

Los Angeles County
Metropolitan Transportation Authority
California

Bike/Bus Interaction On Our Streets:

A WORKING PLANNING
AND DESIGN GUIDEBOOK
FOR MUNICIPAL TRANSPORTATION
PROFESSIONALS



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Los Angeles County
Metropolitan Transportation Authority-
California

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Introduction

Bus operators and people on bicycles frequently interact with each other as they often travel in similar contexts. At a neighborhood level, both modes of travel thrive in areas with high density and accessibility, while at the street level both typically travel as close to the curb as possible. Not only do people on bicycles and buses frequently share the same space, but they also travel at similar average speeds. As public agencies continue to encourage travel by these modes, interactions are likely to increase. This document provides both design strategies and recommended practices to help cities deliver streets that accommodate buses along with people riding bicycles.

Background

This guidebook is the culmination of the Bike/Bus Interface Study prepared by LA Metro in 2018. It serves as a companion document to the Study Report, which includes background and reference material. Design guidance featured in this document is directly built upon the research done for the Study, which analyzed 15 corridors in Los Angeles County and included extensive outreach to bus operators and people on bicycles to better understand their behavior and needs.

The Bike/Bus Interface Study Report includes three main components:

- > Overview of existing best practices and literature
- > Before/after corridor safety and operations analysis
- > Discussion of educational and training recommendations for bus operators and people on bicycles

Education and training are important for improving operational and safety outcomes related to bike/bus interface, and recommendations in this area can be found in the Study report. The report can be accessed at metro.net/bikebus.

How to Use This Document

This document supplements existing design guidance by discussing specifically and explicitly how cities can plan for people on bicycles and buses on the same streets, both with design strategies and by strengthening coordination between cities and transit agencies.

Planners should consider other guidance in addition to this document when planning for interactions between these two modes. The existing guidance listed below, and referenced throughout this document, provides discussions on critical elements such as treatment options for buses and bicyclists, lane widths, bus stop design, and signalization.

- > Caltrans Design Information Bulletin 89-01: Class IV Bikeway Guidance
- > Center for Regulation and Research (CROW) Design Manual for Bicycle Traffic
- > Federal Highway Administration (FHWA) Separated Bike Lane Planning and Design Guide
- > Los Angeles County Model Design Manual for Living Streets
- > MassDOT Separated Bike Lane Planning & Design Guide
- > Metro Transit Service Policies & Standards
- > National Association of City Transportation Officials (NACTO) Transit Street Design Guide

- > NACTO Urban Bikeway Design Guide
- > Transit Cooperative Research Program (TCRP) Report 19: Guidelines for Location and Design of Bus Stops
- > TCRP Report 183: A Guidebook on Transit-Supportive Roadway Strategies

As recognized by many of the guidance documents, every corridor has its unique contextual characteristics and needs. Accordingly, the guidance contained in this document reflects examination and recognition of those differences for specific reconfiguration options.

This guidebook includes the following sections:

Regulations and Guidelines

Provides an overview of existing regulations and guidelines related to bicycling and bus operations.

Modal Concerns

Highlights the individual and overlapping concerns for people on bicycles and buses.

Design Strategies

Eight design strategies for streets to accommodate people on bicycles and buses.

Process Guidelines

Recommendations on implementation process.

Regulations and Guidelines

Rights and Responsibilities for People on Bicycles

The California Vehicle Code (CVC) states that bicyclists can operate on roadways shared with motor vehicles, and they have the same rights and responsibilities as drivers of motor vehicles (Section 21200). If a person operating a bicycle is traveling at a speed less than the normal speed of traffic, they are obligated to ride as close as is **practicable** to the right-hand curb or edge of the roadway (Section 21202).

However, the term “practicable” allows for exceptions for people on bicycles to use the roadway and control a travel lane when they are passing another bicyclist or motorist, making a left turn, avoiding a road hazard, or using a lane that is too narrow for both a bicycle and a vehicle to travel safely side by side within the lane.



Shared Bicycle Bus Lanes

There are presently no statewide regulations that specifically address **shared bicycle bus lanes** (SBBLs), and each City determines whether bicyclists are allowed to ride in these lanes. Because most bus lanes are adjacent to the curb, many cities permit people to ride bicycles in bus lanes according to current regulations.

Vehicles Entering Bikeways

The CVC also states that motor vehicles (including buses) can enter a bicycle lane in order to enter or exit a driveway (Section 21209) and to make a right turn as long as the vehicle enters no more than **200 feet** from the intersection or driveway where the turn will be made (Sections 21209, 21717).

Safe Passing of Bicycles

The Three Feet for Safety Act, AB 1371, effective as of September of 2014, requires the driver of a vehicle overtaking and passing a person on a bicycle, to give **three (3) feet** of distance between the vehicle and the person on a bicycle. The Metro Operator handbook exceeds this requirement by asking Operators to leave between three to four-and-a-half (4.5) feet of space when passing people on bicycles.

Modal Concerns

The implementation of bicycle infrastructure has the potential to increase safety and access for all modes, especially when space allows for separated bicycle facilities. When space does not allow for separate lanes for each mode, concerns (both real and perceived) arise for safety, bicycle comfort, and transit operations. The following outlines individual and shared concerns for people on bicycles and buses as they navigate shared road space and reconfigured roadway facilities.

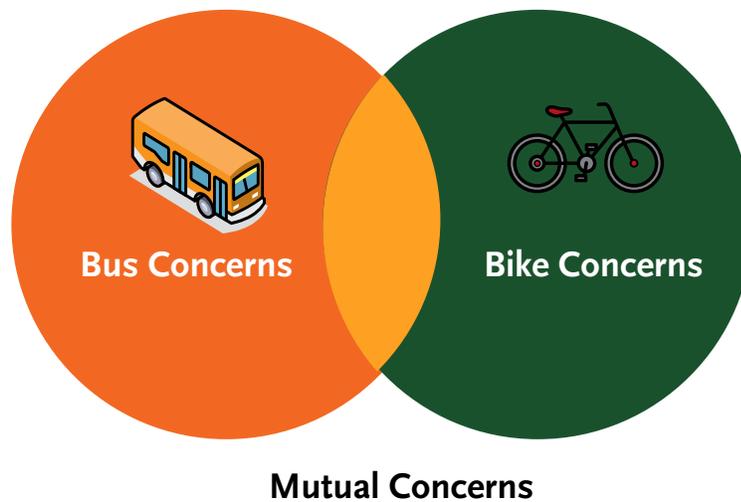
Users, planners, and advocates for both bus transit and bicycling have mutual interests. This guidebook was created to provide design strategies and a planning process to optimize safety and efficiency of both modes.

