Chapter 10: Complete Streets

CHAPTER HIGHLIGHTS

- Introduction
- Context of the Region
- Context of the Street
- Complete Street Design Examples

Introduction

In chapter 3, the concept of Complete Streets was introduced to describe a shift from the traditional transportation engineering practice of optimizing streets for vehicle throughput towards a more multimodal approach that seeks to design streets that are usable, convenient, and safe for all users.

Chapters 6, 7, 8, and 9 have built on this by describing design guidance and potential projects for the full range of transportation modes which are available in the KTMPO region. In those chapters, each transportation mode has been treated separately and independently. This chapter on Complete Streets follows up by considering how each transportation mode can form integrated layers in a balanced regional multimodal network.

Complete Streets treatments are intended to bring the different layers of the multimodal system into a proper balance. This balance does not mean that every street must provide full accommodation for every transportation mode. It does mean that that every street should be designed with an appropriate consideration of all transportation modes to see how they can be balanced together.

The definition of appropriate users for a street is a subjective judgement; not measurable in terms of its current uses. While Complete Streets treatments may not be immediately perceived as appropriate on specific streets that currently have low volumes of multimodal traffic, that perception is based on the use that has been driven by past street design where the street is optimized for automobiles. The inverse may be true; if a street is designed with all users in mind, then the convenience and the safety of the street will attract users. The goal is to build streets that will attract and serve new users for all modes, rather than merely accommodating existing users.

> **…we could lay out an ideal street type, but in an existing city with constrained rights of way…not all streets can do all things at one time.**
>
> **David Gaspers**
> **Principal Planner**
> **City of Denver**

Implementing the desired Complete Streets design may be a challenge with the available right-of-way, funding constraints, and regulatory environment. Two general approaches are used:

The Complete Streets policy which has been adopted in Minneapolis is an example of an approach, where regulations aggressively call for Complete Streets treatments on every street. In this policy, top priority for every street is required to be given to pedestrians first, followed by bicycles & transit, with automobiles receiving the last priority. This is a deliberate decision to upend the traditional pyramid of placing automobiles as the first priority.

The other approach is illustrated by the Complete Streets policy being proposed in the Blueprint Denver Plan, which sets multimodal priorities in separate network layers. The pedestrian network is the first layer and is set as the highest priority for all streets. Each street is then evaluated individually for the appropriate modal priorities for the other layers of bicycling, transit, freight, and automobile. A particular street may therefore be optimized for automobiles, with a nearby parallel street prioritized for transit and bicycles. Conversely, another street may accommodate all modes. This approach is intended to implement a balanced system of modal layers rather than accommodating all networks ubiquitously.

With either approach, the very specific and objective design guidelines for each mode (as described in Chapters 4 through 9) are brought together and balanced under the very general and subjective concepts of Complete Streets (as described in this Chapter). Guidance for developing the proper balance of modes for Complete Streets therefore relies as much on imagination and judgement as it does on engineering.

> **Logic will take you from point A to point B. Imagination will take you anywhere.**
>
> **Albert Einstein**

Two contexts are important when considering the balance of modes for Complete Streets: the region and the street.

The context of the region considers variations of how Complete Streets principles can be applied with the transect of activity density, ranging from undeveloped rural areas to the high-density and high-activity urban cores.

The second context of Complete Streets is that of the street itself. The street may be considered as having various zones dedicated to different modes and uses, such as the sidewalk, the curbside, parking, travel lanes, and medians.

