Designing with Transit

Making Transit Integral to East Bay Communities

A Handbook for Elected Officials, Local Staff, and Other Community Builders


I dream of
cookies 'n cream.

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Message from the President of the Board of Directors

On behalf of the Alameda-Contra Costa Transit District, I am pleased to present *Designing With Transit*. We believe it is an important planning tool for AC Transit; for the cities, counties, and communities of the East Bay; and for other transit and governmental agencies.

We see many signs that East Bay communities intend to support transit in their design and planning. Yet at times there has not been a clear understanding of what is needed to facilitate bus transit. *Designing With Transit* will help structure the dialogue between AC Transit and communities, by providing a clear statement of AC Transit's goals, priorities and concerns.

The AC Transit Board of Directors believes that providing a good transit system and good community environments are inextricably linked. As a Board, we are charged with providing the best transit service possible within the limits of our resources. We are constantly thinking about how to maintain and improve AC Transit's service. The effectiveness and efficiency of that service is immensely increased when communities plan their land and their streets to make transit work.

Transit-oriented planning and design is not a new concern for AC Transit. In 1983 AC Transit published *Guide for Including Public Transit in Land Use Planning*, one of the first statements of its kind. At the same time we also published the *Transit Facilities Standards* manual, to provide clear guidance about what kind of physical facilities best supported transit. In 1994, the AC Transit Board passed *Policy 520: Encouraging the Promotion of Public Transit in Land Use Developments within AC Transit's Service Area*. *Designing With Transit* expands the scope of our earlier documents, and responds to current challenges. It discusses and graphically presents a policy framework based on lessons learned and best practices identified over the past two decades. *Designing With Transit* incorporates a new focus on pedestrian facilities as the system which brings people to transit.

More importantly, transit-oriented planning and design are not new to the East Bay. The East Bay was built around transit. The earliest forms of transit– in cities such as Oakland, Berkeley, and Alameda– were steam railroads and ferries. In the late 19th and early 20th Century, many East Bay neighborhoods grew up

around the streetcar lines of the Key System. The Key System, which ultimately stretched from Richmond to Hayward, was one of the most extensive streetcar systems in the country. Many of AC Transit's trunk lines today are modified versions of Key System routes. The construction of BART (Bay Area Rapid Transit) stimulated a process of rebuilding East Bay communities that continues to this day. Unfortunately the East Bay's transit-oriented traditions have sometimes been forgotten in a rush to accommodate unlimited numbers of automobiles without regard to other modes of travel. But throughout the 20th century some East Bay cities remained among the most transit-oriented in the nation.

The East Bay can be a better place in the 21st century by renewing its transit-focused traditions. We have every hope that the East Bay transit system will become both more extensive and more intensive. We believe that transit can and must play an increasingly important role in the East Bay. AC Transit is planning for the future by providing new forms of transit (such as Rapid buses and Bus Rapid Transit) to complement our local and transbay services East Bay communities now have a golden opportunity to shape their future in conjunction with the transit system. There is the opportunity to design with transit.

Joe Wallace
President, Board of Directors, Alameda-Contra Costa Transit District

SUMMARY: THE THEMES OF DESIGNING WITH TRANSIT

Many East Bay communities are again putting transit at the center of their development. The East Bay was founded around transit, but too much of our land and our attention have been devoted to the automobile. For decades the transit system, especially the bus system, was neglected by public and private decision makers. The pedestrian environment, critical for encouraging people to use transit, was often ignored and degraded.

Now there is a resurgence of interest in transit and in linking development to transit. Transit-oriented development has occurred throughout the East Bay and across North America. Communities across the East Bay are working to make their main streets more vital and pedestrian-friendly. East Bay cities are working with AC Transit to make their streets work optimally for bus service.

Designing With Transit is written to foster and facilitate these positive trends. It is a tool kit, a road map for East Bay communities that want to refocus on transit. It is not a blueprint for a community, because each community is different and must develop its own approaches. *Designing With Transit* outlines key concepts for communities to consider as they improve their transit-friendliness. It highlights key planning and engineering steps and warns of pitfalls to avoid. It illustrates how the bus system as well as the rail system is integral to East Bay transit (see Chapter 2, "The East Bay Transit System"). *Designing With Transit* demonstrates that East Bay and Bay Area communities are already taking steps towards greater transit-friendliness.

Designing With Transit discusses three areas which are critical to improving the transit-friendliness of East Bay communities--planning, walking, and streets and sidewalks:

- Planning (in Chapter 3, titled "Transit-Based Communities: Centering Planning on Transit"): How can communities plan their land use to support transit? In particular, how can communities plan their bus corridors to make them more friendly to transit-oriented development?
- Walking (in Chapter 4, "Safe Routes to Transit: Creating Good Ways to Walk to Transit"): How can communities make it safe and pleasant for people to walk to transit? How can buildings, sidewalks, and bus stops best be linked together to encourage transit ridership?
- Streets and Sidewalks (in Chapter 5, "Transit-Friendly Streets: Making Streets Work for Transit"): How can communities' streets and sidewalks support transit? Where does bus transit fit into "multimodal" street planning? How should bus stops be set-up to work best for both bus operations and bus passengers?

These three areas are critical to making communities more transit-friendly. Planning, structuring land uses so that transit passengers can easily access them, is fundamental. The walking environment must be safe and pleasant to get people to transit. The streets and sidewalks must allow bus operations and bus stops that serve bus transit and its passengers.

Designing With Transit includes both policy concepts ("Policies") and implementation approaches ("Best Practices") for planning, the pedestrian network, and streets and sidewalks. It also includes aids to implementation, such as diagrams, photographs, General Plan policies and, in some instances, recommended quantitative standards.

It took decades to develop the current transportation/land use system, overdependent on private automobiles. *Designing With Transit* suggests some modest steps in the other direction.

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PART 1:

UNDERSTANDING EAST BAY TRANSIT


NO
STOPPING
ANY
TIME

CHAPTER 1

INTRODUCTION TO DESIGNING WITH TRANSIT

WHY IS AC TRANSIT PUBLISHING THIS HANDBOOK?

The broadest purpose of this handbook is to contribute, however modestly, to redressing the balance of the transportation/land use system in the East Bay. The handbook supports city planning that is centered on transit access. The handbook is also intended to encourage "multimodal" transportation planning: planning and engineering which supports transit, walking, and bicycling, not just automobiles. This handbook is particularly focused on the often overlooked needs and potential of bus transit, the most widely used mode of transit. Bus transit also cannot be separated from walking, the way people get to the bus.

The American transportation system has become profoundly unbalanced, excessively reliant on the automobile. For decades, the system has developed to encourage mobility by auto, with transit an afterthought at best. Transit systems that were built in those decades were often themselves designed for access primarily by car. As a result, sprawling, low density development that can only be effectively served by automobiles has proliferated. Bus transit came to be seen by many as "last resort" transportation for the transit "dependent",[1] an image that further discouraged ridership and helped stimulate a spiral of decline. The outcome is that Americans take more of our trips by car than citizens of any other developed country, including Canada.

The East Bay does not escape this automobile dominance. Yet there are foundations here for transit to build on. The older communities of the East Bay were initially developed around transit. More recently, some BART stations have helped reinforce the importance of East Bay downtowns and neighborhood commercial districts. This history has meant that many of these communities continue to have land use patterns that make effective transit service possible.

This handbook outlines AC Transit's analysis of how the East Bay can be rebuilt in a more transit-friendly manner. It aims to provide practical guidance about how these can be achieved through land use planning, development of pedestrian facilities, and traffic engineering. This handbook is designed to help implement AC Transit Policy 520, *Encouraging the Promotion of Public Transit in Land Use Developments Within AC Transit's Service Area*, passed by the AC

[1] The term "transit dependent" overlooks the many passengers who choose to take transit, and overlooks the choices that all travelers have. It is also a loaded term because being "dependent" carries great stigma with it in the United States.

Transit Board of Directors in 1994 and amended in 1997. This handbook also updates AC Transit's *Guide for Including Public Transit in Land Use Planning*, and our *Transit Facilities Standards Manual*, both published in 1983. *Designing With Transit* also forms the background for AC Transit's review of Environmental Impact Reports and other planning documents.

AN EAST BAY FOCUSED HANDBOOK

Designing With Transit is based on the transportation and land use conditions that exist in the AC Transit district, the inner East Bay, as of 2004. In some ways, these conditions are similar to other locations, in other ways they are not. Because of these differences, *Designing With Transit* deliberately avoids examples, however inspiring or intriguing, from distant regions, especially from Europe, Latin America, and Asia. Most of the examples of best practices are drawn from inner East Bay communities, others are from nearby Bay Area communities. Most of the practices needed to make the inner East Bay a model of transit-friendliness can already be found somewhere in the East Bay.

The East Bay is also an area where transportation facilities, land use patterns, and community needs are constantly changing and evolving. These changes provide constant opportunities to guide the evolution of the East Bay in a more transit-friendly, pedestrian-friendly direction. *Designing With Transit* is intended to help the parties involved in the East Bay land use/transportation system to seize those opportunities.

Designing With Transit is written for all 23 cities and unincorporated communities in the AC Transit district, which stretches from Richmond to Fremont. These 23 communities are quite diverse in land use, transportation networks, and population. Oakland is not the same as Ashland. Yet there is much that unites the inner East Bay, whether in North Richmond or Newark.

All East Bay communities need efficient, high-quality transit. To deliver good transit service, AC Transit needs streets and sidewalks that work for transit, in Albany as much as in Alameda. Whether in San Pablo or San Lorenzo, bus passengers need sidewalks and walkways to bus stops that will allow them to walk to bus stops safely and quickly. Most communities in the district have committed in their General Plans to meeting the need for more housing whose residents can use transit as a major mode of transportation. Cities as divergent as Berkeley and Hayward champion mixed use, especially the mixing of residential and retail land uses, in their plans. How these widely shared goals are implemented is likely to differ in communities as different as El Cerrito and Emeryville. But the goals are common, and *Designing With Transit* is intended to help the communities of the East Bay in meeting these goals.

A TOOL FOR PARTNERSHIP

Publishing this handbook is an integral part of AC Transit's ongoing work with our partners. It is important to make our views known because AC Transit provides service primarily on facilities planned and managed by other agencies. Our bus service operates on roads managed by cities, counties, and Caltrans. AC Transit bus stops are located on sidewalks maintained by these agencies, and can be sited only with their approval. AC Transit attempts to serve the land uses approved by cities

and counties, whether those uses are transit supportive or not.

Many agencies have been excellent partners with transit in supporting transit service. But sometimes it is unclear to our partners what issues are important to AC Transit and why. AC Transit has not always communicated well. This handbook is an effort to summarize and organize our knowledge and concerns to improve these collaborative efforts.

The handbook is intended to be a reference, a starting point for discussions between AC Transit and the communities of the district. It does not replace consultation between AC Transit and individual cities and communities about individual issues and sites. It is instead designed to enhance the collaborative process and ground it in general policies and principles. We hope that *Designing With Transit* will give cities, counties, and other stakeholders a clearer idea of AC Transit's basic concerns. It can be used as a basis around which to focus detailed discussion of individual situations.

How to Use This Handbook

AC Transit is publishing *Designing With Transit* for anyone with an interest in making the East Bay more transit-friendly. This handbook is intended to be useful to people who are involved with the local transportation/land use system: city councilmembers, city commissioners, planners, traffic engineers, community activists, and others.

Designing With Transit illustrates various elements of making a community more transit-friendly. Transit-friendliness depends on all of the elements in this handbook: land use, the pedestrian network, and the street/sidewalk system. Although the topics in this handbook are interconnected, many readers will want to concentrate on certain chapters of this handbook. We suggest the following:

Chapters 1 and 2 introduce the Handbook and the AC Transit system, and are for all readers because they provide background for later chapters.

Chapter 3: Transit-Based Communities is particularly relevant to people who are involved with city planning decisions. City councilmembers, planning and zoning commissioners, land use planners, developers and citizen planning activists should read this chapter.

Chapter 4: Safe Routes to Transit is particularly relevant to people working on the pedestrian network. Transportation commissioners, transportation planners, transportation/traffic engineers, and pedestrian advocates should ready this chapter.

Chapter 5: Transit-Friendly Streets is particularly relevant to people who are involved with making decisions about streets, roads, and sidewalks. Transportation and public works commissioners, transportation planners, public works engineers, and traffic engineers should read this chapter.

Transit and land use terms that may be unfamiliar are defined in the Glossary, Appendix One.

HOW TO USE THIS HANDBOOK

Chapters of Particular Interest to Particular Audiences

Audience	Chapter 2 Transit System	Chapter 3 Community Planning	Chapter 4 Pedestrians	Chapter 5 Streets
City councilmembers	X	X		X
Transportation planners and transportation commissioners	X	X	X	X
Land Use Planners and planning commissioners	X	X	X	
Traffic/transportation engineers	X		X	X
TDM coordinators	X			
Developers	X	X	X	

Different chapters will be of greater interest if you are working on a particular type of project or document:

- For a general plan or area plan, see Chapter 3.
- For a zoning ordinance, see Chapter 3.
- For a design review ordinance or practices, see Chapters 3 (particularly Policy 3) and 4.
- For a streetscape plan, see Chapter 5.
- For planning bus stop locations, see Chapter 5.
- For a development application, see Chapters 3 and 4.

Why Should Communities Care About Transit?

This handbook is about integrating transit into East Bay communities. Its basic message is simple: whatever you do in developing your community, consider how it will affect transit, and how it can be made to help rather than harm transit.

But why should your community care about transit at all? Because transit benefits communities in many ways:

MOBILITY CHOICES

Transit provides mobility choices to residents. To people without cars, transit is critical. For people with cars, transit provides another option to always driving everywhere. A recent survey of AC Transit passengers estimates that as many as 40% could have chosen another mode of travel.

ATTRACTS RESIDENTS

Good quality transit can help attract residents to a community. Transit availability is a factor many people consider in evaluating where to live.

AIR QUALITY IMPROVEMENT

Transit shifts people out of their cars and onto less polluting modes of travel. Transit trips are most likely to happen during peak hours and along busy, congested corridors, the very conditions that lead cars to pollute the most.

REDUCED CONGESTION

Transit use may reduce congestion on streets and highways.

MORE EFFICIENT LAND USE

When people reach their destinations by transit rather than driving, it reduces the need for parking. Space that otherwise would have been devoted to parking can be used for buildings instead.

URBAN VITALITY

Transit brings people together in urban centers, making commercial and downtown areas lively. From Boston to Berlin to Beijing, the world's great cities rely on transit to bring people to their centers.

PUBLIC SAFETY

Transit passengers populate the streets of a community, providing "eyes on the street."

Transit is a community service and a community asset, much like libraries, parks, or schools. Investing in transit is investing in the community.


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AC TRANSIT

CHAPTER 2

THE INNER EAST BAY TRANSIT SYSTEM

INTRODUCTION

This chapter describes the existing and planned transit system in the inner East Bay in some detail as background for the following chapters. This chapter describes how AC Transit's route network is structured and the reasons for the structure as well as changes planned to the system.

This chapter highlights the fact that the East Bay transit system consists of both AC Transit and BART, as well as other services. AC Transit provides the primary service within the East Bay, while BART provides most regional connections to San Francisco and elsewhere.[2] Bus service in the East Bay is strongly connected to BART service.

THE INNER EAST BAY AND ITS TRANSIT SYSTEM: AN OVERVIEW

The AC Transit District: The AC Transit district is the legally defined area where AC Transit is the main bus transit provider. The district includes most of Alameda County and part of Contra Costa County. It stretches from Richmond in the north to Fremont in the south. The district includes 13 cities and unincorporated portions of Alameda and Contra Costa Counties. The district is illustrated in Map 1.[3] The AC Transit district is very long and narrow, almost 45 miles north to south but generally less than 5 miles east to west (excluding unpopulated areas).

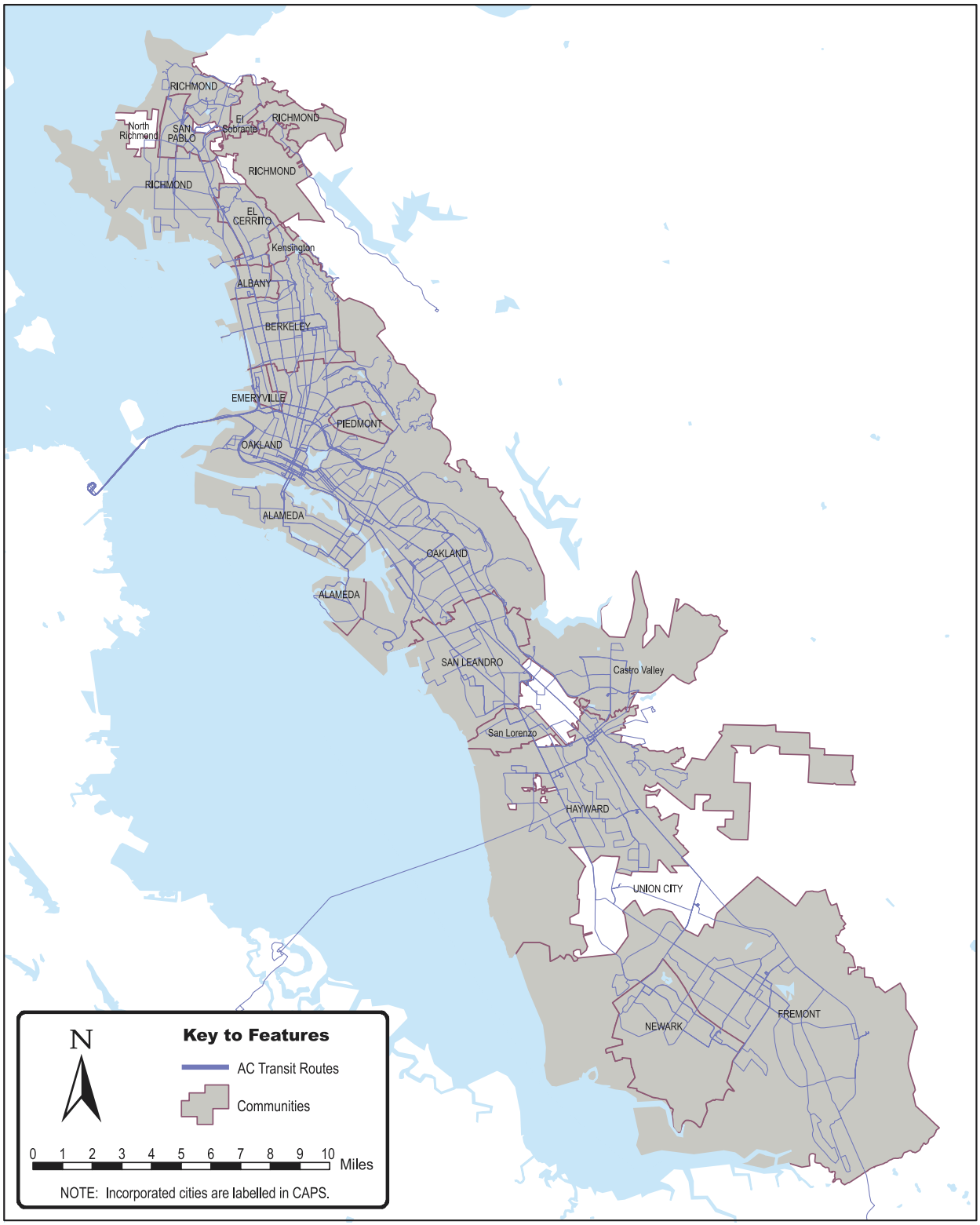
The district includes long-developed urban, higher density areas such as Oakland, Berkeley and Alameda, along with newer, lower-density areas, particularly on the northern and southern edges of the district. Among transit districts in California, the AC Transit district has the third highest population density, after San Francisco and Los Angeles.

The central portion of the district focuses on mixed use centers such as downtown Oakland and downtown Berkeley. North and especially south of the core, major employers and destinations are typically more scattered. The older areas of the district such as Oakland and Alameda were developed around a net-

[2] Levels of bus service vary with the availability of funds. However, the basic structure of service described in this chapter is maintained despite funding changes. In years of poor funding, the system becomes more skeletal, with less service in addition to the trunk lines. In years of good funding, the overall system grows, but the trunk lines remain the most important elements.

[3] Union City is not part of the AC Transit District, but AC Transit operates service there by agreement with the city.

Map 1: Cities and Communities of the AC Transit district



work of streetcar lines, but many destinations (e.g. shopping malls) in newer areas were developed based on freeway and roadway rather than transit access. Given these land use patterns, transit ridership is generally highest in the central and northern portions of the district. Constrained by the Bay to the west and the hills to the east, trips in the inner East Bay are primarily north-south.

The inner East Bay transit system is primarily made up of AC Transit bus lines and BART rail lines. AC Transit operates 78 local (East Bay only) lines, while BART has 21 stations in the AC Transit district, half of its systemwide total of 43 stations. There are also more localized transit services in the East Bay as well as bus routes connecting the East Bay to other parts of the region, including Union City Transit, Emery Go Round, and University of California transit. AC Transit also operates 27 lines with transbay service over the bridges across the Bay, mostly to San Francisco, but also to San Mateo and (as part of a consortium) to Palo Alto.

AC TRANSIT RIDERSHIP AND LEVEL OF SERVICE

Among American transit agencies, AC Transit has relatively strong ridership. AC Transit ranks third in total ridership among Bay Area transit agencies, after San Francisco's Municipal Railway (Muni) and BART respectively. On a per capita basis, AC Transit has the highest ridership in California after Muni. Residents of the AC Transit district each take an average of about 50 rides per year on AC Transit, a figure AC Transit hopes to increase over time.

Transit agencies vary sharply in how much service they provide. The best way to measure the level of service provided is known as "revenue hours per capita." Revenue hours are the hours a bus is in service on the street, carrying passengers or available to carry them. The higher the number of revenue hours per capita, the more bus service is available. AC Transit currently provides some 1.4 revenue hours of service per capita, similar to the levels of bus service provided in Seattle or Portland, but substantially below that provided by Muni.

AC Transit's Systemwide Service Deployment Policies

Given that funds are inadequate to create the ideal transit system, AC Transit must make decisions about what services to provide at what levels. The district must make decisions that will provide an effective, efficient transit system. The following *Service Deployment Policies* are the basis for making those decisions. They were adopted as part of the District's 2003 *Short Range Transit Plan (SRTP)*. The SRTP plays a role that is roughly analogous to a municipal General Plan. It represents the agency's broadest statement of goals, policies, and anticipated strategies for implementation. The policies listed below are explained in greater detail in the SRTP, some are also discussed further in this handbook.

AC Transit At a Glance

- The third largest bus transit service in California after Los Angeles and San Francisco
- Over 2,500 employees working at 7 facilities
- 6,500 bus stops on 105 fixed routes
- Almost 700 buses, driven 21 million annual service miles, connecting to 10 other bus systems, 22 BART stations, and 6 Amtrak stations
- 230,000 passengers per weekday, including 13,000 at the Transbay Terminal in San Francisco
- Almost 69 million passengers each year
- A service area of almost 400 square miles, including 13 cities, 10 unincorporated communities, and a population of 1.5 million, including the following cities and communities:

Richmond	Oakland
North Richmond (unincorporated)	Alameda
San Pablo	San Leandro
Rollingwood (unincorporated)	San Lorenzo (unincorporated)
East Richmond Heights (unincorporated)	Ashland (unincorporated)
El Cerrito	Cherryland (unincorporated)
Kensington (unincorporated)	Castro Valley (unincorporated)
Albany	Fairview (unincorporated)
Berkeley	Hayward
Emeryville	Newark
Piedmont	Fremont

- Service outside the district to Pinole, San Francisco, Foster City, San Mateo, Union City, Palo Alto (Stanford University) and Milpitas.
- Winners of the Best of the Best (bus driving "roadeo") for four years running!

Service Planning and Network Design

AC Transit plans its network of routes based on its service development policies. The first step is developing a network design that focuses resources on the core routes that carry the most riders. The SRTP states that, "The district aims to allocate 70% of its resource to demand-based services, with remaining 30% contributing to a basic level of geographic coverage." The demand-based services are the bus lines with the highest levels of ridership. Geographic coverage refers to the need to provide service to all parts of the district even when that service has lower ridership and revenue.

TRUNK ROUTES

AC Transit's ridership is highly concentrated on trunk lines, a longstanding pattern for the system. Lines on just five corridors carry over 40% of the total ridership on the system. As the SRTP notes, "Not surprisingly, these lines serve the most developed and dense part of the region, with population densities approaching 10,000-12,000 people per square mile on the busiest arterial streets." The population, and therefore the population density, of the AC Transit district is increasing slowly. The location of major high density areas has tended to be stable over time.

The five trunk line corridors with the highest ridership are as listed below. Corridors are identified with the lines that serve them as of July, 2004.