Bus Concerns

- > Travel times may be extended by road reconfigurations and increased interactions with people on bicycles
- > Increased costs are possible if additional buses are required

Bike Concerns

- > Need to consider bicycles as part of the transportation system
- > Need for more bicycle infrastructure to enhance safety and expand network



Mutual Concerns

- > Need for safer, more efficient roadway designs
- > Bicycles as first-last mile solution – people who ride bicycles also ride buses
- > Similar needs – both modes generally occupy right-side of road
- > Safety – conflict minimization
- > Education – training for bus operators and people on bicycles

Design Strategies

This section of the document focuses on street design strategies, with particular emphasis on treatments that are not well covered in other available guidance manuals. Planners and designers should consider the importance of robust bicycle and bus networks during the planning process. Without strong networks, people seeking to travel by bicycle or bus may face longer trips, less safe and comfortable conditions, or both. Disjointed networks will discourage people who wish to take transit or ride a bicycle from making trips or encourage them to use other modes.

Considerations When Selecting Infrastructure Type

While selection of every bicycle or shared bicycle-bus facility must be context specific, there are general approaches that would benefit both bus operators and people on bicycles. For example, increased separation of bicycles, buses, and general vehicle traffic is preferable. However, geometric constraints and competing interests related to vehicle speed and capacity within the existing roadway footprint often limit the options for full separation. The selection of a particular infrastructure type (e.g. standard bicycle lane, buffered bicycle lane, etc.) should consider local bus and bicycle volumes (both existing and potential), prevailing vehicle speeds, and the balance of turning, driveway entry/exit, and parking movements.

Design Strategies

The eight strategies listed to the right promote accommodating buses alongside people on bicycles and address noted gaps in the existing literature and design guidance. The eight strategies generally fall in three categories: bus zones (the area buses occupy when accessing stops, boarding and alighting passengers at stops, or during layovers), intersections, and corridors:

Bus Zones

- > Provide adequate space for stopped bus to clear bikeway
- > Construct bus boarding islands at busy locations
- > Stripe conflict areas at stops

Intersections

- > Identify and reduce conflicts at approaches
- > Provide clear sight lines at conflict points along separated bikeways
- > Guide users through intersections

Corridors

- > Clearly sign and stripe shared bike-bus lanes
- > Implement left-sided bikeways on one-way streets

Each design strategy is organized as shown below.

Goals

Identify behaviors/issues that the strategy is correcting.

Lessons Learned

Findings from Bike/Bus Interface Study that support the design strategies. Refer to the Study Report for details.

Design Recommendations

Detailed recommendations on the treatment designs.

Other Considerations

Potential impacts of the treatment such as parking reduction, etc.

Relevant Local Corridors

Study Corridor name and jurisdiction (example or candidate for the treatment).

Related Guidance

Name of guidance document, page number(s).



Provide Adequate Space for Stopped Bus to Clear Bikeway

Goals

Bus zones should provide enough space for bus operators to pull into a stop fully flush with the curb, completely exiting the travelway (including the bikeway if one is present). Stop design should also allow people on bicycles to ride consistently and predictably through bus zones, whether buses are present or not.

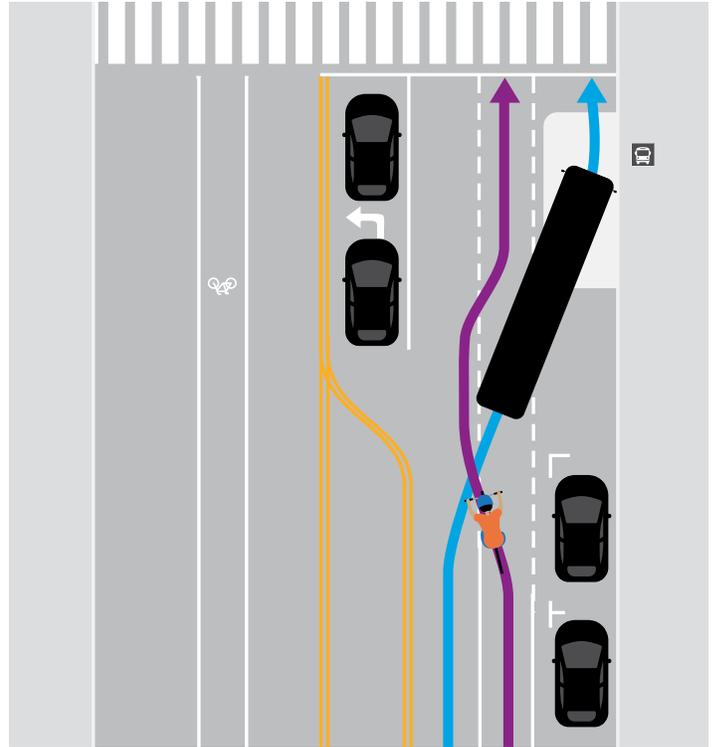
Lessons Learned

Bus zones, especially for near-side stops, are sometimes not long enough for buses to fully pull to curb, as shown in the figure to the right. Often a removal of on-street parking is needed to resolve this issue. This is particularly true on corridors that were designed for 40-foot buses but also have 60-foot buses using them. Often people on bicycles are given no guidance about where to ride in the bus zone, leading to confusion and inconsistent riding behavior.

Design Recommendations

Typically, **far-side stops are preferred over near-side stops** at intersections. Far side stops remove conflicts with turning vehicles, and allow bus operators to use the intersection to access the curb, as shown in the figure to the right. Far-side stops should be placed far enough from the intersection so that buses are not protruding back into the intersection or crosswalk when serving the stop. All bus zones should be long enough to allow bus operators to pull fully parallel to the curb, with the bus between 12 and 18 inches of the curb. If bus lines begin to use articulated buses, all stops should be reevaluated to ensure that stop length is adequate. Striping and signage at bus stops should clearly indicate the bus zone, and should show desired riding position of people on bicycles when no bus is present using sharrows or other conflict markings to continue the bikeway through the bus zone.

If a near-side stop is necessary or chosen for any reason, the bus zone must be long enough to allow the bus to pull in at a safe angle, stand flush with the curb, and pull out at a safe angle. This includes removing obstacles along the curb that could be a hazard for buses pulling in and those that limit the clear space for deploying the wheelchair ramp.



The two photos here show examples of bus zones where a bus may not be able to fully clear the bikeway. Near-side bus stops may have parking immediately adjacent to the stop as shown in the top image. If parking is so close to the bus zone, bus operators may not be able to pull fully parallel to the curb, leaving part of the bus in the bikeway, as shown in the bottom image. This problem can be countered by either providing a far-side stop or removing parking adjacent to a near-side stop.