Complete Streets and the Context of the Region

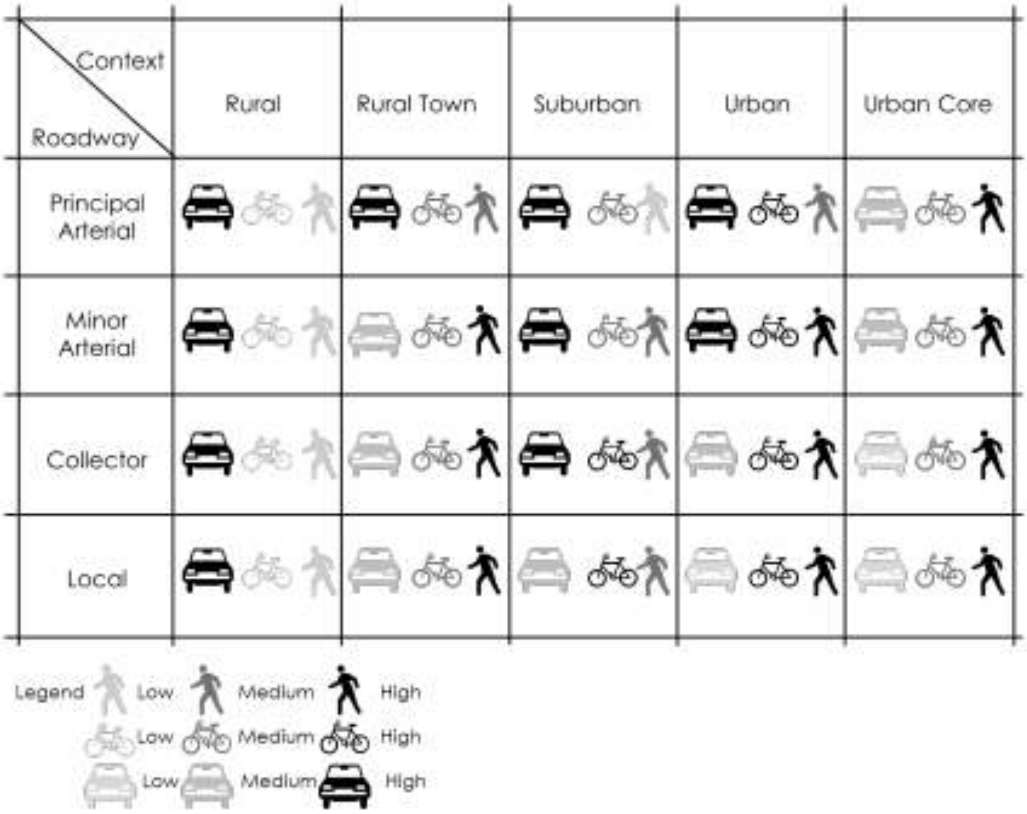
When considering the context of the region, street types are matched to land use characteristics. This context starts with defining a transect of land uses, ranging from undeveloped rural areas to the more intense activity zone in the urban core. **Figure 10-1** shows how activity density increases from rural areas to urban areas in a transect of regional context. This is designed to recognize how the differences in the regional context of density and activity affect street characteristics such as speed, capacity, and lane width.

Figure 10-1: Rural to Urban Transect in the Regional Context

The context of the region is employed in the approach taken by the *ITE Walkable Thoroughfares Manual*, which has been adopted by TxDOT and referenced for its Context-Sensitive Solution, and by the recently published *NCHRP Report 855: An Expanded Functional Classification System for Highways and Streets*. Both publications use the regional context and the type of street to set the appropriate balance and priorities of the street characteristics and the appropriate transportation modes accommodated.

The NCHRP report illustrates this concept with a matrix of street functional class versus regional context, as shown in **Figure 10-2**. It is based on the concept that street design cannot accommodate the best facilities for all modes and users on every street, every time. Street design must therefore consider conceptual priorities for all modes so that the appropriate priorities may be selected.