AC TRANSIT SERVICE DEPLOYMENT POLICIES (SELECTED)

Service Effectiveness Criteria

- Provide fast, thorough, coordinated, reliable, and easily accessible service on trunk routes
- Coordinate service with land use

Service Efficiency Criteria

- Maintain and enforce minimum route productivity standards
- Advocate for and/or implement transit priority and transit preferential measures in congested locations
- Maintain and enforce minimum bus stop spacing

Network Design Criteria

- Adopt service allocation policies based on density
- Implement limited stop/Rapid service based on demand
- Implement express bus service where beneficial
- Implement Transbay bus service where beneficial
- Encourage intra-East Bay ridership on transbay lines
- Investigate flexible service options
- Maintain and enhance owl service on its trunk corridors
- Maintain minimum route spacing/coverage
- Adopt span-of-service definitions for different service types
- Provide seamless transfers (time, location, provider)
- Reorganize branching routes in favor of better connections
- Operate only one bus line per corridor when possible
- Schedule consistent headways
- Renumber the routes so that they have a logical numbering system

- International Blvd./E. 14th St., Hayward-San Leandro-Oakland (Lines 82 & 82L)
- Foothill/Bancroft-Telegraph/Shattuck, San Leandro-Berkeley (Lines 40 & 43)
- Macarthur Blvd., San Leandro-Oakland-Emeryville (Lines 57 & N).
- Broadway/College/Alameda, Berkeley-Oakland-Alameda (Line 51, O in Alameda)
- San Pablo, Oakland-Albany-El Cerrito-Richmond-San Pablo (Lines 72, 72M, 72R)

Trunk routes provide frequent service through densely populated areas to major destinations, accounting for their high ridership. The trunk routes serve Downtown Oakland, Downtown Berkeley, the University of California, and 16 BART stations. Trunk routes also serve a number of key destinations away from BART, such as Hilltop Mall, Alta Bates Hospital, College of Alameda, Eastmont Town Center, and San Leandro Hospital. Trunk routes operate 7 days per week, from at least 6 a.m. to midnight, although several of these lines operate 24 hours a day on at least a portion of their route. They generally operate for several miles along a major street, making their route easy to understand. Weekday frequencies on trunk corridors are generally every 6-15 minutes. Several routes have or will have faster "Rapid" service along with local service.

MAJOR ROUTES

In addition to trunk routes, there are other major routes serving key corridors in the district which have been identified in AC Transit's Strategic Vision. These corridors are:

- Macarthur/Oakland Airport, East Oakland-Oakland Airport (Line 50)
- Hesperian Blvd., San Leandro-Hayward, Union City (Line 97)
- 6th St./Hollis, Berkeley- West Oakland-Alameda (Line 19)
- Sacramento/Market, Berkeley-Oakland (Line 88)
- Outer E. 14th St./Mission, San Leandro-Hayward-Union City (Line 99)

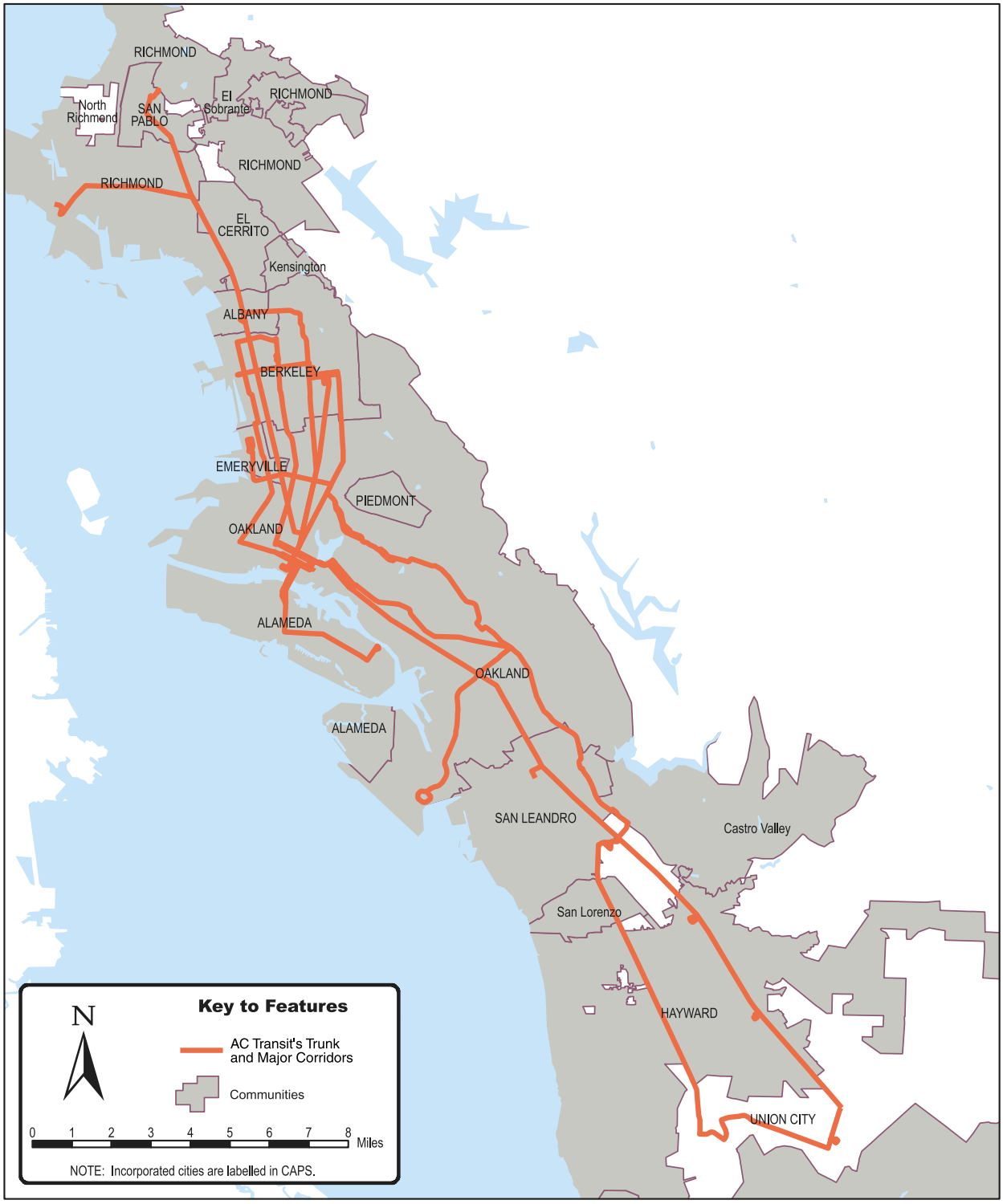
Major routes are scaled down versions of trunk routes. They operate long north-south routes and long hours, but typically at lower frequencies than trunk routes (currently some major routes operate every 20 minutes). They provide the principal service either in lower density areas, or in areas between other trunk routes.

GEOGRAPHIC COVERAGE

Geographic coverage is the other element of AC Transit's service model in addition to trunk/major routes. The trunk and major routes provide service within walking distance of most, but not all of the population of the district. The trunks also generally do not provide east-west service (or "crosstown" service), although some trunk lines turn and run east-west for a portion of their routes. Additional routes are needed to "cover" the remaining areas of the district, to provide service close to more people.

AC Transit thus needs to determine where to operate bus lines to serve these lower demand areas. The SRTP incorporates route spacing and route structure criteria. The criteria are based on population density. Population density is very closely tied to transit ridership– the higher the density of an area, the greater the transit ridership.

Map 2: AC Transit Trunk and Major Routes, as designated in AC Transit's Strategic Vision



COVERAGE AND POPULATION DENSITY

The District's Network Design Criteria (see p. 16) call for service allocation based on population density. Population density varies greatly within the district, the Fruitvale section of Oakland is more than four times as dense as the Oakland hills east of Highway 13. AC Transit has therefore adopted a policy to provide more service where demand is greater, in more densely populated areas. The population density of various areas can be seen on Map 3.

In the densest areas of the district, with population densities over 20,000 people per square mile (or roughly 30 people per gross acre), the service standard is a grid of routes spaced one-quarter mile apart. This means that ideally both north-south and east-west bus routes would be one-quarter mile apart.

Table 1: AC Transit's Types of Bus Service

AC Transit provides three basic types of service

- Trunk routes, which provide frequent service on heavily used corridors
- Crosstown routes connecting neighborhoods to trunk routes and BART
- Express/Transbay routes, which take passengers directly (via the freeway) to major destinations such as Downtown San Francisco

Type of Service	Examples	Purpose of Service Type	Typical Terminals	Typical Service Characteristics	Typical Ridership Characteristics
Trunk	43–Shattuck 51–Broadway 82–International	Main line, usually north-south service carrying large loads to key destinations and BART	BART stations, transit centers	Frequent service, service to multiple destinations, evening service	Heaviest loads, all day demand, travel moderate distances (1-5 miles)
Crosstown	9– Berkeley 76–Cutting 92–Hayward State	Service (generally east-west) connecting to trunks routes and to BART	BART station at one end, local destination at other	Lower frequencies, shorter operating hours	Lighter loads, shorter distance travel
Express/ Transbay	L–Richmond M–San Mateo Bridge O–Alameda	Take passengers from home to San Francisco and West Bay	Transbay Terminal in San Francisco	Non-stop express running on freeway	Highly peaked loads in commute hours

In addition to these main service types, AC Transit runs some more specialized routes. Examples include school-oriented service (school service is open to the general public) and evening/night only service (such as line 376 in Richmond/North Richmond).

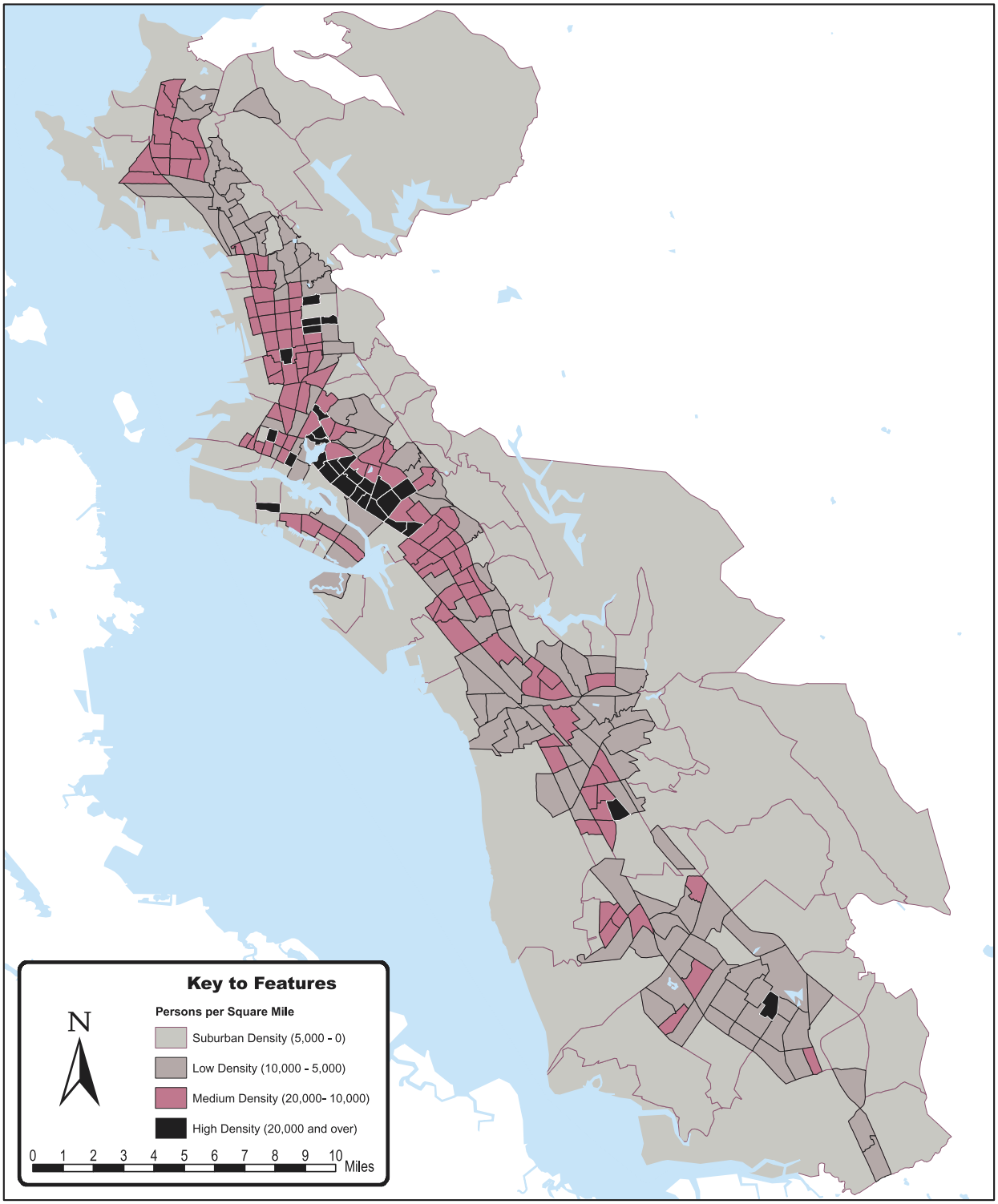
This is very close spacing, to serve a very dense population. Substantial portions of the district have population densities between 10,000 and 20,000 people per square mile (15-30 people per gross acre). In these areas, the District seeks provide a grid of routes spaced one-quarter to one-half mile apart.

In lower density areas, with population densities between 5,000 and 10,000 people per square mile (or 8-15 people per gross acre) the service model shifts. Rather than seek to provide a grid of routes, buses converge on a "focal point" (usually a BART station). The routes are designed to be one-half mile apart at the end of the route. This model is used in the Hayward and Richmond/El Sobrante areas. In Fremont-Newark, service radiates from the BART stations but also forms a partial grid because of the strongly gridded pattern of the streets.

Table 2: Population Density and Service Objectives

Density Category and Examples	**Route Spacing** (distance between lines)	**Route Structure**	**Weekday Base Frequency**	**Weekend Frequency**
High Density: 20,000 people per square mile and over (such as International Blvd., Telegraph Ave.)	1/4 mile	Grid	Trunk: 10 mins. Crosstown: 15 minutes	Trunk: 15 mins. Sat. and Sun. Crosstown: Sat–15 mins. Sun.–30 mins.
Medium Density: 10,000-19,999 people per square mile (such as Oakland, Berkeley, and Richmond flatlands)	1/4-1/2 mile	Grid	Trunk: 10 mins. Crosstown: 15 minutes	Trunk: Sat.–15 mins. Sun.–30 mins. Crosstown: Sat.–30 mins. Sun.–60 mins.
Low Density: 5,000-9,999 people per square mile (such as Hayward, Castro Valley, central Fremont)	1/2 mile	Focal Point Timed Transfer	Trunk: 15 mins. Crosstown: 30 mins.	Trunk: Sat.–30 mins. Sun–60 mins. Crosstown: Sat.–30 mins. Sun–60 mins.
Very Low Density: below 5,000 people per square mile (such as hills areas, parts of Fremont)	1mile	Focal Point Timed Transfer	No set standard	No set standard

Map 3: Population Density in the AC Transit District



The density and service standards refer to large areas or corridors that meet a given density. There are locations in the East Bay with small pockets of higher density population surrounded by lower density areas. Because these pockets are small they cannot generate adequate ridership to justify more frequent bus service. (Parts of downtown Oakland also appear to be low density on the map because they have small resident populations, but have the district's highest density of jobs and services, generating transit ridership.)

The Roles of BART and AC Transit

BART and AC Transit provide the bulk of transit service in the inner East Bay. BART stations are the principal hubs of the East Bay transit system, for both bus and rail service. BART provides high speed heavy rail service to 21 stations in the AC Transit district, generally spaced some 2-3 miles apart (closer together in parts of Oakland and Berkeley). AC Transit provides extensive service to all BART stations in the AC Transit district, and virtually all AC Transit local buses serve at least one BART station. The systems' contrasting characteristics show how they are complementary to each other. Because they largely serve different travel needs, BART and AC Transit together provide greater mobility for transit-oriented development than either system alone would provide.

Types of Trips

AC Transit and BART serve different types of trips. The average AC Transit trip is 3.1 miles, the average BART trip 12.2 miles. Because of the wide spacing of BART stations in most of the AC Transit district, BART is inconvenient for many shorter trips, particularly for trips that do not begin or do not end near a BART station. BART's high operating speeds are ideal for long trips.

Destinations

The majority of transit trips that are wholly within the East Bay are taken on AC Transit. BART handles most of the transit trips from the East Bay to San Francisco. AC Transit's Transbay service (mostly to San Francisco) is concentrated in corridors not within walking distance of BART. During the years of highest BART usage, AC Transit's Transbay service also served to relieve pressure on BART's capacity. AC Transit has more than 3,000 pairs of stops (a stop in each direction) in the East Bay.

Getting to AC Transit and BART

Passengers reach AC Transit and BART by different modes. Some 75% of AC Transit passengers walk to their bus stop. By contrast, 38% of BART passengers systemwide reach BART by driving alone, making driving alone the plurality mode of BART access (BART hopes to reduce this percentage). A small percentage of AC Transit Transbay and express bus passengers reach their bus by driving to park-and-ride facilities in areas where on-street service is not

practical. The proportion of passengers doing this is expected to remain small.

Trip Purposes

Passengers use AC Transit and BART for different purposes. BART ridership is dominated by weekday commute trips, particularly to San Francisco, Downtown Oakland and Berkeley. Over 60% of all BART trips were to or from work, compared with 40% of AC Transit trips. School (at 33%) and shopping (10%) were the next most important destinations for AC Transit travelers, while on BART it was school (9%) and visiting family and/or friends. More of AC Transit's passengers than BART's ride on weekends, especially on Sundays.

Faster Types of Bus Service: Rapids and Bus Rapid Transit

One of the major challenges facing AC Transit is making our service operate faster. However, average speeds for our buses have been falling, and AC Transit's average speed is 5-15% below that of comparable systems.

To speed up and improve trunk line service, and to increase trunk line ridership, AC Transit is beginning to develop "Rapids." Rapid-type service has been very successful in Los Angeles and is being considered by a number of other cities.

Rapids provide fast, frequent service along trunk route corridors. The first Rapid is operating on San Pablo Avenue between downtown Oakland and the city of San Pablo. Key characteristics of the Rapid include:

- More widely spaced stops, for faster operation
- Traffic signal priority (when needed) for faster operation
- Far side stops whenever possible to minimize waiting at signals
- Full low floor buses to ease boarding and alighting
- Shelters with information at Rapid stops
- Special Rapid signage
- "Next bus" informational displays indicating when the bus will arrive (to be implemented 2004)

AC Transit plans to upgrade other trunk lines to Rapid service when possible.

Beyond the Rapid, AC Transit is working with cities to plan Bus Rapid Transit (BRT) on Telegraph Avenue and International Boulevard, operating from downtown Berkeley to Bayfair BART in San Leandro. This routing represents AC Transit's most important corridor and would serve downtown Berkeley, the University of California, Alta Bates Hospital, Temescal, Pill Hill, downtown Oakland, Laney College, Fruitvale, downtown San Leandro, and Bayfair Mall.

In addition to all the features of the Rapid– such as a smaller number of stops and transit signal priority– BRT is designed to have stations at stops, and lanes on the street which are used solely by the bus (known as dedicated lanes). Thus, Bus Rapid Transit will function very much like light rail, but at a very much lower cost using buses instead of train equipment.

Bus Rapid Transit can provide more flexible service, because many bus routes can use portions of the dedicated lanes, then branch out into the community.

Bus Rapid Transit is quickly becoming an important transit option around the country. Bus Rapid Transit in the United States has been inspired in part by the high-capacity bus system in Curitiba, Brazil. Los Angeles, Cleveland, and Boston have developed or are developing Bus Rapid Transit lines. Bus Rapid Transit lines have been proposed for El Camino Real between San Jose and Palo Alto in Santa Clara County, and for various corridors in San Francisco.

Evaluating and Modifying Bus Lines

EVALUATING THE PERFORMANCE OF ROUTES

AC Transit frequently reviews the performance of its lines, especially the number of passengers they attract. When funds are available to expand service, the agency identifies lines that justify more frequent service or longer hours. It also identifies locations that need more transit service. When there is a fund shortfall, AC Transit evaluates which lines are performing poorly. These lines may have service reduced or be eliminated.

In planning service, AC Transit focuses primarily on ridership. The single most important measure of ridership is "passengers per revenue hour." Passengers per revenue hour is the number of people who board a bus during each hour of its operation. AC Transit's planning is strongly influenced by the passengers per revenue hour on a line as a whole and/or on segments of a line. Sometimes some segments of a line are productive while others are not. Lines with insufficient passengers per revenue hour may be reduced or eliminated Lines which have more ridership will generate more fare revenue, but fares are not the primary consideration in service planning.[4]

NEW AND MODIFIED BUS ROUTES

AC Transit is often asked why it cannot change its route structure to accommodate a new development, or for other reasons. AC Transit modifies its route structure to reflect changing conditions in the district. For example, in June, 2003, despite the serious fiscal problems of the district, AC Transit has instituted the new line 19 serving the growing employment centers of West Berkeley, Emeryville, and West Oakland.

AC Transit must exercise caution in modifying bus routes. AC Transit can and has changed existing bus routes, but only when there are compelling reasons to do so. Passengers have a reasonable expectation that service they use will continue. We wish to provide that continuity as much as possible, particularly on trunk routes. Routes are in their current locations because those locations serve passenger demand and reach important destinations. Trunk route locations in particular tend to be stable over time.

[4] Fares on most North American transit services cover only a fraction of the system's operating costs. That ratio is known as the farebox recovery ratio. AC Transit's farebox recovery ratio is currently 21%, although it is higher for trunk lines and most Transbay lines, and lower for most crosstown lines, especially in low-density areas

HIGH FREQUENCY LINES NEED MULTIPLE DESTINATIONS

There are constraints on AC Transit's ability to add new lines in addition to the cost of doing so.

In most cases, a new line serving solely or principally a single destination– even a relatively large one– will attract few passengers. AC Transit's trunk lines and other major lines serve multiple destinations and communities along a single corridor, attracting riders making a variety of trips. To support frequent service, population densities in a bus corridor must generally exceed 10,000 people per square mile for two linear miles or more.

Sometimes AC Transit is requested to operate community service type lines that meander to reach multiple scattered destinations. These lines appear attractive because they serve many destinations. Unfortunately they rarely attract many passengers. The direct, frequent service offered by a trunk line also attracts more passengers than a less frequent, less direct community service style line. With few passengers, a new single-purpose line will require an even greater operating subsidy than usual, making it very difficult to institute without outside funding, particularly in times of fiscal stringency.

Example of Multiple Destinations along a Trunk Route--Line 57 (Macarthur)

- Emery Bay Shopping Center
- Bay Street Shopping Center
- East Baybridge Shopping Center
- Macarthur BART
- Kaiser Hospital
- Piedmont Avenue commercial district
- Oakland High School
- Highland Hospital
- Dimond commercial district
- Mills College
- Eastmont Town Center

BUILD WHERE THE BUS ALREADY IS

For the reasons discussed above, *AC Transit strongly recommends that cities and communities site major destinations in locations with strong transit service, rather than assuming that the transit system will be able to serve dispersed locations.*

Part 2:

Designing with Transit

CHAPTER 3

TRANSIT-BASED COMMUNITIES: CENTERING PLANNING ON TRANSIT

CHAPTER GUIDE

Topic: Planning land uses and corridors to make transit work better.

Particular Audience: City councilmembers, planning and transportation commissioners, transportation and land use planners, developers

Subject of Recommendations: General Plans, Area Plans, Redevelopment Plans, Specific Plans, Zoning Ordinances, facility siting, parking requirements and charges

INTRODUCTION

Creating a community where destinations can be reached by transit and walking is the focus of this chapter. This chapter outlines key planning policies and practices necessary to develop a community where travel by walking, transit, and bicycle is practical and pleasant. Transit-supportive General Plan policies are included for some practices.

This chapter considers three key planning questions:
- How can a community use land to support transit and be supported by transit?
- How can bus corridors be appropriately developed?
- How can parking policies support transit-oriented communities?

The chapter outlines how communities can take advantage of the rich East Bay transit system described in the last chapter. It describes how to structure land uses– housing, retail stores, civic buildings, etc.– so that they work with transit rather than against it.

This type of transit-focused development is natural in inner the East Bay. There are already many walkable, densely built downtowns, main streets, and commercial corridors throughout the East Bay. BART stations have

also reinforced many of these areas. The East Bay's historic centers have offices, stores, restaurants, apartment buildings, government buildings, movie theatres, hotels, and more. A new generation of transit-friendly development can reinforce the East Bay's hubs and make them better places to live, work, and play.

Locations on trunk line bus corridors have important potential for transit-oriented development. Trunk line bus corridors can provide access to local employment and shopping centers, BART, and in some cases directly to San Francisco. These corridors can spread the advantages of transit-oriented development to dozens of locations. Some East Bay communities already highlight the potential of bus corridors in their planning.

The chapter also addresses the difficult issue of parking. Community planning cannot ignore the impact of parking on transit ridership or on the physical form of the community. This chapter proposes ways a community can control parking and integrate parking policy into transit-friendly planning, rather than finding itself controlled by parking.