Other Considerations

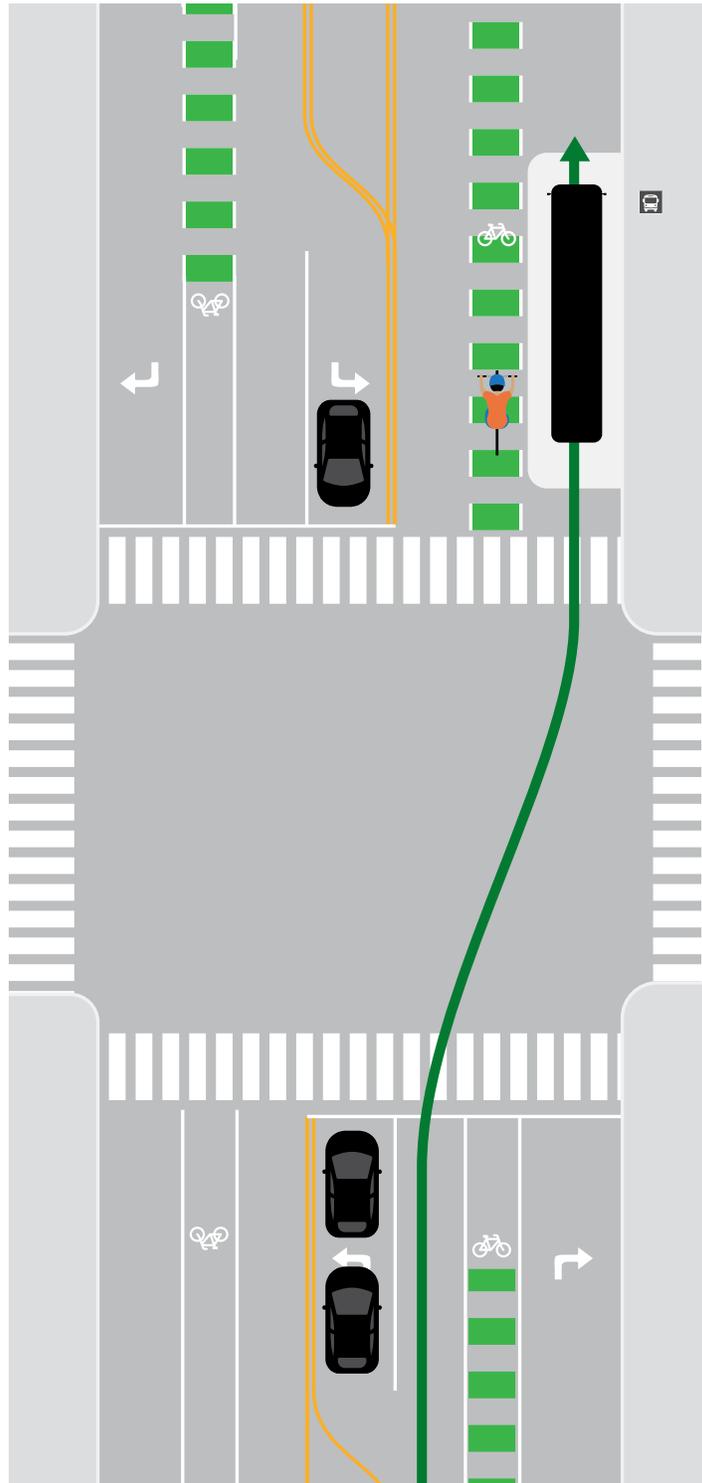
Ensuring bus zones are long enough for buses to pull fully parallel to the curb may require repurposing parking spaces in order to expand the bus zone.

Relevant Local Corridors

- > Van Nuys Boulevard, Los Angeles (candidate)
- > Pacific Avenue, Long Beach (candidate)

Related Guidance

- > Bus Stop Length
 - Metro Transit Service Policies & Standards, p.32, 75-78
 - TCRP Report 19: Guidelines for Location and Design of Bus Stops, p.24-25
 - NACTO Transit Street Design Guide, p.63, 78-79
- > Stop Placement
 - NACTO Transit Street Design Guide, p. 61



Far side stops allow buses to use the intersection to pull to the curb and access the stop. Green arrow shows the expected path of the bus.



Construct Bus Boarding Islands at Busy Locations

Goals

By separating them physically, **bus boarding islands** eliminate the conflicts between people on bicycles and buses that occur near stops during passing maneuvers. They can also improve operational performance as buses no longer need to pull in and out of stops.

Lessons Learned

People riding bicycles and bus operators were each in favor of bus boarding islands. Notably, no bicycle/pedestrian incidents have been reported along Los Angeles Street at the bus boarding island locations to date (no data is available for the same treatment on Harbor Drive in Redondo Beach).

In high-volume locations (for bicycle riding, bus frequency, or bus passenger activity) without boarding islands, people on bicycles often choose not to wait for the bus to pull away, instead merging into the adjacent travel lane, squeezing by the bus in the same lane, or riding up onto the sidewalk. Providing a fully separated bikeway at stops leads to more predictable riding behaviors and lowers the risk for collisions between bikes and buses at stops.

Design Recommendations

There are two options for the specific design of boarding islands related to bikeways:

- > Bikeway can be raised to the level of the bus stop to alert people on bicycles to the potential conflict with pedestrians and convey that pedestrians have right of way.
- > Bikeway can remain at the same level, with curb ramps and crosswalk markings providing crossings for pedestrians and alerting them to the presence of people on bikes.

For either design, proper signage and striping should be used to alert both people walking and biking about the potential conflict.

Other Considerations

Bus boarding islands can be expensive, although less costly temporary treatments are available. The treatment can alter traffic operations because they require buses to board and alight passengers in the travel lane; traffic modeling and analysis are recommended prior to implementation. Repurposing of on-street parking may be necessary, depending on the design and placement of the bus stop.



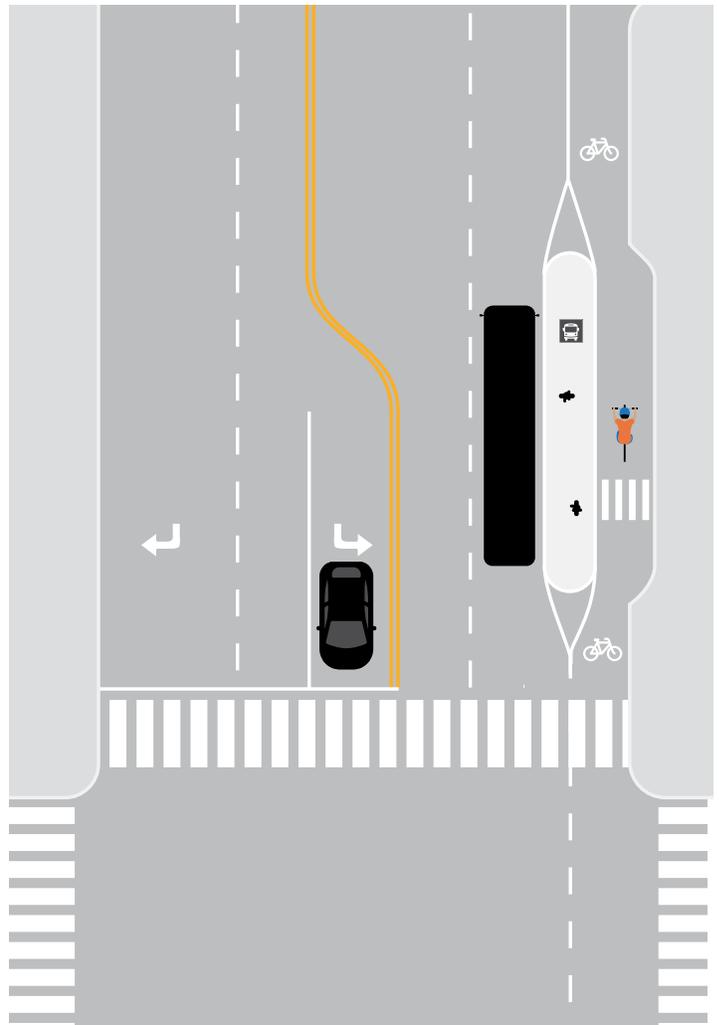
Bus boarding islands separate bus and bicycle traffic.