Figure 10-2: Matrix of Regional Context and Modal Appropriateness



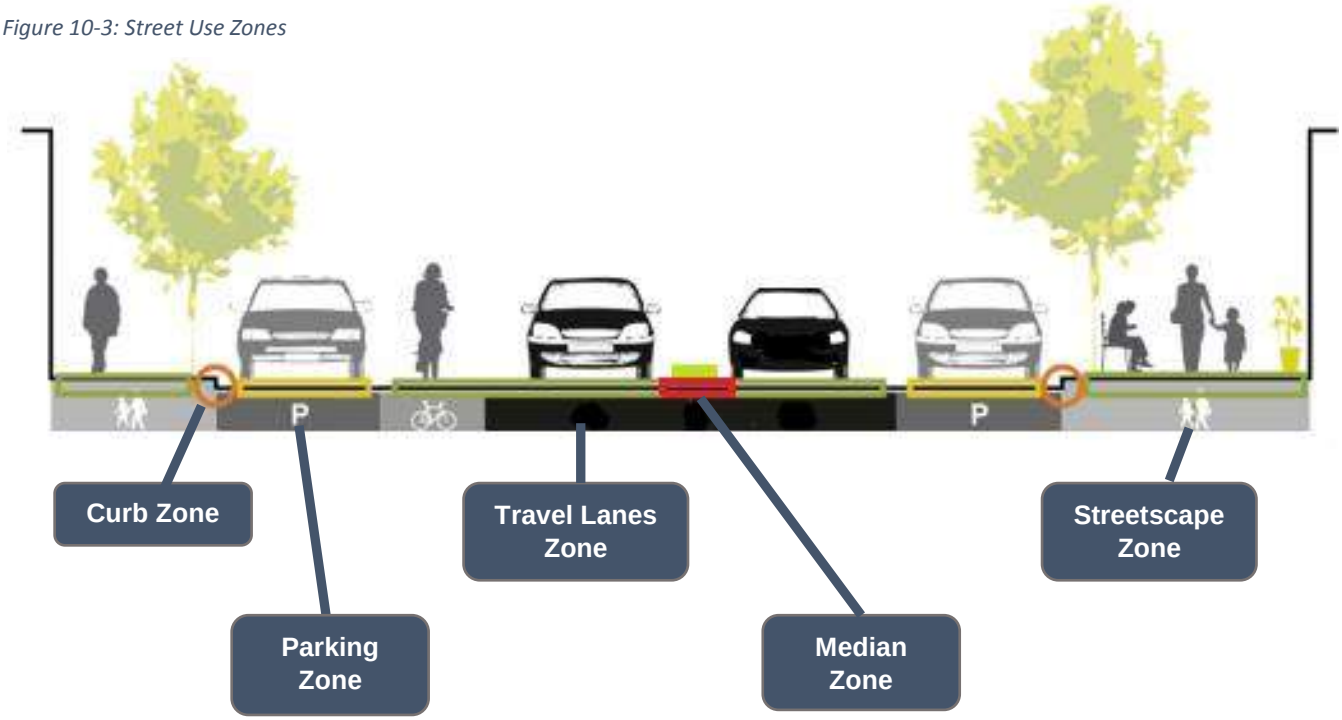
For example, on Principal Arterials, for most contexts the function of the street is to provide regional mobility, so high vehicle speeds are appropriate. The high speeds make Principal Arterials less appropriate for bicycles and pedestrians, and therefore they may be best accommodated with a parallel route whose function allows for lower speeds. Conversely, in the urban core, the functions to provide access and the greater density of sites means that speeds are lower and that pedestrians and bicycles have greater priorities. The presence of facilities such as bicycle lanes, which may reduce automobile speeds and capacity, is seen as appropriate in this context.

It should be noted that this approach defines the general appropriateness of the balance between transportation modes. Safety is an additional layer of consideration. Regardless of any other design parameters, every road should be safe for all its users. Dana Peak Park provides an example; the route for bicyclists to access the park requires traveling on rural streets, which are shown in the matrix as conceptual low-priority areas for bicycles. However, specific routes such as FM 2410 and Comanche Gap Rd should consider the safety of riders with specific bicycle facilities regardless of the conceptual balance of modes.

Complete Streets and the Context of the Street

The street cross section also provides context for Complete Streets treatments because of the different zones of use. **Figure 10-3** shows different zone uses which have typically been recognized.

Figure 10-3: Street Use Zones



The **Streetscape Zone** is the area dedicated to pedestrians. It can be further divided into the frontage zone along the building face, the walking zone, and the street furniture & landscaping zone. Streetscaping can improve the sense of place of a street and create pleasant environments.

The **Curb Zone** provides a clear distinction between the sidewalk and the street, and is important for the street's function and safety. Curb bulb-outs may be provided for safety and transit loading, and illustrate how the relationship between the zones can be malleable.

Strategies that impact the **Parking Zone** are often the most controversial element of Complete Streets design. Various orientations of the parking zone in relation to other zones can be developed to protect bike lanes. Bus turnouts and loading zones may be included with the parking zone.

The **Travel Lanes Zone** ranges from 9' to 12' feet wide. This zone may include dedicated bike lanes or bus lanes as well as general purpose automobile lanes.

Treatments in the **Median Zone** treatments include landscaped swales, raised and paved medians with intermittent turn bays, and continuous turn lanes. Pedestrian treatments in the median may be added to provide for safety islands to reduce the width of the street to be crossed.

Complete Streets General Design Examples

With the two approaches of either specifying full treatments for all streets or modal layers in a balanced network, and considering both the regional and the street contexts, the general and subjective guidance for Complete Streets design can be applied together with the very specific and objective design guidelines for each mode. Bringing all these concepts, approaches, contexts, and guidance together can be seen to require imagination as well as engineering.