The litmus test for transit-focused community planning is this question: **"How does it feel getting around this community by transit and walking? Are the places I need to go easily accessible, or are they difficult and unpleasant to reach?"**

Summary of Transit-Based Communities' Policies and Practices

POLICY 1: DEVELOP DENSE, MIXED USES IN LOCATIONS WITH GOOD TRANSIT ACCESS

Best Practice 1.1: Cluster the community's densest uses where there is the best transit access

Best Practice 1.2: Develop transit-supportive uses, and avoid auto-oriented uses, in locations with good transit access

Best Practice 1.3: Build projects to planned densities in transit-friendly areas

Best Practice 1.4: Avoid high intensity uses in locations with minimal transit service

Best Practice 1.5: Locate special needs facilities in areas with good transit service

Best Practice 1.6: Designate transit-friendly areas for denser development in key planning documents

POLICY 2: PLAN BUS CORRIDORS TO MAXIMIZE THEIR POTENTIAL FOR TRANSIT-ORIENTED DEVELOPMENT

Best Practice 2.1: Develop the area within easy walking distance of a transit corridor with transit-supportive uses

Best Practice 2.2: Assure that residents on bus corridors can easily walk to neighboring and nearby uses

Best Practice 2.3: On commercial strips, focus development at nodes

POLICY 3: MANAGE PARKING AS PART OF AN OVERALL TRANSPORTATION AND LAND USE STRATEGY

Best Practice 3.1: Provide appropriate but not excessive amounts of parking

Best Practice 3.2: Reduce parking requirements in transit-friendly areas

Best Practice 3.3: Consolidate parking into joint lots and structures

Best Practice 3.4: Charge fees to cover parking costs and generate funds for other modes

CONTEXT: ASSESSING THE AVAILABILITY OF TRANSIT FOR TRANSIT-ORIENTED DEVELOPMENT

This chapter urges communities to focus development on locations with good transit service. In order to guide development to the most transit-oriented locations, communities must assess what they are. A location with the best transit service will have not only a strong main line, but also have service to various major destinations, frequent service, and service that operates long hours.

Table 3 on page 3-7 illustrates transit service (as of October, 2004) in four different types of locations in the AC Transit district. The locations were chosen simply to illustrate different levels of transit availability (and not to suggest anything about their appropriateness, or lack thereof, for development):

BART station with bus hub: *El Cerrito Del Norte BART*. This station is served by two BART lines (San Francisco and Fremont), numerous AC Transit bus lines, and bus lines from Northwest Contra Costa, Marin, and Solano counties. This site is illustrative of the 21 BART stations in the AC Transit district.

Service by Two or More Trunk Lines: *Eastmont Transit Center* in East Oakland illustrates a locations served by more than one frequent trunk bus line. This site also has Transbay service to San Francisco. Eastmont is unusual in being served by several trunk lines, though a number of locations have two trunk lines. Eastmont has direct service to downtown San Francisco and downtown Oakland, but trips farther into San Francisco or south of Bayfair require transfers to BART or to other bus lines. Other locations with similar types of service include Solano and San Pablo avenues in Albany; University and San Pablo avenues in Berkeley and Broadway and Macarthur Blvd. in Oakland.

Service by a single trunk line: *College and Ashby avenues,* in Berkeley is served by a single trunk bus line (Line 51) and a single crosstown line (Line 9). Transit passengers here can reach Berkeley and north Oakland destinations directly, and BART, but longer trips require connection. Other locations with similar types of service are widespread, they include Sutter and Hopkins streets in Berkeley; 35th and Macarthur in Oakland; and Estudillo and Bancroft in San Leandro.

Crosstown Service: *Floresta and Monterey* in San Leandro illustrates locations served only by crosstown lines, in this case Line 55. Passengers can connect to BART at either end of the route; to shopping and city services in Downtown San Leandro and Bayfair Mall; and may happen to work in the industrial area along the route. All trips outside San Leandro require transfers. Other locations with similar types of service are very common, they include locations along Cutting Blvd. in Richmond, along Center St. in Hayward, and along 98th Avenue in Oakland.

Table 3: Level of Transit Service at Illustrative Locations

Type of Location	Illustrative Location	Transit Services	Selected Destinations with direct service	Frequency of Service (weekday)
BART station with bus hub	El Cerrito Del Norte BART, El Cerrito	Two BART lines, San Pablo Rapid Line 72R, AC Transit lines 7, 71, 72, 72M, 76, 376, L; Golden Gate Transit; Vallejo Transit; Westcat	San Francisco Downtown Oakland UC Berkeley Contra Costa College Hilltop Mall San Rafael	BART: 7.5 minutes Line 72 R San Pablo Rapid: 12 minutes Line 72 local: 15 minutes to Oakland 30 minutes to Hilltop Mall & San Rafael
Service by two or more trunk lines	Eastmont Transit Center, East Oakland	AC Transit lines NL, other Ns, 40, 43, 50, 57	Downtown San Francisco Downtown Oakland Bayfair Mall (BART)	All lines: 15 minutes
Service by one trunk line (with cross-town line)	College & Ashby aves., Berkeley	AC Transit lines 9, 51	Rockridge BART UC Berkeley Downtown Berkeley	Line 51: 8-10 minutes Line 9: 20-30 mins.
Crosstown line only	Floresta & Monterey, San Leandro	AC Transit Line 55	San Leandro BART, Bayfair BART	Line 55: 30 minutes

General Plan Policy: Increase Density for Transit Hubs, Corridors:

Transit-Oriented Development Corridors and **BART Station Area Node**s are areas designated by the City as generally suitable for higher residential densities, for intensive non-residential uses, and for mixed use; these areas are centered along existing or planned light rail transit (LRT) lines and/or major bus routes and at future Bay Area Rapid Transit (BART) stations. Transit-Oriented Development Corridor boundaries are not precisely defined but, in general, particularly during the early stage of intensification, the corridors are intended to include sites within approximately 500 feet of the right-of-way of the corridor's central transportation facility or within approximately 2,000 feet of an existing or planned LRT station.

Transit-Oriented Development Corridors and BART Station Area Nodes, City of San Jose General Plan Land Use/Transportation Diagram.

Transit-Based Communities' Policies and Practices

PLANNING POLICY 1: DEVELOP DENSE, MIXED USES IN LOCATIONS WITH GOOD TRANSIT ACCESS

A "transit-friendly" area is one where residents, workers, and other users of the area can meet their daily needs by using transit and walking. Transit-friendly areas have three core characteristics:

- High levels of transit service, from bus and/or rail lines;
- A mix of uses, especially basic retail uses;
- A network of safe and pleasant routes for walking around

Mixed uses are important to allow people in the area to conduct their activities by walking. For example, workers can walk to lunch. Residents can walk to a grocery store. Some locations have good transit access but only one use. Workers in single-use areas may resist taking transit because they feel "trapped" at their worksite. Residents may use transit for trips to work but drive for all other trips. (Walking routes are addressed in Chapter 4.)

Planning Best Practice 1.1
Concentrate dense uses in the locations with the best transit access.

To design with transit, a community's most intense uses should be in its most transit-friendly locations. This practice is critical whether the most intense use is a 40 story highrise or a 4 story apartment building. In this way, the land closest to transit is efficiently used, and the people in the biggest building can make use of the transit. Less intense uses near transit hubs waste this valuable land. As noted in the

Denser, mixed use buildings are spreading to new locations such as Fremont.

Table 4: Appropriate and Inappropriate Uses in Transit-Oriented Areas

Appropriate Uses: Transit-Supportive and Higher Density Uses	**Inappropriate Uses: Auto-Oriented and Lower Density Uses**
Higher density housing *Around BART Stations* – Multi-family housing at 40 units/acre or greater (this threshold from BART's *Transit Oriented Development guidelines*) *On trunk bus corridors* – Townhouses and multi-family housing at 20 units per acre or greater	*Lower density housing*
Locally-oriented retail and services: Groceries, drug stores, cleaners, small appliance repair shops, banks	"Big box" retail– e.g. warehouse clubs
Restaurants	Other large scale auto-oriented retail– e.g. furniture stores, lumberyards
Civic and governmental uses–City Hall, Civic Center	Auto-related uses: auto repair shops, car dealers and used car lots, car washes
Libraries and museums	Drive through windows (e.g., banks, restaurants, etc.)
Hotels, Bed and Breakfasts	Surface parking
Senior/community center	Warehouses
Special needs facilities for blind, deaf, developmentally or physically disabled	
Private offices	Mini-storage/Self-storage buildings
Movie theatres and live theatres	Manufacturing uses with low density of employees per square foot.
Post offices and mailing facilities	

"Context" discussion in this chapter, the location with the best transit access may be a major BART hub or it may be a trunk line bus hub, depending on the community.

Planning Best Practice 1.2
Develop transit-supportive uses (and avoid auto-oriented uses) in locations with good transit access

Encouraging transit-supportive uses in transit-served locations key to creating transit-friendly areas. Table 4 (page 3-9) outlines appropriate and inappropriate uses for transit-oriented areas. The appropriate uses are high density uses and uses which can easily be accessed by transit or walking. The inappropriate uses are lower density uses and those where access by car is usually dominant (not all types of land use are shown on the table).

Some uses are particularly suited to transit hubs. Locating civic buildings, such as city halls and civic centers near transit hubs makes them accessible to all parts of the population. It also makes a statement that the community values transit access to its institutions. The City of Hayward took this approach when it built its new City Hall one block from Hayward BART. Major private office buildings have large numbers of employees who can commute by transit when it is nearby. Transit hubs are also a good location for multi-family housing– apartments, and condominiums– as well as for restaurants, and convenience-oriented retail uses. At convenience-oriented retail stores shoppers can buy items easily carried on foot and on transit. Appropriate types of retail or service uses could include banks, cleaners, drug stores, and grocery stores.

Mixed Use

Bringing a mix of uses together can make an area a destination, which in turn makes it more effective to bring bus service to it. Downtown Berkeley is a good East Bay example. The area contains a BART station and is adjacent to the University of California. Downtown Berkeley also includes the city's offices,

This big box retailer preempts a large site within walking distance of a BART station.

county courts, Vista College, the main public library, the main post office, the recently expanded YMCA, a historical museum, movie theatres and live theatres. These uses are within a few blocks of each other, making it possible to focus transit on them.

Mixed use need not be limited to urban core environments but also can found in other types of areas. Downtown Walnut Creek is an area where numerous uses are close together and where a strong pedestrian network makes walking between them possible and enjoyable. San Jose's Santana Row project puts housing and a hotel inside an upscale shopping center, allowing for walking trips. Dublin, California, has built a community-scale shopping center with basic retail uses on the same property as, and immediately adjacent to, an apartment building.

It is also important to avoid placing low intensity and transit-unfriendly uses on valuable sites near transit hubs. An important and all too frequent example is "big box" retail. Big box retailers usually present a huge, pedestrian-hostile face to the community. Their huge size may block streets that formerly went through a site, impeding pedestrian and bicycle access. Shoppers, often intending to buy large quantities at the big box, almost always arrive by automobile. Auto dealers also need large spaces and contribute little to transit-oriented streets. Low density industrial and warehouse uses also underutilize land near transit hubs, though there are some higher density manufacturing activities. Large lot single family housing near transit hubs is also inappropriate.

Planning Best Practice 1.3
Build projects to the planned densities in transit-friendly areas

It is important to develop land around transit hubs to the actual densities permitted in a community's General Plan. Often a General Plan will allow a certain density, but actual projects are developed at far lower densities. In some cases, developers may not immediately see the market for higher-density housing and wish to build a quick project. It is important that communities consider their long-term benefit and maintain available land for denser housing. Some communities, such as Fremont and Milpitas, specify minimum as well as maximum densities in key areas to limit this process of thinning out projects.

This discussion is not intended to suggest that zoning a location for higher density development is sufficient to have that development occur, only that such zoning is necessary for development. Local gov-

General Plan Policy: Limit Transit Served Locations for Public Facilities and Services

Wherever possible, locate public and private institutional uses and community service centers that serve city residents or have a regional-service orientation on transit corridors so that they are accessible to public transportation and will not disrupt adjacent residential areas.

Policy LU-15, Land Use Element ,City of Berkeley General Plan

General Plan Policy: Encourage Dense Development Near Transit

Encourage transit-oriented development; where appropriate, encourage intensive new residential and commercial development within one half-mile of transit stations or one quarter-mile of major bus routes.
City of Hayward General Plan Transportation Element, Policy 10.1

General Plan Policy: Limit Low Intensity Uses Near Transit

Development inconsistent with the objectives of the Transit-Oriented Development Corridors and Station Area Nodes, for instance low intensity uses (e.g., one and two story office buildings), low density residential, and auto related uses (e.g. surface parking lots, automobile sales lots, stand alone big box retail, etc.) should be avoided particularly within 2,000 feet of an existing or planned Light Rail Transit Station.
Development Parameters, Transit-Oriented Development Corridors, City of San Jose General Plan Land Use/Transportation Diagram).

This highrise office building is isolated from transit and other uses, forcing people to drive there.

General Plan Policy: Require Minimum Density at Transit Hubs

To achieve a variety of housing types, the City has designated locations where moderate and higher density development is appropriate. Criteria for the location of higher density housing include access to transit, proximity to commercial areas, proximity to a collector or arterial street, and as a transition use where maximum flexibility in site design is required. For those areas where higher densities are indicated on the General Plan Diagram, construction of housing at significantly lower densities than planned would not meet the City's goals. The City therefore establishes a minimum required density of development for all medium and high density uses …

City of Fremont General Plan Land Use Element, Policy LU 1.9

ernments are aware that in many cases they will need to become actively involved to assure that desired development takes place. Additional regulatory changes may be needed, as may investments in infrastructure and/or public subsidies. These topics are beyond the scope of this handbook. Appropriate land use planning is necessary for transit-oriented development, but often it is not sufficient.

Planning Best Practice 1.4
Avoid high intensity uses in areas with minimal transit service

Just as low intensity uses are inappropriate at transit hubs, high-intensity uses are inappropriate away from transit hubs and corridors. A high density apartment complex or major office building with little or no access to transit is inevitably a large generator of auto traffic. At the same time, such a location virtually forecloses the option of taking transit for its tenants or residents.

Planning Best Practice 1.5
Locate special needs facilities in areas with good transit service

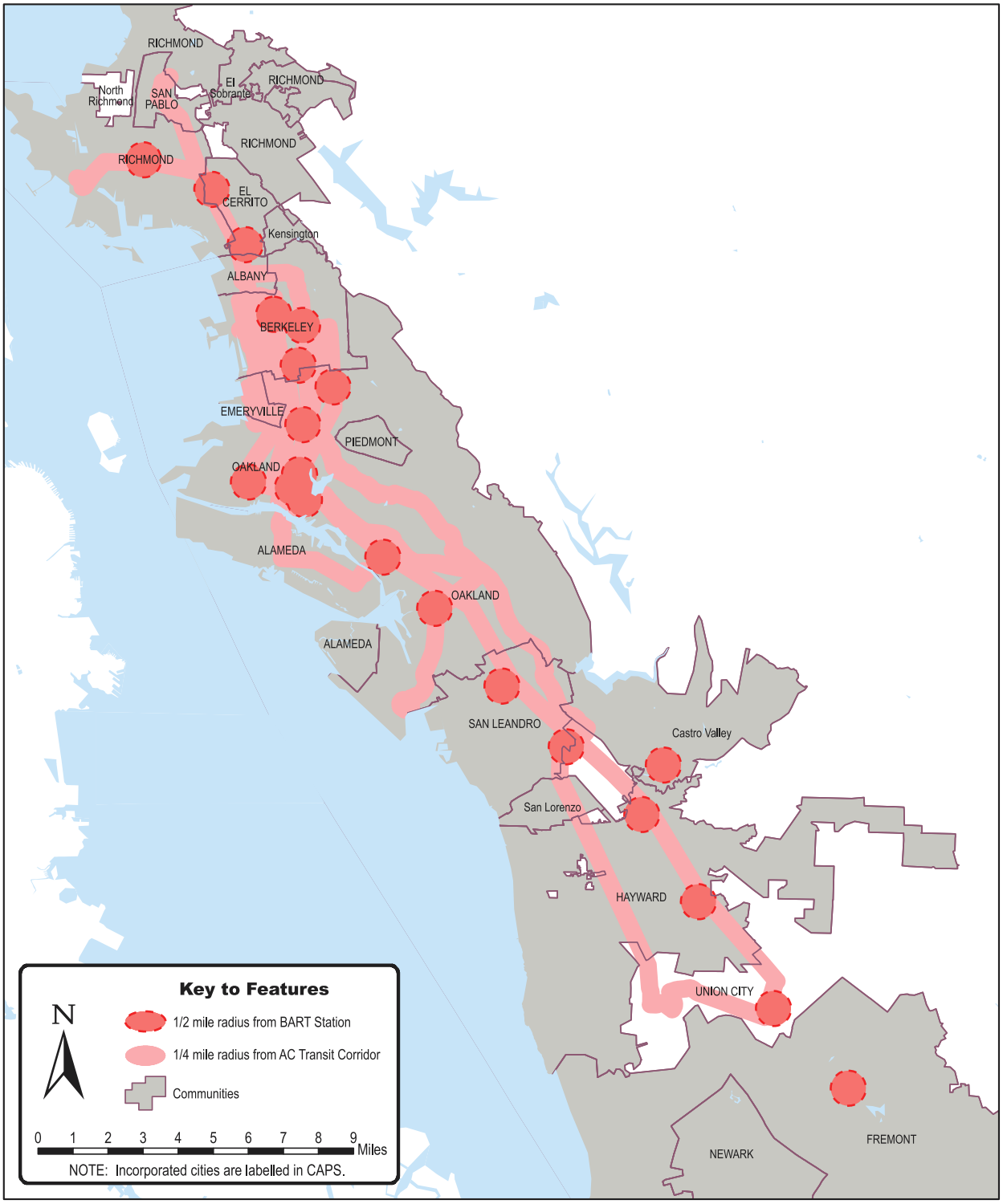
Some facilities provide services that generate a particularly high need for good transit. Examples include rehabilitation services for the disabled, or a training site for the developmentally disabled. Good locations for this type of facility are close to frequent transit service. For example, the Albany Center for the Blind is served by trunk bus Line 72 and is within walking distance of the El Cerrito Plaza BART station.

General Plan Policy: Limit Development Intensities Away from Transit

Preserve the low-density character of San Leandro's predominantly single family neighborhoods. Concentrate new multi-family development in the areas near the BART Stations and along major transit corridors such as East 14th Street.

Policy 2.05, Land Use Element, City of San Leandro General Plan

Map 4: Priority Areas for Transit-Oriented Development: Trunk and Major Bus Corridors, BART Stations



Unfortunately, some communities have relocated special needs facilities away from central locations with good transit service to remote locations that are almost impossible to serve effectively with transit. Sometimes it is assumed that AC Transit can simply create a new line to serve these facilities, but for the reasons discussed in the last chapter, this is usually not possible or cost effective. This type of relocation should be avoided and communities should consult with AC Transit before siting these facilities.

Planning Best Practice 1.6
Designate transit-friendly areas for denser development in key planning documents

It is important legally, politically, and economically that a community's intent to develop higher density housing in transit-friendly areas be reflected in key documents. These include the community's General Plan, Zoning Ordinance, Area Plan or Specific Plan (if applicable), and Redevelopment Plan (if applicable).[5] Legally, showing a similar intended use for an area in these documents makes challenges more difficult. Politically, the community becomes aware that this is the intended use, making it harder for opponents to make credible claims that they were unaware of intensification plans. Economically, the documents send a signal to developers that this is what the community wants for an area and can help attract developers of appropriate housing types.

[5] A new type of land use regulation known as a "form based code" or "Smartcode" is emerging. Form based codes focus are based on the intensity of use of land at a given location. This includes how many square feet of building there may be for each square foot of land–the Floor Area Ratio (FAR), as well as height regulation. By contrast, traditional Zoning Ordinances–while regulating building intensity–are based on land uses–what uses are permitted and prohibited at a given location. The City of Petaluma has recently adopted a form-based code for its central area. Form-based codes allow the possibility of matching permitted intensity of use to the level of available transit service. They also tend to include prescriptive design standards, e.g. buildings shall be built up to the edge of the sidewalk.

These homes are on a local residential street only a block from a bus corridor.

PLANNING POLICY 2

PLAN BUS CORRIDORS TO MAXIMIZE THEIR POTENTIAL FOR TRANSIT-ORIENTED DEVELOPMENT

The value and importance of rail stations as focal points for intensified development has become increasingly recognized in the East Bay. What is so far less widely recognized is the potential for development, especially housing development, along and near major bus transit corridors. Trunk bus corridors include more land in the East Bay than do BART station areas. So they are stable transit locations, these corridors have been trunk routes for decades and will remain.

One of the most important messages of this handbook is that bus corridors, approximately one quarter-mile around bus lines, can and should become foci for transit-oriented development.

Trunk bus corridors provide access to important employment, shopping, and recreational destinations. Trunk bus corridors connect to numerous BART stations for longer distance trips. Most trunk bus corridors already have substantial segments with higher density housing such as apartment buildings, facilitating additional development. Most trunk bus corridors also have vacant and underutilized parcels that can be used for housing development.

The land use and urban design characteristics that make a location transit-friendly apply to bus corridors as well as rail stations (see pages 3-8 to 3-15 for more discussion). The most transit-friendly areas provide good transit service and basic "local serving" stores such as supermarkets and drug stores in a "pedestrian-friendly" environment.[6] Many of the East Bay's principal commercial corridors are also principal transit corridors including San Pablo Avenue, Shattuck Avenue, Telegraph Avenue, and International Boulevard/East 14th Street. In these locations, the availability of transit would probably not be the only reason that a household moved there, but it would be one reason for doing so.

Examples of market-rate housing development along bus corridors include buildings at 40th & San Pablo in Emeryville and near Solano & San Pablo in Albany. The city of Fremont is in the process of rezoning numerous sites along its bus corridors to permit higher density development, San Leandro has begun to do so. A number of bus corridors have affordable housing development, which often serves as the catalyst for future mixed income development.

AC Transit's primary role in fostering such development is to provide the best transit service our funding allows.[7] We plan to improve our trunk lines to Rapid and Bus Rapid Transit levels of service (see Chapter 2 for explanations of these service types). As service on these corridors improves, they will become all the more attractive and viable as locations for transit-oriented development.

[6] Cities with a strong commitment to transit-oriented development have generated transit-oriented development along bus corridors. Portland and Vancouver— cities with densities comparable to the East Bay over much of their area— have highly successful examples of bus-oriented development.

[7] AC Transit can work with communities and developers that can generate additional funding to increase service above basic levels.

General Plan Policy: Encourage Mixed Use on Transit Corridors

Encourage mixed use projects containing ground floor retail and upper floor residential uses along major transit corridors. Such development should be pedestrian-oriented, respect the scale and character of the surrounding neighborhood, and incorporate architectural themes that enhance the identity of adjacent commercial districts.

Policy 3.05, Land Use Element, City of San Leandro General Plan

Planning Best Practice 2.1
Develop the whole within easy walking distance of a transit corridor with transit-friendly uses

To achieve the full potential of a transit corridor, it is important to develop both the main street and other streets. In many cities commercial streets and streets with bus lines are zoned for higher densities. Enacting zoning that will allow development on the major street is an important step. However, the trunk line corridor is not just the street the bus operates on, but also the areas within one quarter-mile of that street. This is the area that is an easy walk, generally estimated to be about five minutes, from the transit line. These one quarter-mile wide corridors are schematically illustrated by Map 5 (Page 4-8). Side streets in transit corridors can provide opportunities for residential development in quiet, attractive settings within easy walking distance of the bus. These corridors incorporate surprisingly large amounts of land. Exclusive of areas around BART stations, the trunk and major bus line corridors in the AC Transit district encompass almost 25,000 acres, or almost 39 square miles.

Residents cannot easily access these stores because of the wall between them and long block lengths.

Planning Best Practice 2.2
Assure that residents on bus corridors can easily walk to neighboring and nearby uses

Placing residential and commercial uses close to each other is necessary, but not sufficient for easy walking between them. In many cases it is impossible, dangerous, or undesirable to walk from one to the other. While many communities have upgraded pedestrian paths to rail stations, the walking environment on many major bus corridors ranges from unpleasant to dangerous.

Walking is particularly problematic when development patterns incorporate long, unbroken walls around subdivisions, shopping centers, or other uses. A resident might be able to walk around the wall on the nearest street. However, overly long block lengths may mean that the nearest street is a discouraging 800 or 1,000 feet away. Some housing developments situated next to a shopping center have pedestrian gates (often key-accessed) allowing people to walk from housing to shopping.

Planning Best Practice 2.3
On commercial strips, focus development at nodes

Many American communities, including East Bay communities have long, low-density commercial strips along their main highways. This type of commercial development is difficult to serve well with transit, and difficult for transit passengers to use. Its low-density, scattered character means that shoppers must stop a number of widely separated locations, which is a difficult pattern for transit passengers. The walking environment is often poor, sidewalks may be narrow or absent, interrupted by frequent driveways and parking lots which extend to the edge of the street. This situation discourages people from walking to the bus. It also often creates a low quality, unfriendly bus stop environment.

Many of these strips already have focal points where development is more intense, buildings may be taller or closer together, there may be more pedestrians on that section of the street. Often these occur where two major streets intersect, especially around intersections that are or were once important transit junctions. Some streets do not have these locations, but have the opportunity to develop them. Planners call these focal points “nodes.” Some plans identify nodes and detail specific policies for them. For example, the El Cerrito General Plan identifies three nodes along San Pablo Avenue, and San Leandro is developing a nodal concept for East 14th St.