Relevant Local Corridors

> Los Angeles Street, Los Angeles (example)

Related Guidance

- > Boarding Island Design and Application
- FHWA Separated Bike Lane Planning and Design Guide, p.92-96
- NACTO Transit Street Design Guide, p. 73-75
- NACTO Urban Bikeway Design Guide, p. 32





Stripe Conflict Areas at Stops

Goals

Stripe and sign conflict areas where buses must pull across bikeways so people on bicycles and bus operators know when and where to expect each other.

Lessons Learned

Although FHWA recommends full separation of modes for locations with more than four (4) buses per hour, bus boarding islands are often not considered due to space constraints and cost. People on bicycles and bus operators both preferred the use of **skip striping** on the approach and through bus zones, which provide clear guidance on where people on bicycles should ride and may increase bus operators' awareness of bicycles.

Design Recommendations

Skip striping provides clear direction for where people on bikes are expected to ride when approaching and passing through a bus zone. These markings are highly visible and alert bus operators to the potential interaction with people on bicycles.

When possible, a bikeway treatment should be carried through bus zones using painted markings that direct bicycle riders to the left of the stop, where the person would be most visible, and also would keep riders further from driveways that may encroach on the bus stop.

In locations where there is not sufficient right-of-way to stripe the bike lane adjacent to the bus zone, sharrows can be used to indicate the riding position of bicycles. These markings should indicate the riding position for people on bicycles when buses are not present. Additional markings showing where people on bicycles should be when a bus is stopped should not be provided, as these may confuse people on bicycles when a bus is not present.

Other Considerations

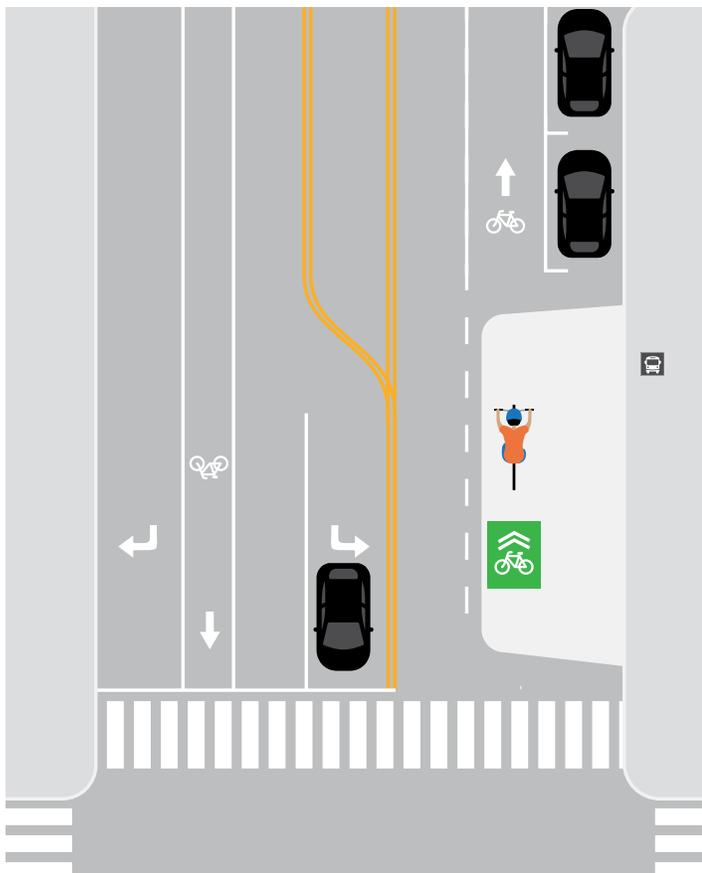
Use of additional striping, including green paint, requires periodic maintenance to ensure striping remains visible. Local jurisdictions should monitor the visibility of conflict area markings, and budget appropriately to restripe conflict markings when worn.

Relevant Local Corridors

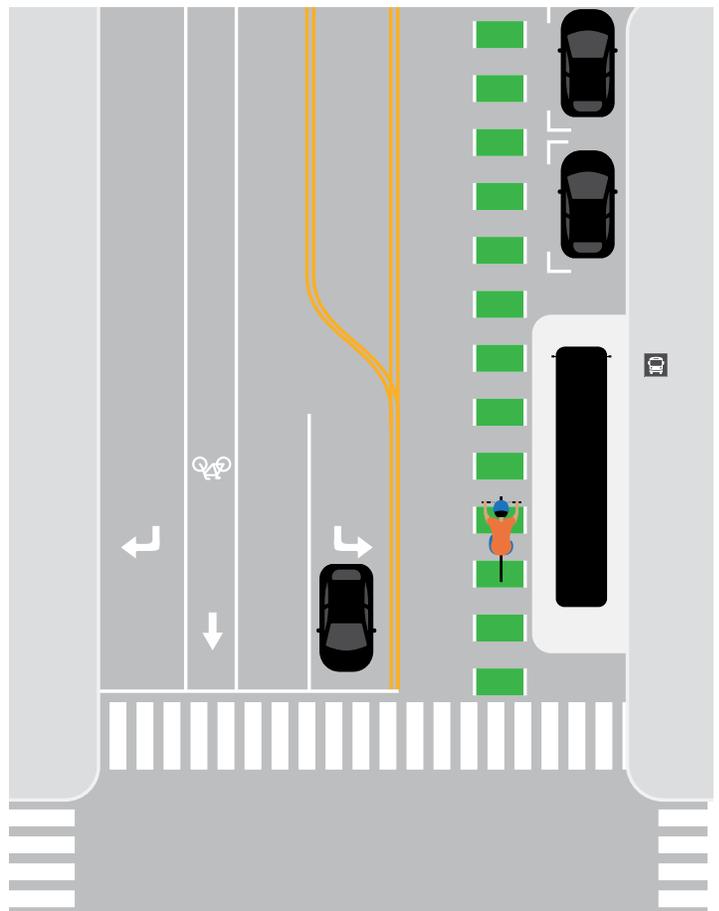
- > Alamitos Avenue, Long Beach (example)
- > Main Street, Santa Monica (example)

Related Guidance

- > Mixing zone guidance
 - FHWA Separated Bike Lane Planning and Design Guide, p. 95
- > Skip striping through bus zone
 - NACTO Transit Street Design Guide, p. 79
- > Skip striping and signage at conflicts
 - NACTO Urban Bikeway Design Guide, p. 122-123



When there is insufficient width to stripe a bikeway through the bus zone, sharrows can be provided to indicate the riding position of bicycles.



