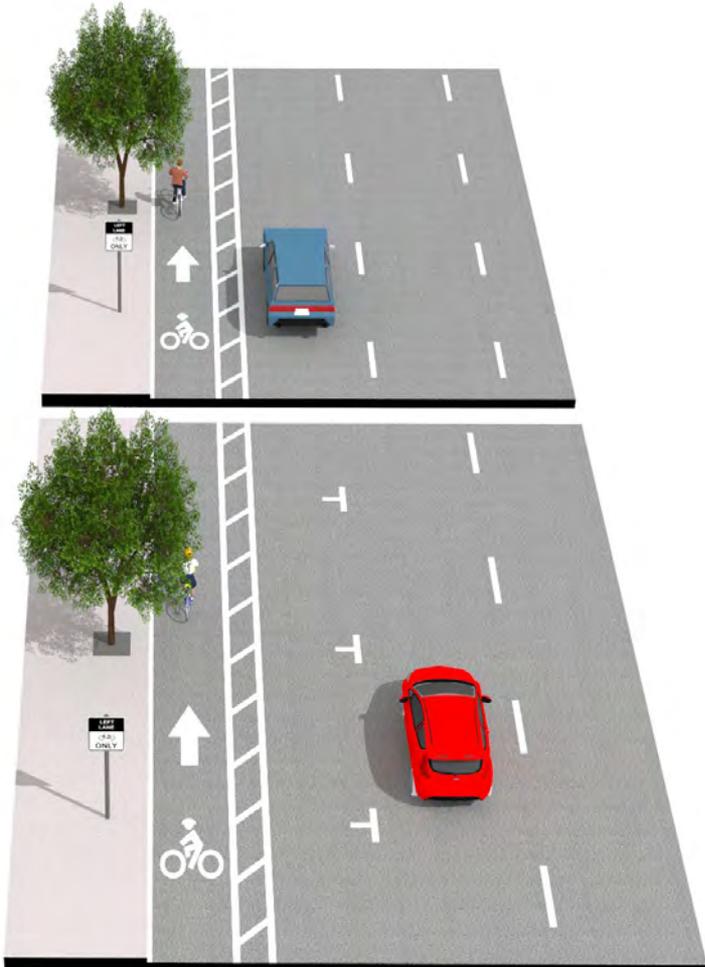


Figure 4.11: Left-Side Bike Lane

*Shared On-Street*

## 4.5 Neighborhood Bikeway

*Seattle, WA***1**

### DESCRIPTION

Neighborhood bikeways combine three essential elements:

- Street design limits vehicle speeds and volumes to make riding in mixed traffic comfortable.
- Treatments to allow people biking to safely cross intersecting arterials
- Bicycle signage and wayfinding

Referred to in NACTO as “Bicycle Boulevards”.

### BENEFITS

Allows people biking to mix safely with vehicle traffic.

Maintains a good level of comfort by minimizing traffic speeds and volumes.

Creates through routes by setting up safe crossings of intersecting streets.

Improves safety for people walking.

Reduces impact of vehicle traffic on neighborhoods.

### APPLICATION

Neighborhood bikeways are recommended for residential streets with  $\leq 1,500$  vehicle average daily traffic and where speeds are 30 mph or less. Thoroughfares are not suitable as neighborhood bikeways.

Neighborhood Bikeways may be best implemented in conjunction with the Neighborhood Traffic Management Program (NTMP), which addresses traffic related problems in residential neighborhoods, including excessive vehicular speed and cut-through traffic. The NTMP has developed a toolbox of “traffic calming” measures, including speed cushions, traffic circles, median islands, curb extensions, and diversion techniques, which may be used to reduce traffic speed and volumes.

**ELEMENTS**

- 1 The route may be marked with sharrows and bicycle signage along the length of the route, with signs in each block. These both guide people biking and keep motorists alert.
- 2 Lanes are not defined with markings, indicating that cars can pass people biking when it is safe.
- 3 Speed cushions, neckdowns, and other Neighborhood Traffic Management Program treatments slow car traffic and discourage speeding. Street parking is useful to reduce vehicle speeds.
- 4 Diverters and intersection treatments are used to eliminate or discourage through traffic, keeping traffic volumes down. Otherwise, the same intersection treatments at arterials that make the route useful for people biking could attract more through car traffic. The bikeway should have priority over intersecting local streets to minimize how often people biking need to stop.

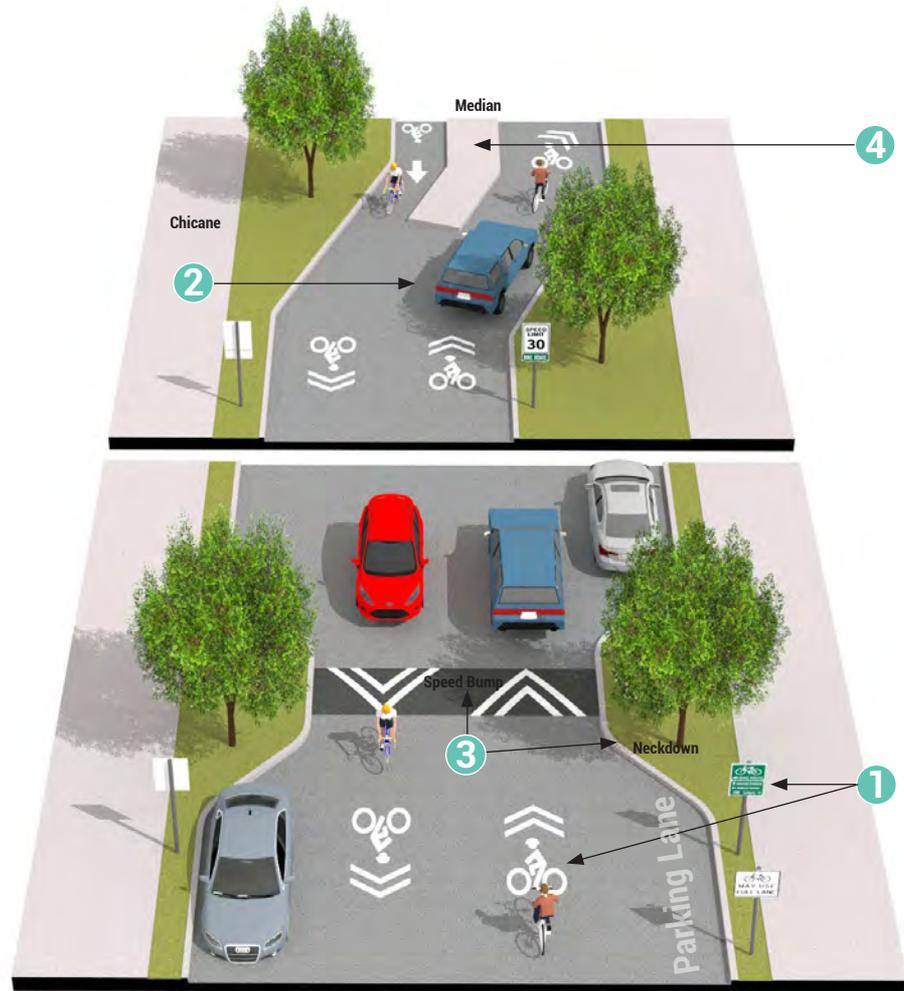


Figure 4.12: Neighborhood Bikeway

*Shared On-Street*

## 4.6 Neighborhood Shared Street

*Houston, TX*

1  
2

### DESCRIPTION

Low speed, low volume residential street shared by motor vehicles and bikes and marked with “Bike Route” signs. Unlike a neighborhood bikeway, a shared street does not include additional treatments to manage speed or volume.

### BENEFITS

Clearly defines a bike route in a bikeway network.

Places bikes on streets where current conditions provide a relatively high level of comfort.

### APPLICATION

Neighborhood shared streets are recommended for residential streets with  $\leq 1,500$  motor vehicle average daily traffic where speeds are 30 mph or less.

Streets with traffic signals on intersecting arterials should be carefully assessed for appropriateness as neighborhood shared streets since the signals may attract more through traffic.

Neighborhood shared streets should be reviewed periodically to make sure that traffic conditions still provide a high level of comfort or if additional tools may be appropriate to improve safety and comfort.

## ELEMENTS

- 1 The route is marked with bicycle signage along the length of the route. These both guide people biking and keep motorists alert. Sharrows may be used to supplement the signs.

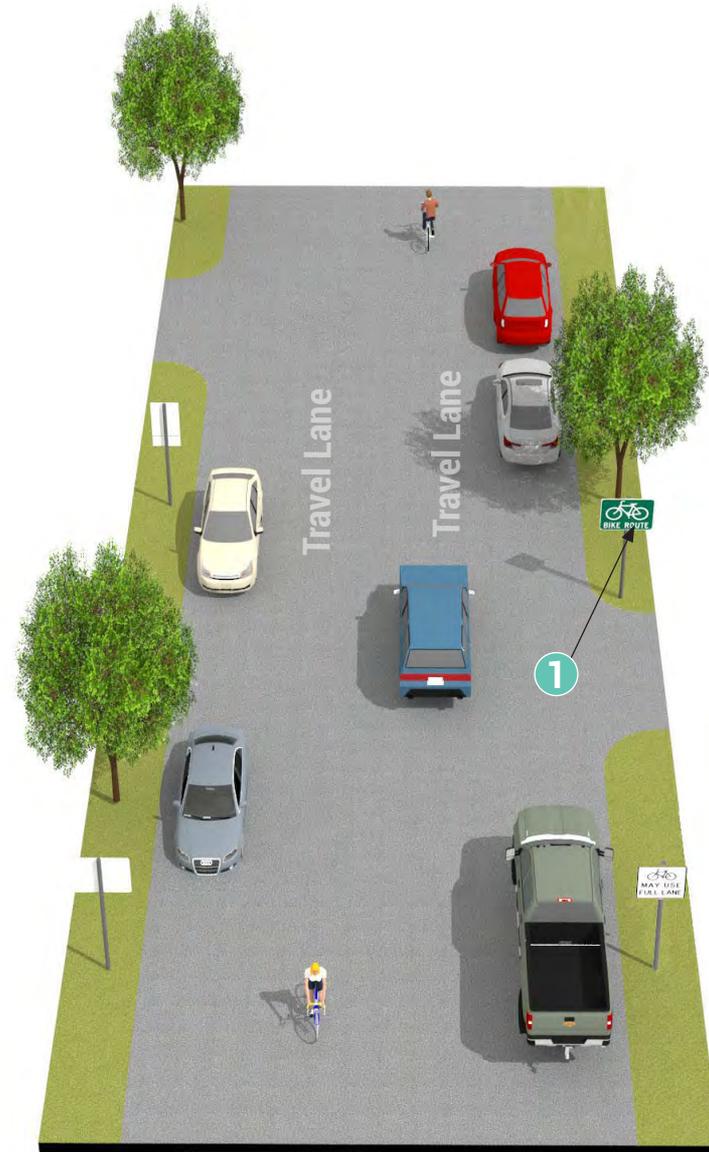
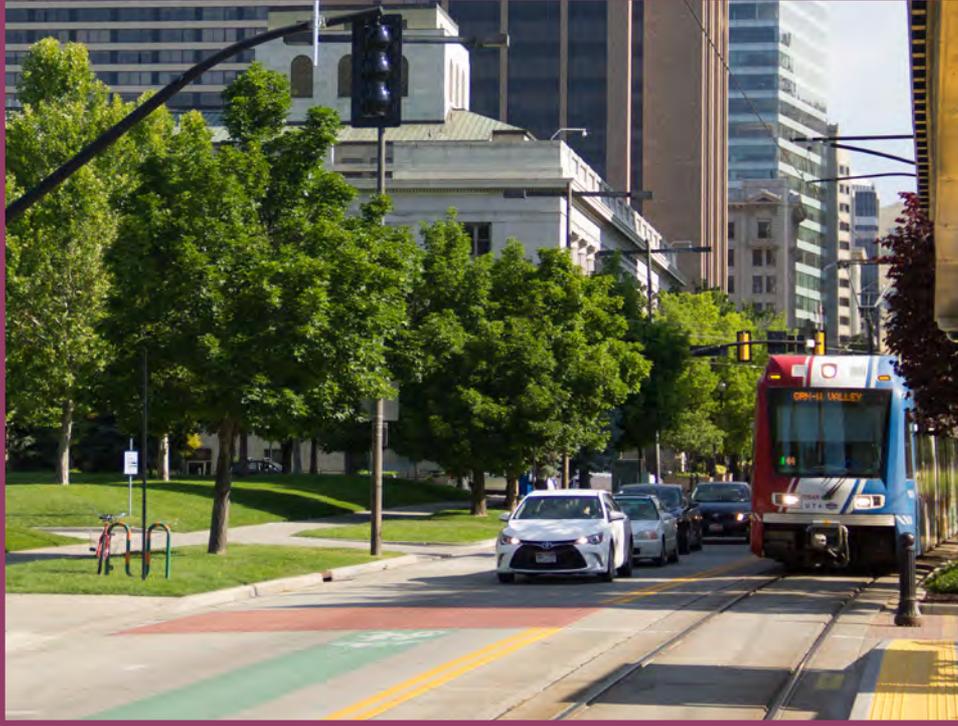


Figure 4.13: Neighborhood Shared Lane

*Shared On-Street*

## 4.7 Shared Lane

*Salt Lake City, UT***3**

### DESCRIPTION

Lane shared by motor vehicles and bikes marked with "Bicycle May Use Full Lane" R4-11 signs and "sharrow" pavement markings.

Referred to in NACTO as "Colored bike facilities" and "Shared lane markings"

### BENEFITS

Alerts motorists to bicycles.

Guides people biking through bikeway network.

### APPLICATION

In situations where there is not enough space to provide separate facilities and a higher comfort bikeway is not currently possible.

In situations where traffic speeds and volumes are low enough for mixing of vehicular and bicycle traffic. This typically will be a lower comfort bicycle facility.

Shared lanes should never be applied to streets with a posted speed over 35 mph and are more appropriate on lower speed streets.

Can be applied to streets with 1 traffic lane in each direction but will work better with 2 traffic lanes in each direction.

In general, the higher the traffic volumes, traffic speeds, and intensity of turning movements are, the more visible the pavement markings should be.

May be appropriate on select non-local streets where a high comfort facility is not feasible and traffic speeds and volumes are low.

**ELEMENTS**

- 1 Markings in the center of a traffic lane indicate that bikes may use the full lane.
- 2 Alternate 1: "Priority shared lane" in green paint with sharrow markings. This is the highest cost and most effective treatment and should be considered where many vehicles are turning or changing lanes, where traffic volumes are relatively high, and where cars tend to move faster.
- 3 Alternate 2: Continuous dashed lines with sharrow markings.
- 4 Alternate 3: Dashed lines at sharrow markings only.
- 5 Alternate 4: Sharrow markings with no lines. This is the lowest cost but also least visible treatments.



**MARKING OPTIONS**

Figure 4.14: Shared Lane

*Off-Street*

## 4.1 Off-Street Bike Path



*Buffalo Bayou  
Houston, Texas*

1

2

:

### DESCRIPTION

An off-street path is a connection for people walking and people bicycling outside of street right-of-way, often with grade separation from cross traffic.

For trails in Harris County Flood Control District rights-of-way, refer to the HCFCO "Trail Sponsor Guidance Document."

### BENEFITS

High level of comfort with few vehicle conflicts and large buffer from parallel traffic.

Attractive for leisure riding and longer trips.

Can provide bypass around major barriers like freeways and railroads.

Can allow higher bicycle speeds if grade-separated from cross traffic and limited conflicts with people walking and jogging.

### APPLICATION

Along bayous and drainage easements.

In rails-to-trails and other utility corridors.

In and adjacent to regional and community parks.

Parallel to freeways in an off-street right-of-way.

As a connection in areas with disconnected roadway networks.

**ELEMENTS**

- 1 Use signs and markings to indicate whether people walking and people biking share space on the path or have separate paths.
- 2 Alternate 1: Shared bicycle and walking path. The desirable two-way off-street bike path width is 12 feet. Minimum width in constrained locations is 8 feet.
- 3 Alternate 2: Path with separate lanes for bicycles and people walking include a two-way bike lane with the desired width of 12 ft (minimum 8 ft), and a walking lane with a minimum width of 5 ft (wider preferred). Walking and cycling paths do not need to remain directly adjacent.
- 4 Alternate 3: Bicycle only path. The desirable two-way off-street bike path width is 12 feet. Minimum width in constrained locations is 8 feet. Provide a parallel walking path.
- 5 Periodic rest areas are useful to both people biking and people walking.
- 6 Signs provide directional information and distance.

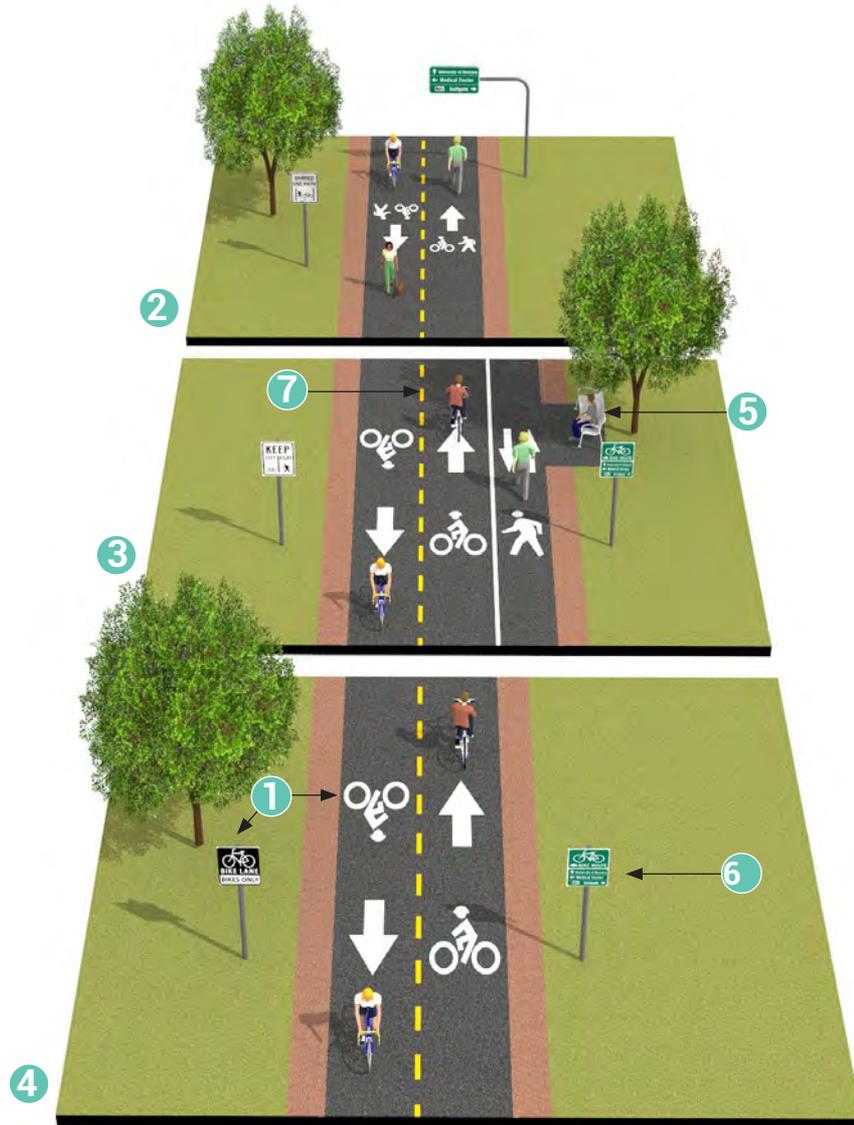


Figure 4.15: Off-Street Bike Path

*Off-Street*

## 4.2 Side Path

*Houston, TX*

- 1
- 2
- 3

### DESCRIPTION

A side path is a path alongside a street but outside the roadway curbs, either shared by bicycles and people walking or for bicycles only.

May be implemented in place of an on-street dedicated bikeway in appropriate locations.

### BENEFITS

Reduces conflict by separating bicycle and vehicular traffic.

Provides perceived sense of safety to casual riders.

Provides an option for adding a bike route along an existing corridor with space behind curb or where easement may be available.

### APPLICATION

Along streets with high traffic volumes and speeds.

As a continuation of off-street paths.

As a retrofit on existing roadways where right-of-way permits.

May not be desirable in areas with high volumes of people walking or with closely spaced driveways.

Generally better suited to residential areas than commercial areas.

**ELEMENTS**

- 1 The path is at sidewalk level, separated from the roadway by a curb or a ditch.
- 2 Alternate 1: Shared path, use in locations with low person walking traffic or other constraints. Minimum recommended width is 8 feet although 10 feet is preferred.
- 3 Alternate 2: Separate bicycle and walking paths. This can be implemented as a one-way path on each side of the street or as a single two-way path. Minimum recommended two-way bikeway width is 8 feet although 10 feet is preferred and walking lane width is 5 feet. If a one-way bike path is provided, a one-way bike path width of 5 feet plus a 5 foot sidewalk is acceptable.
- 4 The path is protected from the adjacent roadway lane with a planted buffer or a buffer strip of contrasting paving materials. Recommended minimum buffer width is 1 foot (measure from back of curb.) If parking is provided, recommended buffer is 3 feet.
- 5 Bike signage makes clear that bicycles may use the path.

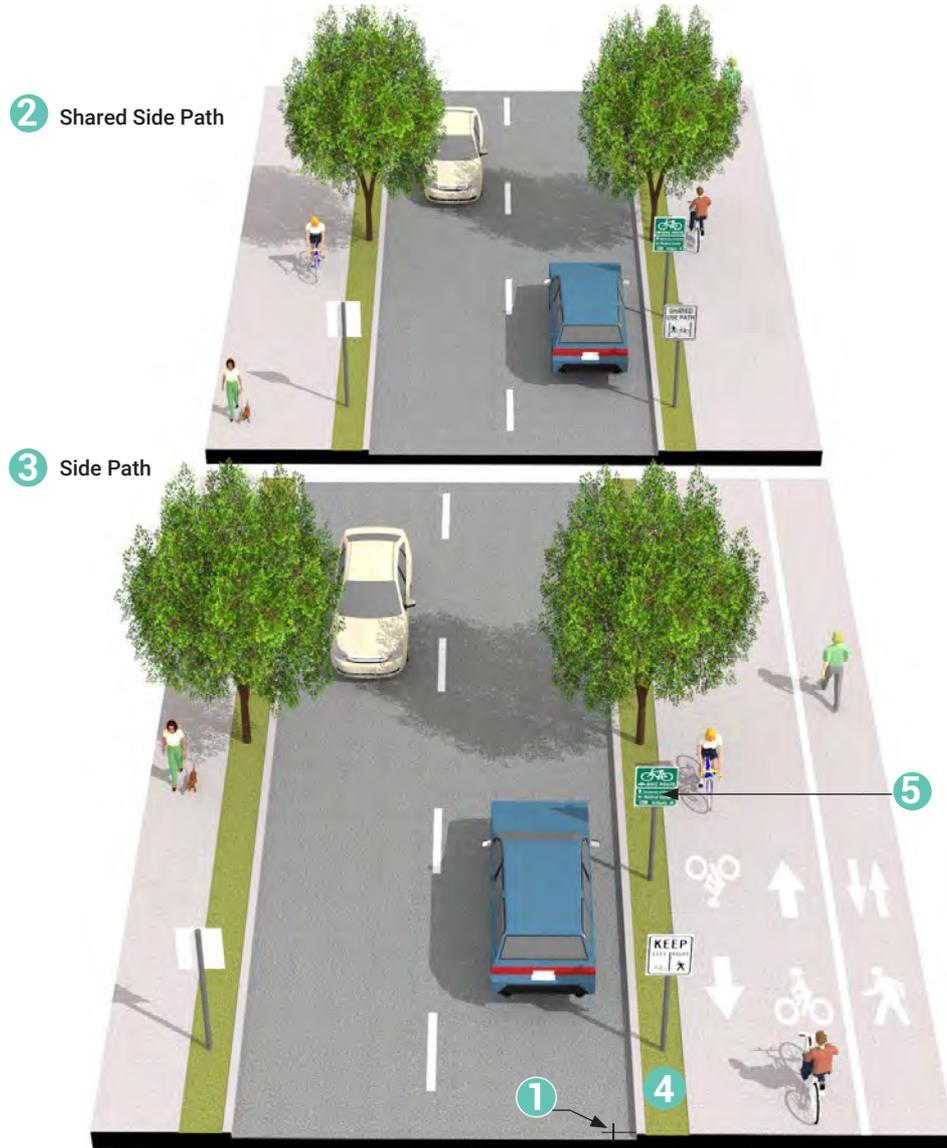


Figure 4.16: Side Path

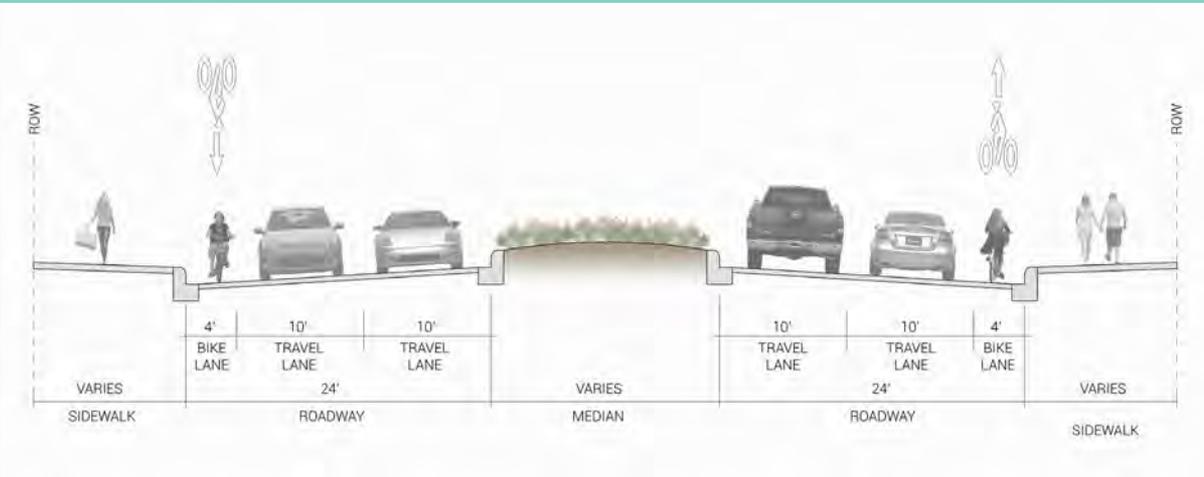
# Projects - Common Situations

## Common Road Sections

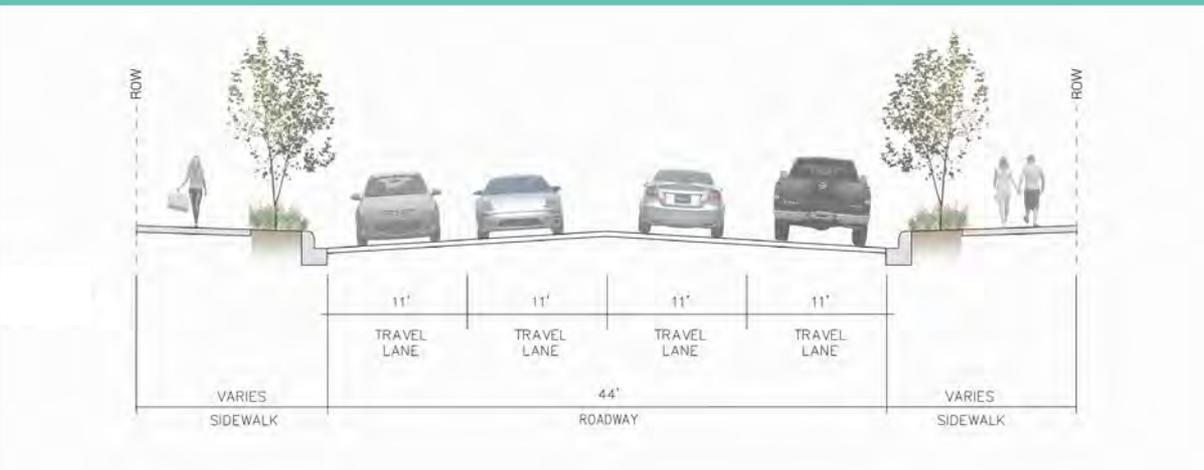
Since many Houston roadways have been built under the same set of standards, some roadway sections are very common across the city. Thus, certain challenges – and opportunities – will reoccur again and again as the city builds out its high-comfort bikeway network. This section shows the options for integrating bikeways in some of these sections. Additionally, this section provides guidance on appropriate crossings of thoroughfares where intersections are not signalized.