It is usually better for transit operations and transit passengers to concentrate commercial development, particularly local serving stores, at major nodes. Nodes at major cross streets are particularly helpful, as they allow crossing transit service. These nodes provide a good opportunity to introduce pedestrian-oriented design (described in Chapter 4) to otherwise unfriendly streets.

PLANNING POLICY 3

MANAGE PARKING AS PART OF AN OVERALL TRANSPORTATION AND LAND USE STRATEGY

Why does a transit-oriented handbook concern itself with automobile parking? Because parking, especially non-residential parking, acts as an alternative to and ultimately an impediment to transit. A plentiful supply of parking, especially free or extremely cheap parking, is a factor encouraging people to drive to their destinations. When parking is free or very cheap, but use of transit requires payment of a fare, the "playing field" is tilted towards parking.[8] Parking availability is not the only reason travelers choose to drive, but it is unquestionably one factor. It is difficult to increase transit ridership in situations where parking is abundant and cheap, even when good transit is provided. A community that wishes to encourage transit ridership and use of alternative modes will have to determine how it wishes to manage parking.

Communities need to manage parking as part of an overall transportation and land use strategy, rather than allow their transportation and land use to be managed by parking. Yet all too often parking dominates planning rather than planning goals shaping parking management. The result is a landscape where parking becomes the dominant user of land, the dominant shaper of the streetscape, and where automobiles are the dominant mode of travel.

In addition to improving transit, transit-friendly communities can implement a variety of strategies to moderate parking demand and reduce the negative impacts of parking facilities. Communities can

[8] There are other costs of operating a motor vehicle besides parking. These costs can be calculated on a per mile basis. However, many of a car's operating costs- such as insurance, maintenance, and registration -are paid separately from individual trips. Therefore these costs tend to be experienced by drivers as "sunk" costs–already paid with apparent operating costs being limited to gas, tolls, and parking charges.

General Plan Policy: Reduced Parking in Transit-Oriented Areas

Reduce parking demand through limiting the absolute amount of spaces and prioritizing the spaces for short-term and ride-share uses.
Policy 16.5, Transportation Element, City of San Francisco General Plan

reduce excessive parking requirements, and recognize that high levels of transit service allow reduced parking requirements. Communities can configure parking into consolidated lots and structures to reduce its negative impact on community form. Communities can avoid subsidizing the capital and operating costs of parking, by charging parking fees to cover costs and to generate funds for transit and other alternative modes.

Planning Best Practice 3.1
Provide appropriate, but not excessive, amounts of parking

Most communities (although not all) set minimum required levels of parking that must be provided with new buildings or uses. Such parking requirements are often discussed as if they are universal and unchanging. However, actual demand for parking varies from location to location, varies over time, and changes with the impact of public policies and traveler decisions. This has recently been legally recognized in a California Court of Appeals decision. Therefore, communities should assure that parking provision is appropriate but not excessive.

Excessive parking increases the impacts discussed above– e.g., induced driving and excessive land consumption. Moderate parking supply can help support a positive feedback loop of more travel by transit and other modes allowing a lowered parking requirement and so on. Excessive parking helps drive a negative feedback loop where driving dominates and reinforces an auto-oriented environment, leading to more demand for parking leading to more driving, etc.

In some instances the appropriate amount of parking is none. The city of Berkeley, for example, allowed both its main library and YMCA in downtown Berkeley to expand based on analysis that there was adequate parking to satisfy the net increase in parking demand they could be expected to generate.

Communities should carefully consider their own planning goals, experience, and transit network in setting parking requirements. Many "standard" parking requirements are based on suburban areas with minimal or no transit, and the assumption that virtually all users will drive alone to a facility. Parking requirements are also based on the idea that each use must have its own dedicated supply of parking. However, there are often opportunities for uses with different parking demands to share parking. In west Berkeley, for example, a school whose parking demand is during the week will be sharing parking

Hayward is one of many Bay Area cities with consolidated parking lots in its Downtown area.

with a synagogue that has evening and weekend parking demand. In some cases, cities have set maximum parking allowances for projects, so that developers do not overbuild parking and undermine city policy goals.

Planning Best Practice 3.2
Reduce parking requirements in transit-served areas

Research by the Center for Transit Oriented Development and others has shown that people who live and/or work in transit-friendly areas own and use cars less than people away from transit. Communities can recognize and encourage this relationship by establishing lower parking requirements in locations with strong transit service. A number of cities in the Bay Area and nationally already provide for such reductions, including Oakland. The most straightforward method is to establish lower parking requirements in the basic zoning for transit-served areas. Another approach is to allow parking requirements to be lowered on a case by case basis through a Conditional Use Permit procedure.[9]

Planning Best Practice 3.3
Consolidate parking into joint lots and structures

Many commercial corridors and districts have numerous adjacent or closely spaced parking lots, each of which serves only one or a few businesses. The lots together may provide more parking than the businesses require, or one lot can be jammed while the other lot is empty. Such parking lots take up most of the land in many of the district's newer commercial areas. They can also make walking along the

[9] Despite these well-documented findings, there is sometimes concern about residents' willingness to reduce their car ownership even in transit-oriented areas. Carsharing, represented in the Bay Area by City Carshare, is a new program that supports residents owning fewer cars. Under the program, participating households that need a car (or a second car) occasionally can borrow one from City Carshare when they need it. Thus they can have access to a car without incurring the expenses of ownership or the requirement for a parking space.

street between businesses difficult and unpleasant.

This condition can be improved by consolidating several lots into a single lot that serves multiple users and takes up less space, freeing up land area for sidewalks, landscaping, or additional development. These lots can have fewer driveways, reducing the potential for pedestrian conflicts. In cases where parking demand is high enough, lots can be consolidated into parking structures. Including active uses, such as retail stores, on the ground floor frontage of parking structures, allows that structure to contribute to the commercial corridor or district rather than interrupting it.

Planning Best Practice 3.4
Charge fees for parking to cover costs and generate funds for other modes

It is important that there be appropriate charges for automobile parking. Parking is not free to create or maintain, so the costs of doing so should be borne by the users of the parking.[10] If this is not done, the costs of parking are paid by all of the facility's users, whether they park there or get there by other means. People who take transit to the facility must pay a fare to get there as well as subsidizing drivers– a double burden. In some cases, parking fees can also be used to support alternative modes of transportation. The city of San Francisco is using public parking revenues in this way.

Charging for parking can also help establish the real demand for parking. People will use more of a "good," like parking, when it is free. Charging can thus help communities determine what is a reasonable rather than excessive level of parking.

Parking charges can also be used to influence travel patterns in a community. The city of Berkeley targets its public parking to shoppers rather than people commuting to work. Berkeley's view is that people commuting to work have a greater opportunity to use transit than shoppers. Therefore their charges for short term parking, for less than two hours, are low but rise steeply for longer term and all day parking.

[10] Environmental and health advocates note the environmental, health, public safety, and other costs created by automobile driving. These are important considerations that illustrate the cost of driving to society, but are beyond the scope of this document.

CHAPTER 4

SAFE ROUTES TO TRANSIT: CREATING GOOD WAYS TO WALK TO TRANSIT

CHAPTER GUIDE

Topic: Developing pedestrian facilities that allow passengers to easily walk to transit

Particular Audience: Transportation Commissioners, transportation planners, planners involved in development review, Traffic/Transportation Engineers

Subject of Recommendations: General Plan Transportation Elements, subdivision requirements, site plans, sidewalk and roadway plans and standards, traffic signal timing

INTRODUCTION

The previous chapter described key community planning policies to create a community that transit can serve effectively. This chapter looks at how transit riders can get to transit. AC Transit passengers overwhelmingly reach the bus by walking to it. Our recent survey of AC Transit passengers found that they were almost eight times more likely to reach their first transit stop by walking than by all other methods (driving, being a car passenger, bicycling) combined.

This chapter addresses the following questions:

- How can pedestrian access throughout East Bay communities be improved?
- How can good walking access to transit be created?
- How should buildings be designed to facilitate walking?
- How best can pedestrian safety at roadways and driveways be achieved?

Some East Bay communities and neighborhoods are pleasant places to walk in, but many are not. There may not be a sidewalk or it may be so narrow that it does not feel protective, and may be effectively impassible to the disabled. Adjacent traffic may pass at a frighteningly high speed. These environments do not encourage people to walk to transit or to other destinations.

There are many ways to make walking a pleasant and effective method of travel. This chapter recommends policies and approaches for creating a good pedestrian environment, including some key dimensions. However, it is not intended to be a manual of technical specifications for sidewalks and other pedestrian facilities. Readers should not assume that any dimensions or configurations of roadway, sidewalk, or bus stop features shown on or implicit in figures, photographs, or text are recommended by AC Transit, unless such a recommendation is specifically stated.

AC Transit's recommendations for walkways and pedestrian facilities are strongly linked to the community planning recommendations in Chapter 3. It is much easier to reach destinations by walking in a compact, mixed-use community. A pleasant place environment for walking is also a pleasant environment for living and working.

These recommendations are physically connected to the recommendations about streets and sidewalks in Chapter 5. Our recommendations also fit into a multimodal transportation planning approach, which is discussed more fully in Chapter 5. The multimodal approach seeks to accommodate all modes of travel. In particular, AC Transit seeks to improve pedestrian conditions without compromising appropriate bus operations. Conversely, there are many potential changes to streets that would improve bus operations but not degrade pedestrian safety discussed in the next chapter. Our goal is streets that are safe for pedestrians and functional for buses and other vehicle traffic. Such streets needs to operate at an adequate and predictable speed, but not necessarily the highest possible speeds. A pedestrian should be comfortable walking along any public right-of-way.

The question that frames the issues discussed in this chapter is **"How would I feel walking to the bus stop? Would I feel safe? Would I enjoy the walk? Would I do it again?"**

Summary of Safe Routes to Transit Policies and Practices

POLICY 1: DEVELOP NETWORKS THAT PROVIDE PEDESTRIAN ACCESS TO ALL LOCATIONS IN A COMMUNITY

Best Practice 1.1: Provide sidewalks on all blocks and assure that they are wide enough

Best Practice 1.2: To maximize pedestrian access, make blocks part of a grid pattern connected to other streets

Best Practice 1.3: Where blocks are long or end in cul de sacs develop alternative pedestrian access

POLICY 2: CREATE ACCESS TO TRANSIT WHICH IS DIRECT, SAFE, UNDERSTANDABLE AND PLEASANT

Best Practice 2.1: Integrate transit stops into activity centers, usually on the street close to key buildings

Best Practice 2.2: Provide direct pedestrian access from activity centers to transit lines

Best Practice 2.3: Provide adequate lighting and clear sight lines on sidewalks and pedestrian paths

Best Practice 2.4: Make sidewalks and paths visually interesting and active

POLICY 3: SITE BUILDINGS TO PROVIDE EASY ACCESS TO TRANSIT

Best Practice 3.1: Site buildings next to sidewalks, minimize setbacks

Best Practice 3.2: Assure that buildings have entrances from the sidewalk

Best Practice 3.3: Retrofit pedestrian-hostile sites with liner buildings to improve sidewalk vitality and site efficiency

POLICY 4: ASSURE THAT PEDESTRIAN CROSSINGS OF ROADWAYS AND DRIVEWAYS ARE SAFE AND EASY TO USE

Best Practice 4.1: Provide pedestrians with safe crossings of major streets, installing traffic signals where necessary for pedestrian safety

Best Practice 4.2: Minimize roadway crossing distances without compromising transit operations

Best Practice 4.3: Limit vehicle turning movements across active sidewalks and walkways

Best Practice 4.4: Locate parking to minimize interference with pedestrian movements into buildings

PRINCIPLES FOR PEDESTRIAN DESIGN

City of Portland (Oregon), Pedestrian Master Plan

This set of pedestrian principles from Portland's *Pedestrian Master Plan* provide a valuable framework for considering how to improve conditions for pedestrians overall. The following design principles represent a set of ideals which should be incorporated to some degree into every pedestrian environment. They are ordered roughly in terms of relative importance.

1. The pedestrian environment should be safe.
Sidewalks, pathways and crossings should be designed and built to be free of hazards to minimize conflicts with external factors such as noise, vehicular traffic, and protruding architectural elements.

2. The pedestrian network should be accessible to all.
Sidewalks, pathways, and crossings should ensure the mobility of all users by accommodating the needs of people regardless of age or ability.

3. The pedestrian network should connect to places people want to go.
The pedestrian network should provide continuous direct routes and convenient connections between destinations, including homes, schools, shopping areas, public services, recreational opportunities, and transit.

4. The pedestrian environment should be easy to use.
Sidewalks, pathways, and crossings should be designed so people can easily find a direct route to a destination and delays are minimized.

5. The pedestrian environment should provide good places.
Good design should enhance the look and feel of the pedestrian environment. The pedestrian environment includes open spaces such as plazas, courtyards, and squares, as well as the building facades that give shape to the space of the street. Amenities such as street furniture, banners, art, plantings, and special paving, along with historical elements and cultural references, should promote a sense of place.

6. The pedestrian environment should be used for many things.
The pedestrian environment should be a place where public activities are encouraged. Commercial activities such as dining, vending, and advertising may be permitted when they do not interfere with safety and accessibility.

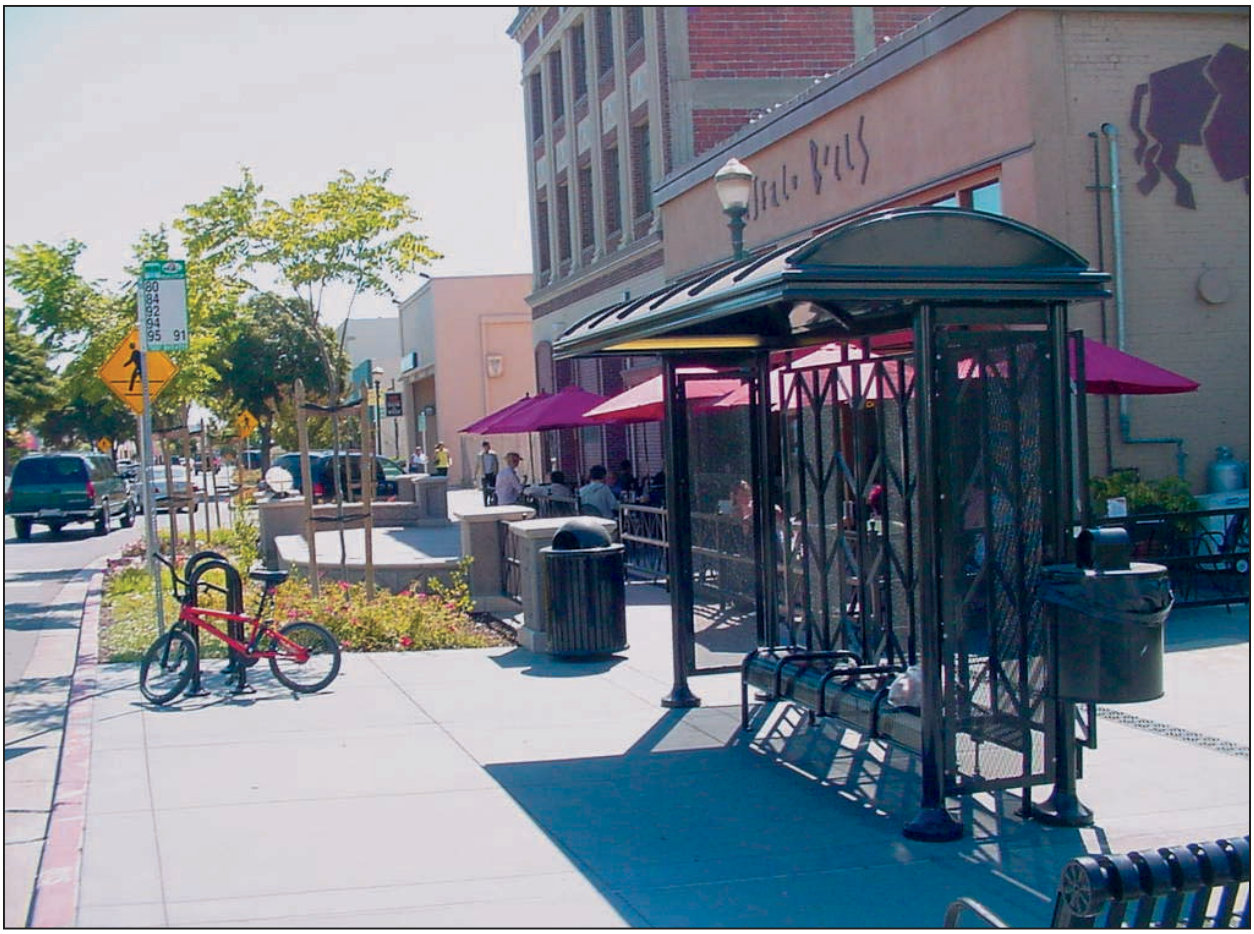
7. Pedestrian improvements should be economical.
Pedestrian improvements should be designed to achieve the maximum benefit for their cost, including initial cost and maintenance cost as well as reduced reliance on more expensive modes of transportation. Where possible, improvements in the right-of-way should stimulate, reinforce, and connect with adjacent private improvements.

CONTEXT: BASIC ELEMENTS OF THE PEDESTRIAN TRAVEL NETWORK

The Pedestrian Travel Network to Transit

It is important to understand how the pedestrian network functions as a network for travel. Certain elements of the pedestrian travel network are particularly important for people walking to transit. Pedestrian routes within one quarter-mile of a bus route are especially significant, since most passengers prefer to walk one quarter-mile or less to their stops. However, pedestrian routes up to one half-mile from the bus route/transit hub should be considered, since some people may walk this distance. When planning around a major transit hub, such as a BART station, a one half-mile radius is appropriate.

First are the **sidewalks on streets with transit routes.** These sidewalks allow passengers to come to or leave the bus stop. Since transit streets are often commercial streets as well, these sidewalks allow passengers to go to stores and other destinations on their way to and from transit. Sidewalks on streets with trunk routes, almost all of which are commercial streets, are particularly important. Some communities describe these as "Main Street" sidewalks. Whenever possible, these sidewalks should be wider than legally required minimums.



This wide sidewalk in Hayward provides space for a bus shelter and outdoor restaurant seating.

While some trips begin or end on the transit street itself, most do not. Thus a pedestrian route to the transit street is required, usually a **sidewalk on a street intersecting the transit street.** Each of these routes are likely to carry a lower volume of pedestrians than the transit streets themselves, but taken as a whole they can carry many passengers. These sidewalks are sometimes considered "neighborhood" level pedestrian paths.

Many communities have **off-street paths to transit.** A network of pedestrian paths was built in the Berkeley and Oakland hills for the specific purpose allowing residents to reach transit lines. Some areas of Fremont have a network of neighborhood "trails" that allow residents to walk to transit streets and other destinations. Pedestrian paths through large properties, such as college campuses, hospitals and business parks also deliver passengers to transit. When large sites are developed or redeveloped, the pedestrian paths to transit should be considered. Existing paths should be retained; the need and opportunity for new pedestrian paths should be considered.

Other features of the urban landscape may also serve as pedestrian routes. There may be important pathways through parks, especially smaller scale parks. Cities may have **pedestrian plazas,** particularly in their downtown areas. For example, Oakland City Center has a pedestrian plaza that connects Clay St. with the BART station and bus lines on Broadway. In some instances there are publicly accessible paths through a building.

Safe Routes to Transit Policies and Practices

WALKING POLICY 1: DEVELOP NETWORKS THAT PROVIDE PEDESTRIAN ACCESS TO ALL LOCATIONS IN A COMMUNITY

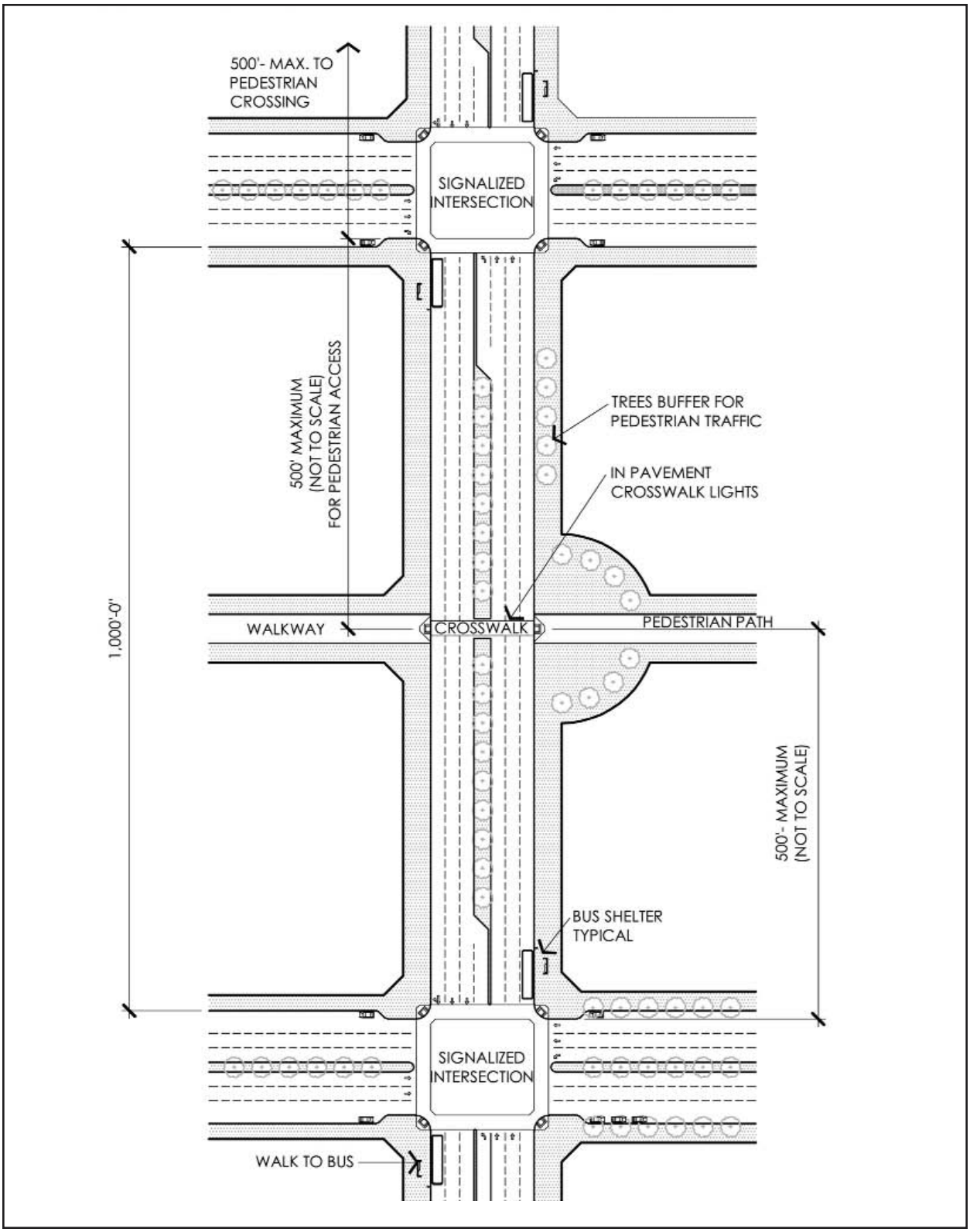
The roadway network reaches all of the places in the East Bay where people live or work. Pedestrian networks need to be just as extensive and comprehensive. This will allow pedestrians, wherever they start their trip, to walk to transit, shopping, or other destinations. In East Bay communities, sidewalks and pedestrian pathways generally provide access to most of the community. However, areas on the fringe of the community, particularly industrial areas and hillsides, often lack a sidewalk. Sidewalks may be absent in areas developed during certain decades. These areas should be connected to the community's pedestrian network.

Walking Best Practice 1.1
Provide sidewalks on all blocks in a community and assure that they are wide enough

Sidewalks are the fundamental building block for pedestrian travel. To allow pedestrians to safely reach all parts of a community, there should be sidewalks of adequate width on every block.

Sidewalks are needed at bus stops. Under disabled access guidelines, AC Transit usually cannot add a bus stop which is not connected to a sidewalk. It is also not possible to put a bus shelter or other bus stop amenities in a location without a sidewalk.

Figure 1: Street Treatments That Assist Transit and Transit Passengers



Map 5: Street Grids that Facilitate and Inhibit Walking to Transit

The wide sidewalk in Hayward shown on page 4-5 provides space for a bus shelter and outdoor restaurant seating.

The appropriate width of a sidewalk will depend on circumstances, especially the number of people using it, whether there are other uses on the sidewalk (e.g., newsracks, sidewalk cafes), and the space available. Four feet is the minimum sidewalk width most communities require to allow disabled access. Six feet provides a more comfortable sidewalk where two people can easily walk side by side. Bus shelter installation requires at least ten feet: four feet for the sidewalk "path of travel" and approximately six feet for the shelter itself (see Figures 8 and 9, pages 5-30 and 5-31). Generous sidewalks in locations with substantial pedestrian traffic can be as wide as 20 feet, allowing both walking space and space for sidewalk tables.