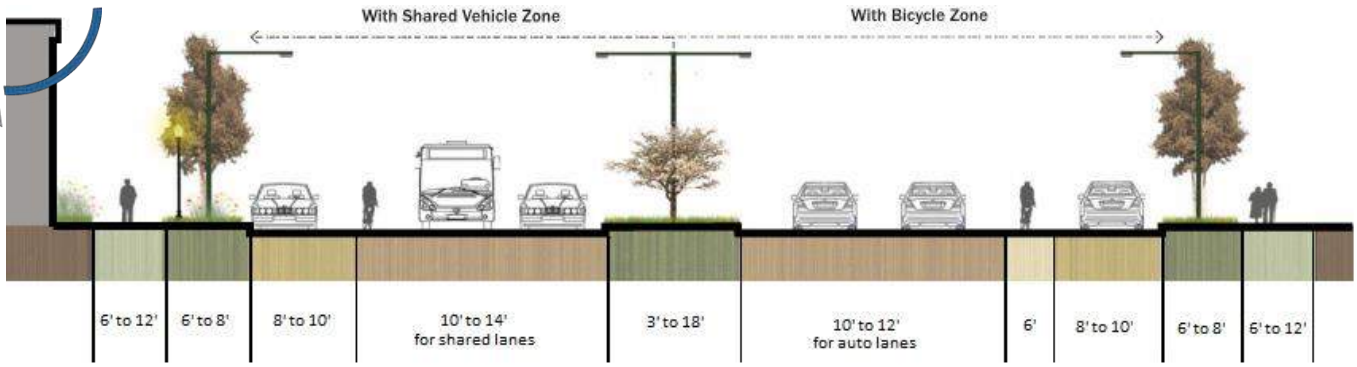
Whatever philosophy is used for Complete Streets design, the streets should address the regional goals as specified in the Metropolitan Transportation Plan (MTP) and in this Regional Multimodal Plan to ensure that the results are convenient and safe for all users and contribute to the development of a balanced regional multimodal system.

The options and artistry involved in implementing Complete Streets projects while conforming to the specific design guidance for the component transportation modes can be illustrated with several examples. **Figure 10-4** shows two examples of treatments on a multi-lane avenue. In the example on the left side, the outside lane is made wider to implement shared lanes. On the right side, the example shows the bicycle lane made separate and placed between the travel lanes and the parking zone.

These types of configurations are suitable for multi-lane streets with low to moderate speeds and traffic volumes to accommodate the shared streets strategy. The separate bicycle facilities as shown on the right side can be justified when traffic volumes or speeds are higher and bicyclist safety becomes more of an issue.

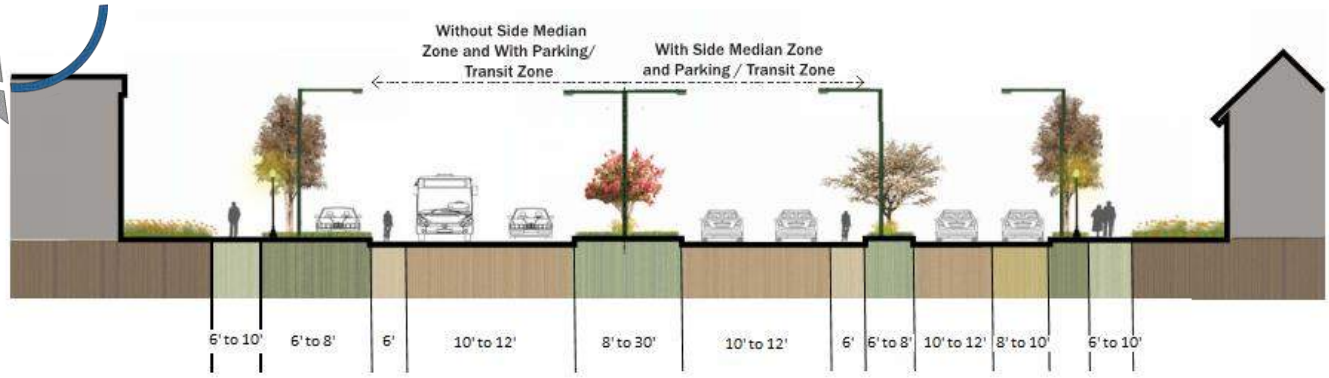
Either example may have a median with intermittent turn bays or a continuous center turn lane. Either treatment may include landscaping, islands, or pedestrian refuges.