## COMMON ROAD SECTIONS

### Boulevards with 24' Roadway Sections .....4-29



### 4 lane roadways .....4-35



### Minor Crossings at Thoroughfares .....4-37

*Common Road Sections**Boulevards with 24' Roadway Sections**Houston, TX***COMMON SITUATION**

Many older sections of Houston are designed as median boulevards with 24' roadways on each side of the median. In previous projects, bike lanes have been retrofitted onto these boulevards, creating narrow lanes. This leads to discomfort as well as potentially unsafe passing scenarios.

**POTENTIAL SOLUTION**

The 4' bike lane is a below standard lane width and often leads to conflicts with gutter pans and drainage inlets. Furthermore, it is difficult for vehicles to follow the City's 3 foot passing ordinance while staying in their travel lane adjacent to the bike lane. The 10' driving lanes can be too narrow for large vehicles.

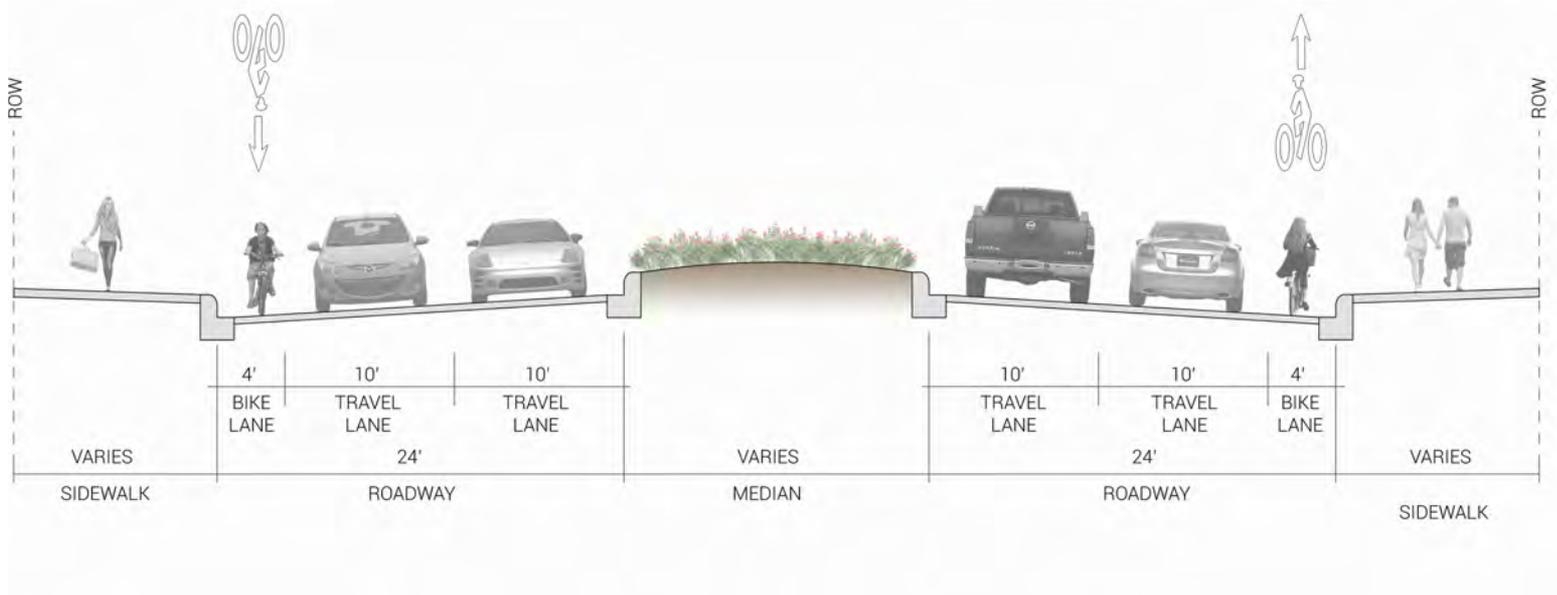
The section of these boulevards should be reimagined with the safety and comfort of people biking in mind. Several options are available to make a more bike-oriented roadway, some requiring larger right-of-ways and wider medians than others. Where no improvements are reasonably possible it may be advisable to remove the below standard bicycle facility and provide an alternate route.

The options presented on the following pages illustrate potential approaches to take into consideration. These can provide wider, more comfortable bike facilities, through consideration for design options such as narrowing medians, removing travel lanes, reallocating pedestrian realm space, adding buffers, or where appropriate, sharing the road. Which options are appropriate in a specific situation will depend on context, and the City of Houston will need to review each situation to identify the preferred approach.

## EXISTING SECTION

### 0 Existing 4' Bike Lane / 10' Travel Lanes

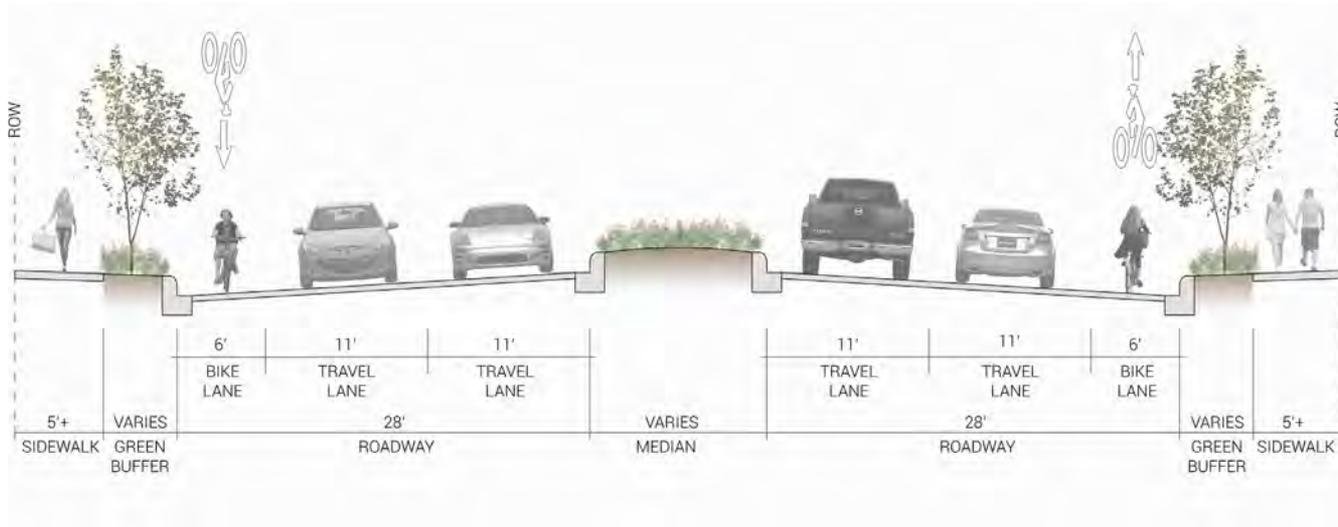
Narrow distances between people biking and vehicles lead to conflicts and an uncomfortable and uninviting biking experience, particularly if there is a gutter or other debris that collects in the bike lane.



ALTERNATIVE OPTIONS

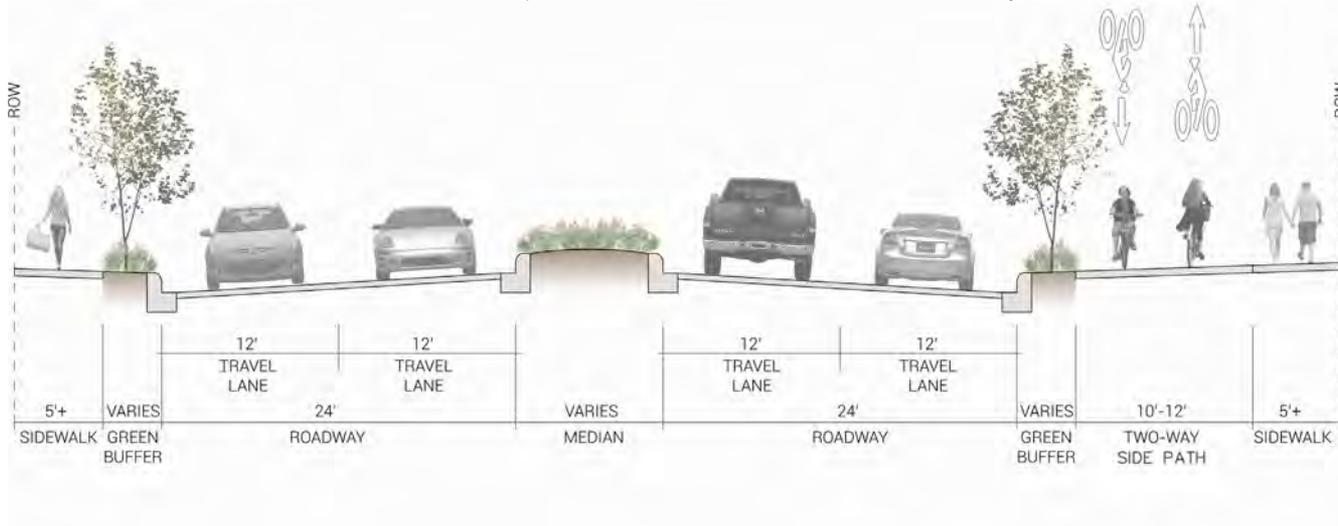
1 Narrowed Median

By narrowing the median, the bike lane can be widened to 6 ft, which is the preferable width for one-way bike lanes. Travel lanes are widened, leading to safer distances between rider and vehicle. This option works best in scenarios with wide medians.



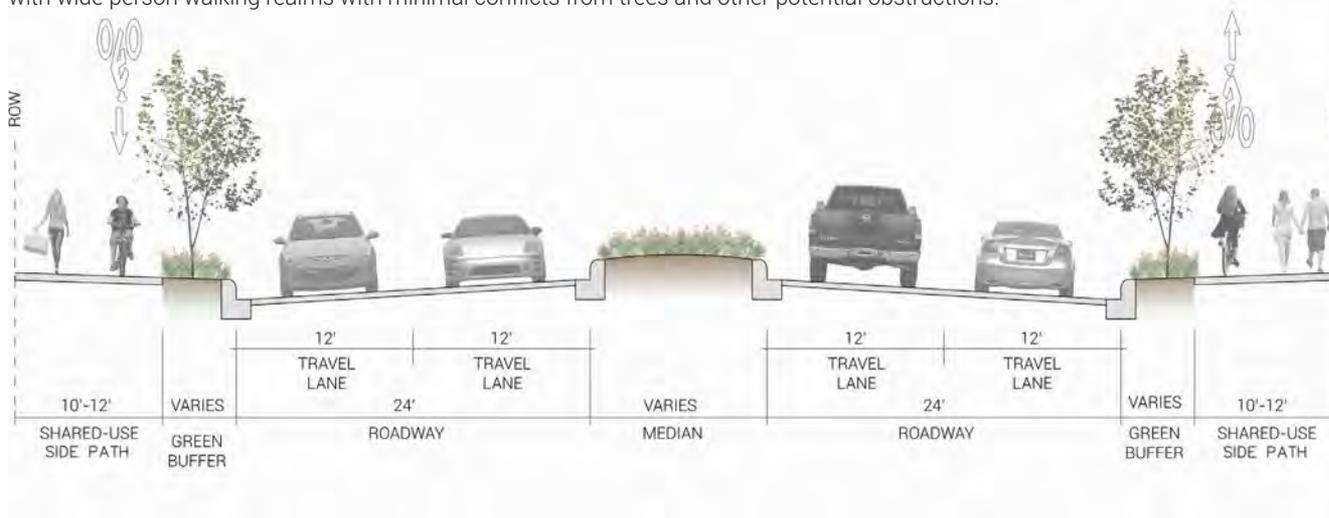
2 Side Path - Two Way Bike Lane

By removing the bike lanes from the roadway, vehicle travel lanes are widened to comfortable 12 foot lanes (or 11 ft lanes with a 2 ft gutter). Bicycle traffic is moved behind one curb as a two-way bike path adjacent to a person walking zone. This option works best in scenarios with wide sidewalks and minimal conflict points on one side of the street or with all the major destinations on one side.



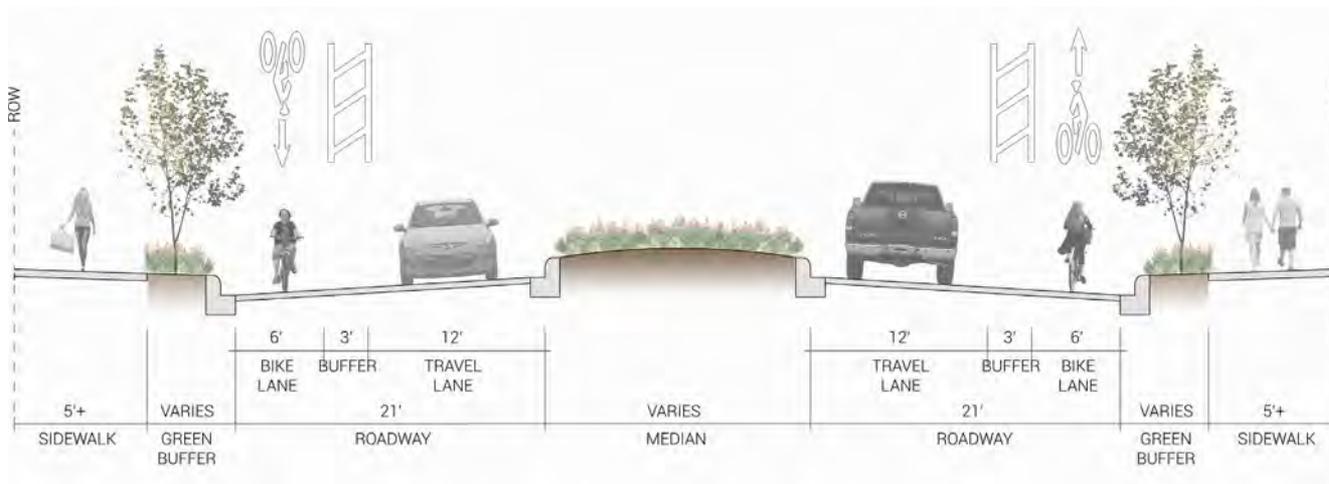
### 3 Side Path - One Way Bike Lane

By removing the bike lanes from the roadway, vehicle travel lanes are widened to comfortable 12 ft lanes (or 2 - 11 ft lanes with a 2 ft gutter). Bicycle traffic is moved behind the curbs in one-way bike lanes on each side of the street. This option works best in scenarios with wide person walking realms with minimal conflicts from trees and other potential obstructions.



### 4 Convert Travel Lane to Bike Lane

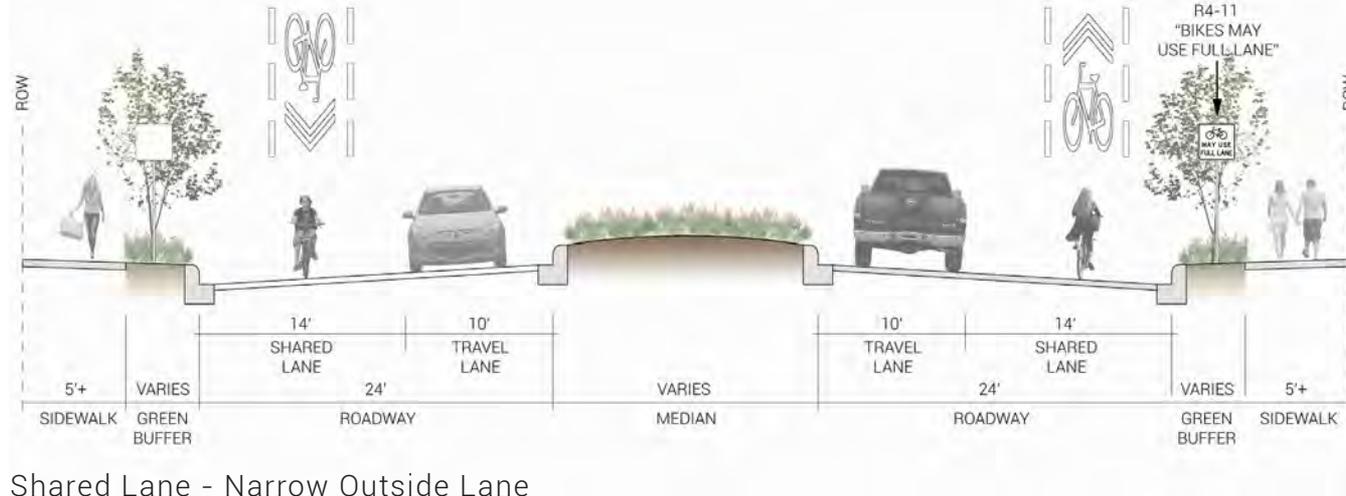
By removing a vehicle travel lane, a buffered bicycle lane can be inserted. This increases rider comfort and potentially reduces vehicular traffic/speed. This option works in scenarios where neither the sidewalk nor the median can change in width and/or existing traffic volumes can be accommodated by fewer traffic lanes. Additional width could be allocated to widen the median and/or pedestrian realm.



ALTERNATIVE OPTIONS (CONT.)

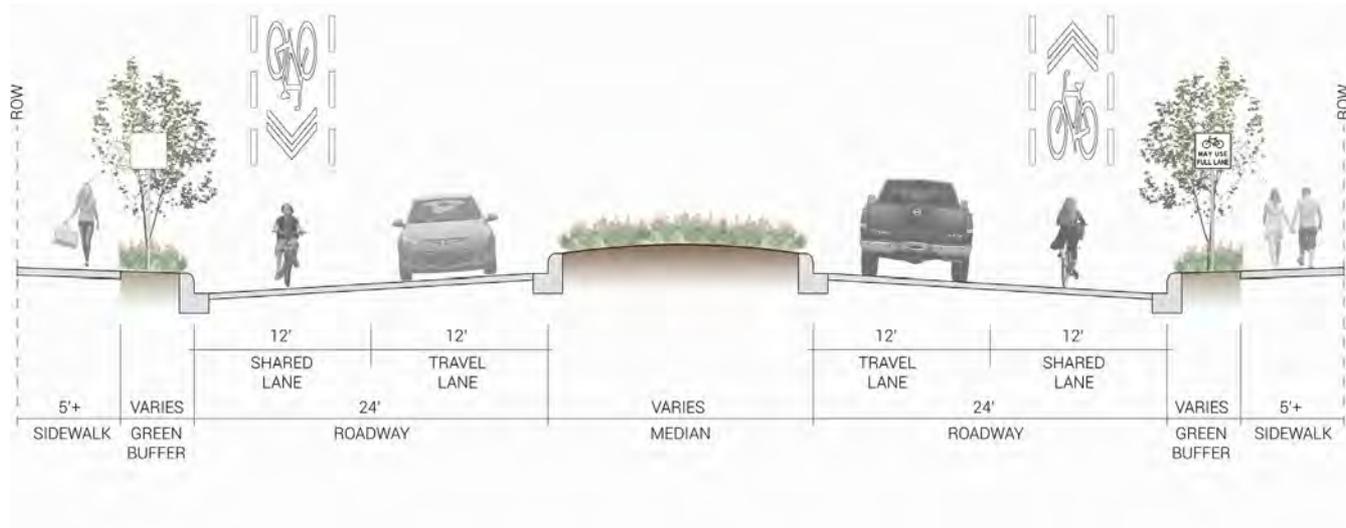
5 Shared Lane - Wide Outside Lane

By converting the 24' roadway to two travel lanes, a wider 14' shared lane can be marked and signed on the outside lane, with a narrower travel lane adjacent to the median. This may allow for easier vehicular passing of bicycles, allowing a car to pass a person bicycling without leaving the lane while keeping the 3 foot safe passing space required by city ordinance. This option works in scenarios where neither the sidewalk nor the median can change in width and should only be used in low traffic, low speed scenarios where people biking can ride comfortably with vehicular traffic. Wide lanes should be monitored to ensure they do not encourage excessive travel speeds. This treatment is typically not applicable to thoroughfares.



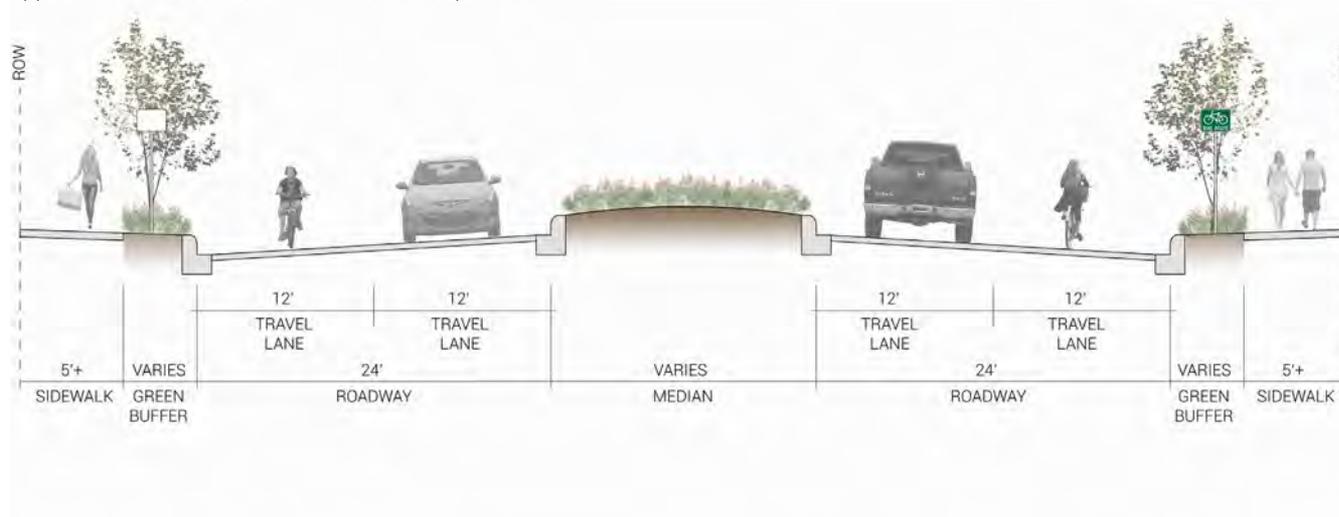
6 Shared Lane - Narrow Outside Lane

By converting the 24' roadway to two travel lanes, a narrow shared lane with can be marked and signed. This option works in scenarios where neither the sidewalk nor the median can change in width and should only be used in low traffic, low speed scenarios where people biking can ride comfortably with vehicular traffic. This may be more appropriate than option 5 in areas with significant truck traffic. This treatment is typically not applicable to thoroughfares.