Recommended sidewalk width:

Minimum: 4 feet

Recommended: 6 feet

Minimum to allow bus shelter: 10 feet

Sidewalk with outdoor seating: 15-20 feet

Walking Best Practice 1.2
To maximize pedestrian access, make blocks part of a grid pattern connected to other streets

For sidewalks to effectively reach all parts of the community, the pattern of blocks must facilitate easy pedestrian access. This requires relatively short blocks, of no more than 500 feet, so pedestrians do not have to travel too far out of their way. It is important to minimize the walking distance to the street with transit, because the bus stop may be as much as an additional 500 feet along the street with transit.

The sidewalk of this cul-de-sac in Newark is connected to the major street.

Map 5 (page 4-8) illustrates the difference that a grid pattern with appropriate block lengths can make. The maps show two areas in the AC Transit district. Residents of streets on the upper map can easily walk to the streets with bus service (darker lines) and to the BART station near the upper right corner of the map. They do not have to walk substantial distances out of their way to make these connections. Some midblock pedestrian connections not shown on the map provide additional walking options. Residents on the lower map, frequently have only one way in and one way out. There is transit service on the major streets in this area also, but many residents cannot access it easily. There are no midblock pedestrian connectors to provide supplemental access routes.

Redevelopment of shopping centers and other large sites can be an opportunity to create new streets. Often streets "T" or end at the back of shopping centers and do not provide access across the center. It may be possible to extend these streets when the site is redeveloped.

Older urban areas tend to have shorter blocks than newer suburban ones. Unfortunately, urban renewal projects have sometimes created oversized "superblocks" by combining one or more existing blocks. The distance between streets thus becomes very long.[11] Superblocks are difficult and sometimes dangerous for pedestrians to cross, as they can create large empty areas. They also often unnecessarily interfere with traffic flow, in some cases including bus flow.

Walking Best Practice 1.3
Where blocks are long or end in cul de sacs develop alternative pedestrian access

Sidewalks along streets are generally the most effective and best used walkways for pedestrians. However, in some instances, communities have poor layouts of blocks that do not provide sidewalks in all locations where they are needed. Blocks may be excessively long, in some cases exceeding 1,000 feet. Streets may end in cul-de-sacs.

Where these conditions exist there are ways to create access besides building a new road through to reach the site. Midblock pedestrian connectors (walkways) can be developed. These are particularly useful for pedestrian-friendly commercial areas and as connectors to transit. The hillside paths in Oakland and Berkeley were initially developed to connect riders to the streetcar lines. The recently adopted Midtown Milpitas Specific Plan calls for the addition of both new streets and new off-street pedestrian paths to create connections to new transit stations.

Sidewalks can also be extended from cul-de-sacs to nearby streets, allowing pedestrians and bicyclists to pass through while still shielding the street from auto traffic. This is illustrated on page 4-9.

[11] Perhaps the country's most famous superblock project is the former World Trade Center site in New York City, which combined numerous formerly active retail blocks into a cold and forbidding superblock. The site will probably be redivided into a number of blocks.

WALKING POLICY 2: CREATE PEDESTRIAN ACCESS TO TRANSIT WHICH IS DIRECT, SAFE, UNDERSTANDABLE AND PLEASANT

Walking Best Practice 2.1
Provide direct pedestrian access from activity centers to transit lines

Pedestrian access from activity centers to transit stops should be easy and direct. This type of pedestrian routing will make it easier for people to walk from a store or office to a bus stop. Routes that are not easy and direct can discourage people from walking to a bus stop. Meandering routes, circuitous crossings, or unnecessary changes of grade should be avoided.[12] Such impediments can also cause a pedestrian to walk in a dangerous manner: e.g., they may cross a street illegally when the only legal route is excessively circuitous. An example is when pedestrians wishing to cross a street are directed around across the intersecting street, then across the first street, then back across the intersecting street in a "C" shape to get to their destination. Many pedestrians will simply assess the risk and cross the street directly.

Pedestrian distances and routes must be evaluated from the pedestrian's perspective. What seems like a short or insignificant detour to a driver or even a bicyclist can be onerous for pedestrians.

For these reasons, it is important to create direct paths for pedestrians to and from activity centers.

Directional signs for pedestrians may also be useful, particularly between major transit hubs, activity centers, and public buildings. These need to be placed and sized for pedestrians, not for automobile drivers. Separate auto-oriented wayfinding signs may also be appropriate.

Walking Best Practice 2.2
Integrate transit stops into activity centers, usually on the street close to key buildings

Transit access at new developments needs to be safe, easy, and attractive. Bus stops should be sited in or near active, central areas of complexes of buildings, such as shopping centers and complexes. Bus stops should not be isolated in remote locations. To effectively serve passengers, transit stops at major activity centers need to be close to the buildings they serve. Depending on the size of the complex, more than one bus stop may be necessary. Bus stops which are far down an arterial street, behind a building or in a little used part of the site are difficult for riders to use and may seem (or be) dangerous.

Bus stops that are hidden in obscure locations also communicate a message to transit riders that they are unimportant; that the facility is not concerned about their ability to travel.

In general, it is best that the bus remain on the street that serves an activity center. Routing the bus off the street into a building complex will generally delay the bus more than can be justified. On-street bus stops are usually most appropriate. They can serve an activity center well if facilities are sited to be easily accessible to the street and if good pedestrian pathways connecting buildings to bus stops are developed.

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[12] Routes that require pedestrians to change levels (i.e. pedestrian bridges and underpasses) should not be created. Pedestrians tend to avoid these routes in favor of quicker surface level routes. Because they are isolated from street level activity and surveillance, bridges and tunnels may become locations for crime.

Pedestrian-oriented lighting in Albany, with roadway-oriented lighting in the background.

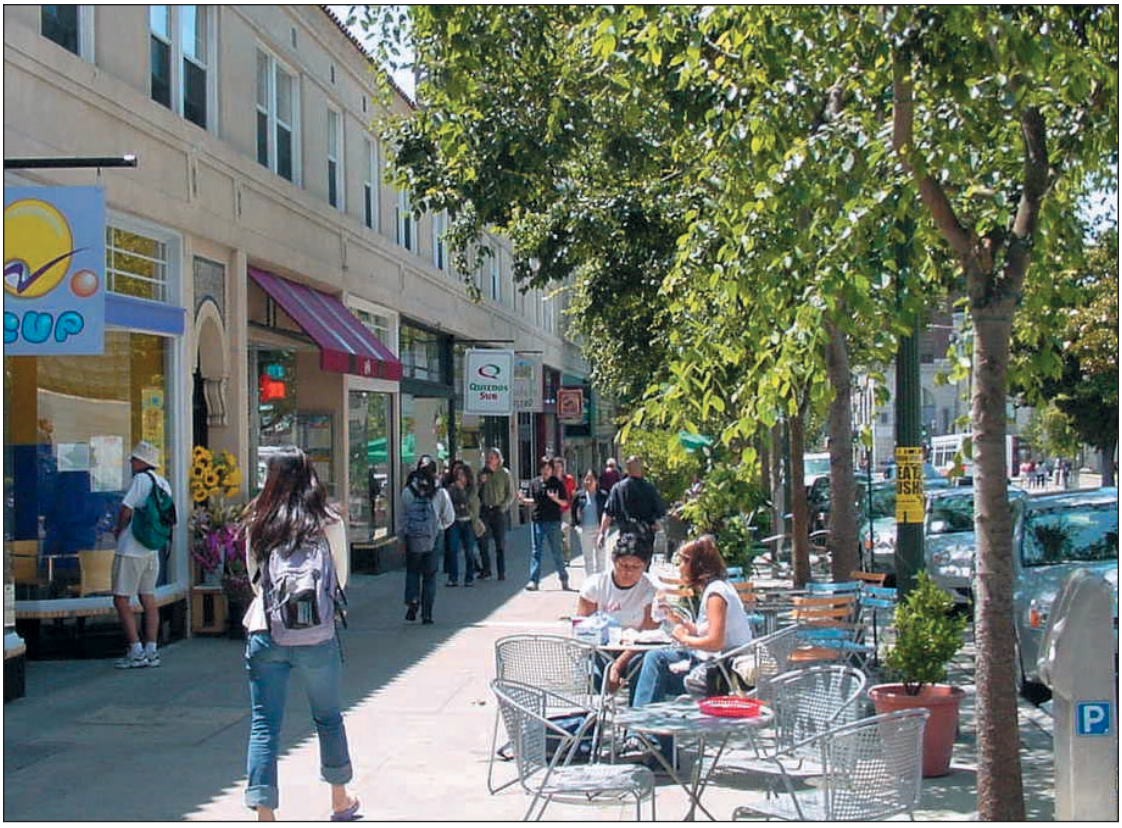
This blank wall deadens a downtown area that is lively around the corner.

Walking Best Practice 2.3
Provide adequate lighting and clear sight lines on sidewalks and pedestrian paths

A clear view of the path ahead is a pedestrian's best defense against both crime and vehicle hazards. Protecting this view requires clear sight lines along major sidewalks, which will also benefit disabled people using wheelchairs. It is important that light for pedestrians be provided from a relatively low height (12-14 feet), not only from high level "Cobra" lights designed to illuminate roadways. Such high level lights do not provide adequate lighting on the sidewalk. Concerning the spacing of lampposts, the Oakland Pedestrian Master Plan recommends lampposts every 50 feet along streets, every 30 feet along walkways and trails because they receive other lighting.

Walking Best Practice 2.4
Make sidewalks and paths visually interesting and active

Since pedestrians are traveling at 2-3 miles per hour (compared to cars traveling 20-30 mph on urban arterials), pedestrians are very aware of and responsible to their surroundings. Sidewalks adjacent to blank walls, large surface parking lots, or other visually boring features are unpleasant to walk along. To the extent that lack of interest discourages pedestrians from using sidewalks, they can become dangerous. Visually interesting sidewalks and walkways are more pleasant and likely to attract more users. Depending on the context, there are a number of ways to make sidewalks more interesting, through the design of building facades, landscaping, public art, and other treatments.



This busy sidewalk is enlivened by store windows, trees, street furniture, and signs.

WALKING POLICY 3: SITE BUILDINGS TO PROVIDE EASY ACCESS TO TRANSIT

Walking Best Practice 3.1
Site buildings next to sidewalks, minimize setbacks

One of the easiest ways to make buildings more pedestrian and transit-friendly is to build the building as close as possible to the sidewalk. Walking distance for bus passengers will be reduced by reducing or eliminating setbacks. The older commercial sections of many East Bay cities, including B Street in Hayward, E. 14th St. in San Leandro, and Macdonald Avenue in Richmond, have buildings built to the sidewalk.

Setbacks in front of retail and commercial buildings are often considered detrimental to retail businesses in the building. Buildings close to the sidewalk tend to convey a positive urban or "Main Street" feel, while deep setbacks tend to connote sprawl and pedestrian-hostile development patterns. At best the pedestrian is not invited across a large setback. At worst the pedestrian faces obstacles likes berms, parking lots, or thick landscaping. Modest landscaping and planting strips appropriate to a building's context can add to its attractiveness without imposing undue burdens on pedestrians. Parking is often interposed between buildings and sidewalks to the detriment of pedestrians. See Best Practices 4.3 and 4.4 (pages 4-19 and 4-20) for recommendations about reconciling parking and pedestrian needs.

Walking Best Practice 3.2
Assure that buildings have entrances from the sidewalk

Some buildings, especially shopping centers, are designed with building entrances opening onto parking lots rather than sidewalks. Even some buildings adjacent to sidewalks do not have entrances from

This store is set back hundreds of feet from the nearest public street and sidewalk.

Parking is provided in this recently developed retail building, but access to stores is from the sidewalk, maintaining the liveliness of street life.

those sidewalks. It is important for easy pedestrian mobility that there be entrances to commercial buildings (such as office buildings and stores) directly from sidewalks. Without a sidewalk entrance, pedestrians are forced to pick their way across parking lots, which can be difficult and possibly dangerous. Crossing a parking lot is difficult for many pedestrians, particularly for disabled people. In some instances, building entrance can be placed at the sidewalk but also serve a parking lot. If an entrance from the parking lot is unavoidable, there should still be a sidewalk entrance that is designed as the building's primary entrance.

Best Practice 3.3
Retrofit pedestrian hostile sites with liner buildings to improve sidewalk vitality and site efficiency.

Unfortunately, many inner East Bay developments have large expanses of parking and buildings set back deeply from the street and sidewalk. These pedestrian hostile sites, however, can be improved by retrofitting them with new "liner buildings" along the street edges of the site. Liner buildings containing retail, residential or other active uses can create a sidewalk environment that is far more inviting than the edge of a parking lot. Liner buildings are usually relatively shallow and relatively tall, at least several stories, so that they make an impact along the sidewalk. Nationally, liner buildings are most commonly used and recommended to wrap around shopping centers, parking lots and parking structures. In the East Bay, the University of California is building liner apartment buildings around its highrise dormitories in Berkeley. These highrises formerly sat isolated in large blocks of open area. The liner buildings will improve the sidewalk and the appearance of the dormitories while using the University's land more efficiently to provide housing. Liner buildings can also be used along the edges of office parks, to provide retail space serving workers there or to provide housing close to jobs.

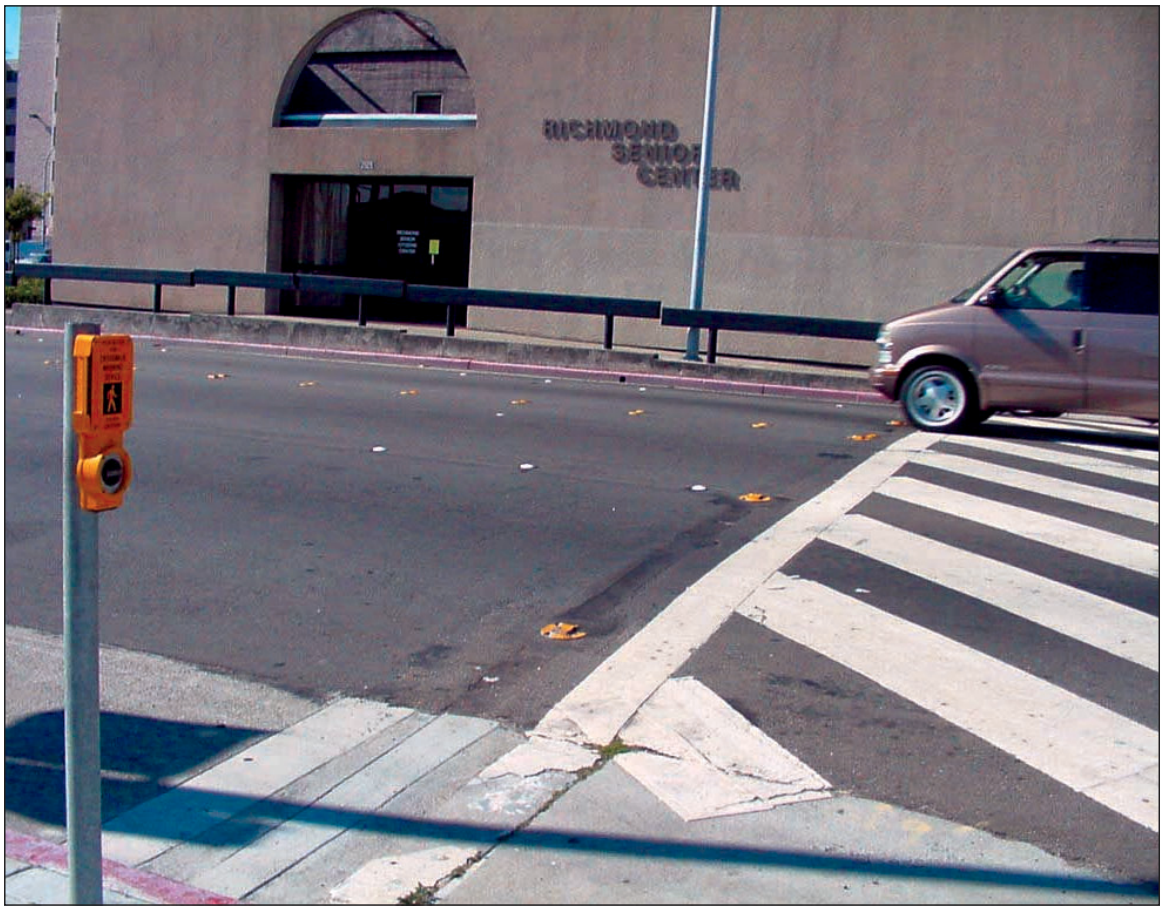
WALKING POLICY 4: ASSURE THAT PEDESTRIAN CROSSINGS OF ROADWAYS AND DRIVEWAYS ARE SAFE AND EASY TO USE

Pedestrians are in most danger from vehicles when they cross roadways. Since pedestrians are vulnerable to injury from motor vehicles, it is critical to make crossings as safe as possible for pedestrians. In addition to assuring pedestrian safety, it is important to make crossings easy for pedestrians to use. Wide, difficult crossings can discourage pedestrians and reduce both the amount of walking and access to transit. Roadways should not be barriers dividing one section of a community from another.[13]

Walking Best Practice 4.1
Provide pedestrians with safe crossings of major streets, installing traffic signals where necessary for pedestrian safety.

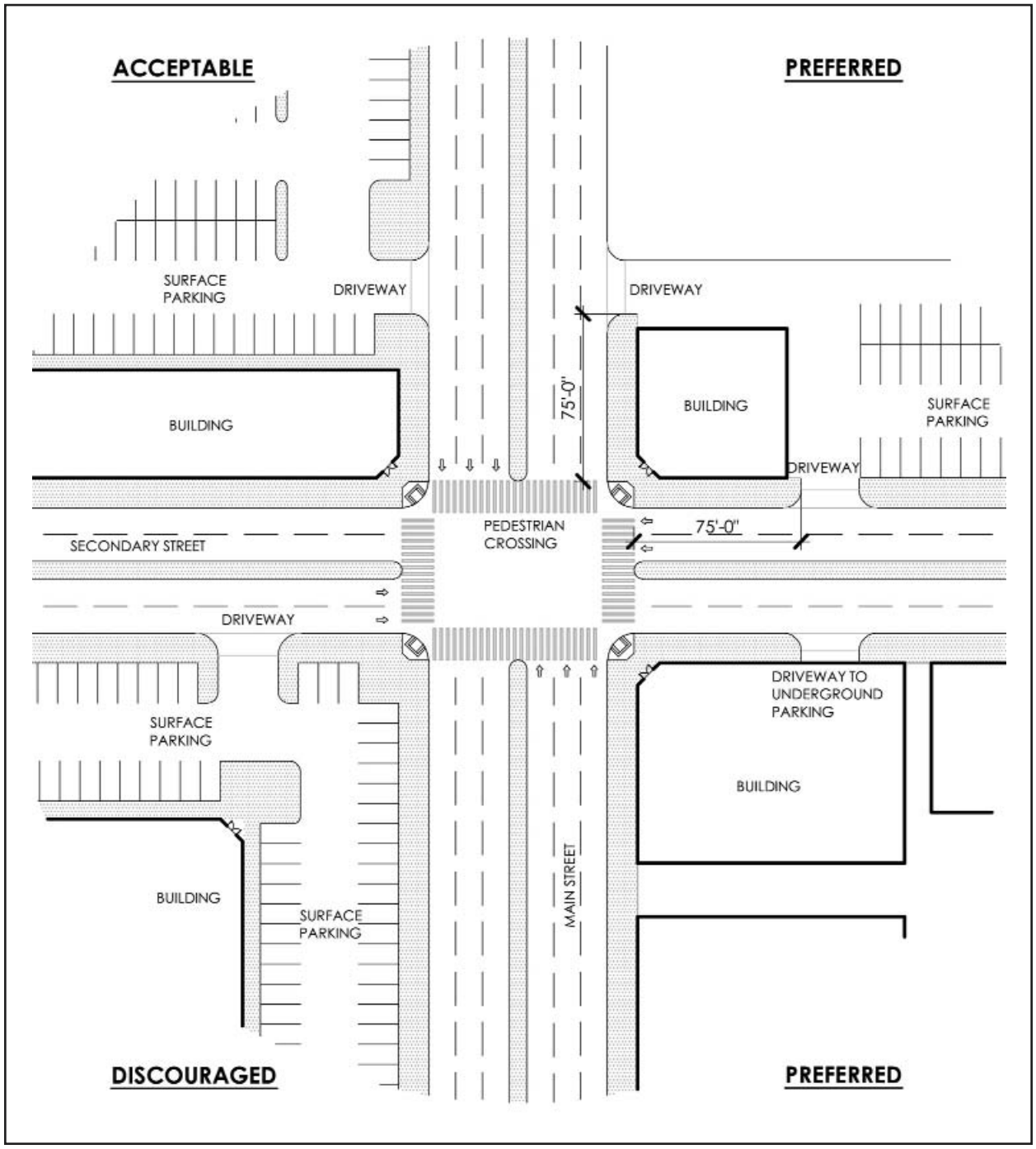
Pedestrians can be endangered when they must cross major roadways, and this is where the largest number of pedestrian-involved accidents tend to occur. One important way to improve pedestrian safety is to install traffic signals at major unsignalized pedestrian

13 Some traffic engineering practice, particularly in the past, sought to protect pedestrians by making it difficult or impossible for them to cross dangerous streets. This approach obviously does not add to pedestrian mobility and should be avoided.



This crosswalk has in-pavement Santa Rosa lights (yellow dots) that a pedestrian can activate.

Figure 2: Preferred and Discouraged Locations for Parking and Driveway at Buildings



crossings. It is important that a jurisdiction's signal installation criteria consider pedestrian use and safety.

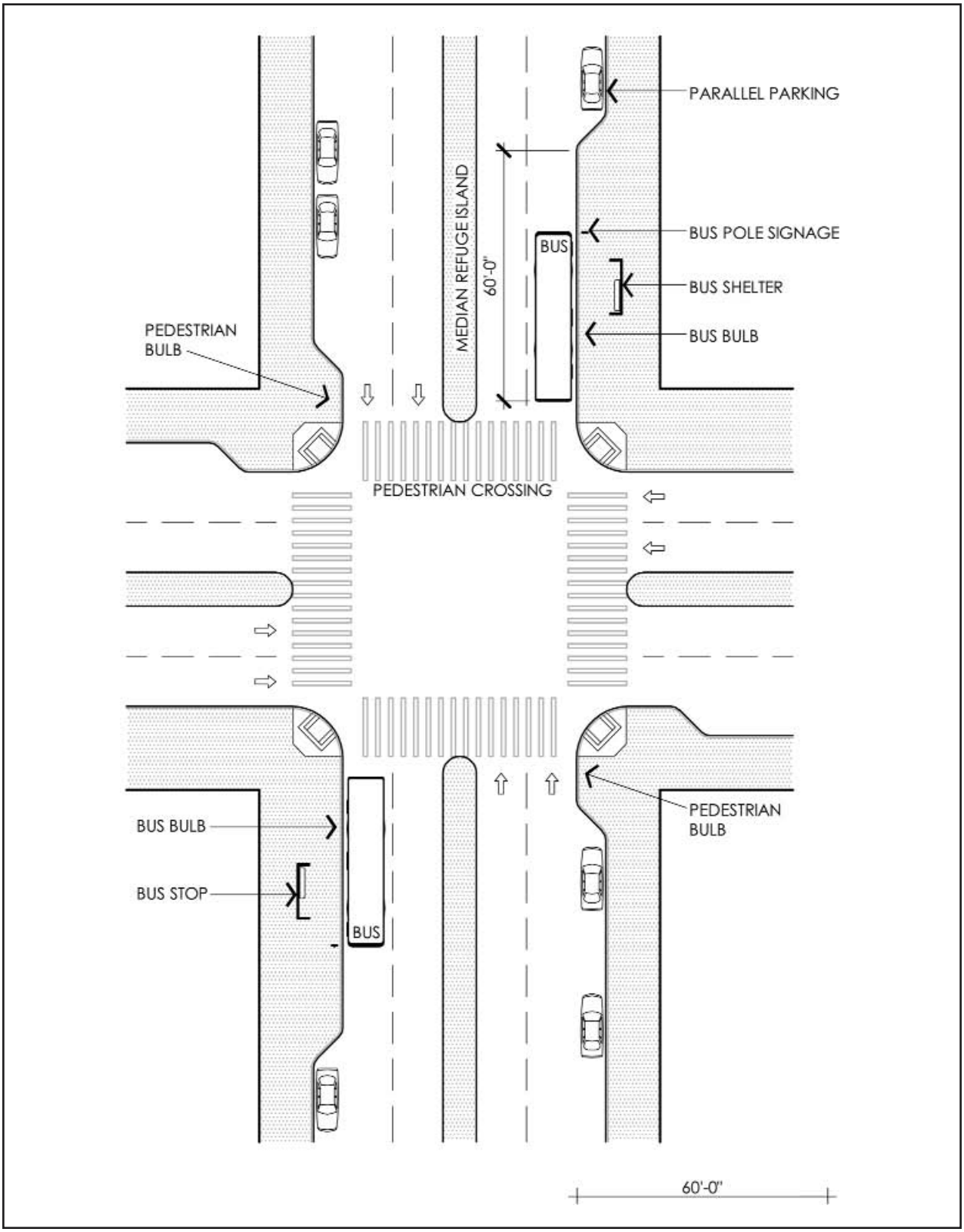
Stop signs are not an appropriate tool on arterial streets or other streets with bus routes. Stop signs create much more delay for buses than do traffic signals. They are also strongly disliked by bicyclists because they force bicyclists to expend a substantial amount of energy stopping and starting up. Stop signs can help pedestrians and may be appropriate on secondary streets without bus routes.