Skip striping provides clear direction to people on bicycles and alerts bus operators to the likely presence of bicyclists.



Identify and Reduce Conflicts at Approaches

Goals

Intersection design should promote separation between modes to improve safety and provide clear expectations for all modes to minimize confusion and unexpected behavior. Separation can be accomplished through physical barriers, separate signal phases for modes, or both.

Lessons Learned

People who ride bicycles expressed the greatest concern about locations where the bike lane disappears approaching an intersection with no clear direction on where they should ride, and this uncertainty leads to confusion for all modes. Green-painted bike lanes at intersection approaches were favored by all focus group participants, whether paired with a bike signal or not.

For left turns, most people who bicycle approved of the concept of bike boxes, but some felt additional signage and striping is needed to convey how they should be used. Many people who ride bikes were familiar with the concept of a two-stage turn (also called a box-turn or a Copenhagen-left), but fewer were familiar with the painted turn box designs as these have been less commonly used in the United States.



Intersections with dedicated bicycle signals, like the one shown in the photo above, can reduce conflicts at turns.

Design Recommendations

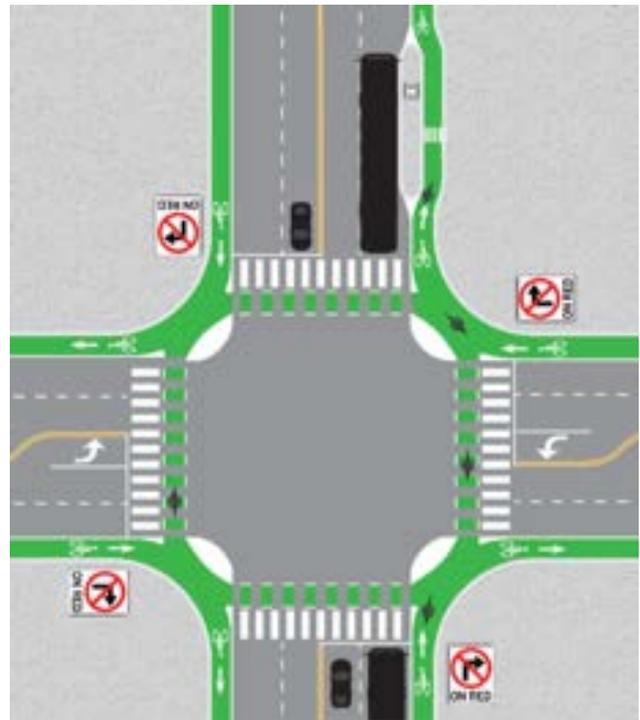
Intersection design should provide guidance to minimize instances where vehicles and bicycles must weave across each other in order to turn. This can best be done with **fully protected intersections**, also known as Dutch intersections.

Where protected intersections are not under consideration or cannot be implemented in the near future, **bike boxes** or **two-stage turn boxes** can provide additional direction for people on bicycles who are turning left.

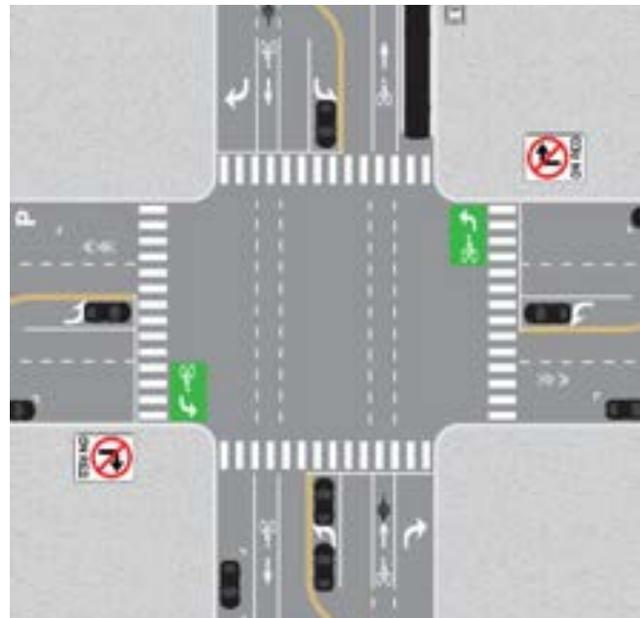
All treatments should be accompanied by signage (either temporary or permanent) and additional striping to instruct people on bicycles how to use them. “No right turn on red” signals or signs could be used to ensure that vehicles do not encroach into bike boxes or two-stage turn boxes.

Planners and engineers should consider the following according to intersection context:

- > Bike boxes across multiple lanes require substantial lateral movement for people on bicycles that must be completed within the red signal phase. This treatment is typically inappropriate when bikes must cross more than one lane.
- > Two-stage turn boxes are generally better for wider streets, but may be impractical near bus stops, as buses often need additional space within the intersection to access or pull away from the curb.
- > A dedicated “all green” signal phase for bicycles from all approaches may be appropriate, which would reduce the interactions between people on bicycles and vehicles. Depending on bicyclist and pedestrian volumes, it may be possible to have an “all green” signal phase for both types of road users.
- > At intersections where cars and buses turn right, right-turn lanes should be provided where possible, so that bicyclists traveling through the intersection and turning vehicles do not have to share a lane.



“Dutch”-style intersections can reduce conflicts at turns by adjusting angles at which vehicles interact.



Two-stage turn boxes can help facilitate left turns.



Other Considerations

Dedicated **bike signals** are still new and rare in Southern California. When they are used, bike signal phases should provide adequate green time for a bicyclist to clear the intersection. Cities may consider additional outreach when bike signals are first unveiled to educate road users. In some recent implementations, temporary signage was placed to instruct bicycle riders to follow the bike signals. Similar temporary signage could be used to instruct proper use of a two-stage left turn box.

Protected intersections may require additional or specific maintenance to ensure that bicycle lanes remain clear of debris.

Relevant Local Corridors

- Broadway, Long Beach (example)
- Los Angeles Street, Los Angeles (example)

Related Guidance

> Fully Protected Intersection

- Caltrans Design Information Bulletin 89-01: Class IV Bikeway Guidance, p. 6-9

> General Intersection Design

- FHWA Separated Bike Lane Planning and Design Guide, p.102-143
- NACTO Urban Bikeway Design Guide p. 47-104

> Use of Green Paint

- NACTO Urban Bikeway Design Guide p. 119-132
- FHWA Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes



Temporary outreach or signage can alert all road users to changes when they are first implemented.



Provide Clear Sight Lines at Conflict Points along Separated Bikeways

Goals

Good design makes people on bicycles easy to spot when they merge with general traffic from separated bikeways. Parked vehicles or other vertical obstructions such as landscaping can obscure people on bicycles.

Lessons Learned

Bus operators expressed concern that people on bicycles who were approaching the mixing areas were difficult to see as they emerge from behind parked vehicles. Available data did not suggest this circumstance has led to collisions, but near-misses are a valid concern that is difficult to quantify.