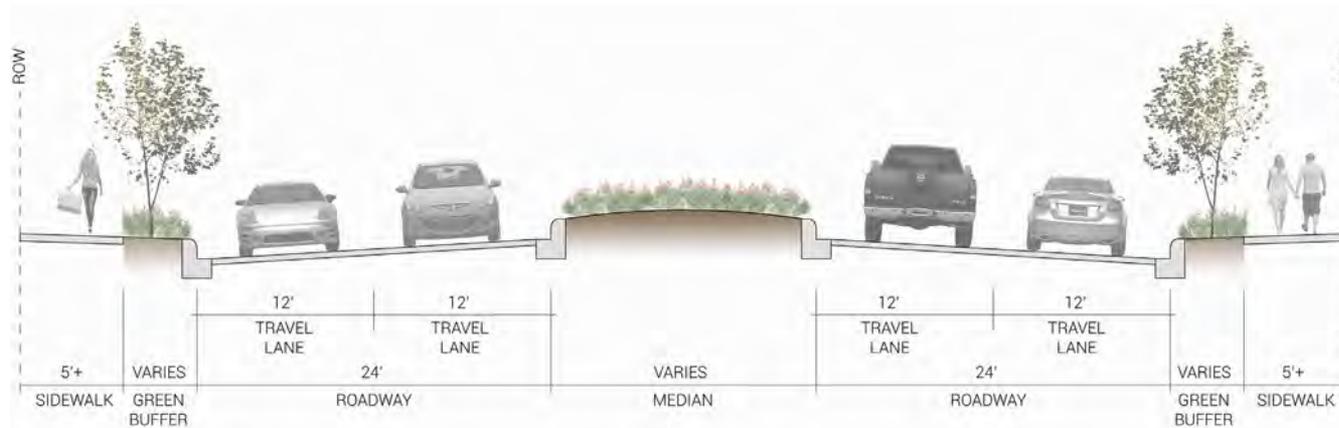
## 7 Shared Street

By removing the bike lanes from the roadway, vehicle travel lanes are restriped to 2 - 12 ft lanes and the roadway can be designated as a Bike Route. "Bike Route" signs should be placed periodically along the route. This option should only be used in low traffic, low speed scenarios where people biking can ride comfortably with vehicular traffic, preferably on non-arterial neighborhood streets where other approaches have been determined to not be possible.



## 8 No Bike Facility

In scenarios where neither the sidewalk nor the median can change in width, and traffic volumes and speed do not allow for the safe application of shared lanes, the bike lanes should be removed and relocated to more appropriate streets. Confident cyclists may still utilize this roadway but it would not be designated on bikeway maps.



*Common Road Sections*

## 4-Lane Roadways

*Houston, TX***PROBLEM**

There are significant stretches of major arterial and collector streets in Houston with a 4-lane cross section. These streets do not include any bicycle facilities, though some are designated as bicycle routes. They are also compromised by the lack of turn lanes which can limit the capacity of the street as vehicles waiting in the inside lanes to turn significantly reduce the traffic capacity of the

street. Four lane roads frequently experience higher crash rates due to lack of dedicated space for turning vehicles leading to conflicts with through traffic (Road Diet Informational Guide, FHWA-SA-14-028, November 2014, section 3.1.) In many cases, these streets do not have additional right-of-way available.

**POTENTIAL SOLUTION**

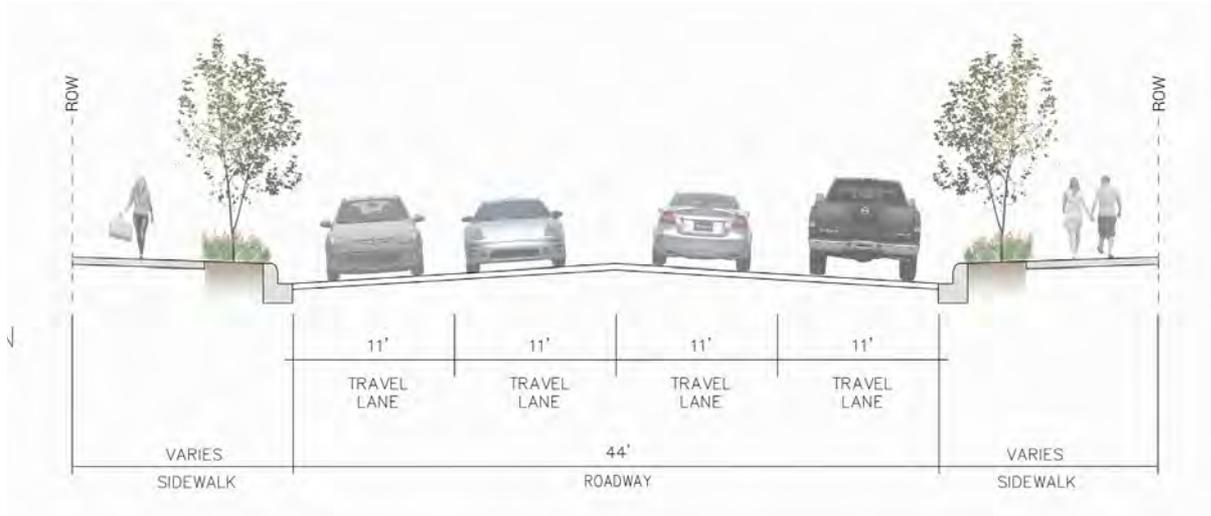
In many cases, optimizing a roadway by changing the cross-section from two traffic lanes in each direction to one through lane in each direction with a center turn lane would smooth traffic flow and provide comparable traffic capacity. Many studies have looked at these 4 to 3 lane conversions and found the street is adequately handling equivalent or greater traffic volumes, sometimes up to 20,000 vehicles per day. (Road Diet Informational Guide, FHWA-SA-14-028, November 2014, section 3.3.5.)

By reallocating the traffic lanes, space is freed up to add bike lanes. On a street with significant bike volumes, this can actually lead to a meaningful increase in traffic capacity since bicycles are not in the regular traffic lanes.

**EXISTING SECTION**

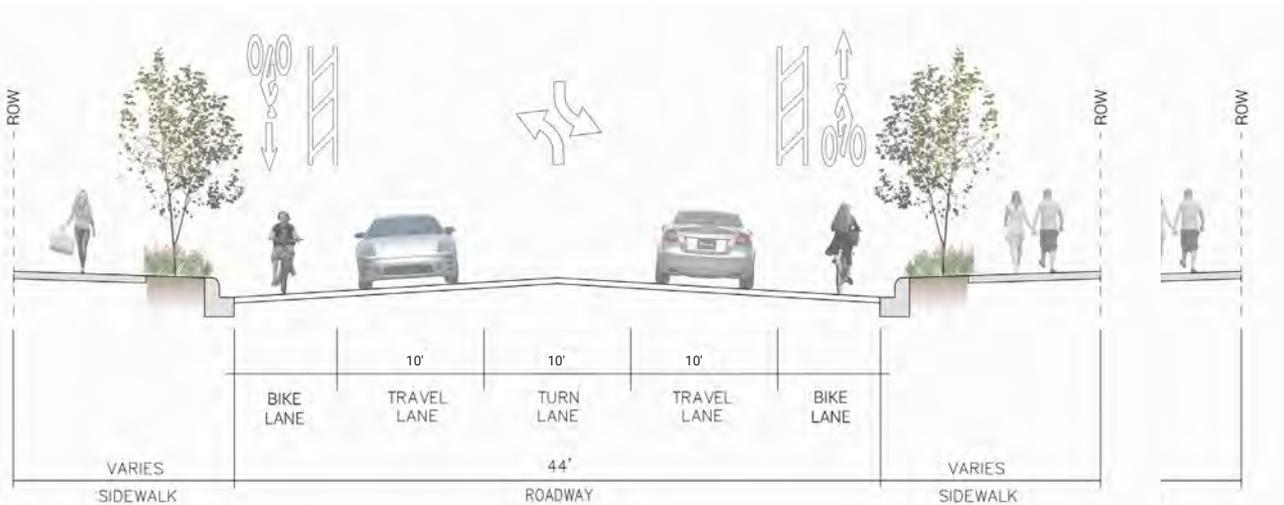
**0** Existing 4-Lane Roadway Section, 11' Travel Lanes

Four 11 foot lanes add up to a 44 ft roadway section.



**1** One-Way Buffered Bike Lanes

Using 10 foot traffic lanes allows for a buffered bike lane in each direction in the same pavement section. This is only one possible conversion; other cross sections, such as unbuffered lanes or two-way buffered bike lanes are also possible.



*Common Situations**Minor Street Crossings at Thoroughfares*

*Toucan Crossing  
Tucson, AZ*

**PROBLEM**

While neighborhood streets and other minor roadways with fewer vehicles and lower speeds may typically be more comfortable for people biking, there are a significant number of instances where these roadways cross thoroughfares with much higher traffic volumes and speeds. Many times these intersections are not signalized and do not meet recognized signals warrants. These

intersections can pose difficulty for people biking to cross the street and require close attention to ensure they address the challenge of crossing for all users of the intersection. Many times the person biking must wait for traffic in both directions to clear before crossing, which results in significant wait times and difficulties judge both directions simultaneously for appropriate gaps.

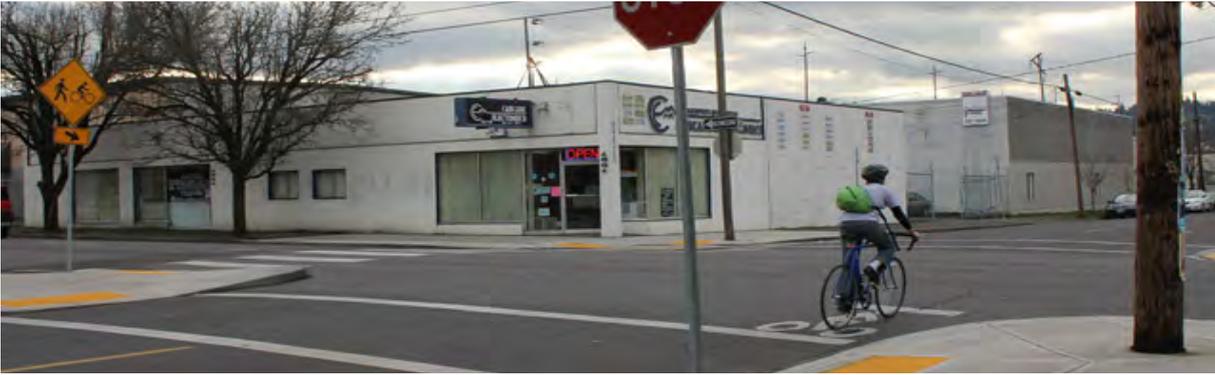
**POTENTIAL SOLUTION**

Utilizing intersection treatments such as crossing markings, advanced signage, median enhancements or refuge islands and innovative traffic control approaches can be effective methods of optimizing the intersection for people crossing on bikes.

NACTO states that at unsignalized crossings of major streets, treatments should result in decreased crossing distances and improve visibility for bicyclists and/or enhance the general awareness of the crossing. Treatments that are potentially appropriate for streets with three or fewer travel lanes and speeds under 35 mph include advance warning signs, curb extensions, intersection crossing markings, and raised intersections.

Crossings of major streets with three or more travel lanes and posted speeds over 35 mph should aim to improve safety and comfort for bicyclists. Potentially appropriate treatments include median refuge islands, traffic beacons and other intersection traffic control devices outlined in this Bike Plan Toolbox or other best practice design guidelines.

## EXAMPLES



All images:  
Portland, OR bicycle  
boulevard treatments  
Source: NACTO

# Projects - Intersection Treatments

## Recommended Intersection Treatments

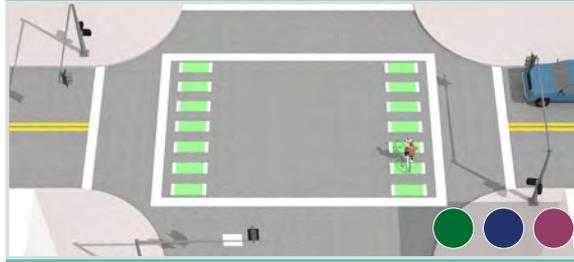
Intersection treatments are critical in creating a high-comfort bikeway network. Intersections are the points of maximum conflict between people on bicycles and people in cars, and thus will determine the Level of Comfort of the entire route.

The treatments are color-coded to show which bikeway types they are compatible with.

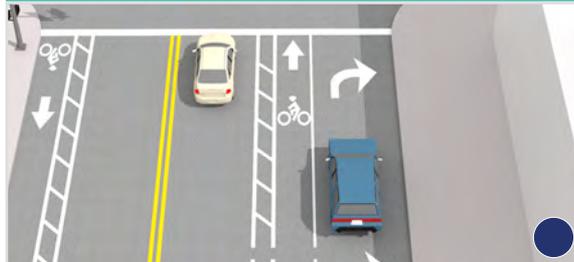
Bicycle intersection designs are evolving rapidly. Thus, national and statewide standards, including the Texas MUTCD, do not include all of these types and special design approvals may be required.

### INTERSECTION TREATMENT

4.8 Intersection Crossing Markings 4-41



4.9 Turn Lane Treatments .....4-43



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4.11 Two-Stage Turn Queue Box...4-51



### INTERSECTION TREATMENT

4.12 Protected Intersections.....4-53



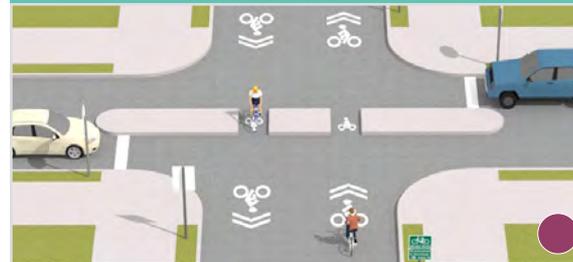
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SIGNALING

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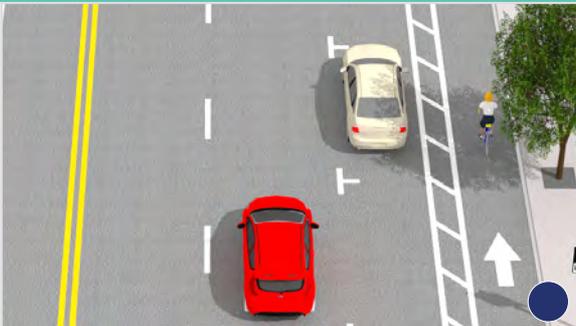


SPECIAL CONDITIONS

4.17 Floating Bus Stop.....4-63



4.18 Parking Protected Bike Lane.4-65



CONNECTIONS

4.19 Bridges / Tunnels .....4-67



4.20 Shortcuts .....4-69



Off-Street

Dedicated

Shared

*Intersection Treatment*

## 4.8 Intersection Crossing Markings

*Chicago, IL*

- Off-Street
- Dedicated
- Shared

**DESCRIPTION**

Intersection crossing markings indicate the intended path of people biking across an intersection with dashed lines and optional green paint.

**BENEFITS**

Makes bicycle movements through an intersection more predictable.

Raises awareness for both people biking and motorists in potential conflict areas.

Reinforces correct yielding behavior by indicating that through people biking have priority over turning vehicles or vehicles entering the roadway from driveways or cross streets.

Helps people biking maintain a straight and direct path through the intersection.

**APPLICATION**

Across signalized intersections, particularly through wide or complex intersections where the bicycle path may be unclear.

Across Stop or Yield-controlled cross-streets.

Across driveways.

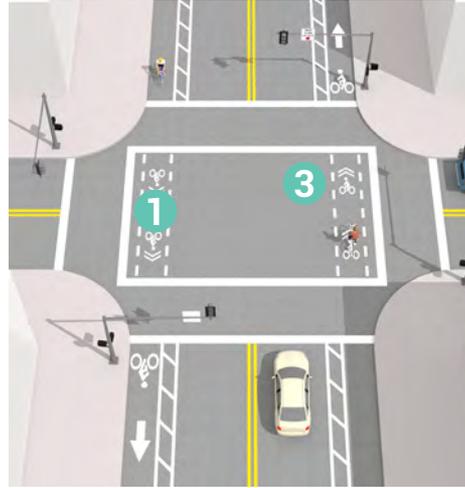
Use where needed, not applicable for all intersections.

**ELEMENTS**

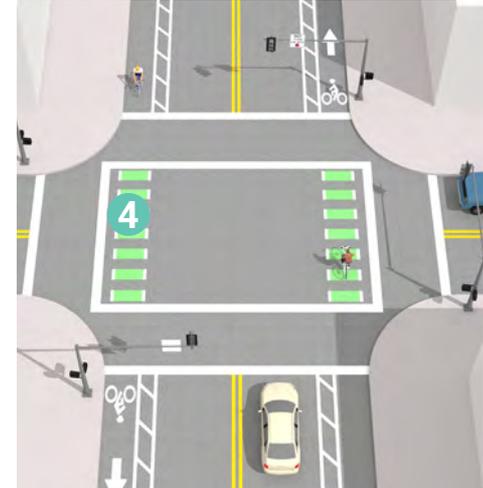
- 1 Match width and positioning of the bike lane so that people biking can cross the intersection in a direct path.
- 2 Dotted lines should be 2 foot lines with 2 to 6 foot spacing.
- 3 Provide shared lane markings in high conflict areas positioned in the center of driving lanes for high visibility. On two-way paths, use markings in opposite directions in the two lanes.
- 4 Use green paint in particularly high conflict areas or as part of bikeways where the entire length of the bikeway is painted green.

**INTERSECTION MARKINGS**

Conventional Markings

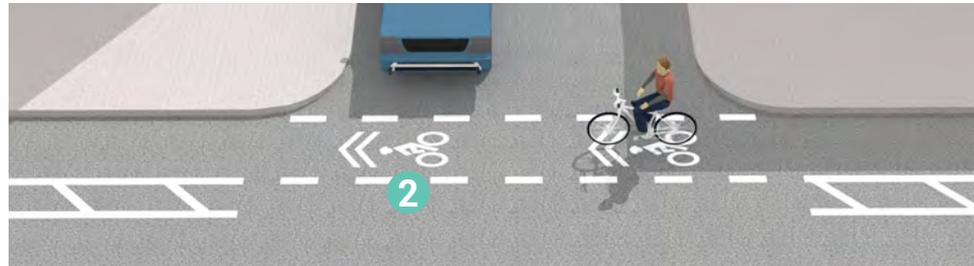


High Conflict Markings



**DRIVEWAY MARKINGS**

Conventional Markings



High Conflict Markings

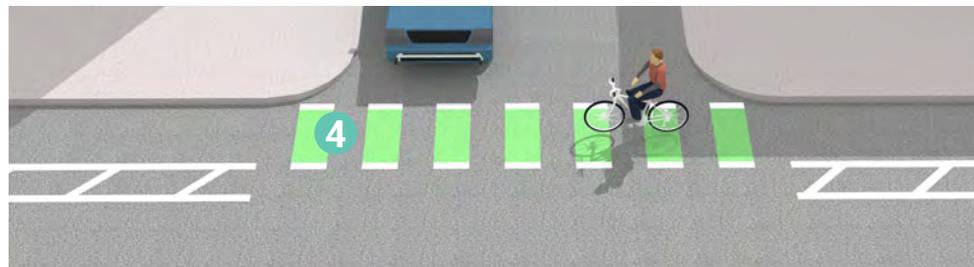


Figure 4.18: Intersection Crossing Markings

## Intersection Treatment

## 4.9 Turn Lane Treatments



Portland, OR

 **Dedicated**

**DESCRIPTION**

Turn lane treatments resolve conflicts between people biking and right-turning cars at intersections.

Design treatment should seek to increase visibility and limit conflicts and risk of people biking being hooked by turning vehicles.

## Intersection Treatment

## 4.9.1 Turn Lane Through Lane

**DESCRIPTION**

In a through lane treatment, turning vehicular traffic crosses over the bike lane into its own vehicular turn lane, which begins just ahead of the intersection (replacing a parking lane or landscaping). The width and direction of the bike lane is uninterrupted.

**BENEFITS**

Places people biking between traffic going straight and turning traffic, making traffic flow when light turns green easy and conflict-free.

Separates conflict point between people biking and turning cars from the intersection, allowing drivers to focus on one conflict at a time.

Provides people biking with a clearly defined area to wait at a light.

**APPLICATION**

Where separation of turn movements from bicycle/vehicle weaving is beneficial and bike lane can be maintained through the intersection.

## ELEMENTS

- 1 Bike lane width matches mid-block bike lane.
- 2 Bike lane is located between the turn lane and the through lane.
- 3 Dotted lines signify a merge zone.
- 4 Right-turn only lanes should be designed appropriately and should be no longer than necessary to accommodate the appropriate queues. Fast moving traffic on both sides can be uncomfortable for people biking.
- 5 Use green paint in particularly high conflict areas or as part of bikeways where the entire length of the bikeway is painted green.

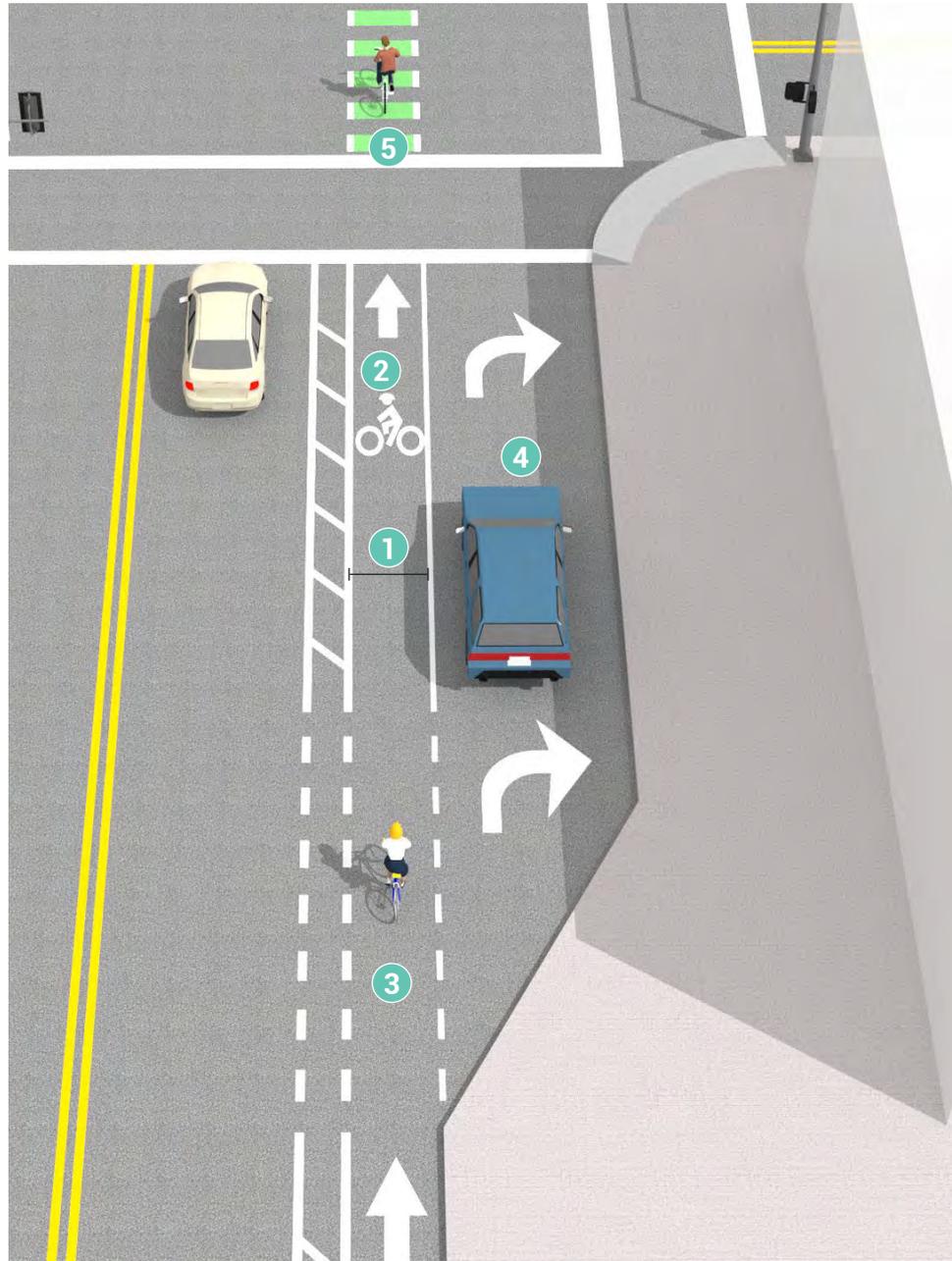


Figure 4.19: Turn Lane



*Right Turn Treatment  
Portland, OR*



*Intersection Treatment***4.9.3 Turn Lane Mixing Zone****DESCRIPTION**

The bicycle lane ends in advance of the intersection, where a shared right turn and bicycle lane is provided.

**BENEFITS**

Clarifies bicycle and driver behavior better than simply ending a bike lane.

**APPLICATION**

On streets where there is a right turn lane but not enough space to maintain a bicycle lane at the intersection.

Typically lower level of comfort than a through lane or combined lane treatment.

**ELEMENTS**

- 1 Bicycle lane ends where the right turn lane begins.
- 2 Turn lane is fully shared between people on bicycles turning right or going straight and people in cars turning right. People on bicycles may use full lane.