If a traffic signal is not feasible, other measures could include installation of crosswalks with in-pavement lights (sometimes called "Santa Rosa lights"). These lights, which flash when a pedestrian is in the crosswalk, can increase driver compliance with the requirement to stop when a pedestrian is in a crosswalk. "Zebra striping", which are thick white lines painted across the crosswalk, plus boundary lines along the side of the crosswalk, can significantly increase the visibility of the crosswalk.

Crosswalks can also be made more visible by the use of special crosswalk paving and/or coloring. The material used should be smooth and easy to walk on, and preferably one that does not become too slick in the rain. Concrete is recommended over brick, as concrete is generally more durable.

This parking structure blends well with the pedestrian-friendly commercial street where it is located.

Figure 3: Treatments to Reduce Crossing Distances at Intersections



Walking Best Practice 4.2
Minimize roadway crossing distances without compromising bus operations

Wide roadways are both physically difficult to cross and create a psychological "fence" effect for pedestrians: pedestrians can be reluctant to cross them. Such roads also reflect excessive heat into the environment.

Every effort should be made to minimize the width of roadways consistent with transit operations. Multi-lane arterial roadways are often larger than needed for traffic volumes, especially in newer communities. These roads can be narrowed without compromising reasonable traffic flow, including bus flow. Communities narrowing roads must be careful not to narrow them so much that bus traffic is impeded. As discussed in Chapter 5, adequate lane width for buses must be maintained. Roadways can be narrowed by widening sidewalks, thereby improving conditions for pedestrians walking along the arterial as well as for those crossing it. Such narrowing both improves conditions for pedestrians and reduces excessive vehicle speeds.

In some instances it is not feasible to reduce overall roadway width. In these circumstances it can be helpful to reduce the pedestrian's effective crossing distance at intersections. Pedestrian bulbs extending from the sidewalk can shorten crossing distances. "Refuge islands" on medians where pedestrians can wait before crossing opposing traffic are another technique, although they may or may not be comfortable places to wait.

Pedestrian bulbs must be designed carefully so they do not interfere with bus movement. Pedestrian bulbs less than 40 feet long (the length of a bus) should not be placed adjacent to bus stops. If bulbs are installed next to bus stops, they should be lengthened so they are the full length of the bus (see discussion of bus bulbs in Section 5.2). If the bulb is shorter than the bus, it will block the bus from pulling fully into the curb, creating a safety hazard particularly for disabled riders.

Walking Best Practice 4.3
Limit vehicle turning movements across active sidewalks and walkways.

Pedestrians can be endangered or impeded when they must cross roadways and driveways with major turning movements, such as entrances to large parking lots. Pedestrians should protected as much as possible from these conflicts. One way to do so is move driveways away from more active sidewalks and pedestrian locations, as illustrated in Figure 2 (Page 4-17). Placing driveways into a major facility on the side or rear of that facility will probably reduce conflicts with pedestrians.

The number of driveways crossing active sidewalks should also be limited. Walnut Creek, for example, has allowed only one driveway per block in new downtown commercial development. Consolidating parking lots together into joint lots and structures can also reduce the number of driveways.

Free right and left turns on roadways, where vehicles can make in a turn in a lane separate from the main travel lane, raise similar problems. These turn lanes are also known as "slip turns." Drivers often go through these turns at high speed and do not necessarily carefully observe whether pedestrians are crossing them. In many instances, these free turns can be removed without causing undue traffic congestion.

Walking Best Practice 4.4
Locate parking to minimize interference with pedestrian movements into buildings.

Traffic in and out of parking lots can be a major source of "friction" or hazard to pedestrians. The previous chapter discussed the importance of minimizing the total amount of parking.

Locating remaining parking where it will impact pedestrians least is also critical. Do not place parking between a building, especially a major activity center, and a bus stop.

Underground or below grade parking accessed by a single driveway will reduce parking's impact on pedestrians. Above grade parking, such as parking on the roof of a commercial structure, will also have the beneficial impact of channeling cars up a single driveway. If parking is on the surface, parking in the rear of the building will allow pedestrians to access the front with less interference from cars. In some cases, parking to the side of a building while maintaining a pedestrian-oriented front entrance is acceptable. Parking in front of the building is the poorest approach, as it generally means that pedestrians will have to find their way among cars to reach the building.

POLICIES TO SUPPORT WALKING: SELECTED POLICIES OF THE OAKLAND PEDESTRIAN MASTER PLAN

Oakland, along with Portland, is one of the first cities in the country to develop a plan to support pedestrian travel. The plan was created to highlight the importance of walking, provide guidance on key pedestrian issues and support the Mayor's goal of having walking trips replace auto trips. The plan sets out policies concerning pedestrians in Oakland, and provides specific guidelines on how to implement these goals. The policy framework set out by the plan, reproduced in part below, is appropriate for any of the communities in the AC Transit district.

Goal 1: Pedestrian Safety– Create a street environment that strives to ensure pedestrian safety

Policy 1.1: Crossing Safety: Improve pedestrian crossings in areas of high pedestrian activity where safety is an issue.

Policy 1.2: Traffic Signals: Use traffic signals and their associated features to improve pedestrian safety at dangerous intersections.

Policy 1.3: Sidewalk Safety: Strive to maintain a complete sidewalk network free of broken or missing sidewalks or curb ramps.

Goal 2: Pedestrian Access– Develop an environment throughout the city, prioritizing routes to school and transit, that enables pedestrians to travel safely and freely.

Policy 2.1: Route Network: Create and maintain a pedestrian route network that provides direct connections between activity centers.

Policy 2.2: Safe Routes to School: Develop projects and programs to improve pedestrian safety around schools.

Policy 2.3: Safe Routes to Transit: Implement pedestrian improvements along major AC Transit lines and at BART stations to strengthen connections to transit.

Goal 3: Streetscaping and Land Use– Provide pedestrian amenities and promote land uses that enhance public spaces and neighborhood commercial districts.

Policy 3.1: Streetscaping: Encourage the inclusion of street furniture, landscaping, and art in pedestrian improvement projects.

Policy 3.2: Land Use: Promote land uses and site designs that make walking convenient and enjoyable.

CHAPTER 5

TRANSIT-FRIENDLY STREETS: MAKING STREETS WORK FOR TRANSIT

CHAPTER GUIDE

Topic: How to make the street and sidewalk system work for buses and bus passengers

Particular Audience: Traffic and transportation engineers, transportation planners

Subject of Recommendations: Street layouts, striping plans, sidewalk layouts, streetscape plans, signal timing plans

INTRODUCTION

Chapter 3 described how a community can become a vibrant mixed use place, closely linked to transit. Chapter 4 discussed how to get the citizenry walking to the bus, by creating a pleasant, enjoyable system of sidewalks and paths. Communities also need a network of streets for the buses to operate on and stop along. This chapter considers the basic requirements for having a functional, transit-supportive network of streets and stops.

Trains have tracks, buses have streets. Unlike a track, a street is a usually a "multimodal" environment. It is multimodal because bicycles, buses, cars, motorcycles, and trucks are all allowed to operate on the street and pedestrians are allowed to cross it. There are often parked vehicles on the street as well as moving ones. The challenge for communities is assuring that people using any mode have safe, pleasant and efficient ways to travel through key corridors.

This chapter describes what is needed for effective bus transit in this multimodal East Bay environment. The details of how a bus travels and stops on a street can make an enormous difference in how well its bus line functions, and what passengers' experiences are. Seemingly minor factors can determine whether a bus travels quickly or slowly, whether it moves through traffic smoothly or with difficulty.

Many of AC Transit's discussions with communities are about street and stop related issues. Most communities strive to accommodate AC Transit while dealing with their own concerns. Many important bus routes have been transit corridors for decades. However, the management of some streets has been so oriented to automobiles that buses and other modes suffer.

This chapter outlines the basic framework for on-street bus operations. It discusses how to work with AC Transit to designate a network of streets for transit. The chapter looks at streets and sidewalks as the place for an integrated system of routes and stops. The chapter also looks at:

- What are the characteristics of streets which are good for transit?
- How can streets and roads be made better for transit?
- Where should bus stops be?
- How should bus stops be set up on the road?
- How should bus stops be set up on the sidewalk?

Note: this chapter illustrates minimum and/or required dimensions for many important items, such as the length of the bus stop. However, there are roadway, sidewalk, and bus stop features illustrated in the figures and photographs and described in the text that do not have specific dimensions recommended by AC Transit. Readers should not assume that any dimensions or configurations of these features that are shown on or implicit in these figures, photographs, or text are recommended by AC Transit.

The test for this chapter is what the experience on waiting for and riding a bus is like: **"Do I feel safe at the bus stop? Is it a pleasant place to wait? Does the ride on the bus seem smooth and fast? Or is it strewn with needless obstacles and delays?"**

Summary of Transit-Friendly Streets Policies and Practices

Section 1--Streets

POLICY 1: IDENTIFY A NETWORK OF STREETS FOR BUSES

Best Practice 1.1: Approve the network in the General Plan or other document regulating streets

Best Practice1.2: Assure that transit streets have the appropriate characteristics for bus operations

Best Practice 1.3: Assure that land use and development on key transit streets is transit-supportive

Best Practice 1.4: Do not create driveways in bus stops

POLICY 2: MANAGE TRANSIT STREETS FOR FAST, RELIABLE BUS OPERATION

Best Practice 2.1: Assure that roads width is adequate but not excessive

Best Practice 2.2: Assure that travel lanes and curb radii are wide enough for buses

Best Practice 2.3: Assure that these streets have adequate street composition to support buses

Best Practice 2.4: Assure that signal timing is supportive of bus operations

Best Practice 2.5: Assure that any traffic calming methods on bus routes are compatible with bus operations

POLICY 3: IMPLEMENT PRIORITY TREATMENTS FOR TRANSIT ON KEY CORRIDORS

Best Practice 3.1: Provide transit signal priority on trunk corridors when necessary

Best Practice 3.2: Reduce the amount of on-street parking if necessary to relieve congestion

Best Practice 3.3: Create queue jumper to move buses through congested intersections

Best Practice 3.4: Consider dedicated bus lanes for congested, high transit volume corridors

SECTION 2--BUS STOPS

POLICY 4: SITE BUS STOPS AT SAFE, EFFICIENT, AND CONVENIENT LOCATIONS

Best Practice 4.1: Site bus stops to balance speed and convenience concerns

Best Practice 4.2: Site bus stops in the best operational locations, usually on the far side of an intersection

Best Practice 4.3: Site bus stops where passengers are less likely to experience crime

POLICY 5: LOCATE BUS STOPS APPROPRIATELY WITHIN THE RIGHT OF WAY

Best Practice 5.1: Provide a curbside bus stop in most instances

Best Practice 5.2: Install bus bulbs where they would facilitate bus operation and pedestrian movement

Best Practice 5.3: Avoid bus pullouts (turnouts)

Best Practice 5.4: Design Transit Centers for effective, efficient operation

POLICY 6: CREATE SAFE, FUNCTIONAL AND LEGAL BUS STOPS WITH NEEDED AMENITIES

Best Practice 6.1: Make bus stops long enough for the buses that will use them

Best Practice 6.2: Paint the curb at bus stops red

Best Practice 6.3: Assure that sidewalks are wide enough and clear enough for bus stops

Best Practice 6.4: Provide an ADA compliant bus boarding/alighting area of at least 8 feet by 5 feet

Best Practice 6.5: Provide bus shelters with appropriate amenities

CONTEXT

MULTIMODAL CORRIDORS-- ACKNOWLEDGING THEM, MAKING THEM WORK FOR BUS TRANSIT

Multimodalism in the East Bay

The streets of the East Bay are inherently "multimodal" in that they carry the "modes" of cars, buses, bikes, etc. Many of the streets of the East Bay, especially in the older areas, were originally designed around streetcar lines. However in the last half-century many East Bay streets were planned (or re-planned) for the benefit of motor vehicles, of private cars.

Traffic engineering has historically sought to move cars, while a multimodal approach seeks to move people. The standard approach measures and processes vehicle trips, while multimodalism handles person trips, whether the traveling persons are in cars, on buses, on bicycles, etc. The person trip approach is sometimes described as a concern with "throughput," how many people can move through a corridor. A vehicle trip approach would treat both a bus with 15 passengers and a single occupant car as one vehicle trip and act upon the fact. A throughput approach would recognize and act upon the fact that the bus carries 15 people through the corridor, while the car carries one.

Transportation planning has begun to be multimodal, to give serious attention to modes other than automobiles. In the last few years, particularly in the East Bay, bicycles have gained long-needed attention. Cities and counties have developed Bicycle Plans, particularly once funding was tied to adoption of a bike plan. These plans typically designate routes, whether striped bike lanes or other facilities, and set standards for bicycle facilities. Oakland has developed a **Pedestrian Master Plan**, and several other East Bay communities are planning to do so. Local plans for transit have also been rare, although the city of Alameda has adopted such a plan, and Oakland and Berkeley have identified transit street networks.

The net result is that most road managing agencies have moved towards more inclusive traffic engineering. But comprehensive multimodalism (streets, roads, and corridors managed to genuinely support all modes) has not been achieved. Moving cars often remains agencies' paramount objective. The purpose of this chapter of *Designing With Transit* is to further the process of integrating buses into multimodal planning, by describing the many practical approaches for doing so.

AC Transit: Main Street is Our Route

Good multimodal street planning is not just a buzzword for AC Transit, but a vital necessity. The main streets AC Transit uses are often the most congested, the most multimodal and are the most complex in their area. AC Transit's trunk routes and major routes often operate along major commercial streets, such as International Boulevard/E. 14th Street, Telegraph and Shattuck avenues. They operate along major through routes such as San Pablo Avenue (State Highway 123), Hesperian and Mission boulevards (State Highway 238). Our buses also operate on dense, narrow streets such as College and Solano avenues.

Unlike other modes which can divert from congested routes, transit buses generally must travel on main streets. Passengers know that the bus has been there historically, and have a reasonable expectation that it will remain there. The main streets provide longer distance through routes. Key destinations, especially retail and commercial uses, are often found along the main streets. Residents of secondary streets would not necessarily appreciate having major through bus operations moved to their streets.

IMPROVING MULTIMODAL CORRIDORS FOR TRANSIT

AC Transit's trunk/major routes are embedded in major streets, which are themselves integral to travel corridors. How should these corridors be designed and managed to support transit?

This handbook assumes that bus transit will play a continuing and increasing role on the trunk and major corridors. AC Transit's plans, the Metropolitan Transportation Commission's plans, and the cities' plans all call for improved transit service. This handbook also assumes that the overall width of major East Bay streets is generally fixed or almost so. Therefore, the recommendations do not depend on roadway widening, although it may be appropriate to reallocate portions of the right-of-way to different uses.

Designing With Transit suggests a series of practical approaches that will maximize the efficiency and effectiveness of transit on these corridors. These policies do not compromise the efficiency of other modes. In fact, many of them facilitate travel by both transit and other modes. Policy 1 discusses planning to support transit corridors. Policies 2 and 3 focus on physical facilities needed on the street while also including some recommended traffic management practices (e.g. signal timing). Policy 3 addresses how transit corridors can be taken to a higher level of performance by implementing transit priority measures. Policies 4 through 6 shift the focus to the needs of bus stops.

DELAY OF BUS ... PENALIZES PASSENGERS, COMMUNITIES, AND AC TRANSIT

People often believe that the key factor in travel time for buses is how fast the bus can be driven. Usually, however, various delay factors are more important. This is particularly true for buses that operate on crowded arterial streets and stop frequently, the context for most AC Transit trunk lines. This is one reason why AC Transit is having difficulty maintaining the travel speeds of its buses. But the problem is common throughout urban transit: a study in Los Angeles found that transit buses spent as much as 50% of their service hours not moving!

Bus delays annoy passengers and discourage them from riding the bus. They are also costly to AC Transit. In 2003, each hour of operation of an AC Transit bus costs $82. Since AC Transit has a fleet of some 800 buses, these costs can quickly add up. But if we were able to increase speeds, the savings could be put towards additional service. Key sources of delay include:

- Street-Related Delay
  - Waiting at traffic signals
  - Slowed/stopped due to congestion
  - Maneuvering from bus stops into and out of travel lanes
- Passenger-Related Delay
  - Passenger loading time
  - Time paying fares

All of the Policies in this chapter and many of the practices are designed to improve bus travel speeds. Key practices to improve bus travel time include:

- Assure that transit streets have the appropriate characteristics for bus operations (1.2).
- Assure that road width is adequate but not excessive (2.1).
- Assure that travel lanes and curb radii are wide enough for buses (2.2).
- Assure that signal timing is supportive of bus operation (2.4).
- Assure that any traffic calming methods on bus routes are compatible with bus operations (2.5).
- Provide transit signal priority on trunk corridors when necessary (3.1).
- Reduce the amount of on-street parking if necessary to relieve congestion (3.2).
- Space bus stops to balance speed and convenience concerns (4.1).
- Site bus stops in the best operational locations, usually on the far side of an intersection (4.2).
- Provide a curbside bus stop in most instances (5.1).
- Install bus bulbs where they would facilitate bus operation (5.2).
- Avoid bus pullouts (turnouts) (5.3).
- Make bus stops long enough for the number of buses likely to use them (6.1).
- Paint the curb at bus stops red (6.2).

Streets with Transit Polices and Practices

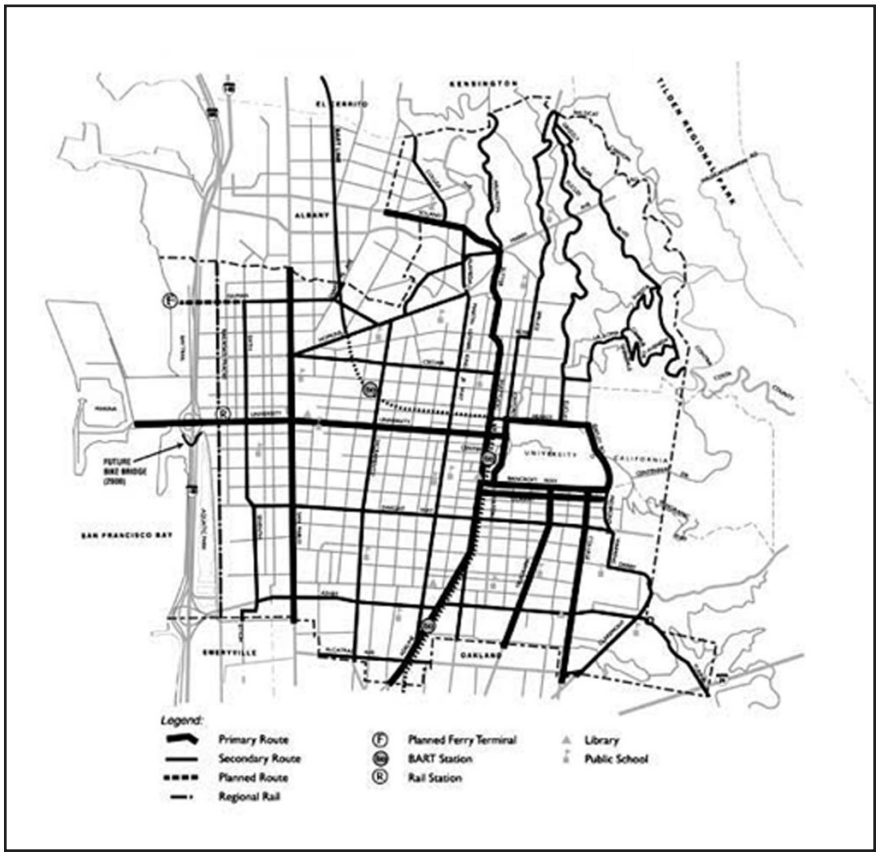
Section 1: Streets

STREETS POLICY 1: IDENTIFY A NETWORK OF STREETS FOR BUSES

Streets Best Practice 1.1
Designate a network of transit streets in the General Plan or other document regulating streets

Designated Transit Streets: It is important that AC Transit and communities identify together what streets buses will use. It is important to indicate a long term framework of streets for bus operations. Like the roadway network itself, the streets which buses operate on are likely to be generally stable over the long term, though the bus routes may change.

A community can plan streets for transit in the General Plan or another document by designating a network of Transit Priority Streets or Transit Preferential Streets for buses. Except in downtowns, near transit centers (including BART stations), and near route terminals, buses operate only on a small percentage of streets. In most situations, it is preferable to operate buses on arterials and collectors designated in a community's General Plan. Local streets may be used to access transit hubs such as BART stations, to reach major destinations, at the ends of a



Berkeley designates a network of transit streets in its General Plan.

route, and on routes specifically designed to provide neighborhood service.

Streets Best Practice 1.2
Assure that the identified streets have the appropriate characteristics for bus operations

The designated street network should be adequate to meet transit service goals. Therefore the network should have streets with the following characteristics. The designated network should provide for bus operations on the following types of streets.

- Streets already being used by AC Transit (unless appropriate alternative streets are agreed upon by the jurisdiction and AC Transit).
- Streets which allow route spacing consistent with AC Transit Practices
- Streets which reach all major destinations in the community
- Streets which reach planned future destinations (e.g., a new ferry terminal)
- Streets which provide direct through routes with a minimum of turns
- Streets on which physical traffic calming is not planned
- Streets with the shallowest possible grades, in no case more than 10%

San Francisco's *Transportation Element* (Objective 20) describes the city's approach to establishing Transit Preferential Streets as follows: *"… transit improvements should be based on a rational street classification system in which all transportation functions of the street network are analyzed, and only certain streets or locations are designated 'transit preferential.' Transit preferential streets (TPS) should be established along major transit routes, and general traffic should be routed away from these streets wherever possible."* Transit-preferential streets in San Francisco include Market and Mission streets, Geary Blvd., Fillmore St. (a secondary transit street), and numerous other streets.

Streets Best Practice 1.3
Assure that land use and development on key transit streets is transit-supportive

The streets where trunk routes, major routes, and high ridership crosstown routes operate are key streets for transit. As such it is crucial that both street operations and land use on these streets support transit. Land uses on these should be transit supportive as outlined in Chapter 3: higher density housing, mixed use, neighborhood serving commercial. The streets should not be given over to auto-oriented uses such as big box commercial, auto dealerships and repair shops, or large surface parking lots. The layout or "urban design" of these properties is also important. Driveways onto key transit streets should be minimized, as these can interfere with both bus operations and pedestrians. Some cities have developed special zoning to support transit and pedestrian orientation on these streets, such as the C-17 zoning Oakland applies to College Ave. in Rockridge.

For example, the city of San Jose's *General Plan* states that new development on major transit corridors *"…should be compact, urban in form and designed to make efficient use of existing services and facilities."*

Streets Best Practice 1.4
Do Not Create Driveways in Bus Stops

Driveways in bus stops can create dangerous conflicts for automobile drivers, buses, and bus passengers. Driveways should not be added within the red curbed area of a bus stop. New driveways should be at least five feet behind the red curbed area of a stop, or 45 feet behind the bus stop flag, whichever is greater.

Driveways in front of bus stops can provide space for the bus to merge back into traffic, particularly if the driveway has a low traffic volume. However, these driveways should begin at least ten feet in front of the flag at a bus stop.

AC Transit generally seeks to avoid including existing driveways in bus stops. However, in some instances a location with an existing driveway may be the most appropriate for a new or relocated bus stop (see Section 2 of this chapter, *"Bus Stops,"* or a fuller discussion of bus stop locations). A bus stop which includes a driveway with a low or moderate volume of traffic can be safe and functional for both buses and cars.

STREETS POLICY 2: MANAGE TRANSIT STREETS TO SUPPORT FAST AND RELIABLE BUS OPERATION

Since buses only operate on certain streets, it is all the more important that the traffic operations of those streets be optimized for buses to the greatest possible degree. Other than Transbay buses, almost all AC Transit buses always operate on public streets with other traffic. Many of these corridors have high traffic volumes and are often highly congested. AC Transit's average bus travel speed has fallen from 14.2 miles per hour to 12 miles per hour in 15 years. This 15% loss of speed frustrates riders, causes some to choose other modes, and costs AC Transit millions of dollars annually for increased operating costs. If AC Transit could restore the higher operating speed, we could increase service by some 15% without increasing costs. It is also important that buses be able to move in and out of traffic easily, for speed, safety, and smoothness of ride.