Design Recommendations

NACTO's Urban Bikeway Design Guide states that “[i]f the cycle track is parking protected, parking should be prohibited near the intersection to improve visibility. The desirable no parking area is 30 feet from each side of the crossing” (p.32). Cities should consider providing additional setbacks for parking from intersections and locations where motor vehicles would cross a bikeway, based on vehicle speed and the angles at which cars merge. Setback should be measured from the initial conflict point, not the intersection.

Other Considerations

Providing additional setback may require repurposing of on-street parking.

Relevant Local Corridors

- > Reseda Boulevard, Los Angeles (candidate)
- > Rosemead Boulevard, Temple City (candidate)

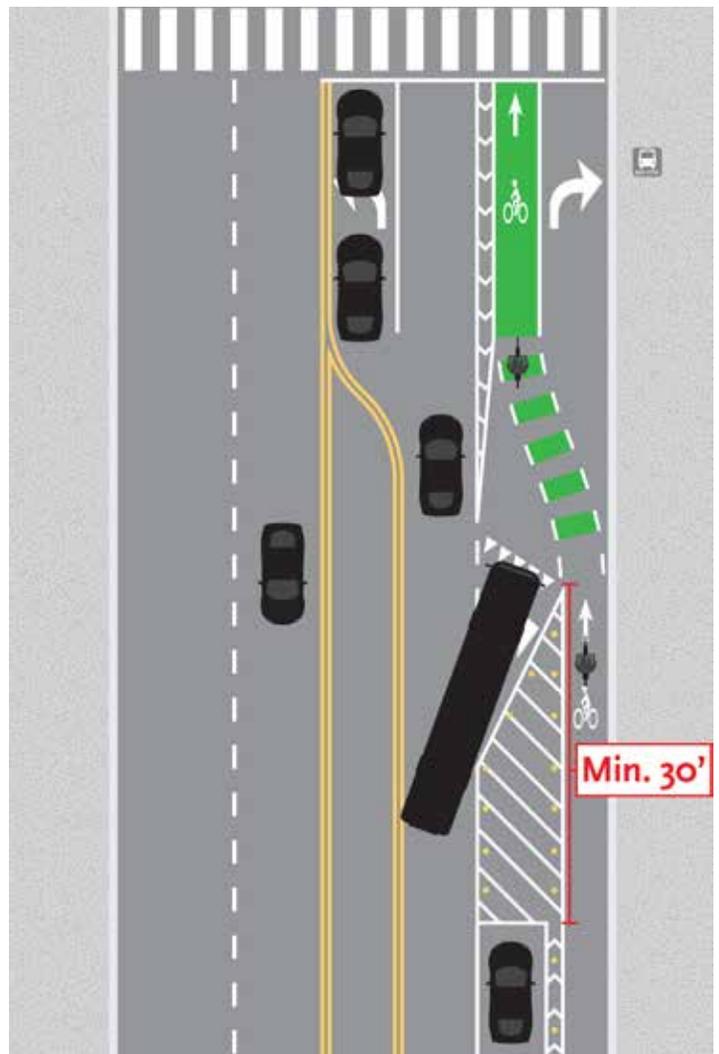
Related Guidance

- > Design Options
 - FHWA Separated Bike Lane Planning and Design Guide, p.104-106, 110
 - NACTO Urban Bikeway Design Guide, p. 32, 83, 85-90
- > Sight Distance
 - MassDOT Separated Bike Lane Planning & Design Guide, p. 63-68
- > Speed Considerations
 - MassDOT Separated Bike Lane Planning & Design Guide, p. 52
- > Parking Setback Distance
 - NACTO Urban Bikeway Design Guide, p. 85-90



Above: Parking is set back only a few feet from the merge area, which does not provide enough space for people on bicycles and drivers to see each other.

Below: Parking should be set back from conflict points to ensure that people on bicycles are not obscured as they merge with other vehicles.





Guide Users Through Intersections

Goals

All road users should be aware of where to expect people on bicycles in intersections; people on bikes should have clear indications about where they are expected to ride.

Lessons Learned

Because it is more visible, people on bicycles preferred green paint to indicate merging areas versus the dashed white lines which are typically used. Green skip striping through intersections can highlight conflict areas, but should be done in a way that clearly indicates to all users where people on bicycles should ride.

Design Recommendations

Cities should standardize use of green **skip striping** at intersections, major driveways, crossing of a bikeway and a turn-lane, and at bus stops. Designs should allow bicyclists to ride straight through the intersection with minimal lateral movements, such as from a curb lane to a floating lane or vice versa.

Other Considerations

Use of additional striping, including green paint, may require additional maintenance to ensure striping remains visible. Local jurisdictions should monitor the visibility of conflict area markings, and budget appropriately to restripe conflict markings when worn.

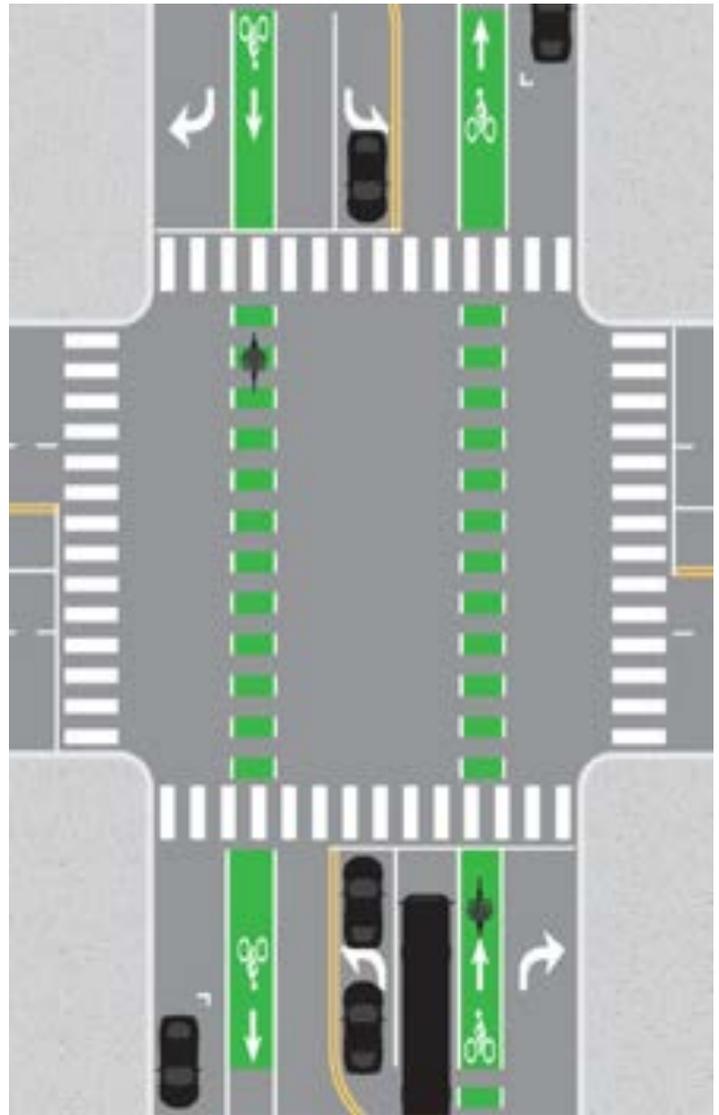
Relevant Local Corridors

This design is not currently implemented on any study corridors, but could be applied on all corridors.