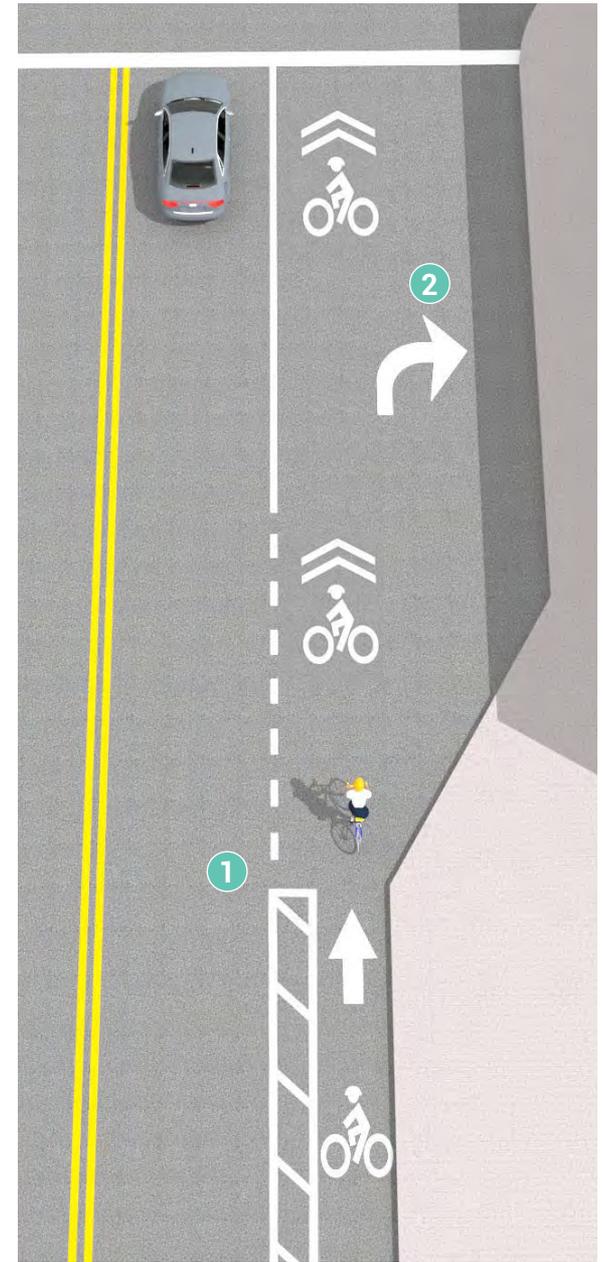


Figure 4.21: Turn Lane - Mixing Zone

## Intersection Treatment

### 4.9.4 Through Lane Mixing Zone

#### DESCRIPTION

The bicycle lane ends in advance of the intersection where a shared through, right turn and bicycle lane is provided.

#### BENEFITS

Clarifies bicycle and driver behavior better than simply ending a bike lane.

#### APPLICATION

On streets where there is not enough space to maintain a bicycle lane at the intersection and no right turn lane.

Typically lower level of comfort than a through lane or combined lane treatment.

#### ELEMENTS

- 1 Bicycle lane ends before the intersection
- 2 Turn lane is fully shared between people on bicycles turning right or going straight and people in cars turning right or going straight. If there is only one lane in each direction, the same lane will also accommodate left turns. People on bicycles may use full lane.



Figure 4.22: Through Lane - Mixing Zone

*Intersection Treatment*

## 4.10 Bike Box

*Portland, OR*

 **Dedicated**

### DESCRIPTION

A Bike Box is a designated area at the head of a traffic lane at a signalized intersection that provides people biking with a safe place to wait during a red light.

### BENEFITS

Increases visibility of people biking.

Can facilitate person biking left turns by allowing people biking who arrive at the intersection when the light is red to shift to the left.

Helps prevent 'right-hook' conflicts with turning vehicles at the start of the green indication by positioning the person biking ahead of the car.

Provides an area for groups of people biking to wait at an intersection.

### APPLICATION

On 2 to 4 lane streets with bike lanes at signalized intersections.

For use only in special circumstances with high bike usage.

May be combined with two stage turn box.

**ELEMENTS**

- 1 The Bike Box is ahead of the stop bar for cars. Stop lines and a "wait here" legend mark the point where people in cars would stop at a red light. Extend bike box to the street centerline.
- 2 Right turns on red are prohibited.
- 3 The bike lane leads into the bike box.
- 4 Consider use of bicycle detection devices for activating signal

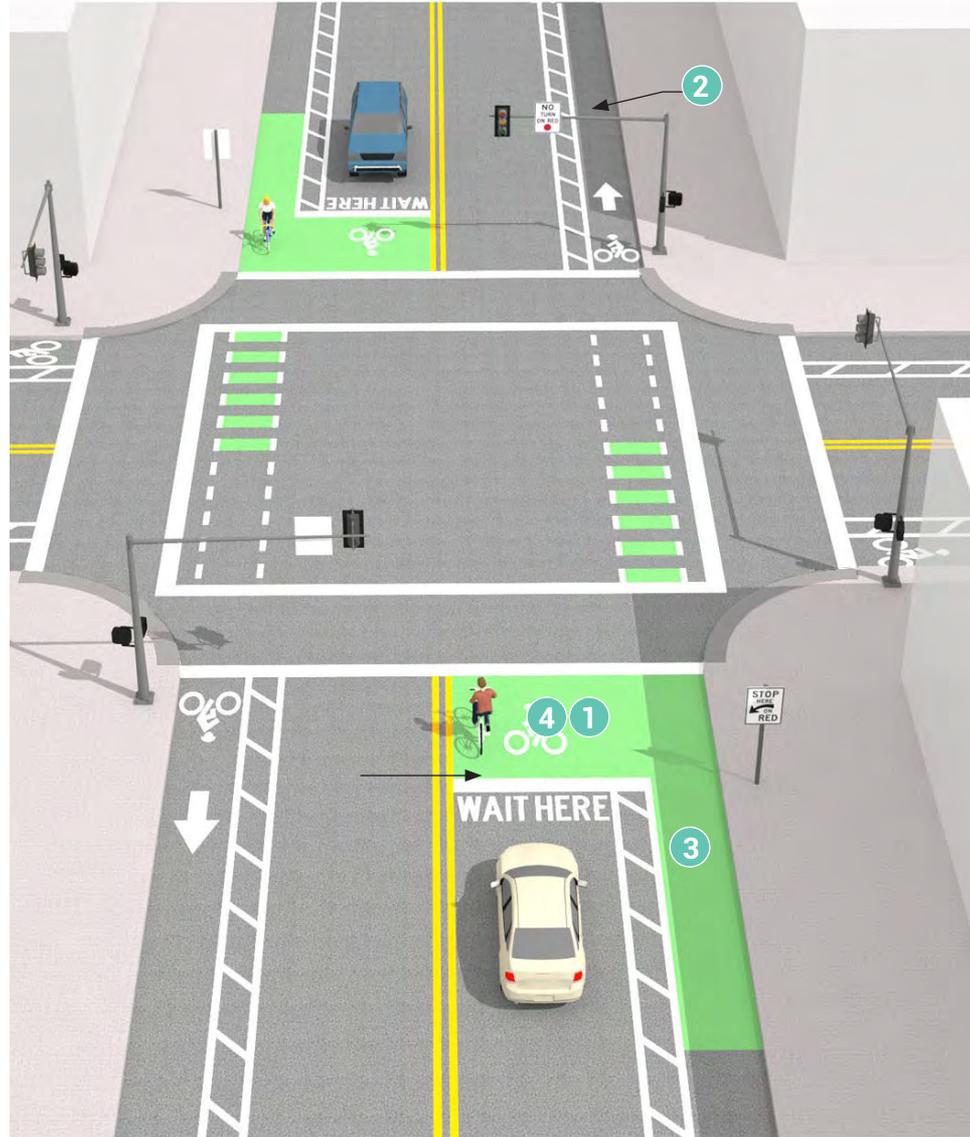


Figure 4.23: Bike Box

*Intersection Treatment*

## 4.11 Two-Stage Turn Queue Box

*Portland, OR*

 **Dedicated**

**DESCRIPTION**

Two-stage turn queue boxes offer people biking a safe way to make left turns at multi-lane signalized intersections from a right side bike lane, or right turns from a left side cycle track or bike lane. Two-stage turn queue boxes may also be used at unsignalized intersections to simplify turns from a bicycle lane or cycle track, for example, onto a bicycle boulevard.

**BENEFITS**

Improves a person's ability to bike safely and comfortably make left turns.

Provides a formal queuing space for people biking making a two-stage turn.

Reduces turning conflicts between people biking and motor vehicles.

Separates turning people biking from through people biking.

**APPLICATION**

At signalized and unsignalized intersections.

Along roadways with high traffic speeds and/or traffic volumes.

Along multi-lane roadways.

Where a significant number of people biking turn left from a right side facility.

Along cycle tracks.

To safely navigate light rail tracks adjacent to bike lane.

For use only in special circumstances with high bike usage.

## ELEMENTS

- 1 An area is designated to hold queuing people biking and formalize two-stage turn maneuvers. This is in a protected area, such as within an on-street parking lane or between the bicycle lane and the crosswalk. The queue box is positioned laterally in the cross-street to promote visibility of people biking. The queue box may also be positioned laterally in the cross street parking lane rather than in front of the travel lane.
- 2 Right turns on red are prohibited to keep the queue box protected.
- 3 A bicycle signal, with leading bicycle interval, may be installed in conjunction with the two-stage turn queue box.
- 4 Consider use of bicycle detection devices for activating signal

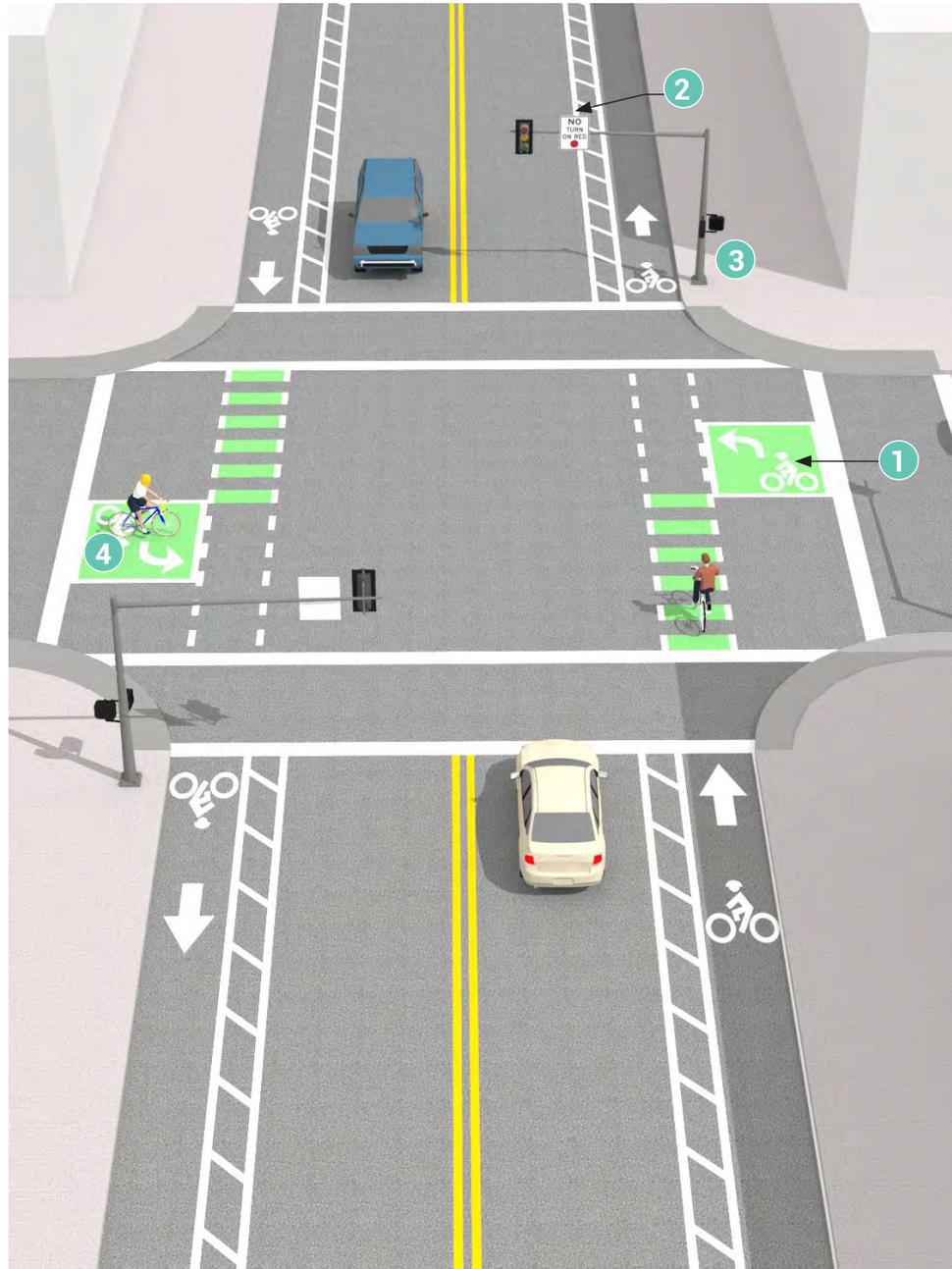


Figure 4.24: Two-Stage Turn Queue Box

*Intersection Treatment*

## 4.12 Protected Intersections

*Austin, TX*

 **Dedicated**

**DESCRIPTION**

A signalized intersection that provides a full bicycle lane encircling it.

**BENEFITS**

Provides clearly designated area for all movements, including turns.

Allows people biking to wait in fully protected areas.

Places bicycles in highly visible area where they can be seen by cars turning right alongside them.

**APPLICATION**

Use where two separated bike facilities meet.

Use where separated bike facility meets a roadway with a high bicycle volume.

Long term maintenance needs to be considered in design and placement of curbs.

## ELEMENTS

- 1 A green colored bike lane extends all the way around the intersection, between the crosswalks and the intersection.
- 2 People biking may advance into the waiting area at the corner to wait for the light. Here, they will be highly visible to the cars waiting behind them.
- 3 A curb protects the waiting area.
- 4 Bike signal phasing accommodates the crossing.

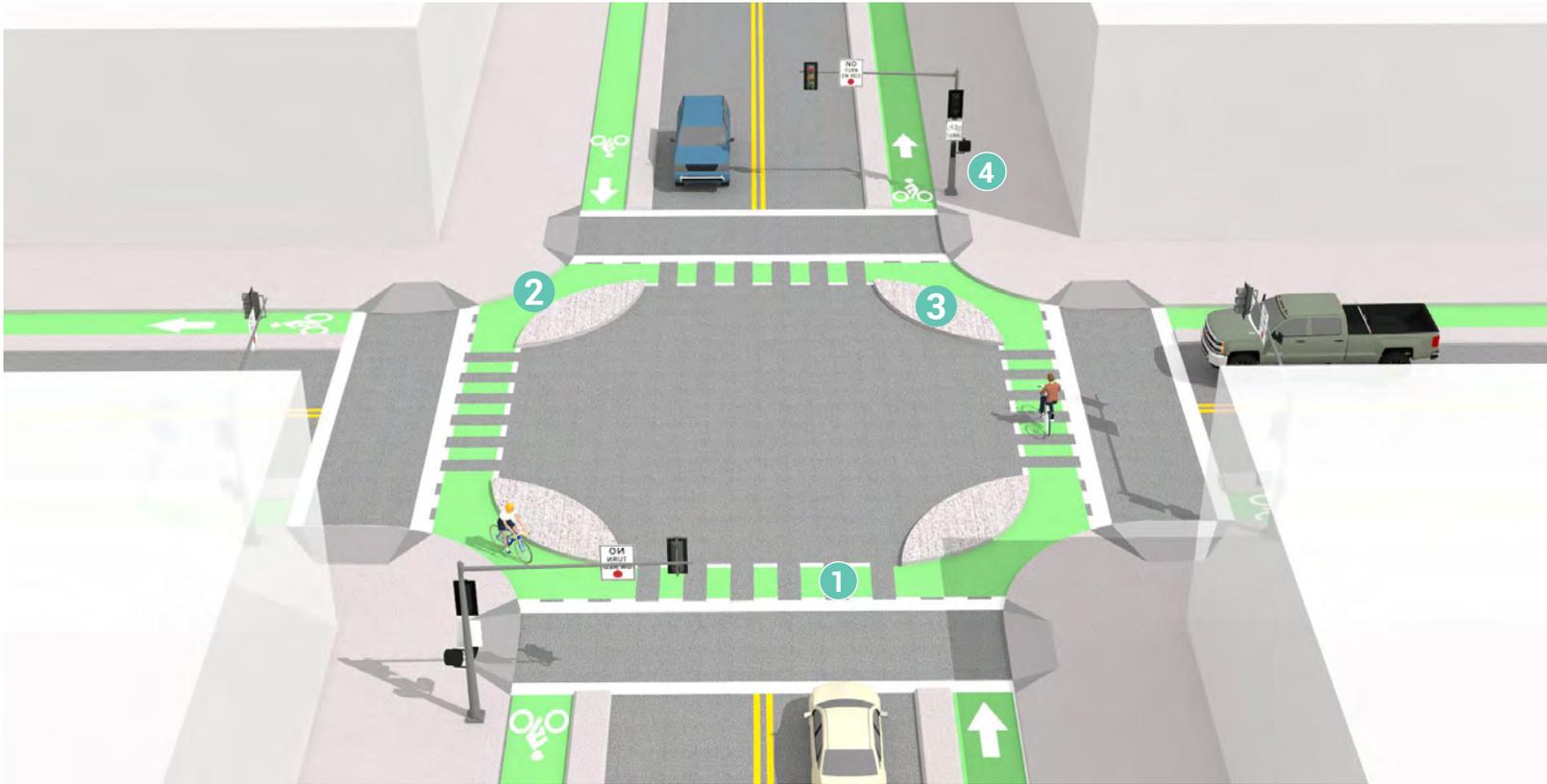


Figure 4.25: Protected Intersection

## Intersection Treatment

## 4.13 Beacons



Dallas, TX

● Off-Street

## DESCRIPTION

Active warning beacons are user-actuated amber flashing lights that supplement warning signs at un-signalized intersections or mid-block crosswalks.

## ACTIVE WARNING BEACON

## BENEFITS

Offers lower cost alternative to traffic signals and Toucans.

Significantly increases driver yielding behavior at crossings when supplementing standard crossing warning signs and markings.

## APPLICATION

At locations where bike facilities cross roads at mid-block locations or at intersections where signals are not warranted or desired.

## TOUCAN

## BENEFITS

Creates gaps for people biking to cross busy streets.

Can be implemented when a conventional signal warrant is not met or where a conventional traffic signal is not desired due to the potential to increase traffic volumes.

## APPLICATION

Where bike routes intersect major streets without existing signalized crossings.

At mid-block crossings of major roadways with high crossing volumes.

## ACTIVE WARNING BEACON

### ELEMENTS

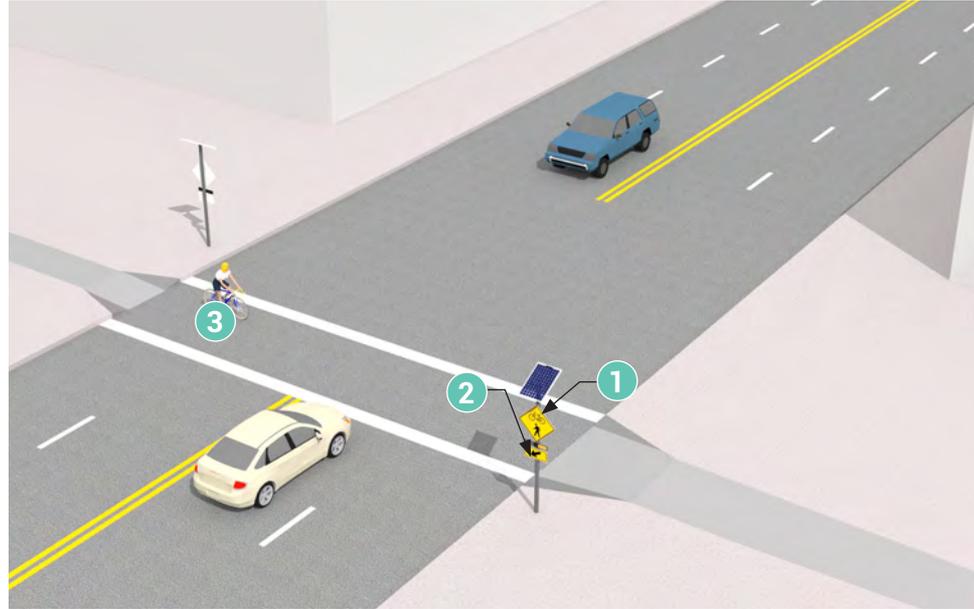
- 1 Active warning beacons are installed on the side of the road. There may be secondary installations in center islands or medians.
- 2 Push button actuation is provided so people biking can activate the signal without dismounting.
- 3 Active warning beacons supplement standard person walking and bicycle crossing signs and markings.

## TOUCAN

### ELEMENTS

- 4 Traffic signal heads alert traffic to crossing people on bicycles and people on foot.
- 5 Where present, right turn movements are typically stop controlled
- 6 The installation includes suitable signs and pavement markings.

Active Warning Beacon



Toucan



Figure 4.26: Beacons

*Intersection Treatment*

## 4.14 Median Refuge Island

*Portland, OR*

- Off-Street
- Dedicated
- Shared

**DESCRIPTION**

Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and person walking crossings of two-way streets by allowing people biking and people walking to navigate only one direction of traffic at a time.

**BENEFITS**

Allows people biking to more comfortably cross streets.

Provides a protected space for people biking to wait for an acceptable gap in traffic.

Reduces the overall crossing length and exposure to vehicle traffic for a person biking or person walking.

Calms traffic on a street by physically narrowing the roadway and potentially restricts motor vehicle left turn movements.

Establishes and reinforces bicycle priority on bicycle boulevards by restricting vehicle through movements.

**APPLICATION**

Where a bikeway crosses a moderate to high volume or high-speed street.

At key bicycle and pedestrian connections.

Where it is desirable to restrict vehicle through movements, a median can double as a divider to prevent cut-through traffic on a bicycle route.

**ELEMENTS**

- 1 Where a median refuge is intended for use by people on bicycles, the median should be designed to comfortably accommodate the use of a bicycle
- 2 On a two-way street, the median refuge is placed between the opposing directions of travel.
- 3 At signalized intersections, push buttons or other detection methods may be provided to actuate the signal head.
- 4 The median refuge can be carried across the entire cross street approach to act as a divider to prevent cut-through traffic on a bicycle route.

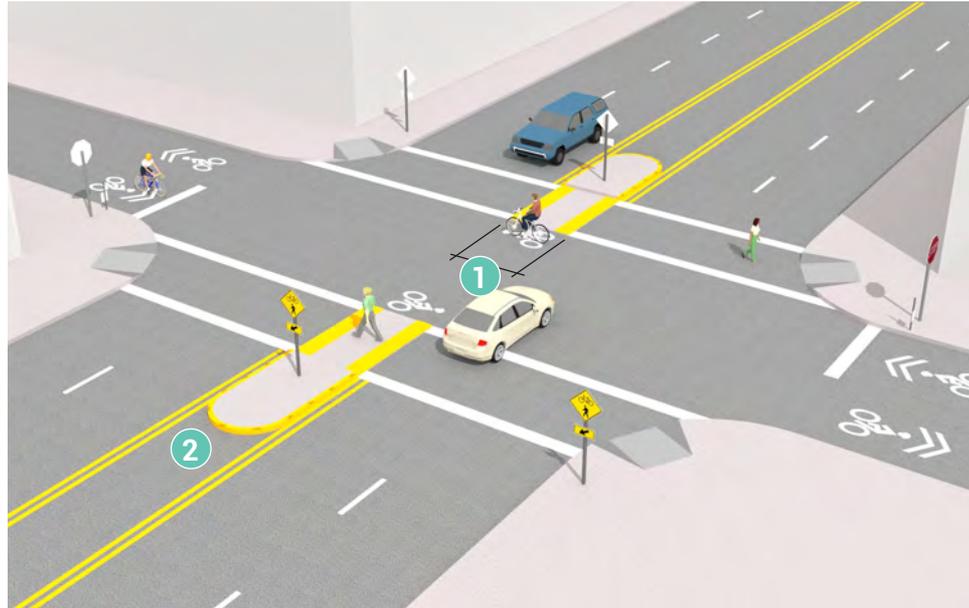


Figure 4.27: Barrier Refuge

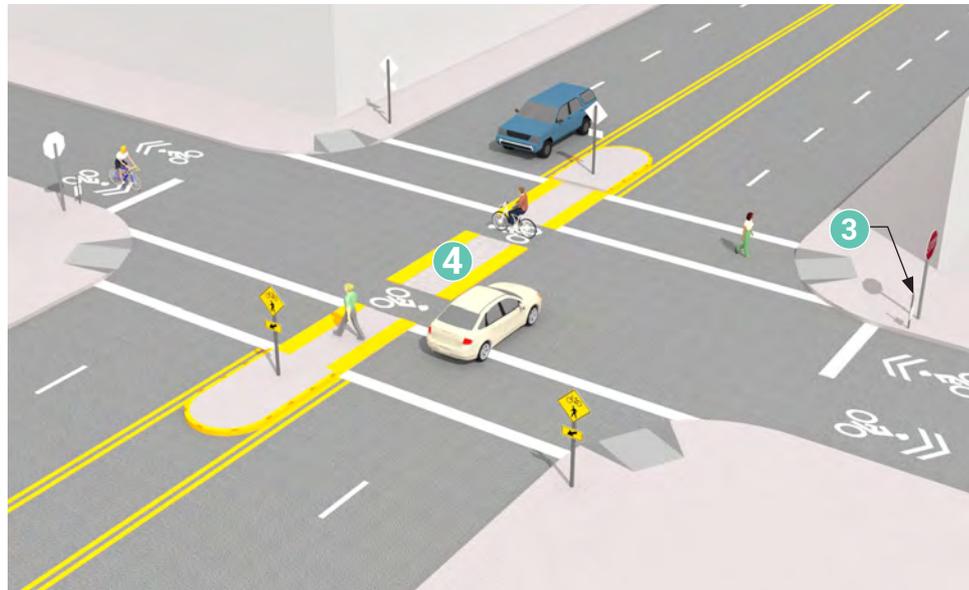


Figure 4.28: Median Refuge Island

*Intersection Treatment*

## 4.15 Neighborhood Bikeway Intersections

*Portland, OR***Shared****DESCRIPTION**

Neighborhood bikeways function best when they have low traffic and a continuous flow. Design for crossings of minor streets can give the right-of-way to bicycle traffic, with stop signs only present on the intersecting street. Geometric design elements may also be considered in order to reduce speed and volume where necessary.