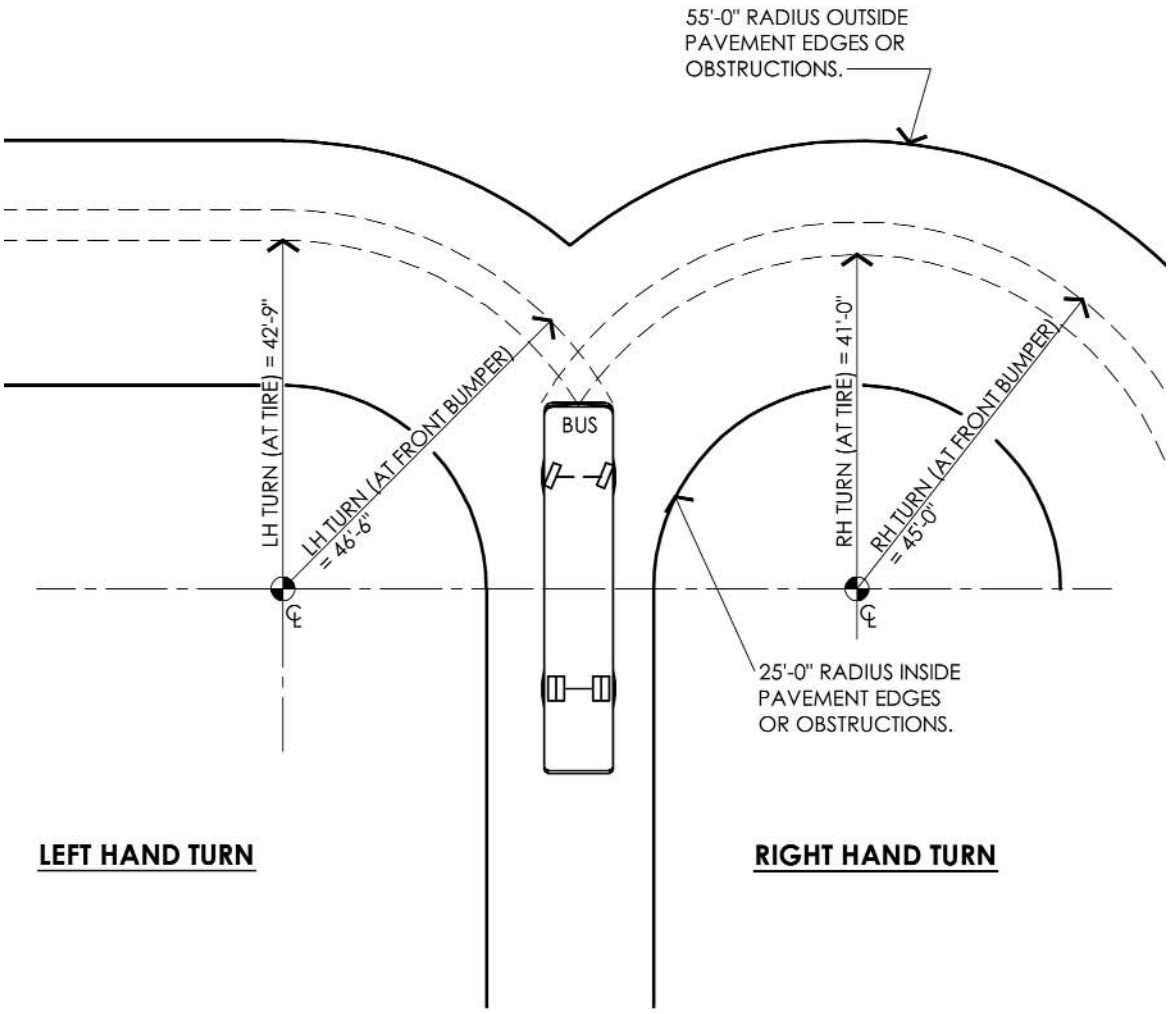
The critical variable for average bus travel speed is not its cruising speed, but rather it is whether the bus can ever reach its cruising speed! Congestion at intersections, difficulty getting into and out of bus stops, and inappropriate signal timing and progression are among the major sources of delay for urban transit buses. These are issues which roadway managers can address and have a positive impact on bus travel, without setting excessive speed limits or widening roads.

For cities to implement Transit First policies and for buses to move at reasonable speeds, the needs of transit must be a central consideration in roadway design.

Streets Best Practice 2.1
Assure that road width is adequate but not excessive

Bus operations require adequate road width. Buses cannot operate well on extremely narrow roads. The bus needs room to drive, to pull in and out of stops, to avoid parked and parking cars, and to maneuver around stopped vehicles. However, the specific road width is adequate will depend on traffic and parking volumes and conditions on a given roadway segment.

Figure 4: Bus Turning Radius



SCALE 1"=20'-0"

NOTES:

THE DIAGRAM ABOVE SHOULD BE CONSIDERED MINIMUM FOR AC TRANSIT.

DIMENSIONS ABOVE ARE REFERRED TO MCI BUS (45'-6-1/4" x102").

RADII OF 55' (OUTSIDE) AND 25' (INSIDE) ARE RECOMMENDED FOR PAVEMENT EDGES OR OBSTRUCTIONS. ARTICULATED BUSES CAN BE ACCOMMODATED WITH THE ENVELOPE ABOVE.

PROVIDE MINIMUM OPERATING TURNING ENVELOPE OF 60' OUTSIDE RADIUS IN DESIGNING TRANSIT CENTERS.

In many cases, one travel lane in each direction will be adequate, particularly if it is a wide lane. In other cases, that will result in undue delays.

Excessive road widths are also problematic for bus transit. The need to minimize the distance for pedestrians across roads is noted in Walking Best Practice 4.2 (Page 4-20). Excessively wide roads also encourage excessively high speeds by some vehicle drivers, a potential hazard to buses. The high speed roads do not generally reduce bus travel time significantly, as the bus must stop and start frequently and cannot travel as fast as the speed limit.

Reductions in the number of lanes on a roadway can also be problematic for bus operations. Communities may restripe roads to provide space for a bicycle lane or to ease pedestrian crossings and improve the pedestrian environment. Reducing the number of lanes may cause congestion and delays, particularly at intersections with substantial amounts of cross traffic. Restriping a roadway from two travel lanes in each direction to one is a particular cause for concern. In some situations, however, like the restriping of Grand Avenue in Oakland for three lanes per direction to two, there was no apparent negative impact. In other instances, creation of a two way center turn lane may rationalize turning movements and not therefore not negatively impact bus operations.

Before reducing the number of lanes on a roadway for any reason, it is very important that communities review their plans in detail with AC Transit. It is also critical that traffic analysis of lane reductions evaluate their impact on buses specifically. Many standard analysis evaluate only the impact on cars, which can be quite different from that on buses. AC Transit must carefully evaluate the effect of these changes situation by situation.

Streets Best Practice 2.2
Assure that travel lanes and curb radii are wide enough for buses

In addition to having adequate capacity on the road as a whole, each lane of a transit street must be wide enough for safe bus operation. AC Transit's preferred lane width is 12 feet, although buses can operate safely in 11 foot lanes. These widths are also consistent with Caltrans standards for state highways. Curb radii should be adequate to allow buses to turn without crossing the centerline, see Figure 4 (Page 5-11). The need for appropriate corner radii reinforces the importance of designating a street network for transit. On transit streets, corner radii should be adequate for bus operations. However on other streets cities may wish to use tighter radii to ease crossings for pedestrians.

Streets Best Practice 2.3
Assure that these streets have adequate street composition to support buses

The composition of streets with regular bus service should be strong enough to absorb the load of a bus. Communities should also prioritize pavement rehabilitation and reconstruction to streets with transit. A well-paved street provides a more pleasant ride for passengers and reduces wear and tear on the bus. Most communities choose to install concrete bus pads. AC Transit is supportive of this practice, but it is designed to protect roadways from wear and tear, and is thus at the community's option.

Figure 5--How Transit Signal Priority Operates

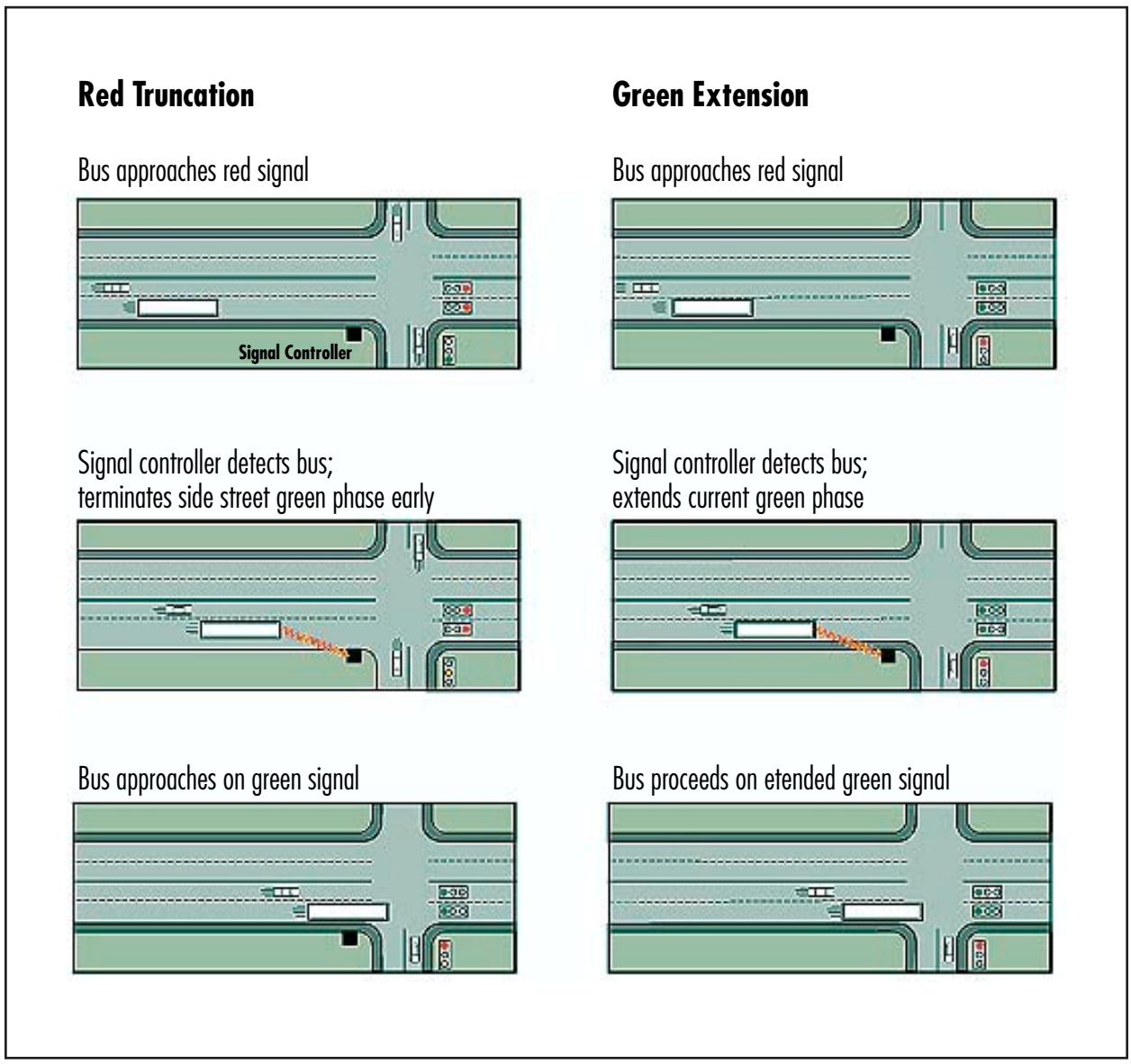


Image courtesy of Transit Cooperative Research Program (TCRP)

Streets Best Practice 2.4
Assure that signal timing is supportive of bus operations

Signal timing and progression is also very important for transit-friendly streets. Streets with Rapid or limited stop bus service are particularly important. Signals on these streets should be timed to allow reasonable, continuous, although not necessarily high speed, flow. It is more important to bus operations to reduce delays waiting for traffic signals than to be occasionally able to travel at high speeds. In most cases, 25-30 miles per hour speed limits will suffice. Good signal timing is important for all transit streets, in the next section we discuss priority treatments for key corridors.

Streets Best Practice 2.5
Assure that any traffic calming methods on bus routes are compatible with bus operations

As traffic volumes have increased, East Bay communities have become increasingly interested in "traffic calming" techniques, particularly for residential streets. Traffic calming techniques are designed to reduce speeds, volumes, and/or erratic driving behavior. They may seek to discourage through traffic from "shortcutting" on local streets. In the long run, these problems can only be solved by reducing the amount of automobile miles traveled. In the short term, there will continue to be pressure for traffic calming.

Most traffic calming techniques are designed to improve conditions on local streets, where most residents live, rather than on arterials. However, most bus routes operate on collector or arterial streets. Some cities, such as Berkeley and Oakland, have policies targeting traffic calming only to streets that do not have transit operations.

An important companion to traffic calming on local streets is traffic management on major streets, on their collectors and arterials. Minimizing congestion on collectors and arterials will help reduce traffic volumes on local streets, as fewer drivers will feel the need to seek short cuts through neighborhood streets.

Bus transit's need for smooth flowing traffic does not mean, however, that buses need high speed traffic. As discussed in the "Delay of Bus …" (Page 5-7), what buses need is often not higher travel speeds but fewer sources of delay like congestion, badly timed traffic signals, etc. Moderate speed with regular flow works best for buses.

There are therefore some traffic calming techniques that are appropriate for arterial and collector streets. Control of speeds through signal timing can be appropriate for transit streets. In some cases, installation of additional traffic signals or enhanced crosswalks (e.g., "Santa Rosa lights") may aid pedestrians. Traffic calming signage (e.g. "Watch for Children") may be helpful. Properly designed sidewalk bulbs can also ease pedestrian crossings (see Section 3). Traffic calming programs must be carefully designed for their particular circumstances--with an understanding of what problem they are trying to solve. AC Transit urges communities to review proposals with us before proceeding with traffic calming on transit streets.

"Vertical deflection" methods of traffic calming (devices that slow vehicles by moving them up and down) should be avoided on bus routes. Devices that cause major vertical deflection of buses, such as speed

humps, are definitely not appropriate for transit streets. Speed humps cause damage to buses and an unpleasant ride for passengers. If speed humps are installed on a street with a bus route, AC Transit may consider removing the route.

Some techniques that deflect traffic horizontally are also inappropriate. Diverters (often called "barriers") on a transit street would force a bus to divert off its route and are clearly inappropriate.

Traffic Calming Methodologies: Appropriateness for Transit Streets

Methods most likely to be appropriate:

- Arterial signal timing
- Additional traffic signals
- Improved crosswalks
- In-pavement lights ("Santa Rosa Lights")
- Traffic calming signage
- Bus bulbs
- Pedestrian bulbs (properly designed)

Methods which may or may not be appropriate:

- Reducing number of roadway lanes
- Narrowing street crossing distance

Inappropriate methods:

- Speed humps or bumps
- Other vertical deflection devices
- Diverters ("barriers") or semi-diverters
- Chicanes or serpentines

STREETS POLICY 3: IMPLEMENT PRIORITY TREATMENTS FOR TRANSIT ON KEY CORRIDORS

Bus ridership in the East Bay is heavily concentrated in a few key corridors. Many of these corridors are congested, particularly at major intersections. Getting buses through these congested areas and quickly along their route is key to maintain and increasing bus ridership. In many instances, techniques to prioritize bus transit are necessary. These techniques may involve traffic signals, traffic lanes or both. Experience both in the East Bay and other areas has shown that priority techniques can be implemented without causing significant delays for other traffic.

Streets Best Practice 3.1
Provide transit signal priority on trunk corridors when necessary

Transit signal priority allows buses to receive green lights at more traffic signals, reducing delay. In simple terms, the system works by having an "emitter" on the bus automatically request an extension of a green light if the bus is approaching a signal that is about to turn red. The extension lasts only a few seconds, 10 seconds at the very most, but that is often adequate to get the bus through the signal. In some systems, the bus can request a shortened red light. The process is automatic and not operated by the bus driver. The extension of green time benefits all vehicle traffic on the main arterial that the bus is traveling on, including cars. This system does not use special bus-only signals.

Transit signal priority is being implemented for the San Pablo Rapid (but not local buses on San Pablo

Avenue). The signal priority there will be evaluated in early- to mid-2004. Signal priority has yielded significant improvements in bus travel time in Los Angeles, Seattle, and elsewhere. Transit signal priority is particularly important on congested corridors, like the streets where many of AC Transit's trunk routes operate. Clearly, with implementation of signal priority, it becomes even more important to place bus stops on the far side of signalized intersections.

Some fear that transit signal priority will delay cross traffic, but this has not proven to be the case. Studies in Los Angeles and Seattle have shown little or no delay on streets which cross the transit priority street. There are various reasons for this. If the cross street loses a few seconds in one cycle, it can be granted extra time on another cycle. Systems can have limits built in as to how frequently signal priority will be granted. Transit signal priority is thus the conditional, not the absolute, right of signal preemption sometimes given to public safety vehicles.

Streets Best Practice 3.2
Reduce the amount of on-street parking if necessary to relieve congestion

On-street parking has a valuable role to play in the urban environment, but under some circumstances it interferes unduly with bus operations. On-street parking is not only attractive to drivers, it can also play a useful role in shielding pedestrians from traffic. On active commercial streets, on-street parking is usually permitted except as needed for bus stops and turns at corners. This approach is far better than keeping all lanes clear for high speed driving. However, in circumstances where on-street parking unduly impedes bus operations, it can be helpful to prohibit parking along for a greater than usual distance from the corner.

Prohibiting on-street parking in key locations can improve the maneuverability of the bus and other vehicles, and the traffic flow of the street. Getting into and out of curbside bus stops is one of the most time-consuming operations for a bus. In urban areas, the bus must often maneuver past parked cars to get to the stop. If this becomes too difficult, the bus driver may simply not attempt to pull into the curb and may stop the bus on an angle with the back of the bus protruding into traffic. AC Transit policy instructs drivers not to do this, but they do not always comply.

In some instances, restrictions on parking near corners may not be sufficient, particularly under peak hour conditions. In these circumstances, an all-day or peak hour prohibition on parking in the parking lane may be useful. This technique is widely used, particularly on arterials that access a major employment area. Improving traffic flow on an arterial in this way can help coax shortcutting drivers off local neighborhood streets or can be the "carrot" accompanying the "stick" of neighborhood street traffic calming. Limiting parking does permanently or temporarily eliminate the calming effect on the sidewalk that parked cars provide.

There may be objections to parking prohibitions, and concern about lost business. However, in most locations, on-street parking is a minor part of the parking supply. In central business districts, consolidated parking structures and lots provide most parking spaces. Along commercial strips, most businesses have off-street parking lots for their cus-

tomers' use. Publicity about other parking options (as well as transit) may be the appropriate response to these concerns.

Streets Best Practice 3.3
Create queue jump lanes to move buses through congested intersections

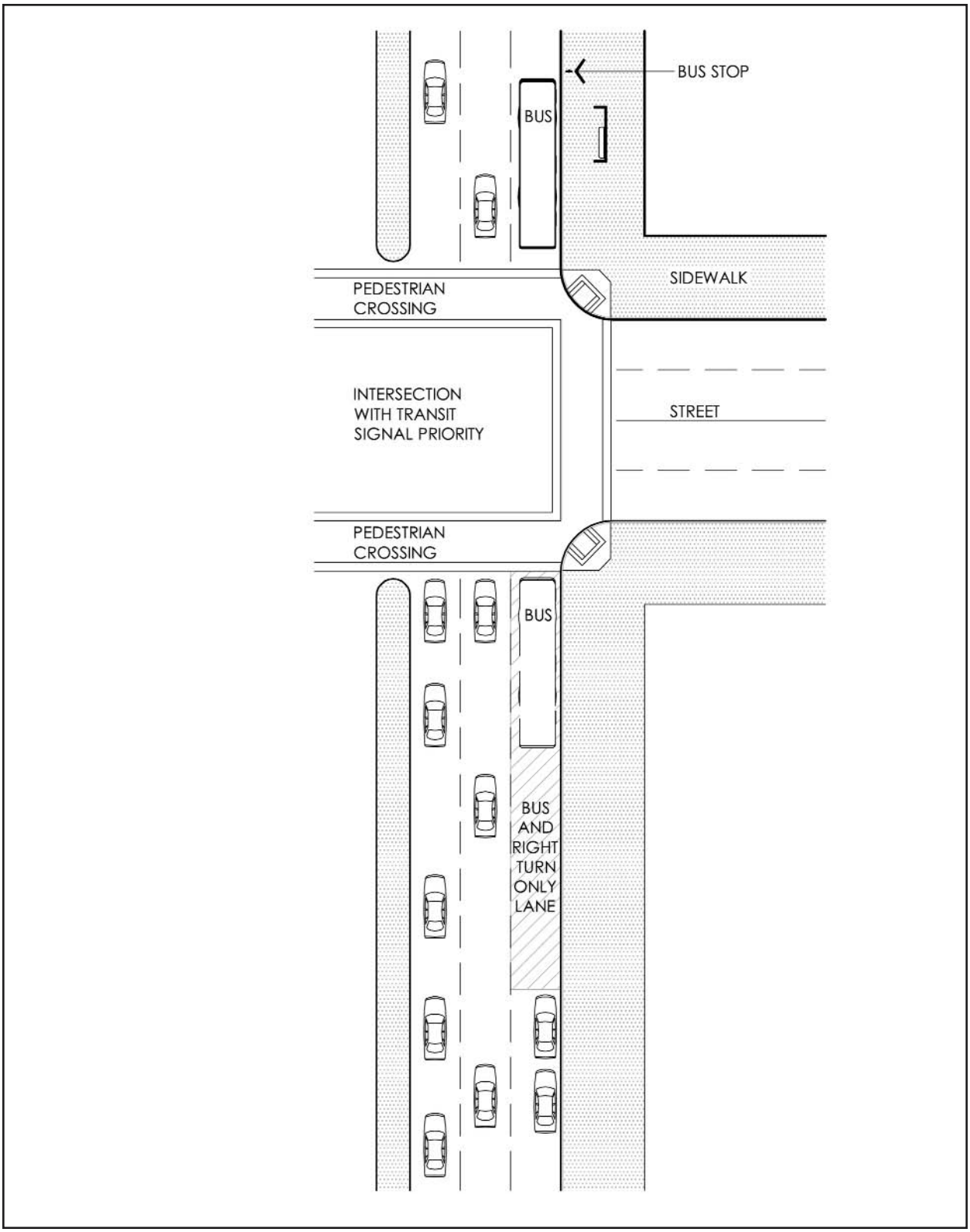
Getting through intersections can be a major source of delay on congested arterials. Buses can lose several minutes at particularly snarled intersections. Queue jump lanes help buses move more quickly through an intersection.

To create a queue jump lane, parking is prohibited back from the intersection, at least as far as the usual length of the queue waiting for the light. It may be necessary to limit parking for several hundred feet. This lane is typically dedicated to buses and right turns only--cars can use it for right turns, but only buses can use it a straight through lane. If properly implemented, buses can save substantial amounts of time through use of a queue jump lane. A queue jump lanes has been created on San Pablo Avenue south of the El Cerrito Del Norte BART station *(see below)*.

This queue jump lane speeds bus access to El Cerrito Del Norte BART station.

Bus in a bus (and right turn) lane.

Figure 6: Queue Jump Lane



Streets Best Practice 3.4
Consider dedicated bus lanes for congested, high transit volume corridors

Parking restrictions and queue jump lanes respond to congestion at an intersection. Where congested conditions persist over long distances, and where bus volumes are high, more continuous treatments may be needed. Some form of dedicated or restricted bus lane may be appropriate. A dedicated lane is a lane which only buses may use. Light Rail Vehicles such as those in San Jose typically operate in dedicated lanes. Buses in dedicated lanes can provide many of the advantages of light rail.

San Francisco has an extensive network of curbside lanes restricted to buses and right turns only. Some of these lanes are restricted at all times, others only in the peak hour. Peak hour bus lanes can be used for general vehicle flow or parking in off-peak hours. Besides a bus only lane, another variation is a bus/high-occupancy vehicle (HOV) lane. Finally, the East Bay Bus Rapid Transit project is evaluating dedicated lanes in the center of the roadway to allow creation of "track" like conditions with center stations for the BRT. San Francisco uses this approach on some streets.

SECTION 2--BUS STOPS

Bus stops are the "stations" of the AC Transit system. Bus stops should be functional for bus operations, safe and pleasant for passengers, and compatible with surrounding roadways and communities. Bus stops should be easy to find. Bus stops should be appropriately located along bus routes and in the specific appropriate location at intersections. They need to be long enough along the curb for the buses that will use them, often two or more buses at the same time. They need to be wide enough across the sidewalk to provide legally mandated (Americans With Disability Act) boarding/alighting space, and should be wide enough to accept a bus shelter for passengers' convenience. This section discusses how cities and AC Transit can address these concerns about bus stops.

Policy 4: Site bus stops at safe, efficient and convenient locations

Best Practice 4.1 Site bus stops to balance speed and convenience concerns

Best Practice 4.2 Site bus stops in the best operational locations, usually on the far side of an intersection

Best Practice 4.3 Site bus stops where passengers are less likely to experience crime

Policy 5: Locate bus stops appropriately within the right of way

Best Practice 5.1: Provide a curbside bus stop in most instances

Best Practice 5.2: Install bus bulbs where they would facilitate bus operation and pedestrian movement.