Related Guidance

> Intersection Markings

- FHWA Separated Bike Lane Planning and Design Guide, p.113-114
- NACTO Urban Bikeway Design Guide, p.55-60
- MassDOT Separated Bike Lane Planning & Design Guide, p. 81



Buses often use the intersection to access the curb (far-side stop) or travel from the curb to the travel lane (near-side stop). Striping bike-ways through intersections provides direction for people bicycling and alerts bus operators to the potential presence of people on bikes in the intersection.



Clearly Sign and Stripe Shared Bike-Bus Lanes

Goals

All users should be aware of when they are permitted in a shared bike-bus lane, including buses, people on bicycles, and right-turning vehicles.

Lessons Learned

In Los Angeles County, it is not always clear who is allowed in shared bike-bus lanes. This issue is particularly true for people on bicycles. This finding is supported by survey data which shows that as many as half of respondents did not know that they can ride in shared bike-bus lanes, and by focus group discussions with bus operators, where some operators thought bikes were allowed in the lanes while others thought bikes were prohibited or should not be allowed to ride in shared bike-bus lanes. Data collected on Wilshire Boulevard showed that the vast majority of riders were using the sidewalk, which may be partially due to unclear guidance for people riding bicycles. Striping and signage design should be **consistent** throughout the county.

Design Recommendations

Incorporate lane markings and signage to clarify that buses and bikes may share the lane, consistent with CA-MUTCD. Intersection approaches where motorists may enter the shared bike-bus lane to make legal turns should be striped to indicate this. Skip striping should be used in locations where private vehicles are allowed to enter the shared bike-bus lane to turn right. The length of skip striping should comply with the CA-MUTCD and be determined by local factors such as the volume of turning vehicles and the street design speeds.

Green-backed sharrows can be used near intersections to alert turning vehicles to the likely presence of bicycles, but only at locations where they indicate appropriate riding position for people on bicycles at all times of the day. Signage and striping for shared bike-bus lanes should be applied consistently to clearly indicate that both buses and bicycles are allowed in the lane, and to indicate where turning vehicles may enter the lane.

Shared bike-bus lanes should not include diamond symbols, as the CA-MUTCD states these are to be used only for high-occupancy vehicle lanes.

Other Considerations

Use of additional striping, including green paint, may require additional maintenance to ensure striping remains visible. Local jurisdictions should monitor the visibility of conflict area markings, and budget appropriately to restripe conflict markings when worn.

Relevant Local Corridors

- > Wilshire Boulevard, Los Angeles (candidate)
- > Figueroa Street, Los Angeles (candidate)
- > Sunset Boulevard, Los Angeles (candidate)

Related Guidance

- > Signage and Striping
 - California MUTCD, p. 483-504, 787-791
 - City of Los Angeles Complete Streets Design Guide, p. 135-137
 - NACTO Transit Street Design Guide, p. 122-123
- > Stop Considerations
 - NACTO Transit Street Design Guide, p. 123
- > Use of Green Paint
 - NACTO Urban Bikeway Design Guide p. 119-132
 - FHWA Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes



Striping and signage should clearly indicate if bicycles are permitted to ride in shared bike-bus lanes.



At intersections where private vehicles are permitted to use the shared bike-bus lane to turn right, green-backed sharrows can be used to highlight the likely presence of people on bicycles. Sharrows should only be used at locations where they indicate appropriate riding position for people on bicycles at all times of the day. Sharrows should not be used in locations where parking is permitted during off-peak periods.



Implement Left-Sided Bikeways on One-Way Streets

Goals

Reduce conflict between bikes and buses on one-way streets with **left-sided bikeways**.

Lessons Learned

Clear transition areas at the beginning and end of the bikeway are critical, i.e. where the street transitions between being a one-way and two-way street. At intersections with higher volumes of left-turning vehicles, **providing a dedicated bicycle phase** using bicycle signals is preferable to requiring people riding bikes to merge right across left-turning automobile traffic, which is an unusual movement for all road users.

Design Recommendations

In urban areas, implementing a bike lane on one-way streets with bus service should generally be done on the left side, which eliminates conflicts with buses servicing stops on the right side. Implementation must always consider the transition at either end of the facility as well as at major intersections, and provide clear guidance on where people should ride to enter and exit the bikeway safely. Improved transitions can adopt principles from the section “Intersections: Reduce and Identify Conflicts.” In particular, installing “all green” dedicated bicycle

phases at intersections allows people riding bicycles to transition from one side of the street to another without experiencing automobile conflicts.

Other Considerations

As people on bicycles are not typically found on the left side of the street and therefore are less expected by drivers, special attention should be given to conflict areas with left turns. At areas with high automobile left-turn volumes, separated facilities and signal phasing should be considered, with protected automobile left-turns to prevent drivers from turning left when bicyclists have a green signal. Doing so reduces the available green-time for left-turning traffic, but reduces the risk of collision between vehicles and people on bikes. A photo of a **bicycle signal** is shown on the right. Signal phasing considerations are similar for protected bikeways on the right side of the street.

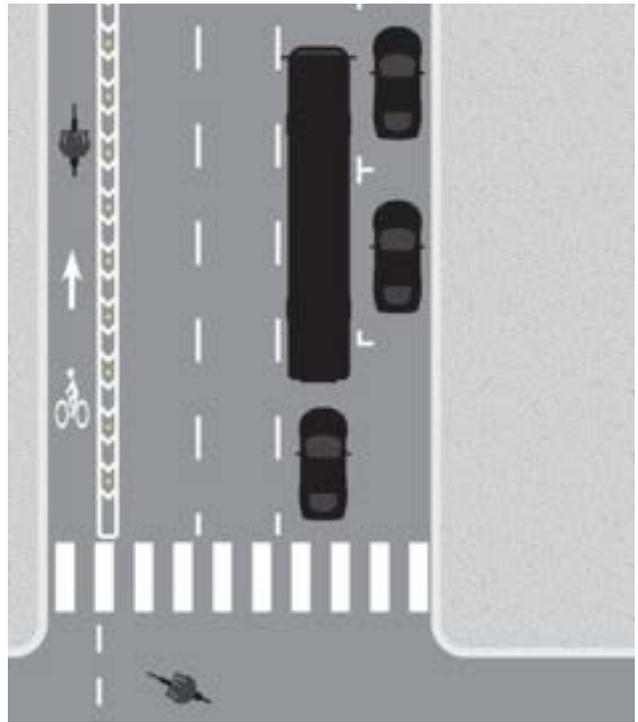
Relevant Local Corridors

> Broadway, Long Beach (example)

Related Guidance

> General Guidance

- Caltrans Design Information Bulletin 89 -01: Class IV Bikeway Guidance, p.3
- FHWA Separated Bike Lane Planning and Design Guide, p.49-50, 78, 80
- NACTO Transit Street Design Guide, p. 52-53
- NACTO Urban Bikeway Design Guide, p. 21-26



Left-sided bikeways greatly reduce, and in some cases eliminate, conflicts between bike riders and buses. Design above shows a painted buffer with soft-hit posts.