**BENEFITS**

Provides uninterrupted route through neighborhoods.

Protects people biking at minor intersections.

Manages vehicle volume on Neighborhood Bikeways, providing a more comfortable and safer route.

**APPLICATION**

On Neighborhood Bikeways.

In conditions which modification to traffic are necessary.

**ELEMENTS**

- 1 Stop signs on intersecting streets, give the right-of-way to traffic on the Neighborhood Bikeway, while the city does not typically mark stop bars on neighborhoods streets, they may be beneficial for safety purposes on some corridors.
- 2 Provide bicycle safety treatments, such as mini roundabouts, curb extensions, and median islands where necessary to improve the safety of people bicycling.

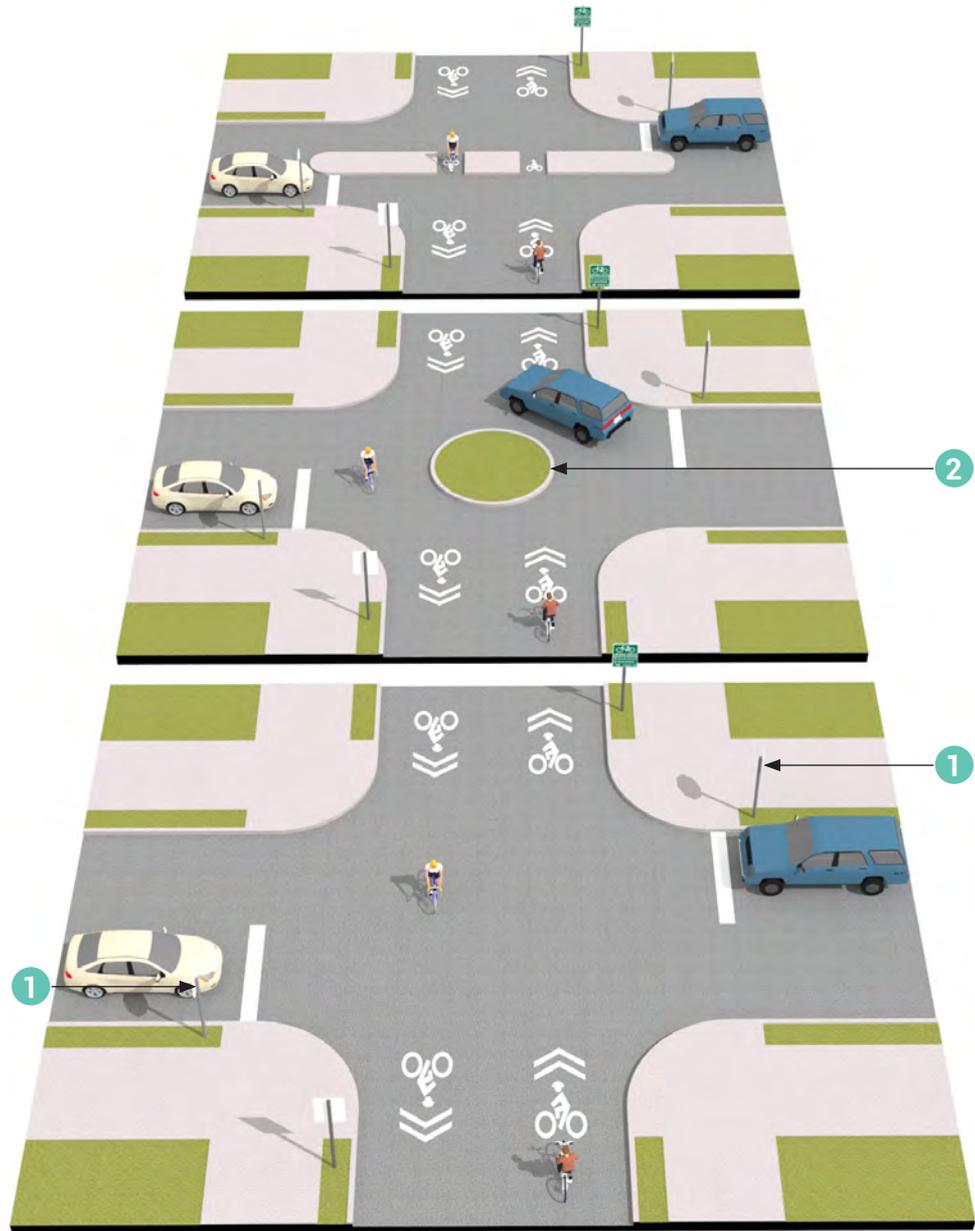


Figure 4.29: Bike Crossings of Minor Streets

## Signaling

## 4.16 Bike Signal Treatments



Seattle, WA

- Off-Street
- Dedicated
- Shared

**DESCRIPTION**

The operation of bicycle signals can be implemented to allow for safer and more efficient bicycle operations.

**BENEFITS**

Allows for dedicated bicycle phasing at a signalized intersection.

Can allow bicycle leading interval, giving people on bicycles a green light before people in cars, to increase visibility in the intersection.

Supports contraflow bicycle movements at a traffic signal.

Clarifies bike movements.

**APPLICATION**

Design for bicycles at all signalized intersections.

## ELEMENTS

- 1 The bicycle signal is in a location clearly visible to oncoming bicycles and is marked with a "Bicycle Signal" sign.
- 2 Either provide a bicycle signal on each phase or activate through loops or another detection method. Push buttons for bikes are not desirable.
- 3 Consider a bike leading interval so that people on bicycles can start across the intersections first.



Figure 4.30: Bike Signal Treatments

*Special Conditions*

## 4.17 Floating Bus Stop



Seattle, WA

 **Dedicated**

### DESCRIPTION

Floating bus stops are median islands with bus stop facilities that are located between the vehicular traffic lane and bike lane, allowing bicycle traffic to pass behind the island without interruption.

### BENEFITS

Prevents conflict between stopped buses and moving bicycle traffic.

Allows uninterrupted flow of cyclists past bus stop locations.

Prevents merging bus conflicts at bus stops.

### APPLICATION

In locations where high-transit traffic volumes and frequent stops interrupt the bicycle travel lane. Should be considered on any street that has a bicycle lane and frequent transit route(s).

Can be applied on streets where parking lanes are located. The parking lane would terminate and the bicycle lane would shift into that lane.

In instances with no parking lane, if adequate right-of-way space exists, the bicycle lane and sidewalk would bulb away from the street into the person walking realm.

**ELEMENTS**

- 1 The island is designed both for ADA accessibility to the bus and the expected volumes of passengers.
- 2 The island accommodate the length of a city bus (40 ft.). If the route is served by 60 foot articulated buses, it is correspondingly longer.
- 3 The bicycle lane angles around the median island. This slows bicycle traffic down to prevent conflicts between people walking and biking.
- 4 ADA accessible ramps and adequate crosswalks next to the bus stop direct person walking safely across the bike lane. The crosswalk should be raised to emphasize pedestrian right-of-way.

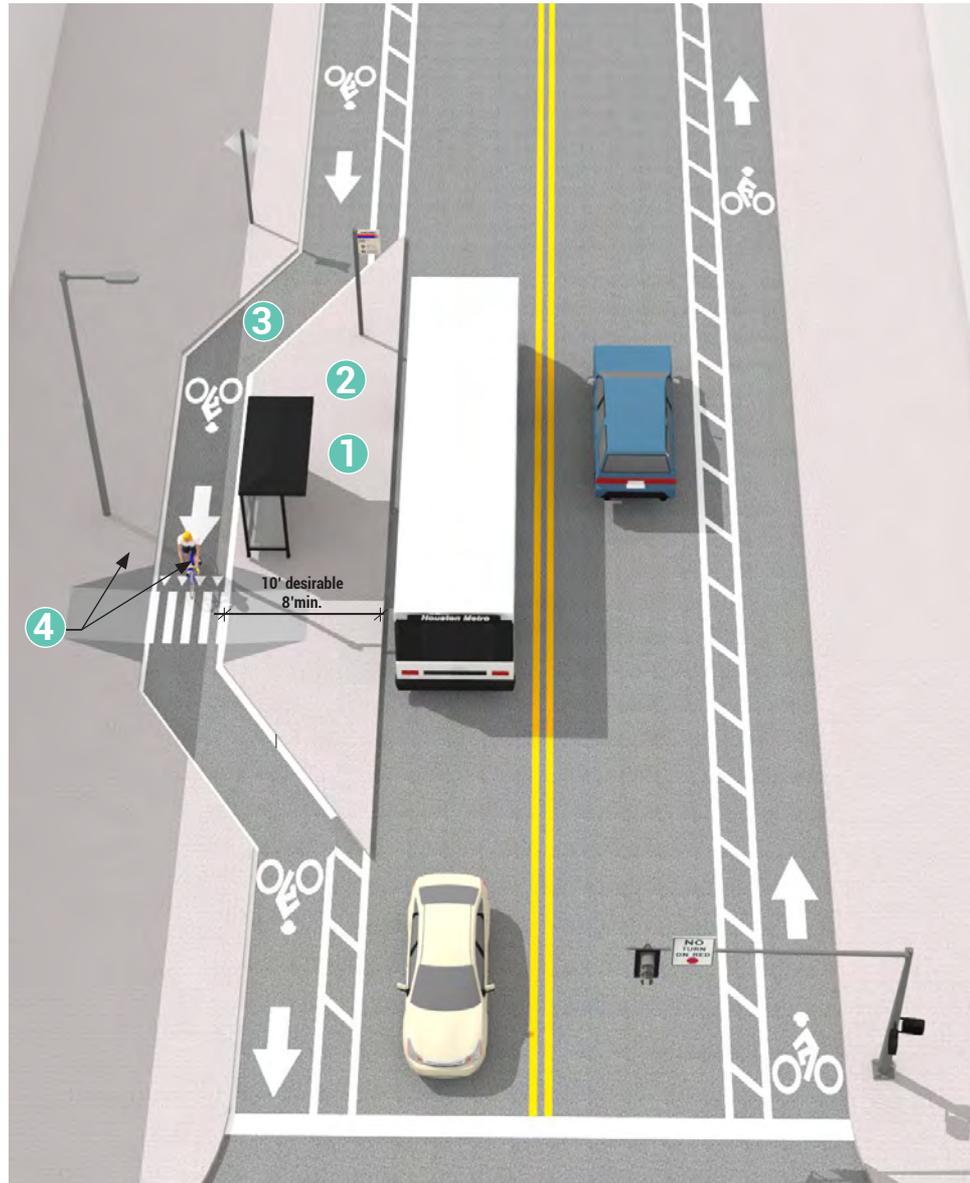


Figure 4.31: Floating Bus Stop

*Special Conditions*

## 4.18 Parking Buffered Bike Lane

*Chicago, IL*

 **Dedicated**

**DESCRIPTION**

Parking buffered bikeways create a separated bikeway facility where a row of parking and a striped buffer is used to create separation between the bikeway and moving traffic.

Bike lanes adjacent to curbside parking lanes should be implemented based on guidance for standard bike lanes with special care taken to eliminate door zone conflicts.

**BENEFITS**

Provides a safer more comfortable environment for people biking, particularly on high volume high speed commercial streets.

Reduces risk of 'dooring' compared to a bike lane and eliminates the risk of a doored bicyclist being run over by a motor vehicle.

Reduces likelihood of illegally parked vehicle blocking bike lane.

**APPLICATION**

On roadways with bicycle lanes and significant parking demand where space allows.

Where parking can provide an additional buffer to people riding in the bike lane to feel comfortable.

Where parking can be integrated with transit stops to provide multimodal corridor.

Where design can allow adequate visibility i for motorists and cyclists.

## ELEMENTS

- 1 Provide adequate striped buffer to minimize risk of dooring. Consider raised barriers to prevent illegally parked vehicles from blocking the bikeway.
- 2 Eliminate parking in advance of intersections and driveways to ensure visibility for cyclists and motorists.
- 3 Design may include floating transit stop islands integrated into parking lane, particularly where there are no conflicts with turning movement.
- 4 Colored pavement may be used to increase visibility and definition at conflict points such as driveways.

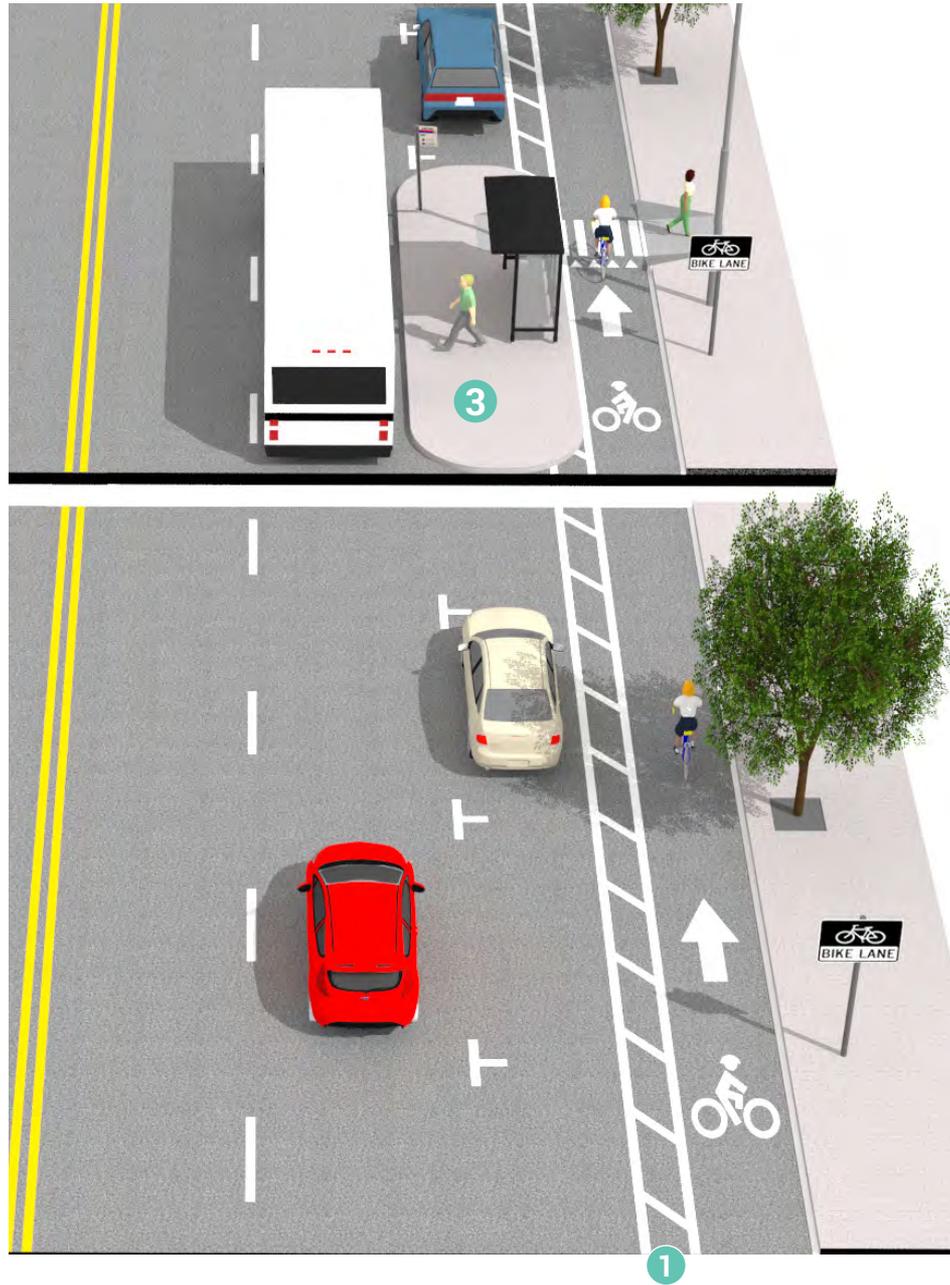


Figure 4.32: Parking Buffered Bike Lane

*Connections*

## 4.19 Bridges / Tunnels

*Houston, TX*

- Off-Street
- Dedicated

**DESCRIPTION**

Bridges and tunnels or over-and-under crossings provide safe grade-separated crossing at major intersections and other obstacles.

**BENEFITS**

Eliminates conflict between people biking and heavy vehicular traffic.

Provides connections over or under impassable barriers such as waterways, railroads, and highways.

Connects disjointed areas.

**APPLICATION**

In locations where an impassable barrier exists (highway, waterway, railroad tracks, extreme grade change, and high traffic crossing).

Typically applied to Off-Street Paths.

### BRIDGE ELEMENTS

- 1 The two way bridge path should be sufficiently wide for two way bike traffic to pass comfortably.
- 2 If the bridge is used by pedestrians, slopes must comply with ADA Standards.

### TUNNEL ELEMENTS

- 3 The two-way tunnel path should be sufficiently wide for two way bicycle traffic to pass comfortably.
- 4 Consider appropriate overhead clearance requirements in design.
- 5 If the underpass is used by pedestrians, slopes must comply with ADA Standards.
- 6 Safety and security measures should be considered (proper lighting, line of sight).
- 7 Drainage should be considered at low points to prevent unsafe biking conditions and blockage of route.

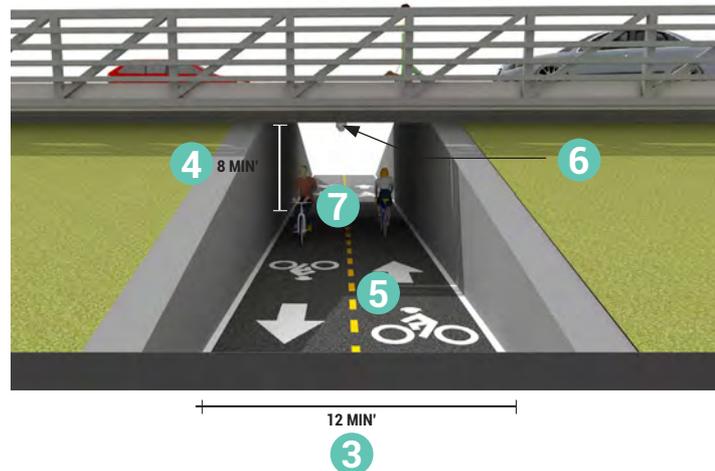
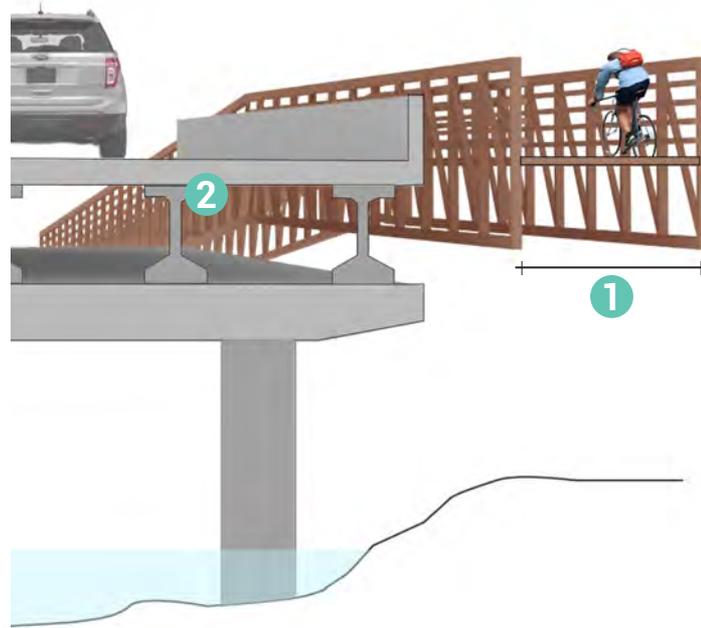


Figure 4.33: Bridges / Tunnels

## Connections

## 4.20 Shortcuts



Houston, TX

- Off-Street
- Dedicated
- Shared

## DESCRIPTION

A bicycle and person walking only connection between on-street bicycle facilities to enable more direct bicycle trips than could be made solely by using the street network.

## BENEFITS

Creates quicker bicycle trips.

Avoids indirect, long trips if street network only were used.

## APPLICATION

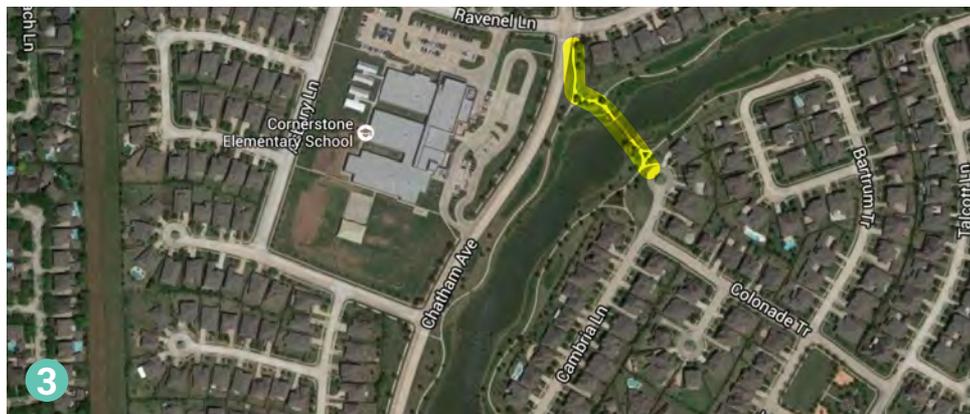
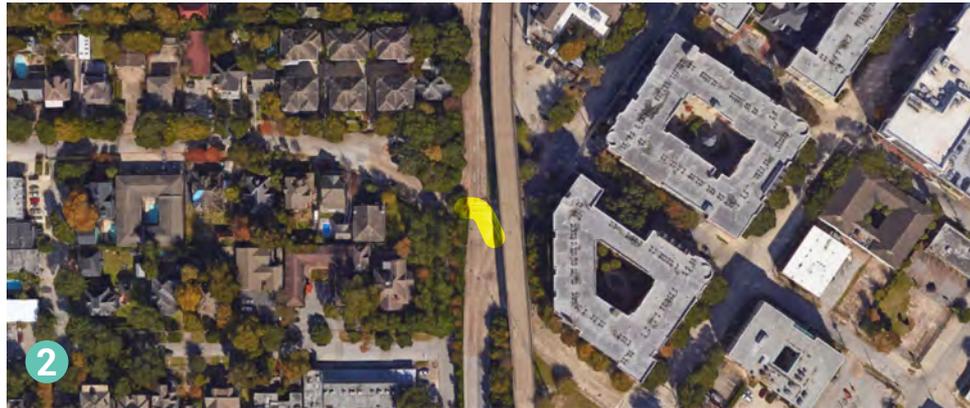
Provide shortcuts where they allow more direct connections between bicycle routes.

Provide shortcuts where they connect additional neighborhoods to the bicycle network.

Provide shortcuts where they allow people biking to make trips on low-traffic streets and avoid congested areas or high-speed traffic.

## EXAMPLES

- 1** Davis, CA: A short off-street trail connects high-comfort low-traffic side streets where the only other alternative would be a high-speed, high-traffic arterial through a cloverleaf interchange.
- 2** Houston, TX: Hawthorne Street and Hollman Street are connected with a person walking crosswalk and a short path.
- 3** Sugar Land, TX: A bridge and paths connected to residential streets and cul-de-sacs creates a direct connection between two neighborhoods, making the trip from one side of the lake to another a 0.1 mile trip instead of a 1.4 mile trip.



# Projects - End of Ride

## PARKING

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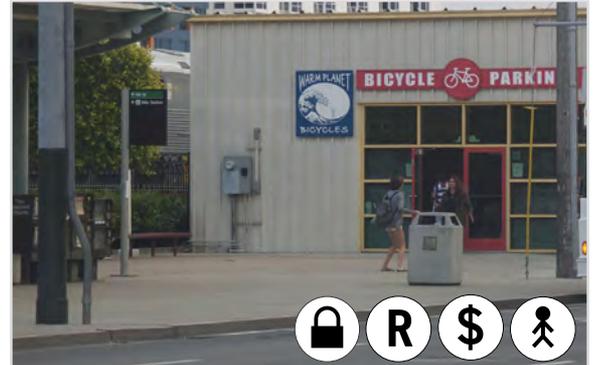


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Most Secure



Can be reserved



Relatively expensive to implement



Relatively inexpensive to implement



Requires significant property



Requires operating staff

Parking

## 4.21 Bike Racks



Houston, TX



### DESCRIPTION

The bike rack is a parking solution for temporary visitors. It is a simple, permanent structure that allows guests with their own locking mechanism to secure the bike frame and one or both wheels.