Figure 10-4: Complete Streets Treatments on a Multi-Lane Avenue



Higher functional classed facilities with significant traffic volumes and high speeds are also amenable to Complete Streets treatments, as shown in **Figure 10-5**. In this example, the left side shows multiple travel lanes and a bicycle lane against the curb. Parking is accommodated with intermittent bays located in the curb and landscaping zone. On the right side, the example uses an intermediate median to separate the travel lanes from the parking and curb zones. This example includes a slower-speed travel lane along with the parking lane to provide access. This configuration separates slow-speed traffic and parking from the higher-speed main travel lanes, and features separate bicycle facilities in both examples.

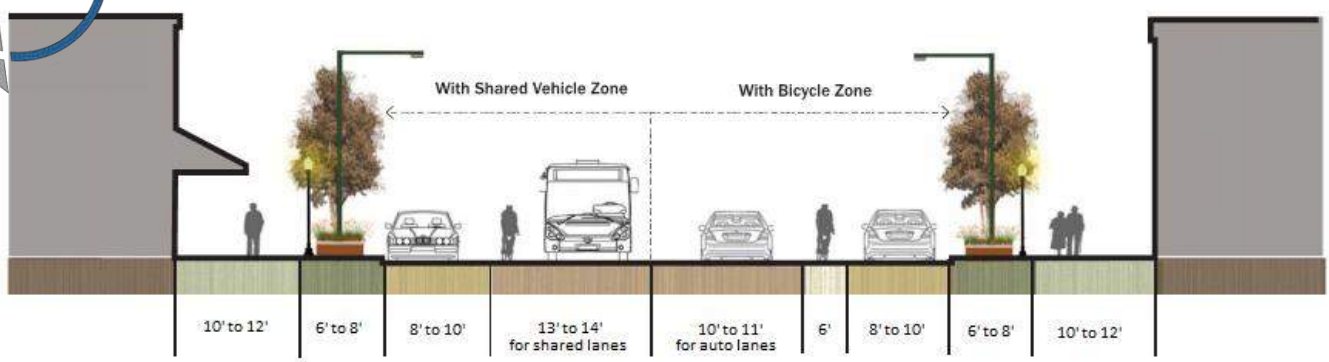
Figure 10-5: Complete Streets Treatments on a High Speed Multi-Lane Boulevard



Complete Streets treatments for a small urban core are shown in **Figure 10-6**. This kind of street is a destination, featuring more intense density and points of access in a smaller area. Traffic speeds are lower, but traffic volumes may be higher. Separate bicycle lanes are shown on the right, but the lower speeds in the area may make shared lanes a viable option, as shown on the left.

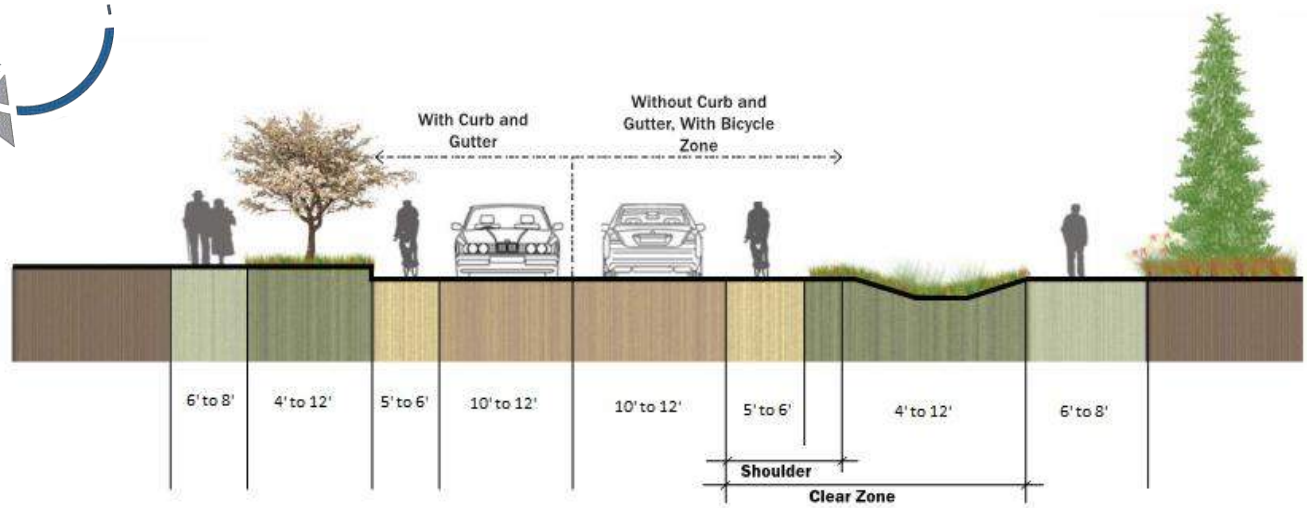
The sidewalk zones may be made wider to support pedestrian volumes and activities.