Process Guidelines

Metro and other transit agencies seek to work with cities while new street designs are being planned. Coordination between cities and transit agencies provides opportunities to discuss larger changes around networks that may affect local street designs.

To ensure effective relationships between agencies, Metro recommends:

- > **Collaborative Process**
- > **Early Engagement**
- > **Follow Up Analysis**



Collaborative Process

By engaging with transit agencies, cities can learn more about transit operations needs and have the potential to discuss changes to street design that can improve transit service, often without altering the effectiveness of a new bikeway facility. The results of these discussions can be carried forward to future planning efforts by the city.

Contacting the Right People

City staff should work with transit service planning and operations staff to discuss how new designs will impact transit service. There may also be opportunities to engage directly with bus operators, who are intimately familiar with their corridors. Many transit agencies have periodic (e.g. monthly) operator meetings, which may be a good forum in which discuss planned street reconfigurations.

Please contact Metro Service Planning for more information at 213.418.3400 or forgiarinij@metro.net.

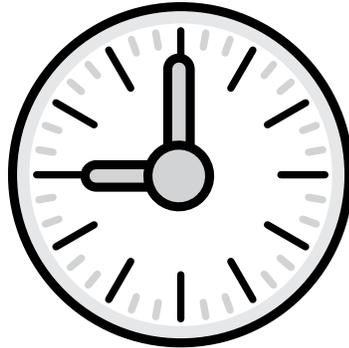
Asking the Right Questions

As cities are planning for new bicycle facilities, they should consider focusing on three discussion points:

- > Stop placement and frequency along the corridor
 - Should stops be moved or consolidated to reduce bike/bus conflicts?
- > Stop design, including signage and striping
 - How can new designs communicate to bus operators and people on bicycles about each other's presence?
- > Corridor design
 - Can design treatments create greater separation between bicycles and buses?
 - How might new designs affect transit speed and reliability?

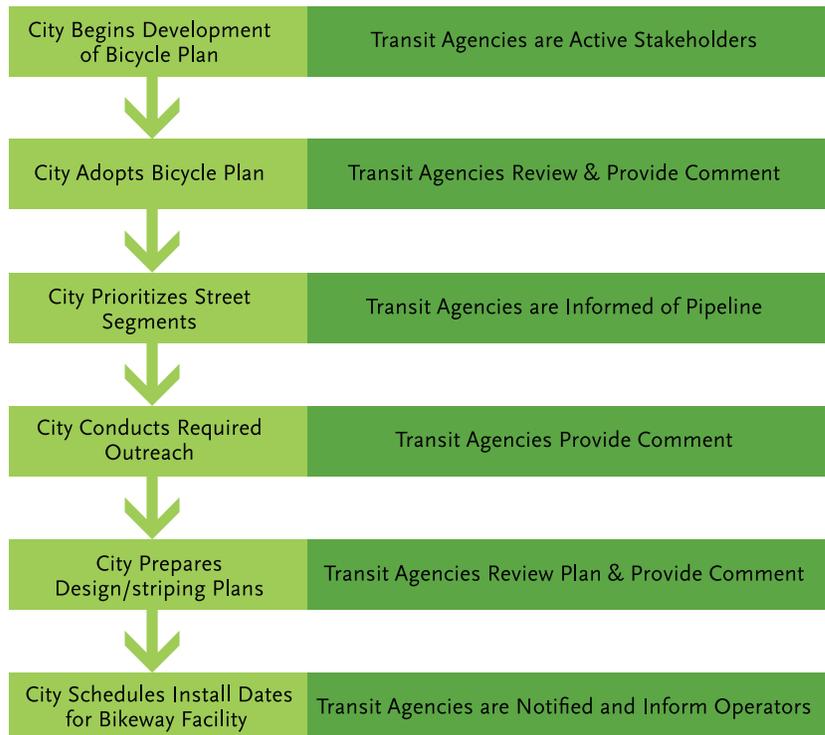
Working with Metro Active Transportation Planning

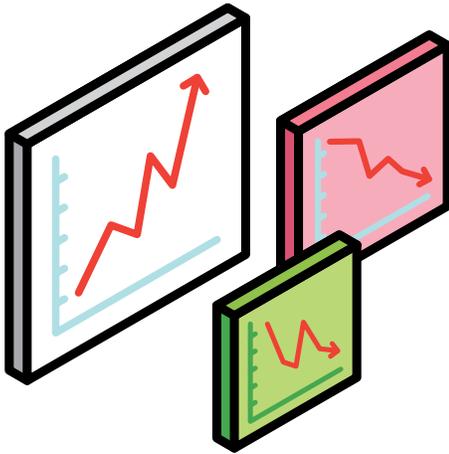
In addition to transit planning, Metro plays an important role in bicycle planning across LA County through facilitating first mile/last mile connections to transit and supporting bicycle transportation through various policies and programs. Metro's Active Transportation Strategic Plan identifies transportation improvement opportunities and how Metro can work with cities to implement them. Local cities should coordinate with Metro's Active Transportation Planning group to ensure that their designs coordinate with countywide plans, and to learn about potential funding opportunities. All inquiries can be sent to bikeinfo@metro.net.



Early Engagement

To maximize modal harmony, cities should engage with Metro and other transit operators as early and often as possible when making roadway changes. The graphic below summarizes an ideal engagement process that allows several points for Metro and other transit agencies to collaborate and coordinate with cities on upcoming bikeway-related projects.





Through these conversations, planners can use the design strategies discussed in this guidebook along with other existing guidance to develop their plans. Once decisions have been made about which facilities will be implemented, transit agencies should be notified as early as possible of any potential changes to roadway designs where buses operate. This will allow time to inform operators and adjust service if necessary and feasible.

Metro, along with many other transit agencies, adjusts bus service biannually, and any changes to roadway designs often prompt analysis of traffic conditions and ridership demands. Therefore, transit agencies should be notified at least six months in advance of any bicycle facilities or shared bike-bus lane implementation on roadways with bus services in order to allow the transit agency to consider new service options.

Follow Up Analysis

Cities are encouraged to use the methodology established in the Bike/Bus Interface Study to analyze how roadway changes have affected bicycle and transit safety, comfort, and operations. Municipal transit agencies and Metro can assist by providing data of their bus operations.

As staff time allows, Metro's Service Planning can work with individual cities to analyze its data before and after implementation of bicycle infrastructure. Please contact Metro Service Planning for more information at 213.418.3400 or forgiarinij@metro.net.

Los Angeles County
Metropolitan Transportation Authority
California