### BENEFITS

Provides low-cost bike parking.

Creates a highly visible indication that bikes are welcome.

### APPLICATION

Use widely near front doors of any building other than single-family residential.

Locate in person walking realm every block or less in dense commercial zones.

Locate at transit stops.

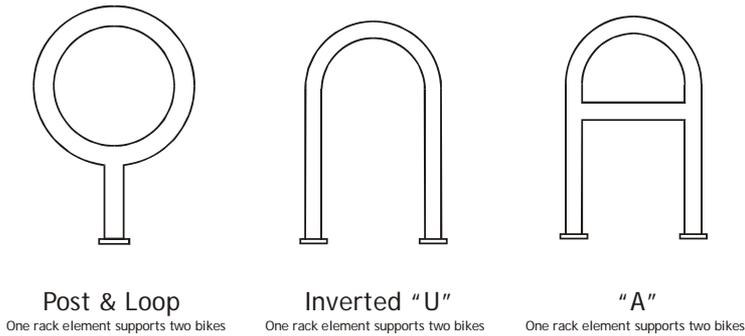
See the “policies” and “programs” sections for ways to encourage the installation of bike parking.

**ELEMENTS**

- Bike racks are, first and foremost, functional objects. While custom designs can be a distinctive element, all bike racks must be easy to understand and use.
- Support the bicycle upright by its frame in two places. Enable the frame and one or both wheels to be secured.
- Racks should be spaced so that there is adequate spacing between bicycles (recommended 36" on center spacing).
- Accommodate locks securing the frame and both wheels (preferably without removing the front wheel from the bicycle).
- Do not impede or interfere with person walking traffic. There should be 30"-36" of space between the curb/edge of building and the end of the bike rack, as well as 30"-36" of space between the end of the bike rack and the person walking corridor. This is to allow adequate space for the bicycles, as well as prevent tripping by people walking and protrusion into vehicular lanes.
- Provide adequate lighting for security, ease of riding, and as a part of wayfinding to identify the location of the parking area.
- Locate the rack to be visible to passersby to promote usage and enhance security.

**RECOMMENDED**

One rack element supports two bikes and can lock both the frame and one or two wheels.



**NOT RECOMMENDED**

These racks options do not properly support the bike or provide adequate security.

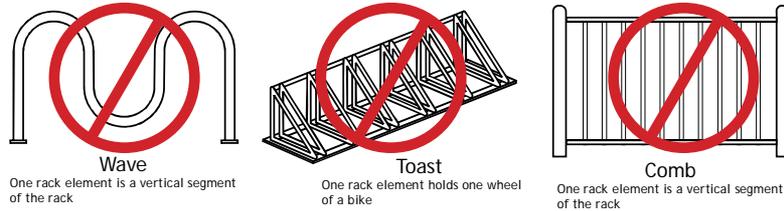


Figure 4.34: AASHTO Recommended Types of Bicycle Racks

**RECOMMENDED CONFIGURATION**

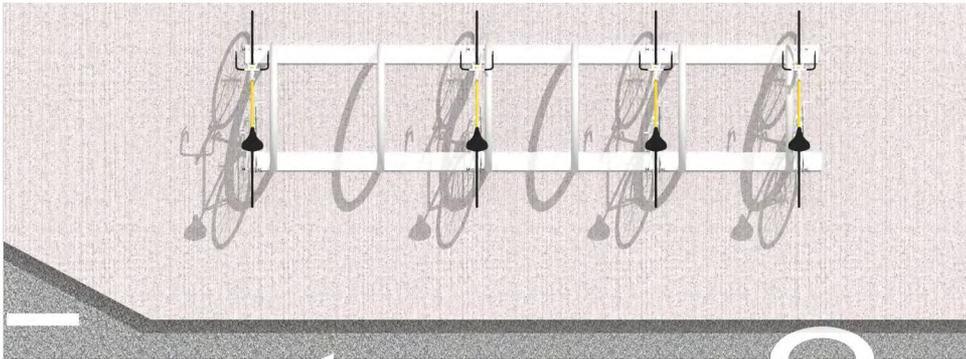


Figure 4.35: Bike Racks

*Parking*

## 4.22 Bike Lockers

*Houston, TX*

### DESCRIPTION

These are stand-alone enclosures designed to hold one bicycle per unit. Each unit is secured with a separate locked door. Each unit is rented monthly to an individual bike commuter for a nominal fee. Alternatively, units are secured with a subscription smart card system that allows any registered user to use any locker.

### BENEFITS

- Provides an additional level of security over bike racks.
- Protects bicycles from the elements.
- Provides a long-term parking solution.
- Encourages bicycle commuting.

### APPLICATION

- Appropriate at any location where the same people will bike every day.
- At employment locations.
- At college campuses.
- At transit stops.
- See the “policies” and “programs” sections for ways to encourage the installation of bike parking.

## ELEMENTS

- 1 Lockers can be controlled with traditional key systems or through preferred subscription systems. Subscription locker programs allow more flexibility within locker use by not restricting access for a user to a single locker. These are typically controlled through magnetic card reading systems.
- 2 Adequate lighting should be required for security, ease of riding, and as a part of wayfinding to identify the location of the parking area.
- 3 Adequate signage should indicate that the facility is a long-term parking facility.
- 4 Signage with directions for use and membership should be posted.
- 5 Several bike locker configurations exist. The basic locker is typically wedge shaped, and can be organized in a radial or rectangular shape. Final configuration should depend on spatial constraints and accessibility.
- 6 If stacked, the top lockers should be equipped with wheel tracks to aid in moving the bicycle to the upper level.
- 7 Adequate space should exist between the person walking sidewalk and the bike lockers to allow for maneuvering and pre-ride preparations.
- 8 Adequate space should exist between lockers and bikeway to allow users to pass those loading and unloading bicycles into a locker. Refer to locker manufacturer specifications.

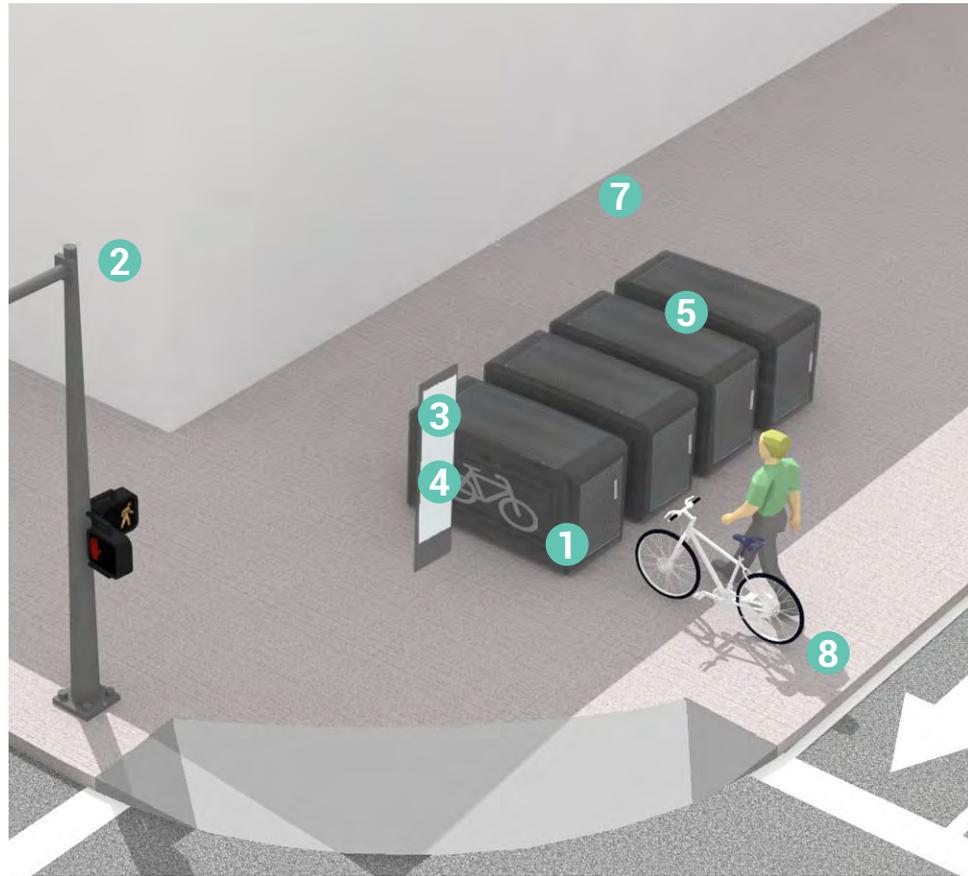


Figure 4.36: Bike Lockers

*Parking*

## 4.23 Bike Cage

*Portland, OR*

### DESCRIPTION

These are un-staffed locked shared enclosures that hold dozens of bicycles and are accessible only to subscribers.

### BENEFITS

More secure than bike racks.

Higher capacity than bike lockers.

Protects bikes from rain and other outdoor elements.

### APPLICATION

At any bike destination where the same users park every day, including employment locations, colleges, and transit stops.

Locate in a prominent location.

See the “policies” and “programs” sections for ways to encourage the installation of bike parking.

## ELEMENTS

- 1 Alternate 1: Locate in existing building or parking garage.
- 2 Alternate 2: Locate as a freestanding building.
- 3 Provide door with key card access to prevent theft and increase security. Manage car access to prevent access by unauthorized users. Facility should operate 24 hours and provide security cameras.
- 4 Bicycles are stored on racks or stacked racks within the facility.
- 5 Bicycles must have protection from the elements.
- 6 The station should be entirely enclosed to provide effective security. If designing an open air facility, impenetrable screening should be used.
- 7 Adequate lighting should be required for security, ease of riding, and as a part of wayfinding to identify the location of the parking area.
- 8 Adequate signage should indicate that the facility is a long term parking facility, provide instructions for users, and inform prospective users how to register.
- 9 Dimension based on specifications for rack manufacturer and projected demand.



Figure 4.37: Bike Cage

Parking

## 4.24 Bike Corral



Portland, OR



### DESCRIPTION

Stand-alone enclosure designed to hold six or more bikes in an area previously used for on-street or off-street parking. Currently allowed in permanent parking space in City of Houston Infrastructure Design Manual.

### BENEFITS

Provides additional bike parking in high demand areas.

8-10 bicycles can park in a location that would hold 1 car or truck.

Highly visible.

### APPLICATION

Use in locations with high bike parking demand where there is not sufficient space on sidewalk or private property for racks.

See the “policies” and “programs” sections for ways to encourage the installation of bike parking.

**ELEMENTS**

- 1 Mark ends of corral with parking blocks, planters, or other visible physical barriers.
- 2 See City of Houston Infrastructure Design Manual for recommended dimensions.
- 3 May stripe with diagonal stripes.



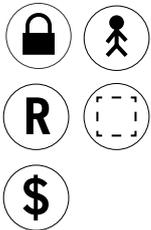
Figure 4.38: Bike Corral

Parking

## 4.25 Bike Station



Berkeley, CA



### DESCRIPTION

These are staffed locations that provide bike valet parking with an attendant as well as other person biking-oriented amenities such as showers/lockers, bicycle supplies, repair stations, and rental options. See San Francisco Bicycle Parking Guidelines.

### BENEFITS

- Provides an additional level of security.
- Protects bicycles from the elements.
- Provides long-term parking solution.
- Encourages bicycle commuting.
- Provides person biking with additional amenities for personal hygiene and bike care.

### APPLICATION

- At major transit hubs.
- In major employment centers.
- At colleges or other major destinations.

**ELEMENTS**

- 1 Facility hours can be limited based on staffing. It is often appropriate to co-locate with a 24-hour bike cage.
- 2 The attendant receives and returns bikes for valet parking, sells supplies, repairs bikes, and provides information.
- 3 Bicycles are stored on racks or stacked racks behind the attendant's desk.
- 4 Facility is completely enclosed and air conditioned.
- 5 Provide self-service bike repair station with air pump and tools.
- 6 Provide an area behind the counter for paid bike repair services.
- 7 Provide shelving to sell bike supplies include tires, parts, helmets, and gear.
- 8 Provide prominent signage.

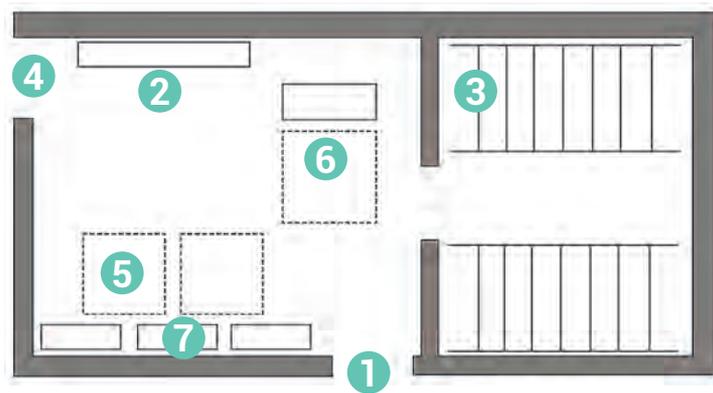


Figure 4.39: Bike Station

## Connections

## 4.26 Bike-and-Ride



Ottawa, ON

**DESCRIPTION**

Parking provided at transit stops so that people can travel to/from transit on a bicycle without taking their bike on the bus or train.

**BENEFITS**

Extends the reach of transit to several miles beyond the transit stops.

Connects residential areas to transit, increasing the transit catchment area.

Provides “last mile” connection from transit stops to employment not directly on transit.

**APPLICATION**

Provide at all major transit hubs, including Park & Rides, transit centers, and rail stations.

Provide at on-street bus stops where demand exists and space is available.

Provide on routes where on-vehicle bike space is regularly filled.

**ELEMENTS**

- Use bike racks, bike corrals, bike lockers, bike cages, or bike stations as appropriate.
- Where parking that requires a subscription (bike lockers or bike cages) or is not available 24 hours (bike station) is used, also provide bike racks.
- Locate bike parking as close to the transit stop as possible. Bike parking should be as close or closer than vehicle parking (except for ADA spaces).

## 4.27 Trail head



San Antonio, TX

### DESCRIPTION

A trail head is parking area with convenient access to an off-street bike trail.

### BENEFITS

Provides access to recreational trails for users who cannot comfortably bike to the trails.

Creates greater visibility of trail access point.

### APPLICATION

Where major off-street paths meet convenient road access and right-of-way is available.

At parks adjacent to off-street paths.

Person walking access and bicycle access should be prioritized over vehicle access.

### ELEMENTS

- A trail head serves as a highly visible gateway and should be attractive and welcoming.
- Ensure that vehicle circulation and parking does not make it difficult or dangerous for people biking to reach the facility from surrounding streets.

Support

## 4.28 Lockers / Showers



Austin, TX



### DESCRIPTION

Lockers and showers to allow riders the ability to shower and change when they arrive at their final destination.

### BENEFITS

Allow people biking to wash and change after a ride.

Supports year-round bicycling in Houston weather.

Makes it easier for people who have jobs that require business casual or business attire to commute by bike.

### APPLICATION

Locate in offices under the management of property owners.

Locate at colleges under the management of the college administration.

Locate in fitness center near employment or other destinations in conjunction with quality bicycle parking.

Maintenance and management are critical. An agency with staff and budget must be identified to operate.

Use is typically limited to subscribers who agree to the terms of use guidelines and are given access cards. Lockers are reserved.

## 4.29 Bike Repair Station



Minneapolis, MN



### DESCRIPTION

Stations with a selection of tools tied down with cables, a fixed hand pump, and a rack for holding a bicycle while working on it. Vending machines with parts, especially tubes, may be provided.

### BENEFITS

Allows people biking to keep their bikes in good condition and repair breakdowns.

### APPLICATION

Any location with high bike usage.

### ELEMENTS

- Provide a rack to suspend a bike.
- Provide common tools for inflating and changing tires, maintaining chains, and adjusting seats and handlebars. Attach tools to rack with cables so they cannot be removed.
- Provide clearance to access bike without blocking circulation.
- Provide a vandal-resistant vending machine and stock with common tubes and other parts.
- Provide lighting.
- Ensure regular inspection, restocking, and maintenance.

## Networks

## 4.30 Bikeshare (Houston B-Cycle)



Houston, TX



## DESCRIPTION

A station where riders can check-out and check-in bikes either by buying a daily membership at the station with a credit card or by using a yearly subscription smart card.

## BENEFITS

Make biking easy for people who do not have bikes or do not have their bike with them.

Can be attractive to recreational or tourism users.

Allows trips without having to utilize personal bicycle.

Can expand reach of transit network.

Can replace many short vehicle trips.

## APPLICATION

Create network of stations spaced to allow access to many other destinations (e.g., every 1/4 mile).

Align with bikeway network to support safe, comfortable riding opportunities.

Locate at major destinations, including, places of employment, colleges, retail, entertainment, cultural institutions, civic buildings, and dense residential.

Locate at light rail stations, major transit stops, and transit centers to expand the reach of the transit system.

## ELEMENTS

- Select highly visible locations.
- Provide sufficient space to allow for circulation without blocking any surrounding bikeways.

## 4.31 Bikes on Transit



Houston, TX

### DESCRIPTION

Provisions for transit riders to take bicycles on board transit vehicles.

### BENEFITS

Extends the reach of transit to several miles beyond the transit stops.

Connects residential areas to transit.

Provides "last mile" connection from transit stops to employment not directly on transit.

### APPLICATION

Provide accommodations for bikes on all transit vehicles as currently provided by Houston METRO.

### ELEMENTS

- Provide external bike racks or underfloor bike storage bins on all buses.
- Provide open floor space for bikes in all trains. Internal bike racks should also be provided.

# Projects - Wayfinding

SIGNAGE + WAYFINDING  
4.32 Comprehensive Wayfinding System .....4-91



MUTCD Signage

## WAYFINDING INTEGRATION

### 4.33 Integration into Building Wayfinding .....4-93



### 4.34 Integration into Transit Wayfinding .....4-94



*Signage + Wayfinding*

## 4.32 Comprehensive Wayfinding System

*Portland, OR*

COH

### DESCRIPTION

A comprehensive set of signs that guides people biking from their origin to their destination along safe connected routes.

### BENEFITS

- Guides cyclists to their destinations .
- Highlights high comfort routes and key connections.
- Increases awareness of the bicycle network.
- Encourages ridership by making people aware of possible destinations.

### APPLICATION

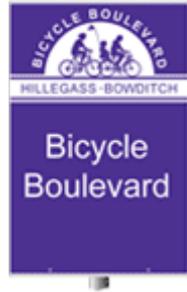
- Provide signs along the entire designated bicycle network.
- Give highest priority to existing high comfort facilities, links to bayou trails, and useful but non-obvious connections.
- MUTCD compliance and standardization support efficient ongoing maintenance.
- Coordinate with Houston Parks Board-implemented Bayou Greenways wayfinding system.

ELEMENTS

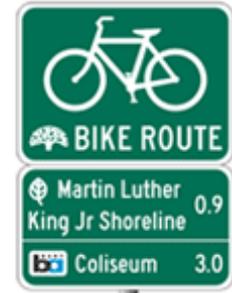
- 1 Follow MUTCD standards for placement and size of signs.
- 2 The design of signs may vary and can include distinctive branding for neighborhoods, the Bayou Greenways network, or specific routes. All signs placed on streets (as opposed to off-street trails) should incorporate an MUTCD bicycle symbol to clearly indicate they are intended for people biking, not cars or people walking.
- 3 All directional signs should include destinations and distances. Distances to destinations should be shown directly on the trail such as parks and civic buildings, to neighborhoods on the trail, and to major activity centers (Downtown, Texas Medical Center, UH/TSU, Greenway Plaza, Uptown, Westchase, Energy Corridor, Greenspoint.) All signs should show distances; minutes may be added to encourage people to explore new destinations.
- 4 Decision signs should be placed in advance of all turns (near side of the intersection) or decision points along the bicycle route. Where there are multiple routes to the same destination, such as a shorter lower comfort route and a longer higher comfort route, it may be appropriate to include additional information.

CONFIRMATION SIGNS

Indicate to people biking that they are on a designated bikeway. Make motorists aware of the bicycle route.



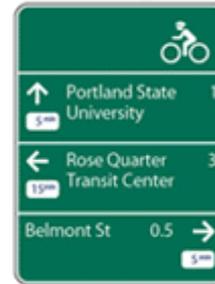
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3

DECISION SIGNS

Mark the junction of two or more bikeways. Inform people biking of the designated bike route to access key destinations.



2



TURN SIGNS

Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.



4

Figure 4.40: Source: NACTO Bike Route Wayfinding Signage System

## Wayfinding Integration

## 4.33 Integration into Building Wayfinding



Portland, OR



### DESCRIPTION

Signs guiding people biking from an on-street or off-street bicycle route to bicycle parking on the grounds of a building or campus.

### BENEFITS

Helps people biking find available parking.

### APPLICATION

Include in all public buildings by policy.

Encourage in all private buildings.

### ELEMENTS

- Integrate signs with building wayfinding.
- Provide signs at regular spacing in visible locations.

## 4.34 Integration into Transit Wayfinding



Portland, OR



### DESCRIPTION

Signage at light rail stations, transit centers, and Park-and-Rides showing connections between transit and bicycle routes.

### BENEFITS

Guides people biking from the bike network to transit.

### APPLICATION

Provide signs from the bicycle path to the station platform or bus boarding area wherever the bicycle network connects to a transit facility.

### ELEMENTS

- Make sure that signs follow a rider's entire path from the transit vehicle to the citywide bicycle network.

# Policies



**COH**  
City



**PA**  
Public Agencies



**BO**  
Building Owners



**TxDOT**



**METRO**



**BO**  
Building Owners

*The icons above are used in this section to identify responsibility of the recommendation and coordination that may be required.*

Policies play a critical role in creating an environment for cycling.

Over the past half century, cities, states, and the federal government have shaped transportation policies around the needs of people in cars. Since bicycles are distinctly different from cars, some of these policies disadvantage people on bicycles and make bicycling less safe or less convenient.

There are many opportunities to make a significant difference with relatively small changes in policy.

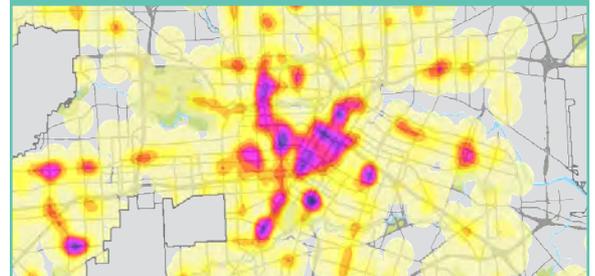
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Standard  
Specifications

## Policies

## 4.35 Complete Streets



Houston, TX



The city's complete streets policy, developed through a Mayoral Executive Order, has been a critical step towards developing more context sensitive street designs that take all users into consideration. But success will ultimately be measured by the continued development of completed networks for people traveling using all modes of transportation. That will require hard decisions. Building a complete street is easy where right-of-way is unconstrained and budgets are unlimited. That is rarely the case.

Where options are constrained, true complete streets thinking requires considering all modes equally given the surrounding land use context. This is a significant change from how the city and the region have designed roads and developed our existing bikeway network. The traditional approach has not resulted in a complete bikeway network.

It may be possible to achieve a complete network by acquiring additional right-of-way or by building a parallel facility on another street. However, these options add cost and if that additional cost moves a project further back into future Capital Improvement Plans, the improved network is delayed. In some cases, creating a complete bicycle network within budget constrains will require providing fewer vehicle lanes than originally desired.

### RECOMMENDATIONS

Further ingrain complete streets and context sensitive design principals into city policies and standards.

Complete streets and context sensitive design should be considered as an ordinance, not just an executive order.

## Policies

## 4.36 CIP Process



Houston, TX

COH

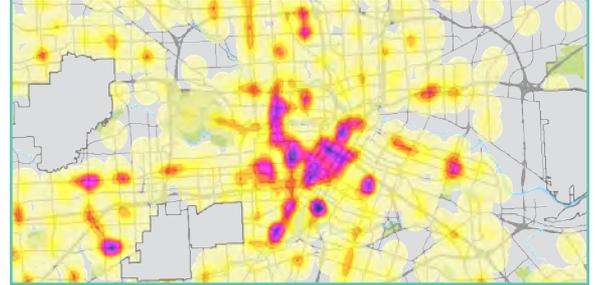
The Capital Improvement Plan process which prioritizes streets for reconstruction primarily considers traffic volumes and pavement conditions in prioritizing corridors for study and reconstruction.

**RECOMMENDATIONS**

Capital Improvement Plan criteria should be updated to allow projects which close key gaps in the bicycle network or improve bicycle safety to be prioritized.

## Policies

## 4.37 Safety and Vision Zero



Houston, TX

COH PA

Crashes and people's sense of safety are key factors in the decisions people make in moving around the city. This impacts people's quality of life regardless of their mode of travel. The most vulnerable road users, including people walking and biking, can be most negatively impacted by safety challenges.

**RECOMMENDATIONS**

Adopt Vision Zero: a goal of eliminating traffic fatalities on city roadways.

Adopt a systematic approach to identify and address root cause issues to reduce the number of serious and fatal crashes that occur in the city.

Develop a forensic approach to identify opportunities to improve safety related to any fatal crash regardless of cause.

## 4.38 Major Thoroughfare Plan

COH

The Bicycle Master Plan should work alongside the Major Thoroughfare Plan to shape the city's transportation network. Because bicycles move at a fraction of the speed of cars, distance matters more to a person biking than to a driver. Thus, major bicycle routes often must be spaced more closely than major thoroughfares, and streets not designated in the Thoroughfare Plan may need to be bike routes.