Figure 10-6: Complete Streets Treatments on a Small Urban Main Street



Complete Streets treatments for a suburban or rural two-lane road are shown in **Figure 10-7**. These street configurations are suitable for Local Streets, Collectors, and Minor Arterials with low to moderate traffic speeds and volumes. They may not include curbs & gutters or parking zones. In both examples, a separate bicycle lane is shown on the outside and the sidewalk zone is separated from the travel lanes with a generous landscaping zone.

Figure 10-7: Complete Streets Treatments on a Two-Lane Road



Complete Streets As-Built Examples

While Complete Streets is still a fairly recent concept, many examples have been completed to show the effects of the treatments. **Figure 10-8** shows a built example of a road diet on East Blvd in Charlotte, NC. The "before" configuration of a 4-lane undivided street through a residential area was under capacity and contributed to speeding and to safety issues for pedestrians and bicyclists. While the posted speed was 35 mph, cars were frequently observed traveling up to 50 mph. After the road diet was implemented to convert the street to 2 lanes with a center turn lane, pedestrian islands, and conventional bicycle lanes on the outside, the instances of speeding dropped measurably. Traffic data showed that the speed traveled by 85% of vehicles (the 85th percentile speed, which is a traffic engineering measure) dropped from 43 mph to 40 mph, but the average travel time remained constant. These results show that speeding dropped but that the mobility of the corridor was not affected.

Figure 10-8: Road Diet Example from Charlotte, NC

An example on Lancaster St in Lancaster, CA shows an imaginative treatment of the median in a commercial area. As shown in **Figure 10-9**, the parallel parking zone along the curb was supplemented by angle-in parking in a landscaped median. The landscaping in the median includes pedestrian amenities at the crosswalks.

Figure 10-9: Median Treatment Example from Lancaster, CA

This example dropped the posted speed from 35 mph to 15 mph. The combination of fewer travel lanes, the median, and the change in posted speed reduced total crashes on the street by 50%, and reduced crashes with injuries by 86%. The corridor also saw extensive economic development with the Complete Streets treatment, with forty-nine new businesses totaling 116,000 square feet of commercial space being added to the 8-block long project.

The landscaped median also provides space for special events. Farmer's Market days, holidays, and special events take advantage of the space by restricting median parking and using the space to set up vendor's booths.

Ben Franklin Parkway in Philadelphia, PA illustrates another way to configure bicycle and pedestrian facilities with medians. **Figure 10-10** is an aerial photo, showing the paved central median on a 6-lane arterial. On both sides, a landscaped intermediate median separates flanking 2-lane streets with slower speeds and access to adjacent sites with curbside conventional bicycle lanes. **Figure 10-11** shows how the intermediate medians and the street edge both have multi-use lanes.

Figure 10-10: Multiple Medians Example in Philadelphia, PA

Figure 10-11: Multi-Use Paths in Medians in Philadelphia, PA

Octavia Blvd in San Francisco, CA shows a slightly different use of intermediate medians. In this example shown in **Figure 10-12**, the center median serves as a center turn bay in some locations. The intermediate medians separate the high speed traffic focused on mobility form the flanking streets serving lower-speed traffic focused on access. The flanking streets feature parking zones and sharrows.

Figure 10-12: Multiple Medians Example in San Francisco, CA

Summary

The KTMPO regional network consists of layers of interrelated networks for the auto, bicycle, bus, truck, and walk networks. Each of these networks has its own specific design standards specified by law or by professional practice. The Complete Streets concept is one tool that can help develop these individual networks into a balanced and integrated multimodal network.

Actually implementing the desired Complete Streets design may be a challenge with the available right-of-way, funding constraints, and regulatory environment. Two general approaches are used to define a policy: either applying Complete Streets treatments to every street, or defining layers of modal networks and determining the appropriate mix of treatments for each street.

Complete Streets treatments also depend upon the regional and the street contexts, which define the intensity and character of activities and where they take place on the street for each mode.

With either approach, the very specific and objective design guidelines for each mode are brought together and balanced under the very general and subjective concepts of Complete Streets. Guidance for developing the proper balance of modes for Complete Streets therefore relies as much on imagination and judgement as it does on engineering.