In addition, current right-of-way designations are insufficient to allow the inclusion of bikeways. For example, typical 4 lane roadways are set as standard 80 ft right-of-way. Assuming 2-6 ft bike lanes, 4-11 ft travel lanes, a 16 ft median and two 10 ft pedestrian realms, all typical standard dimensions for that design element, it equals 92 ft. Standard 80' right-of-ways would require some trade off to support multimodal street design or acquisition of additional right-of-way.

The MTFP is a regulatory document directly impacting private development through right-of-way dedication, building setbacks, and other requirements. Unlike the MTFP, the Bike Plan is a guide for implementing bicycle facilities by public agencies, and has no regulatory impact. The Bike Plan does have a potential impact on MTFP designations. Adding a bicycle facility can modify the

right-of-way needs for a particular street. The recommendations of the Bike Plan are only one component that determines the amount of ROW needed for a street. Some streets will need additional considerations for parking, transit, vehicular lanes, medians and pedestrian needs. Additional analysis is needed to consider all of the modes of transportation for a street and its ultimate ROW needs.

The City regularly performs this analysis, for example, through its sub-regional mobility studies and its preliminary pre-engineering studies, and proposes amendments to the MTFP accordingly with the ROW needs determined in these studies. The Bike Plan alone does not provide adequate design detail to determine the ROW need of a street or its MTFP designation. Updates to the MTFP take into consideration the Houston Bike Plan and future plan updates, completed sub-regional mobility studies, and other applicable plans

### RECOMMENDATIONS

Coordination is required where a bike route is on a street also designated on the thoroughfare plan. Staff should evaluate the designated bike routes to make sure that the current thoroughfare designation, right-of-way width, and number of lanes and propose adjusted designations where required. Standard right-of-ways for particular lane counts should also be reviewed and policies such as Chapter 42 amended as needed to support the development of multimodal corridors.

## Policies

## 4.39 Bike Connections in New Developments



Toronto, Ontario



Frequently, development standards do not take bicycle connectivity into account when sites are developed.

**RECOMMENDATIONS**

City development ordinances should be updated to require all new developments to provide safe bicycle connections from surrounding public roadways to the front doors of all buildings. Development standards should also be updated to provide bicycle-only “shortcuts” where cul-de-sacs or a lack of roadway connections would require people biking to go more than 1/4 mile out of their way to reach a surrounding roadway. This recommendation complements and builds upon a similar mobility recommendations in the City of Houston’s Northwest Sub-regional Study completed in 2015.

## Policies

## 4.40 Infrastructure Design Manual



Houston, TX



The city’s Infrastructure Design Manual, which guides the design of every city street, should be updated to include the tools in this toolbox. While the City of Houston has proven itself capable of designing great bike facilities with the focused attention of city staff and the hiring of consultants with deep bicycle expertise, this is not possible on every project. Incorporating bicycle facilities in the IDM, with standard details, will enable high quality design facilities to be realized on a “typical” street project, regardless of the designer.

**RECOMMENDATIONS**

The Infrastructure Design Manual, which guides the design of every city street, should be updated to include tools in this toolbox. IDM standards should also be examined to consider their bicycle safety impacts on streets where cars and bikes share right-of-way.

## Policies

## 4.41 Construction Coordination



Houston, TX

COH

Houston is a growing city and new development projects and roadway and utility construction projects continue to impact the streets and bikeways in the city. Given the limited network of existing high comfort bikeways in the city, when one is disrupted by a construction project, there can be limited alternatives for people bicycling to make their desired trips. These impacts occur on city streets and also the network of off-street bike paths. Continued expansion of the bikeway network will provide more alternatives but also more potential locations that may be impacted by roadway and development construction projects.

Currently, policies in the city require addressing these impacts on a street corridor when they are linked to impacts in vehicle traffic lanes but specific bikeway issues tend to be handled in an ad hoc fashion. Off-street

facilities, frequently maintained by the City of Houston Parks Department or partners like the Houston Parks Board, also have limited ability to require the provision of a detour when construction impacts the use of a trail or path.

The City of Seattle recently developed a new Construction Management Plan policy to handle construction in walking and biking hotspots to try and modernize its policy for working with developers to incorporate a multi-modal approach to these issues. This policy develops stricter requirements when bikeways and sidewalks can be impacted by construction projects and the required mitigations.

### RECOMMENDATIONS

Develop Construction Management Planning policies that support the City of Houston's ability to require the mitigation of impacts to the bikeway network due to construction projects. This should include maintaining the existing bikeways where possible and the provision of a suitable alternative where closure is required for any meaningful amount of time. The City should also take the lead in providing quality alternatives and other mitigations when performing roadway or utility construction projects as part of CIP projects.

*Policies*

## 4.42 Dedicated Funding Source

*Houston, TX*

COH

There is currently no dedicated funding source for bikeway projects. This includes both the capital funds required to build or stripe new facilities or funds for ongoing maintenance. Without dedicated and predictable funding, implementation of the bikeway plan becomes challenging. This also presents challenges when trying to communicate and discuss priorities with the community as lack of reliable funding makes time lines difficult to set.

### RECOMMENDATIONS

Develop dedicated funding source/stream for bike project as capital and/or operations projects. Find ways to allow projects to be funded and implemented more rapidly than allowed by current CIP process.

*Policies*

## 4.43 Pursue Funding Opportunities



COH

The City of Houston has typically avoided using federal funds for transportation projects (except very large ones) deeming the management of the projects not worth the additional funding. With city finances tight, federal grant funds could be valuable in moving more projects forward and expanding the high-comfort bicycle network sooner.

### RECOMMENDATIONS

The city should look at ways to use federal funds and other available sources either by applying for funds directly or by partnering with other organizations that already use federal funds, such as management districts, METRO, or the Texas Department of Transportation. This can be done most effectively by packaging improvements into larger projects, such a long connected routes or upgrades to entire neighborhoods.

## Policies

### 4.44 Include Bike Facilities in Restriping / Overlays



Houston, TX

COH

One of the ways that many cities are expanding their bikeway network is to implement pavement marking changes as part of regularly scheduled street maintenance. As street surfaces are overlaid, which improves the riding surface of a street without a complete rebuild, the City of Phoenix has been reviewing projects for the potential of adding bicycle facilities. Where capacity exists, either through narrowing vehicle travel lane widths or reallocation of space, new pavement markings have been applied to include bikeway facilities including bike lanes and bike routes. This has been done both with grant funding obtained by the city as well as through regular maintenance programs.

Regular maintenance of on-street pavement markings and street restriping programs are another opportunity to improve and expand the bikeway network. As streets that have

been identified as potential bikeways are restriped, new comfortable bike lanes and intersection enhancements such as bike boxes can be considered. These may require modifications to existing traffic signal timing or detection which should be considered in the implementation of the programs.

## RECOMMENDATIONS

When streets are overlaid, or pavement markings are maintained, street corridors on the City of Houston Bikeway Map should be reviewed and bikeways and intersection improvements should be included where possible. This will likely require additional oversight of maintenance projects by the City's Traffic Operations Division. Improvements that are made through maintenance projects should be captured on the City's existing bicycle map and in performance metrics collected by the city. New projects should be celebrated as expansions of the high-comfort bikeway network.

## Policies

## 4.45 Speed Limits



Portland, OR



State law sets speed limits in urban areas at 30mph unless designated otherwise. However, the state permits cities to set speed limits as low as 25 mph on streets of four lanes or less that are not state highways. There is a dramatic difference in bike safety and level of comfort between these speeds. FHWA's "Bicycle Road Safety Audit Guidelines and Prompt Lists" cites studies which showed that the percentage of people biking killed or severely injured on streets with 30-35 mph speed limits was twice as much as on streets with 20-25 mph speed limits.

**RECOMMENDATIONS**

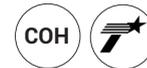
The city should support legislative action to allow a citywide speed limit of 25 mph for neighborhood streets, including neighborhood bikeways.

## Policies

## 4.46 Lighting



Seattle, WA



Roadway lighting in the City of Houston is installed and maintained by CenterPoint Energy to standards agreed upon by CenterPoint and the City of Houston. This lighting is intended to be adequate for on street lighting. In cases where lighting does not exist or a facility is off-street, enhanced lighting may be provided. AASHTO calls for average maintained horizontal illumination levels of 5 lux to 22 lux.

**RECOMMENDATIONS**

Where possible, provide lighting on off-street trails that form a key part of the city's bicycle network and cannot be avoided at night by the use of parallel safe on-street facilities.

## Policies

## 4.47 Bikes on Sidewalks Ordinance



Houston, TX

COH

Current city ordinance restricts riding a bicycle on the sidewalk in commercial zones. Without many attractive alternatives, sidewalks are often the most comfortable place to ride in commercial areas that have many destinations people want to reach by bicycle.

**RECOMMENDATIONS**

The City Ordinance should be updated to allow people biking to ride on sidewalks. The Ordinance should continue to require people biking to yield to people walking.

This would match general current practice and take an ordinance that is not currently enforced off the books.

## Policies

## 4.48 Bike Crossing of Minor Street



Portland, OR

COH

Where people biking cross a major street and no traffic control is provided to enable them to cross, they must either detour out of their way to the nearest signal (which by city standards could be 1/4 mile away) or risk crossing at that location.

Under current city practices, where a well-traveled bike path crosses a minor street, the path has stop signs, while the street does not. This stopping and starting has a much greater impact on people biking than on a vehicle. It also encourages law-abiding cyclists to use arterials instead of off-street bike paths.

**RECOMMENDATIONS**

As bicycle volumes increase, monitor and consider appropriate treatments of bicycle paths crossing minor streets on a case by case basis.

*Policies*

## 4.49 Prohibit parking in bike lanes

*Houston, TX*

COH

Currently, parking is allowed in on-street bike lanes unless there is specific signage prohibiting people from parking their vehicles there. Placing signage along existing and future bike lanes would be costly and create significant additional sign clutter.

While not universal, in many cities such as Chicago, parking in a bike lane is illegal and subject to ticketing and a fine and does not require the additional of a "No Parking in the Bike Lane" sign. In Chicago the fine for parking in a bike lane is \$150.

### RECOMMENDATIONS

Develop an ordinance prohibiting parking in a bike lane at all times subject to ticketing, fine ,and/or towing of the vehicle. Coordinate with education of police department to support enforcement of the new regulation.

*Policies*

## 4.50 24 hr operation of trails in city parks

*Houston, TX*

COH

As part of the transportation network people utilize bikeways at all hours of the day. However, many Houston parks are open from dawn to dusk, meaning people riding home later at night would be entering a park when it is officially closed.

Some cities, such as St. Louis, have developed special provisions that allow people bicycling to access the park to utilize the trail for their trip. Signage at the park can create the exception to allow passing through the park but still prevent park use during off-hours for other uses. Where feasible, lighting for the trail should also be provided.

### RECOMMENDATIONS

Develop a provision in the standard park operating hours that allows people bicycling to utilize a trail on the bikeway network through the park 24 hours a day.

Policies

## 4.51 Bike Parking Requirements



Grand Rapids, MI



City parking ordinances require bicycle parking for new office, recreation, food and beverage, and retail uses, and allow additional bike parking to be substituted for car parking.

### RECOMMENDATIONS

This ordinance should be expanded to require or create incentives for bike parking at all buildings except single-family residential, to apply to buildings that are remodeled even if the building use is not changed, and to require bike parking to be within 100 feet of the front door of the building.

Parking should be designed both for short term users, like retail customers, and longer term users, like employees.

Policies

## 4.52 Bike Facilities at Public Buildings



Houston, TX



Convenient bike parking is critical to support an increase in bike usage. The City and other agencies can be role models in providing quality parking to people working at or visiting their facilities.

### RECOMMENDATIONS

Every City-owned building should provide conveniently located, well-lit bike parking located in a highly visible secure location. The City should work with other public agencies to adopt similar policies.

## Policies

## 4.53 Bike Friendly ISDs



Hutto, TX



School aged children are one of the most accessible and important groups of potential people biking. Yet, many do not receive formal training and encouragement to ride.

**RECOMMENDATIONS**

The City should work with school districts to encourage biking to school by providing secure bike parking, setting clear policies on bike riding to school, providing safety training as part of the curriculum, and regularly communicating to parents and students.

## Policies

## 4.54 Agency Coordination



Achieving the City's Vision of a bicycle friendly city will require coordination with many partner agencies. As the City builds out its bikeway network and implements policies and programs to improve bicycling, there will be an increase in instances that key bikeways and connections will be on roadways or easements that are controlled by other agencies such as TxDOT, Harris County, or neighboring cities like Bellaire, West University Place, or Missouri City. Each of these entities has or is developing bikeway projects that will connect to the overall City of Houston plan. Many City bikeways intersect streets, frontage roads, toll roads and drainage easements managed by these other agencies.

A lack of coordination can lead to gaps or missed opportunities in a well-connected bikeway network, making trips more difficult for people bicycling in the city. Therefore, it will be important that the City facilitate conversations on network

connectivity, bikeway design elements, and policies to support a consistent experience for people biking. Where possible, the City should advocate for projects that are aligned with the goals outlined in the Bike Plan. Success in achieving the goals, including increased bicycle ridership and improved access to a high-comfort citywide bikeway network accessible by people of all ages and abilities, can be impacted by how partner agencies implement bikeway projects. For example, implementing low-comfort facilities, such as shared lanes on higher speed roadways, is not aligned with the recommendations and guidance in this Plan. On these roadways, a Separated Bike Lane or a Side Path would be a better solution.

## RECOMMENDATIONS

Coordinate with adjacent cities and agencies such as TxDOT, Harris County, and METRO to align the recommendations in the plan with their plans and projects. Existing forums like H-GAC's Pedestrian and Bicycle Subcommittee can be utilized.

Additionally, a **City of Houston Bikeway Program Advisory Committee** comprised of community members, advocacy groups, and public agencies, should be established for coordination and prioritizing future efforts. Targeted meetings should be held on a regular basis to discuss coordination on specific projects and help set the overall vision and priorities for Bike Plan implementation. This is detailed further in **Chapter 6: Implementation Strategies**.

The city can also encourage the use of elements and approaches outlined in this chapter to create consistent bikeway designs, wayfinding approaches, and riding experience for people bicycling in and near the City of Houston.

The City of Austin's 2014 Austin Bicycle Plan also recognizes the importance of coordination with other agencies and provides special considerations for TxDOT roadways. The City of Houston should work with TxDOT to identify the appropriate bikeway types and tools that are pertinent to TxDOT facilities within the City and develop an agreed-upon approach to coordinating and constructing bikeways as identified in the Bike Plan.

# Programs

## PROGRAM TOOLKIT

Programs make up an important but often overlooked component in creating a successful culture of cycling within a city. Uniquely, successful programs may be put into practice by a number of different stakeholders including the City of Houston, management districts, advocacy organizations such as BikeHouston, private businesses, and individuals. Each of these stakeholders plays a role in building a supportive environment for people who ride bikes.

Throughout the country and world, there are literally thousands of bicycle programs, and new ones are being created all the time. While not exhaustive, this toolkit identifies major programs, some of which are already taking place in Houston and could be expanded, and others that would be newly introduced.

Broadly, the programs have been classified in five categories:

- **Certifications**
- **Outreach**
- **Bicycle Access and Repair**
- **Data and Technology**
- **New Facilities and Maintenance**

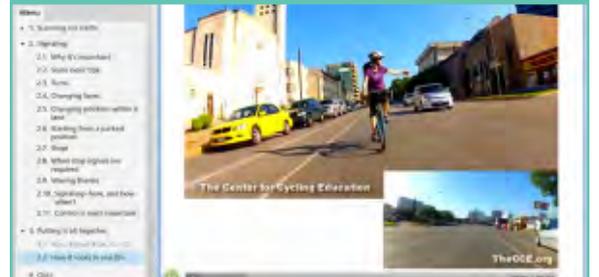
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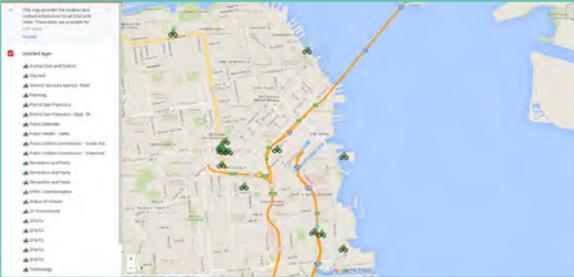
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Engineering



Education



Enforcement



Encouragement



Evaluation

# Programs

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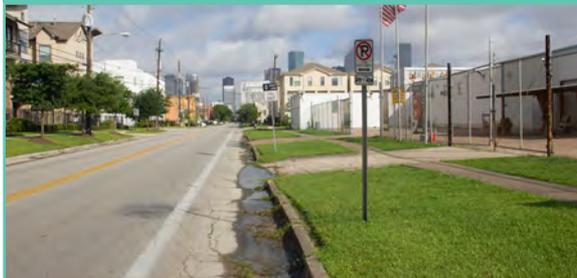
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Engineering



Education



Enforcement



Encouragement



Evaluation

Award / # of Communities / % Total



*Houston is one of five Texas communities that have received a Bicycle Friendly Community designation from the League of American Bicyclists, and is one of 252 communities across the country that have received the bronze award.*

*Source: League of American Bicyclists, Current Bicycle Friendly Communities Fall 2015*

## Programs - Certifications

### 4.55 Bicycle Friendly Certifications



## POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations, Universities, and Private Businesses.

## DESCRIPTION

The Bicycle Friendly Community (BFC) program is administered by the League of American Bicyclists, which guides communities in understanding the opportunities to improve conditions for bicycling. The League has identified focus areas, known as the "Five E's", for creating a bicycle friendly community: engineering, education, encouragement, enforcement, and evaluation/planning.

 **Engineering** addresses the design of the bicycle network and roadway conditions, total mileage of facilities, and access to public transportation.

 **Education** includes public outreach, bicycle classes for adults, and support for schools.

 **Enforcement** is achieved through the creation, enforcement, and interpretation of bicycle-friendly laws and ordinances.

 **Encouragement** is achieved through active bike clubs and events, which are supported by an active bicycle advisory committee and advocacy group.

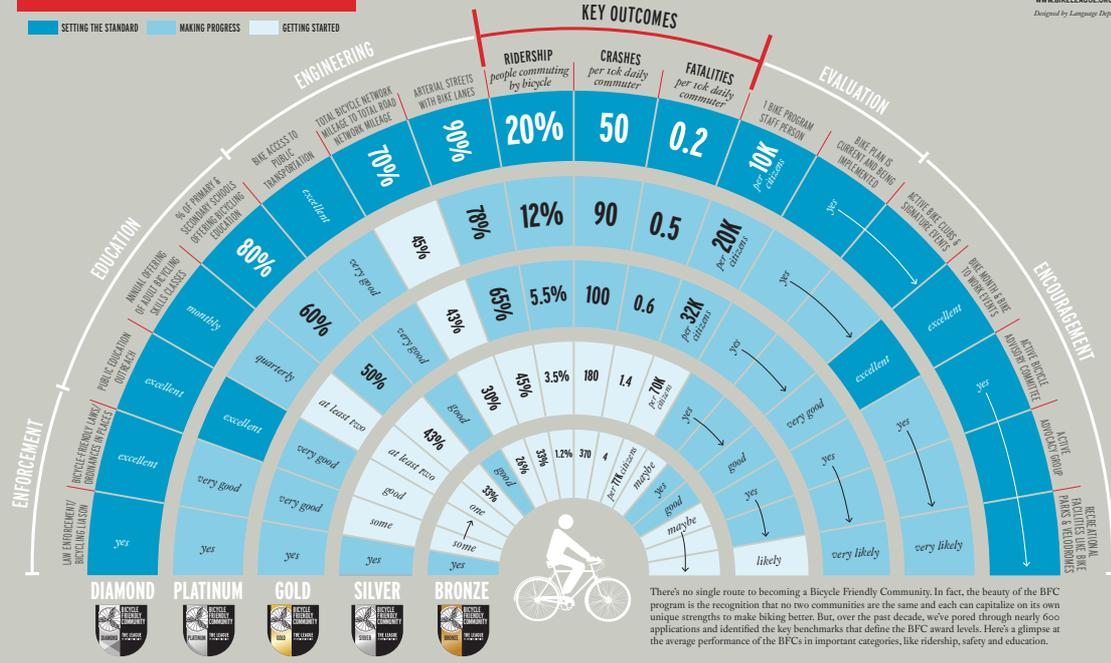
 **Evaluation** of an actively implemented bike plan is supported by bike program staff that help achieve desired outcomes, such as increased ridership and a reduction in crashes and fatalities.

Houston was awarded the bronze-level designation in 2013 and has a goal of achieving the gold-level by 2027. Advancing from bronze to gold in ten years is unprecedented, but achievable with diligent outreach and implementation efforts by the City and its partners in all five areas. Bloomington, Indiana is pursuing the ambitious goal to reach platinum-level from gold in five years, an initiative that has been led by the Bloomington Platinum Bicycle Task Force. Bloomington's implementation strategy details action items for each target including yearly targets for key indicators, cost estimates, and involvement of lead and supporting agencies.

Bicycle Friendly designations may also be pursued by universities and businesses,

# THE BUILDING BLOCKS OF A BICYCLE FRIENDLY COMMUNITY

produced by  
**THE LEAGUE**  
 OF AMERICAN BICYCLISTS  
 WWW.BIKELEAGUE.ORG  
 Designed by Language Dept.



There's no single route to becoming a Bicycle Friendly Community. In fact, the beauty of the BFC program is the recognition that no two communities are the same and each can capitalize on its own unique strengths to make biking better. But, over the past decade, we've pored through nearly 600 applications and identified the key benchmarks that define the BFC award levels. Here's a glimpse at the average performance of the BFCs in important categories, like ridership, safety and education.

## The Building Blocks of a Bicycle Friendly Community

Source: League of American Bicyclists

important pillars of support for the City's effort to improving bicycling conditions for student and employee commuters. Many businesses and universities in Houston may already be well positioned to apply, and the League is a great resource that provides a roadmap for improvements. The League offers a Quick Assessment on their website for those interested in applying.

### RECOMMENDATIONS

A Gold Bicycle Friendly Community designation is an explicit goal of the Houston

Bike Plan. In addition, the City of Houston should coordinate with local universities to create campus bicycle plans and encourage applications for Bicycle Friendly Universities.

The City, management districts, and local advocacy groups should develop programs to assist and encourage private companies to apply for Bicycle Friendly Business designations by providing audits and advice. A specific target – perhaps 100 in 2 years – for increasing the number of bicycle friendly businesses in Houston should be set as goal for this encouragement.

*Bike Safety Training*  
 Source & image courtesy  
 of The Source,  
[thesource.metro.net](http://thesource.metro.net)

Programs - Outreach

## 4.56 Bike Safety Training



### POTENTIAL IMPLEMENTERS

The City of Houston, Municipal Courts, Bicycle Advocacy Organizations.

### DESCRIPTION

Confusion over traffic laws can make it challenging for drivers, people biking, and people walking to coexist. Many members of the local non-profit BikeHouston are certified as League Cycling Instructors by the League of American Bicyclists and offer courses that guide participants at all levels: from basic riding skills to advanced lessons on riding in traffic and avoiding crashes. Although these courses are offered for a fee, the organization also partners with communities for free safety events.

### RECOMMENDATIONS

The City of Houston can increase its role in providing courses to the general public by offering free classes throughout the city at

easily accessible locations. Los Angeles Metro did just that in 2015, and used a \$224,000 grant from the California Office of Traffic Safety to provide free bike safety courses across the region during Bike Week. Classes were offered at three skill levels: Entry Level, Traffic Skills 101, and Intermediate Commuting.

The City can also partner with BikeHouston to offer additional courses and expand their offerings including building upon the on-line training available at [bikeed.org](http://bikeed.org). that has been sponsored by the City of Houston.

Boston Bikes was able to educate citizens on safe biking habits and to determine their level of knowledge on the subject with a single tool, an urban cyclist quiz. The City of Houston can improve on Boston's clever quiz in a number of ways. The City should create an online quiz with questions of greater depth and more critical thinking whose results can then be run to determine relevant statistics such as helmet and light use, intersection precaution, and several other topics of interest outlined in the Bike Plan. The quiz questions should be easily modified to gain insight into a variety of topics that change with every analysis. Its results can serve to inform future programming. Another way to widen the sample of feedback is to enter the participants into a raffle that incrementally distributes a box of prizes. In doing so, the quiz keeps participation up through incentives.

## 4.57 Defensive Cycling



### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

In many communities, people biking are viewed as rule breakers. Unlike driving, safe cycling is not commonly taught in our country. In Houston, adult cyclists who break traffic laws and receive citations have the option to dismiss the citation and waive the fine by taking a Defensive Cycling course.

The course teaches participants about laws that apply to people biking and empowers them to practice safe bicycling behavior.

### RECOMMENDATIONS

Include defensive cycling in annual police officer training and require police officers to proactively inform cyclists about their options.

## 4.58 Bike Shop Outreach

### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

Bike shops are a central component of bike-friendly communities. In addition to a business that sells, rents, and repairs bikes, bike shops often act as social centers and promote cycling by offering classes on riding skills, maintenance, and repairs.

The Portland Bureau of Transportation keeps an up-to-date list of local bike shops on its website. Activities and services are broken down into four categories: shops that offer repair-space by the hour; clinics and group classes; individual tutoring or small-group instruction; and in-depth professional training. The City's bike map also shows the location of bike shops and includes a list of contact information.

### RECOMMENDATION

Maintain a list of bicycle shops and their contact information and publish the information on the City's website. Bike shops can also be integrated into printed maps and other material as sponsors or just as community information.

*Defensive Cycling  
Source & image courtesy  
of The Center for Cycling  
Education, thecce.org*

### Bike Trains

Source: mynorth.com

Image courtesy of  
elgruponorte.org

#### Programs - Outreach

### 4.59 Bike Trains / School Bus



#### POTENTIAL IMPLEMENTERS

The City of Houston, School Districts, Bicycle Advocacy Organizations, Parent Associations.

#### DESCRIPTION

When safe routes to schools are available but underutilized, initiating a “bike train” can create excitement and overcome doubts about safety by helping children learn safe routes, teaching riding skills, and building community among neighbors and families. Nortel, a youth cycling non-profit in Traverse City, Michigan, used a \$25,000 Safe Routes to Schools grant to organize The Great Traverse City Bike Train Experiment, a city-wide effort to create better connectivity between public schools.

Through the program, adult guides led elementary and middle school students on rides through their neighborhood streets and explored safe urban paths to different

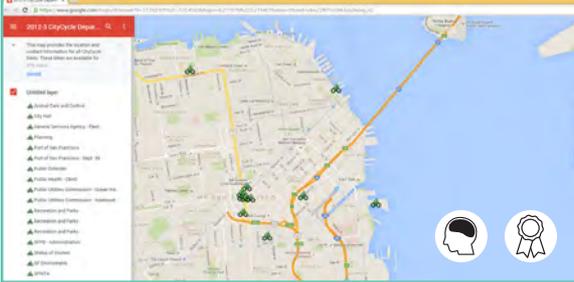
schools. The desired outcomes include: more confident cyclists, increased self-esteem for children, reduced traffic congestion, and stronger social connections between friends and neighbors.

#### RECOMMENDATIONS

In coordination with local school districts, The City of Houston should develop an annual “Bike-to-School” day and coordinate with advocacy organizations and parent associations to develop a bicycle safety program in conjunction with City-wide Bike Trains.

## Programs - Outreach

### 4.60 Commuter Outreach



#### POTENTIAL IMPLEMENTERS

The City of Houston, Management Districts, Bicycle Advocacy Organizations.

#### DESCRIPTION

Outreach to employers about commuting options can encourage them to promote bicycling. Outreach can help employers understand and address conditions that keep employees from cycling, such as a lack of shower facilities. In addition to providing information, employers can host “lunch and learn” events, employee challenges, and other programs to educate and encourage commuters. Non-profit organizations have proven to be strong partners in implementing these programs.

In addition to commuting, work-related trips to job sites and meeting locations present an opportunity to partner with employers and provide company bikes, or bike share memberships. The City and County of San

Francisco initiated the CityCycle program to provide bicycles for each city department that employees can use when traveling to meetings, site visits, etc.

One specific program for employers is the Parking Cash Out Program. By offering free parking spaces, employers inherently subsidize employees who commute by car. A Parking Cash-Out Program allows employees who bike, walk or take transit to receive a cash subsidy, rather than paying for a parking space they do not use. These subsidies create a more equitable situation that allows car-free employees to offset costs, such as bike maintenance or transit fare, or simply keep the cash.

California law requires a Parking Cash-Out Program be initiated by businesses that employ over 50 people and subsidize employee parking. The City of Santa Monica, for example, implements the program as a part its Emission Reduction Plan and offers incentives to reduce the number of employer-subsidized parking spaces.

#### RECOMMENDATIONS

Houston's Management Districts, which typically do a significant amount of outreach to the businesses within their boundaries, are a terrific opportunity for commuter outreach. The City of Houston can team with management districts to craft programs specific to each district.

*Commuter Outreach source & image courtesy of Department of the City and County of San Francisco, [sfenvironment.org](http://sfenvironment.org)*

*Safe Routes Ambassadors  
Sources & image courtesy  
of Chicago Department  
of Transportation,  
chicagocompletestreets.  
org*



### POTENTIAL IMPLEMENTERS

The City of Houston, School Districts, Bicycle Advocacy Organizations, Parent Associations.

### DESCRIPTION

The percentage of children walking and biking to school in the US has dropped drastically since the 1970s. Parents choose to drive their children to school instead, often due to concerns about safety. In addition to creating safer roadway conditions through physical improvements, the City may create a Safe Routes Ambassadors program, like one initiated in Chicago.

The City of Chicago's Department of Transportation offers two programs: the City of Chicago's Safe Routes Ambassadors and the City of Chicago's Bicycling Ambassadors. Ambassadors visit schools twice; first for a safety presentation, and then to conduct an outdoor workshop that applies lessons from

the presentation. The program is funded by a grant from the Illinois Department of Transportation, Division of Traffic Safety and by the Chicago Department of Transportation (CDOT), with staffing assistance from the Active Transportation Alliance.

### RECOMMENDATIONS

In coordination with local school districts, The City of Houston should develop a Safe Routes Ambassadors program. Bicycle advocacy organizations and parent organizations may be able to provide volunteers for the program. The City should set a target for the program.

*Programs - Outreach***4.62 Incentive Programs****POTENTIAL IMPLEMENTERS**

Bicycle Advocacy Organizations, H-GAC.

**DESCRIPTION**

Cycling has many benefits: it is a fun and healthy physical activity, an affordable transportation option, and allows commuters to breeze through rush hour traffic congestion. Several incentive programs have helped cyclists realize these benefits with rewards, prizes and discounts.

Zap Twin Cities enters frequent users (eight or more rides per month) into a drawing for rewards. Similarly, NuRide (available in Houston) allows users to redeem commuting points earned by biking, carpooling, taking transit, and other “green” modes of transportation. Capital Bike Share of Washington DC area offers member benefits that include discounts at participating local businesses.

**RECOMMENDATIONS**

Expand awareness of NuRide and the required resources to support its growth.

*Programs - Outreach***4.63 Guaranteed Ride Home****POTENTIAL IMPLEMENTERS**

City of Houston, Management Districts, Employers.

**DESCRIPTION**

The creation of a Guaranteed Ride Home program helps riders mitigate unpredictable situations that can discourage people from biking, including the possibility of inclement weather, riding at night because of unscheduled overtime, a flat tire, or a family emergency. Houston METRO already has a similar program for transit riders. The Alameda County Transportation Commission offers a Guaranteed Ride Home Program that is supported by the Bay Area Air Quality Transportation Fund for Clean Air. All permanent full-time and part-time employees who are employed within the county, and live within 100 miles of their work site are eligible to participate. Participants can register for this free service, which allows them to take a rental car, car share, or taxi ride, and submit their receipt for reimbursement of the cost.

**RECOMMENDATIONS**

Create a Guaranteed Ride Home program for people who bike to work in conjunction with management districts or private businesses.

*Driver Education*  
 Source & image courtesy of  
 San Francisco Bicycle Coalition,  
[sfbike.org](http://sfbike.org) / [Bike Cleveland,](http://Bike Cleveland, bikecleveland.org)  
[bikecleveland.org](http://bikecleveland.org)

Programs - Outreach

## 4.64 Driver Education



### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations, METRO.

### DESCRIPTION

As more cyclists and drivers share roadways, increased awareness and education is needed to guide their interactions. The San Francisco Bicycle Coalition has partnered with the City and private companies to train thousands of drivers, including 1000+ taxi drivers per year, on making safe turns, loading and unloading, person biking rights, and general rules of the road. The Coalition coordinated with the San Francisco Municipal Transportation Agency to develop a Muni Operator training video, that is regularly viewed by transit operators. The trained professional drivers lead by example and help create safer streets. This type of course could be a valuable exercise for the Houston Police Department, whose officers are responsible for interpreting

and enforcing safety laws. Bike Cleveland organizes a two-day seminar for officers on Enforcement for Pedestrian & Bicycle Safety that covers common causes of person walking and bicycle crashes; person walking & bicycle laws; and protocol for investigating & reporting a crash.

### RECOMMENDATIONS

Develop a driver education program including enhanced education on bicycling specifically targeted at those who spend a great deal of time on Houston's roads and who are regulated by the City. This includes all City of Houston employees, METRO bus drivers, commercial vehicle drivers, and taxi drivers (including Uber and Lyft.) The Houston Police Department and the city's Fleet Management program would be key participants.

Implement a program through the city courts where those with traffic violations, especially those involving a person on a bicycle, can take driver education courses to dismiss their charges.

## Programs - Outreach

### 4.65 Bike Commuter Buddy



#### POTENTIAL IMPLEMENTERS

Bicycle Advocacy Organizations

#### DESCRIPTION

Commuting by bike can be intimidating: dealing with weather, choosing a safe route, navigating through rush hour traffic, and even deciding what to wear can be the difference between choosing to bike or drive. "Bike Buddy" programs connect interested cyclists with experienced riders who act as mentors, teach skills, and build community.

Bike East Bay is a non-profit based out of Oakland, CA that connects people with "bike buddies." Interested participants sign up online to be connected with a buddy. The free program is supported by organization volunteers.

#### RECOMMENDATION

Support and advertise the development of a Bike Buddy program.

## Programs - Outreach

### 4.66 Better Block



#### POTENTIAL IMPLEMENTERS

City of Houston, Bicycle Advocacy Organizations.

#### DESCRIPTION

"Better Block" is an event and demonstration tool that is designed to promote street-life and help communities reimagine the physical environment. The events provide an opportunity to "test" bike lanes, sidewalk bulb-outs, landscaping, parklets, and other streetscape components. These interventions allow the public and implementation partners to experience the proposed right-of-way design. Several better block events have been initiated by volunteer groups and non-profit partnerships in Houston.

#### RECOMMENDATION

Institutionalize temporary projects as an outreach technique for new projects.

*Bike Commuter Buddy  
Source & image courtesy  
of Bike East Bay,  
[bikeeastbay.org](http://bikeeastbay.org)*

*Organized Bike Rides*  
 Source: City of Fort Worth,  
[fortworthtexas.gov](http://fortworthtexas.gov)  
 Image courtesy of: People  
 For Bikes, [peopleforbikes.org](http://peopleforbikes.org)

### Programs - Outreach

## 4.67 Open Streets



### POTENTIAL IMPLEMENTERS

City of Houston

### DESCRIPTION

Open Streets events transform streets into active spaces where people can walk, bike, dance, and socialize. They can be one-time or recurring events, where streets are closed to traffic for a full day or a few hours. The City of Houston has had a successful Open Streets program, Sunday Streets, since Spring 2014. The event is organized by the Department of Health and Human Services and sponsored by Cigna.

### RECOMMENDATION

Expand Sunday Streets HTX to a year round event with the goal of moving to weekly or multiple times per month.

### Programs - Outreach

## 4.68 Organized Bike Rides



### POTENTIAL IMPLEMENTERS

City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

Hosting a city-organized bike ride encourages physical activity in communities, provides face-time between the public and city staff, and an opportunity to discuss bicycle facilities and rules of the road in an informal setting.

Mayor Betsy Price of Fort Worth leads a regular Rolling Town Hall across the City, often joined by Council members and Bike Fort Worth representatives. The ride is 5 to 7 miles long and stops at parks, community centers, and other neighborhood destinations.

### RECOMMENDATION

Build on existing rides like Bayou Bikers and Tour de Houston to develop a regular schedule of group rides with city staff to promote the Bike Plan.

## 4.69 Awareness Campaigns



### POTENTIAL IMPLEMENTERS

City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

Awareness campaigns can be targeted to inform the public about laws and consistent concerns that need to be addressed. Campaign messages should be tailored to local needs and concerns.

For example, after experiencing a 262% increase in commuter cycling, the New York City Department of Transportation initiated a "Don't Be A Jerk" bike safety campaign that humorously highlights issues like riding with traffic (not against), yielding to people walking, and staying off sidewalks.

In the City of Portland, the Smart Trips program targets a specific neighborhood for a door-to-door campaign to help educate people about their opportunities to walk

or bike to work and the available resources that are available to help them do it. This has been shown to lead to a significant increase in walking and biking mode share. This approach can also be combined with outreach on transit or other opportunities.

### RECOMMENDATIONS

Develop an awareness campaign upon completion of the Bike Plan in order to publicize the results of the Plan.

Develop/partner to implement a targeted outreach program similar to Smart Trips to build awareness of opportunities to bike and share other programs that are available to people (e.g., Commuter Buddy).

Develop a safety campaign targeted at both people in cars and people on bicycles.

*Awareness Campaigns  
Source & image courtesy  
of New York Department  
of Transportation*

*Programs - Outreach**4.70 Bicycle Patrol Training***POTENTIAL IMPLEMENTERS**

Houston Police Department

**DESCRIPTION**

The Houston Police Department has a fleet of 361 bikes and has bike patrols operating in a majority of its stations. They serve a variety of purposes, patrolling in major activity centers, neighborhoods, regional parks, airports, and special events. There are many benefits to bike patrols, including being able to access areas that a car cannot, and ability to engage with the community by breaking down the physical barrier of an automobile.

Over 900 officers are trained to conduct bicycle patrols. This training is voluntary; officers must complete an 8 hour Bike Orientation class along with a 32 hour Bike Certification class. Once an officer completes the training, the officer is considered "Bike Certified" and can work Bike Patrol on-duty and on extra-employment.

Additionally, this type of training helps officers better understand the needs and challenges that people biking face on roadways, and learn the rights and responsibilities of a cyclist. HPD also offers an optional Bike Refresher class that officers can take on a yearly basis, and an optional Bike Maintenance class.

HPD also orients all officer on bicycles. A roll call training video updated all officers on the rules of the road for motorists and cyclists, bike safety, and the safe passing ordinance, and two departmental circulars were also released to all officers in regard to the Safe Passing Ordinance. Training for new officers includes the same information.

Raleigh, North Carolina trained all its sworn officers in a "Bicyclist Safety and Law Enforcement" program in 2011, and the Chicago Police Department has put extensive efforts in training new bike patrol, with the allocation of \$2 Million to assemble specially-equipped bikes for its expansion of 200 bike patrol assignments in the city's most dangerous neighborhoods.

**RECOMMENDATIONS**

The Houston Police Department should require all sworn officers to complete a more extensive bicycle safety and law enforcement course

The Houston Police Department should continue to expand the bike patrol and encourage more officers to get bike patrol training.

## 4.71 Earn-a-Bike



participants, who leave the experience with new skills and a bike they can be proud of.

### RECOMMENDATION

Support additional earn-a-bike programs, especially in underserved communities and at elementary and middle schools.

*Earn-a-Bike*  
Image courtesy of Nick De  
La Torre, Chronicle

### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

Earn-a-Bike programs increase access to bikes and empower youth and adults who spend time developing valuable skills by building their own bike. Typically, these programs are organized through non-profit organizations that require participants to volunteer a certain amount of time in return for the training, space and materials to build their own bicycle. Volunteers learn how to build, repair, and maintain cycles through collaboration and hands-on experience.

These organizations often host special volunteer hours to encourage women, children, and other underrepresented groups to participate. Compared to bike giveaways, these types of programs empower

*Bike Repair Workshops*  
 Source: LADOT Bike  
 Program, [ladotbikeblog.wordpress.com](http://ladotbikeblog.wordpress.com)  
 Image courtesy of: Caltech  
 Bike Lab, [caltechbikelab.blogspot.com](http://caltechbikelab.blogspot.com)

## Programs - Access and Repair

### 4.72 Bike Repair Workshops



#### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations.

#### DESCRIPTION

Casual riders are often intimidated by simple problems that are actually easy to repair. Sometimes, these simple problems keep casual riders off the road for several months at a time. Many non-profit organizations offer bike repair workshops to empower people to fix their own bikes. The classes can cover general maintenance skills, flat tires, parts identification, cleanings, safe riding skills, map reading, and connections with transit. These workshops also give riders access to specialized tools for maintenance and repair.

In addition to workshops, cities can install service stations in parks and other places with heavy bike traffic. These self-service stations include tools for changing flat tires, adjusting brakes and derailleurs, and inflating tires. The

LA DOT Bike Program (Los Angeles) installed stations with funding from a \$17,000 grant by the Bikes Belong Foundation.

#### RECOMMENDATION

The City and/or partners should create a system of bicycle repair stations, targeting major trails, bicycle parking facilities, libraries, and multi-service centers.

The City can support advocacy groups and bicycle shops which offer bike repair workshops, especially in undeserved communities.

The City can support advocacy groups and bicycle shops which offer bike repair workshops, especially in underserved communities, by providing venues, organizing logistics, and marketing the workshops.

## Programs - Access and Repair

### 4.73 Bicycle Co-op



#### POTENTIAL IMPLEMENTERS

Non-profit organizations, University programs, bike shop owners.

#### DESCRIPTION

Bicycle co-ops provide affordable bikes and bike repair. These are typically non-profit organizations that are operated by volunteer support and funded by grants. They may also rely heavily on donated supplies to build and repair functioning bicycles.

Fort Collins Bicycle Co-op is dedicated to providing bikes to people who can't afford to purchase one, educating neighbors on all bike-related issues, reclaiming old bikes, and providing for those in need through donated bicycles and other charity events. The organization has a variety of programs that are designed to serve the various needs of the community, including mountain bike outings with undeserved youth and a partnership with

the city to help recover stolen or abandoned bikes.

#### RECOMMENDATIONS

The City should look for opportunities to partner with similar organizations, such as the Third Ward Bike Shop, to determine how partnerships can be developed to achieve common goals. The City can facilitate partnerships between community-based non-profits and bike groups, help develop the proposals, and seek grant funding.

*Bicycle App*  
 Source: City of Toronto,  
 toronto.ca  
 Image courtesy  
 of Dandy Horse,  
 dandyhorsemagazine.com



### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations, H-GAC.

### DESCRIPTION

Online web tools and smart phone apps have become an integral part of trip and route planning, allowing people biking to avoid heavy-traffic roadways and find more bicycle-friendly routes. Existing resources like Google Maps include some functionality for cyclists. Cities can build on these resources by developing an open-source platform for city data and inviting web developers to create apps that are designed specifically for cyclists.

Many cities, including Toronto, San Francisco and Minneapolis have developed official apps and on-line platforms. Cycling Toronto allows cyclists to record their routes, which can be shared with peers and used to inform city planning efforts. Toronto's app has

approximately 3,700 users and features GPS route mapping, real-time trip stats, location of water fountains and bike share stations. The app also provides personalized information, including data on calories burned, greenhouse gas offset, and distance traveled. With enough use, apps can also provide useful data to planners, revealing the most used routes and undeveloped desire lines for cyclists.

### RECOMMENDATION

Develop a bicycling app on the model of Toronto's to inform people who bicycle and collect data for the City's use.

## 4.75 Data Collection



### RECOMMENDATION

The City should expand its existing count program to conduct regular bicycle counts throughout the city including both spot counts and fixed location counts that provide data on seasonality and overall trends.

*Data Collection  
Source: National Bicycle  
and Person walking  
Documentation Project  
Image courtesy of Los  
Angeles County Bicycle  
Coalition, la-bike.org*

### POTENTIAL IMPLEMENTERS

The City of Houston, Bicycle Advocacy Organizations.

### DESCRIPTION

Improving bicycle-related data collection is crucial to understanding and planning for demand and behavior. Data collection provides information about usage before and after infrastructure is improved and to track demand as a means to support future infrastructure investments.

New York City, Seattle, and San Francisco all use the National Bicycle and Pedestrian Documentation (NBPD) methodology to count bicycles and people walking citywide. Counts are collected quarterly in January, May, July, and September - at PM peak (5-7pm), off peak (10am-noon), and Saturday (noon -2pm) time periods at each location.

## Programs

## 4.76 Maps



Houston, TX

**POTENTIAL IMPLEMENTERS**

The City of Houston, BikeHouston.

**DESCRIPTION**

Even with smartphones and online mapping, paper maps are an invaluable tool for understanding the network and discovering new trails.

**RECOMMENDATIONS**

Continue to update high-quality, easy-to-read, pocketable paper maps of the trail system. Distribute through outreach channels and make available online.

## Programs - Facilities and Maintenance

## 4.77 “Adopt-a- . . .” Program

**POTENTIAL IMPLEMENTERS**

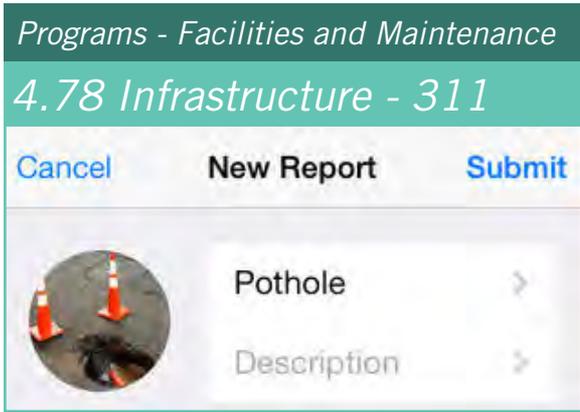
The City of Houston

**DESCRIPTION**

Poor maintenance of bicycle facilities can severely limit their usefulness to the public and the network. At the same time, the costs of maintenance on a city wide level can be difficult. An “adopt-a-bicycle lane” or “adopt-a-trail” program, modeled on similar programs for bus shelters or roadways, would provide additional funding for bicycle specific maintenance. Generally, organizations or individuals are recognized with signage for their contributions.

**RECOMMENDATION**

The City should develop “adopt-a-....” program for bicycle infrastructure.



**POTENTIAL IMPLEMENTERS**

The City of Houston

**DESCRIPTION**

311 provides a useful service for residents throughout Houston. People who bicycle can currently provide feedback on the existing 311 system, a specific code for bicycle related comments will allow them to be sorted and tracked separately.

**RECOMMENDATION**

The City should add a 311 code for bicycle specific feedback to track overall performance on bicycle related issues.

The city should add specific service request categories for bicycle-related items not currently listed in the 311 systems, like debris in a bike lane or bicycles not being detected by signals.



**POTENTIAL IMPLEMENTERS**

ISDs

**DESCRIPTION**

When children ride their bikes to school, children are healthier and both parents and school districts save money.

A safe routes to schools program focuses capital improvements on enabling safe trips for school aged children to get to school. The City of Houston already has this program for children walking to school; it can be expanded to include greater focus on biking as well.

**RECOMMENDATIONS**

The City should work with school districts to identify safe bike routes to schools from neighborhoods within their attendance zones, and to prioritize improvements within those zones in city projects.

*Programs - Facilities and Maintenance***4.80 Bike Rack Grant Program***Houston, TX***POTENTIAL IMPLEMENTERS**

The City of Houston

**DESCRIPTION**

End-of-trip facilities are an important component of a complete bicycle trip. A bicycle network that does not include adequate and convenient parking is unlikely to encourage more people to ride. Two barriers to better parking are access to quality bicycle racks to install (see Bicycle Parking in this chapter for a description of preferred racks) and the process to permit them for placement on city right-of-way. As the Houston Health Department has done recently, grants can be a good way of making bike racks accessible to people who would not otherwise be able to afford them. The Health Department obtained a grant and is working through a process that will allow new bike racks to be installed with partners who are interested. Harris County Health and Environmental

Services Department also obtained a grant which allowed the installation of bicycle racks at light rail transit stations.

It is also important to have a clear process for where bike racks can be installed if considering placing them in the public right-of-way. This includes requirements for placement and clearance for the racks so as not to create hazards, or block sidewalk or other travel ways. It also includes a straightforward permitting process to allow bike racks to be installed in convenient and useful locations.

**RECOMMENDATIONS**

Develop grant programs that make it possible for more people to have access to quality bike racks.

Develop permitting process as necessary to readily set criteria for installation and allow bike rack installations to be permitted in appropriate locations.

## 4.81 Maintenance



Houston, TX

Source: BikeHouston

### POTENTIAL IMPLEMENTERS

The City of Houston

### DESCRIPTION

One of the most common points of feedback on the current bikeway network in the Houston region is the variable and often poor condition of the existing bikeways. This includes debris, ponding, and pavement and gutter conditions that make riding in some existing bike lanes difficult and potentially dangerous where the risk of falling or swerving into travel lanes is possible. Issues also include the degraded or substandard quality of some off-street facilities in parks and along easements or bayous.

The problem is exacerbated when bike lanes or trails are narrow and below current desirable standards. As the City and its partners expand the bikeway network and bring existing bikeways up to standard, the challenge of maintenance will grow.

Cities have adopted various strategies to maintain bikeway facilities including spot maintenance programs, which can be tied to community feedback. These often use programs similar to Houston's 3-1-1 program to address issues with riding surfaces, encroaching vegetation, faded markings, missing signage, or drainage issues. Partnerships are also critical. Adopt-a-bikeway type programs or partnerships with local entities such as management districts can supplement city efforts. Advocacy Advance (A partnership between the League of American Cyclists and the Alliance for Walking & Biking) developed an overview guide that discussed how cities and states across the US have addressed maintenance issues and provides additional strategies for implementation. (<http://www.advocacyadvance.org/docs/Maintenance.pdf>)

### RECOMMENDATIONS

Maintenance should be a key factor in the design of new bicycle facilities and fully thought through as new facilities are implemented. Materials should be chosen to minimize life cycle maintenance requirements while supporting a safe and high-comfort riding experiences. Thought should be given to where higher cost elements (e.g., green pavement marking) will have the biggest benefit. On-street bicycle facilities should be maintained or enhanced as part of routine roadway maintenance though it may be beneficial to prioritize bikeway maintenance

issues as a tool to help address the safety of more vulnerable roadway users.

The City should develop a maintenance program to improve the conditions of the existing bikeway infrastructure including street sweeping, pavement repair, and striping. This can be developed through the use of city funds, partnerships with the private sector, and public programs such as adopt-a-bike lane. The City should also define a minimum level of maintenance for bicycle facilities. Current funding levels will not allow the City of Houston to achieve the desired level of maintenance and should be addressed as new facilities are developed and will require new sources of funding and higher funding levels.