Best Practice 5.3: Avoid bus pullouts (turnouts)

Best Practice 5.4: Design Transit Centers for effective, efficient operation

Policy 6: Create safe, functional and legal bus stops with needed amenities

Best Practice 6.1: Make bus stops long enough for the buses that will use them.

Best Practice 6.2: Paint the curb at bus stops red.

Best Practice 6.3: Assure that sidewalks are wide enough and clear enough for bus stops

Best Practice 6.4: Provide an ADA compliant bus boarding/alighting area of at least 8 feet by 5 feet.

Best Practice 6.5: Provide bus shelters with appropriate amenities

Table 5: Summary of Bus Stop Siting Criteria

SUBJECT	GUIDELINE AND DWT REFERENCE	RATIONALE FOR GUIDELINE	FACTORS WHICH MIGHT MODIFY THE DECISION
Where along the route should a bus stop be?	Approximately every 1,000 feet, outside of downtown areas (Streets Policy 4.1), except for Rapid stops. 1,000 feet (or 1/5 mile) will generally be every two to three blocks.	Stops should be close enough together so passengers can walk to them easily, but far enough apart to help move buses quickly.	Irregular block lengths (e.g. 700 ft.), hilly topography, presence of a special needs facility (e.g. senior center) or major activity center, heavily used existing stops or transfer points.
At an intersection, where should the bus stop be?	On the far side (Streets 4.2), especially if the intersection has a traffic signal or is likely to get one. Far side stops are critical if the bus has signal priority. Midblock stops are to be avoided.	Far side stops allow buses to get through traffic signals and generally interfere less with other traffic. Midblock stops are hard for the bus to get into and out of and invite jaywalking.	Buses which turn right at the intersection, because a far side stop would require a separate stop for each bus. Unsafe conditions on the farside. Large transfer movements made easier by a near side stop.
Where within the right-of-way of a street should the bus stop be?	Generally at the curbside (Streets 5.1), sometimes on a bus bulb (Streets 5.2), not in a turnout (Streets 5.3). Bus Rapid Transit stations may be in the median of a roadway.	The curb usually has the best combination of convenience for passengers and bus operations; in high volume, congested conditions bus bulbs can be helpful. Turnouts slow down bus operations by forcing the bus to pull into and out of the turnout.	On roadways with only one lane in each direction (and no parking lane), turnouts may be necessary. Roads with typical traffic speeds over 40 mph (rare in the East Bay) may justify turnouts.
How can the chance of bus stop crime be minimized?	Bus stops should be sited where crime is less likely (Streets 4.3)	Active locations tend to have less bus stop crime than locations with less activity. Active locations include stores, schools, other uses with foot traffic. Bus stops should not be next to vacant buildings or vacant lots.	Other considerations in siting stops may modify this.

STREETS POLICY 4: SITE BUS STOPS AT SAFE, EFFICIENT AND CONVENIENT LOCATIONS

Communities and AC Transit must work together closely to identify and implement appropriate sites for bus stops. AC Transit seeks to locate bus stops where they will best meet both passenger and operational needs. Local officials are often concerned about integrating bus stops into the buildings, sidewalks, and traffic patterns of their community. Bus stops are also important as "signposts" to the general public that bus service is available in a given location and along that street.

Streets Best Practice 4.1
Space bus stops to balance speed and convenience concerns

Bus stops are the locations where bus passengers access the AC Transit system. Bus stops must therefore be convenient to the places where passengers wish to go. This might seem to argue for a great many bus stops, as close as possible to as many origins and destinations as possible. However, too many bus stops can slow a its travel time, as it brakes to stop and maneuvers to and from the curb. Convenience and speed must be balanced in siting bus stops.

Outside of downtown areas, AC Transit generally seeks to have bus stops approximately 1,000 feet apart, or slightly under 1/5 of a mile apart. This target has been set with the goal of increasing travel speed for AC Transit buses. Stop spacing of 1,000 feet means that stops will generally be two to three blocks apart, although some suburban blocks are close to 1,000 feet long.

This target means that some existing stops, particularly low ridership stops, will be eliminated.

The 1,000 foot distance is a target which will be modified based on specific conditions, particularly the location of streets. Stops must be located at intersections: for safety reasons, AC Transit generally does not establish mid-block stops. Other factors affecting the location of stops include the location of major destinations, transfer points, and hills. In some cases, streets have long segments without sidewalks or locations where legal bus stops can be established.

Streets Best Practice 4.2
Site bus stops in the best operational locations, usually on the far side of an intersection

In general, AC Transit prefers bus stops on the far side of an intersection rather than the near side.

Far side locations are particularly important at signalized intersections and intersections likely to be signalized in the future. Far side stops reduce conflicts between right turning vehicle and stopped buses. At near side stops, auto drivers may be tempted to go into the center of the roadway and "zip around" a stopped bus, a potentially unsafe maneuver. Far side stops also reduce sight distance deficiencies on approaches to an intersection. Far side stops also encourage pedestrians to cross the street more safely behind the bus rather than in front of it. Rapid buses also use signal priority to get though traffic signals so it is key that their stops be on the far side.

This bus stop is isolated from active land uses and hidden by the large wooden sign.

There are situations where it is impractical or unsafe to locate bus stops on the far side. In these situations, near side stops are acceptable. For example: At intersections where there are two bus routes and one turns right, a stop on the far side would require two separate stops for the two bus lines. It may be best to locate the bus stop on the near side, particularly if there is substantial transfer activity between the buses.

Bus stop locations should be determined by the needs of passengers and bus operations. Bus stops are located on public rights-of- way and the public interest should be paramount.[14]

Streets Best Practice 4.3
Site bus stops where passengers are less likely to experience crime

Safety from crime must be a consideration in siting bus stops. Most bus related crime occurs at bus stops, rather than on the buses themselves. Passengers waiting for buses are more vulnerable than passengers on buses. However, stops with active uses around them, such as stores, schools, or other facilities have been proven to have less crime than stops in the same neighborhood next to vacant lots or inactive uses. Thus while there is sometimes pressure to move bus stops away from active uses, it is important for passenger safety not to do so.

[14] Business and neighboring property-owners sometimes view bus stops as a negative, arguing that they attract "undesirables." We are not aware of any statistical evidence that demonstrates this. Bus stops can in fact provide additional people with "eyes on the street" increasing public safety. Bus stops are also a source of customers for adjacent businesses. Shelters and benches are often enhancements to street corners. In transit-oriented cities, bus stops adjacent to businesses do not seem to be viewed as a negative. In Vancouver, British Columbia, for example, there are bus stops served by multiple bus lines adjacent to the city's largest department stores.

This bus bulb facilitates quick boarding and alighting on a major bus line in San Francisco.

STREETS POLICY 5: LOCATE BUS STOPS APPROPRIATELY WITHIN THE RIGHT OF WAY

The specific location of a bus stop within the right-of-way is important to bus operations. A good bus stop location is one that is operationally safe and efficient for buses and is safe and convenient for passengers. Within those guidelines, the stop should be at the location where it causes minimum interference possible with pedestrian movements and other traffic, including bicycle traffic. The best place is usually right alongside the street's curb, although there are some exceptions for bulbs and transit centers.

Streets Best Practice 5.1
Provide a curbside bus stop in most instances

The curb that continues along a street is generally the most functional location for a bus stop. The curb is the location where buses can stop and start with least delay. Curbside stops also generally require the least modification to the street. Generally curbside stops will be in parking lanes, but they can also work in travel lanes without undue traffic delay on streets with multiple lanes in each direction and no curbside parking.

Special difficulties can arise on certain suburban "boulevards." These boulevards have local service lanes on the side of the roadway and through travel lanes in the center of the roadway. The local and through lanes are separated by medians. Some communities prefer to have buses operate and stop along the center lanes, with bus stops being located on the medians next to the center lanes. This approach is most efficient for bus travel. However, to stop in the center lane, communities must provide an ADA compliant bus stop waiting area (see Practice 6.4) and a crosswalk to and from the stop.

Streets Best Practice 5.2
Install bus bulbs where they would facilitate bus operation and pedestrian movement

In congested locations on high volume routes such as trunk routes, bus bulbs can be useful. At a bus bulb, the sidewalk is extended into the parking lane without interfering with the travel lanes. The appropriate width of a bus bulb depends on many factors, including the width of travel lanes, presence of bike lanes, and need four sidewalk space. The bulb allows the bus to stop without having to pull into the curb, saving travel time for the bus. The bus bulb also provides a waiting area for passengers, and can relieve sidewalk congestion if any. The bus stops briefly in the travel lane, then continues.

It is often feared that bus bulbs will slow traffic, but Federal Highway Administration studies show that bus bulbs actually speed up traffic. Bus bulbs reduce the phenomenon of bus drivers stopping with the bus protruding into traffic, thereby regularizing traffic flow. San Francisco has installed numerous bus bulbs in a highly successful program. If bulbs are installed the bulb should be at least 60 feet long, so buses can pull up alongside it and let passengers board and alight from all doors (see the discussion and illustration in Walkways Best Practice 4.2). Typically, bus bulbs should not be installed on high speed roads, where the average travel speed is 35 miles per hour or above as stopping in the travel lane may be unsafe there.

Streets Best Practice 5.3
Avoid bus pullouts (turnouts)

Unlike bus bulbs, bus pullouts are generally detrimental to bus operations under most circumstances found in the AC Transit district and should be avoided.

At a pullout, the roadway is widened just at the bus stop, in order to channel the bus into a special curb lane. The bus then stops out of travel lanes. Pullouts are not generally desirable for bus operations because they force the bus to pull farther into and out of the curb than would otherwise be the case. This slows its operation, particularly when the bus seeks to reenter traffic. Pullouts are generally designed for the convenience of other vehicles, not buses.

Special cases where pullouts may be appropriate are unusually narrow roadways, such as those consisting of one unusually narrow travel lane (with no parking lane) in each direction. High speed roadways with no parking lanes may also be appropriate for pullouts. A Transit Cooperative Research Program (TCRP) report suggests pullouts for roads where traffic speeds are 40 mph and above, but these are rare in the AC Transit district. Bus stops on freeway ramps may be designed as pullouts. Sometimes a turnout stop is required on narrow roadways within shopping cen-

ters. In some instances, pedestrian bulbs at either end of a short block may create a situation resembling a bus pullout between them.

Streets Practice 5.4
Design Transit Centers for effective, efficient operation

While most AC Transit bus stops are at on-street bus stops, some of the busiest bus stops are at transit centers. Transit centers are off-street locations designed for buses to pick up and drop off passengers and lay over at the end of their route. Transit centers are appropriate where multiple buses stop, and particularly where multiple buses lay over. Most of AC Transit's transit centers are at BART stations, but there are also transit centers at other locations such as Contra Costa College and Eastmont Town Center. Some cities, such as in Union City at the Union Landing shopping center, have also designed their own transit centers in cooperation with AC Transit.

It is important that these transit centers be designed properly for both bus operations and passenger comfort and safety. AC Transit has developed a set of transit center design guidelines that are included as Appendix Two. The "sawtooth" layout is generally the most efficient for bus loading bays at transit centers and is illustrated below.

It is important that transit centers contain an adequate number of bus bays for bus operations and for ease of passenger use. A bus bay that serves as the stop for a single bus route is easiest for a passenger to understand. It also avoids the possibility of multiple buses needing to use the same bay at the same time. Passengers transferring from a train or another bus look at a given bus bay to see if the bus they wish to take is loading. Associating a bay with a bus line also makes bus circulation patterns the clearest.[15]

The transit centers at BART stations are generally located close to the station entrance. This is critical to allow transit passengers to connect easily to trains, and to attract riders to bus transit (especially when other factors, such as the higher cost of using transit, serve as disincentives). If riders must walk long distances to reach trains they are more likely to not use the bus at all.

Unfortunately other would-be uses sometimes covet this "prime real estate." They argue that transit centers consume valuable land and create "dead" space close to the station, and should therefore be kept as small as possible. This attitude overlooks the operational and passenger needs discussed above. It also neglects the "liveliness" of bus bays that deliver passengers to a station all day long, while automobile parking spaces almost always house only a single "dead" car for the entire day. In terms of passengers per square foot of station area land, transit centers are clearly more efficient than auto parking spaces.[16] Nor is the hustle and bustle of what BART describes as "the hectic zone" immediately next to the station entrance ideal for transit-oriented residences. These are generally more attractive and enjoyable in quieter zones slightly away from station entrances.

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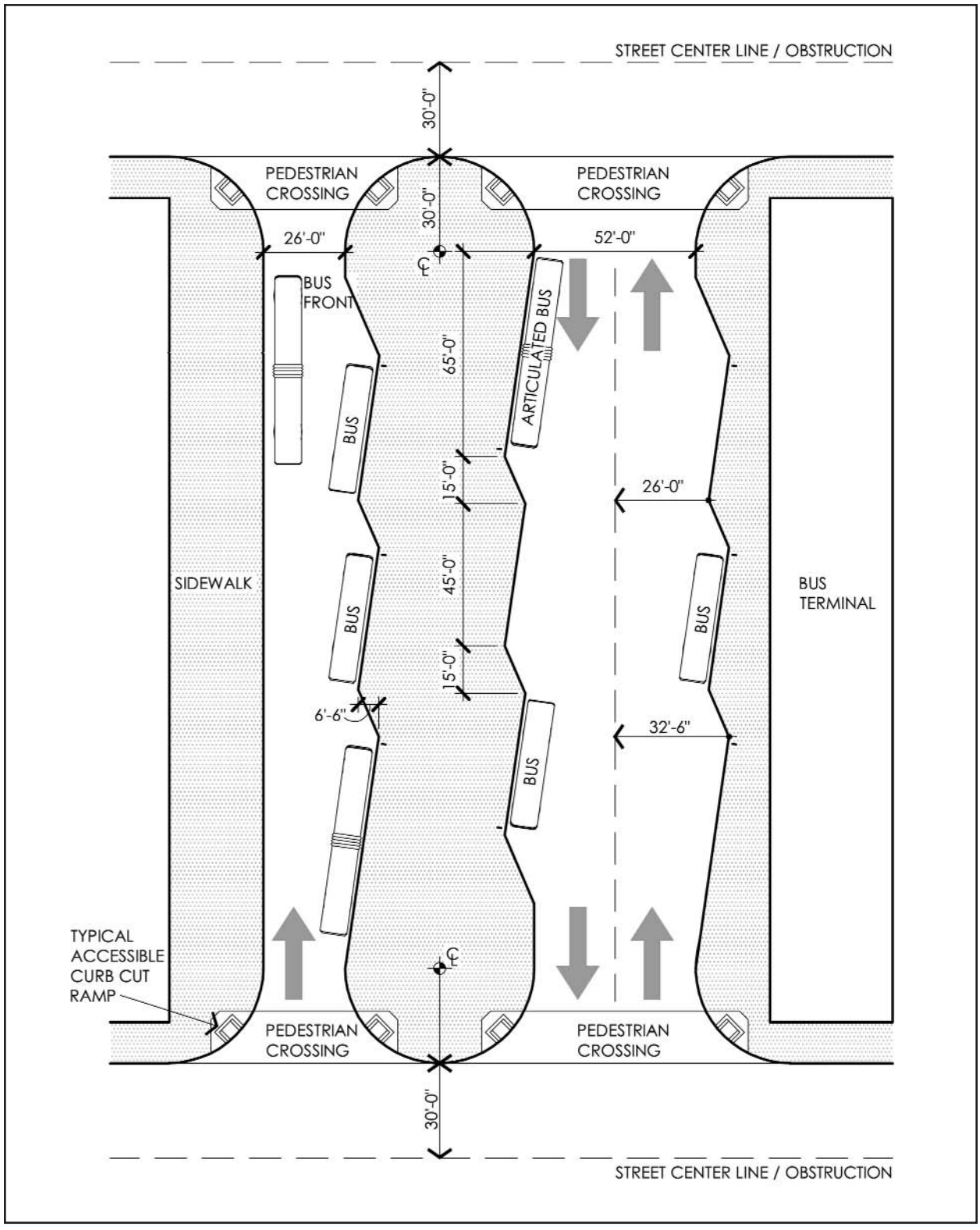
15 The space available for transit centers can affect service patterns. It is often suggested that AC Transit buses at a given BART station should "pulse"–all arrive and depart at the same times, so passengers are aware of the pattern, connect best to trains easily transfer between buses. A pulse pattern, however, requires a large number of bus bays, as each bus stop can only serve one line with no overlaps.

16 As a matter of scale, the largest transit centers occupy a few thousand square feet, while surface parking at BART stations can easily occupy 100,000 square feet (2.5 acres) or more.

Figure 7: Preferred Sawtooth Transit Center Design



Before any transit centers are built or modified, AC Transit, the community involved, and any other interested parties would have extensive discussions about the individual site.

STREETS POLICY 6: CREATE SAFE, FUNCTIONAL, AND LEGAL BUS STOPS WITH NEEDED AMENITIES

Policy 4 outlines how to structure a bus stop on the pavement (usually at the curb, sometimes with a bulb). This Policy describes how to make bus stops both functional for bus operations and pleasant for passengers. Bus stops are the first point of contact between the transit system and their passengers, so it is crucial that they work as well as possible. Insuring this requires a collaborative effort between AC Transit and local jurisdictions.

Streets Best Practice 6.1
Make bus stops long enough for the buses that will use them

In addition to the appropriate location, there are other important characteristics a bus stop must have. The stop must be long enough so that buses can not only stop there, but also get into and out of the stop easily. Adequate length bus stops make it more likely that the bus driver will actually pull into the stop, rather than leave the back of the bus protruding into the travel lane.[17] Because stopping flush with the curb is key for disabled passengers, providing a sufficiently long stop is an ADA issue. **AC Transit's basic recommended minimum bus stop length is 80 feet.** This length is needed to provide three sections of the stop. On a far side stop, these are:

1. Bus clearance from the crosswalk: Minimum 5 feet for pedestrian safety
2. Stopping space for bus: 60 feet (length of articulated bus)
3. "Take off" space for bus to leave stop: 15 feet

Total Length- Far Side Stop for one bus: 80 feet

Near side stops require slightly more space. The recommended length is 90 feet, divided up as follows:

1. Approach space for the bus: 15 feet
2. Stopping space for the bus: 65 feet
3. Bus clearance from crosswalk 10 feet

Total length- Near Side Stop for one bus: 90 feet

The near side stop requires additional stopping space to insure that it can stop with its doors at a disabled-accessible location. At some stops, it can be necessary to stop the bus before it reaches the flag, meaning that the bus would overlap out of the back of its stopping space. The additional distance from the crosswalk allows right turning vehicles to proceed safely.

These dimensions are illustrated in Figures 8 and 9.

When a bus stops immediately after making a right turn, red curbed space in addition to the normal amount may be needed. The bus needs the distance to make its turn and pull into a stop. The red curb space required will be 75 feet plus the distance needed to make the turn and pull in flush with the curb, which can be calculated from the turning radius diagram (Figure 4, p. 5-11). Parking should be prohib-

[17] Failing to fully pull into a bus stop is against AC Transit policy and bus drivers are trained about this. Nonetheless, it is more likely to occur if bus stops are too short.

ited in that area. Left turns do not generally present the same difficulties, because the bus does not need to turn as tightly.

Major bus stops are likely to have more than one bus stopping simultaneously, possibly a Rapid and a local bus. In that case the far side stop dimension should be at least 125 feet.

1. Basic bus stop length: 80 feet
2. Space for second bus: 40 feet
3. Space between two buses: 5 feet

Total length- Stop for two buses: 125 feet

At some very busy locations, multiple stops in a line with more than one bus pole and flag may be needed. The need for multiple flags is different from the need for space for two buses behind a single flag. The need for multiple stops with bus flags can occur at bus layover points. It can also occur when transit centers are designed with straight line rather than sawtooth curbs.[18] These groups of stops should be designed so that there is adequate space for each bus and at least 20 feet between each bus (from the front of one bus to the back of the bus in front of it).

Streets Best Practice 6.2
Paint the curb at bus stops red

It is important that the curb alongside the bus stop be painted red, to prevent cars from parking there. This red curb is also useful in keeping the travel lane clear. If cars are parked in a bus stop, then the bus will be forced to stop in the travel lane. This practice interferes with other traffic and is inconvenient and dangerous for passengers, especially disabled passengers.

It is important to paint an adequate length of curb red, to prevent cars from parking in locations where they might interfere with buses entering and leaving stops (see Figures 8 and 9).

Streets Best Practice 6.3
Assure that sidewalks are wide enough and clear enough for bus stops

Sidewalks on transit streets often get cluttered with newsracks, utility and light poles, trees, and other features. While each has its place, it is important and legally necessary to keep sufficient clear space for bus stops and shelters. These items should be kept away to the maximum degree possible from the entire length of the bus stop, so that the overhang on a bus pulling out of a stop does not hit them.

A sidewalk can be thought of schematically as having three zones. Each is best used for certain purposes, less appropriate for others. They are generally not visibly delineated, though some cities use differing pavement treatments and marking to distinguish them:

The zone closest to the street is the **Curbside Zone**. This is where people board the bus at bus stops. Away from bus stops, such equipment as lampposts, telephone poles, tree wells, parking meters, and other equipment are appropriate in the Curbside Zone. On wide sidewalks, it can be used for outdoor seating. At bus stops and street crossings, the Curbside Zone

[18] AC Transit's preferred transit center configuration is sawtooth curbs (see Figure 7, page 5-23. However, for various reasons, some transit centers are designed with straight line curbs. For example, the new transit center planned for Union City BART is proposed to have straight line curbs to make the area seem more like a typical city street.

Figure 8: Far Side Bus Stop Template

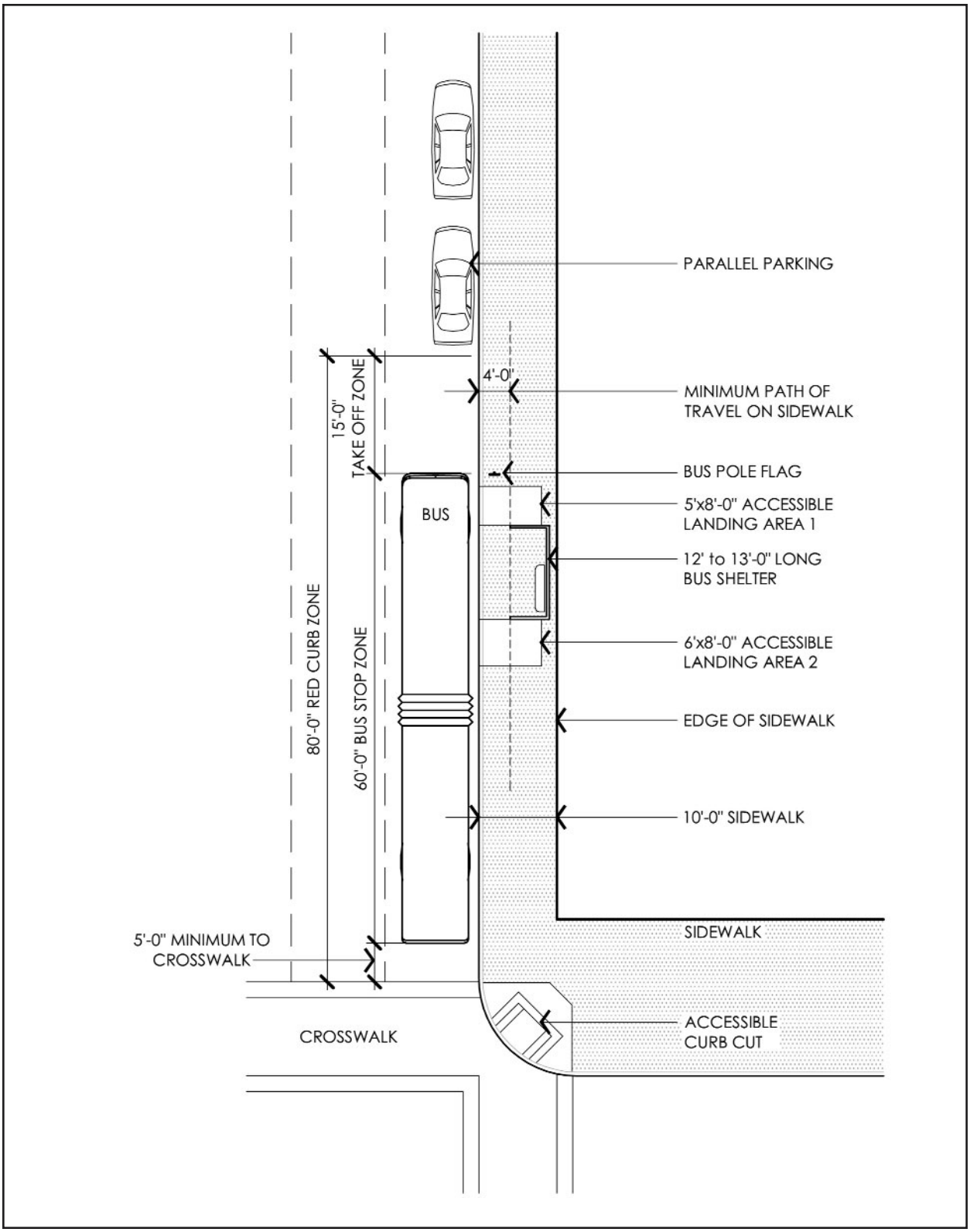
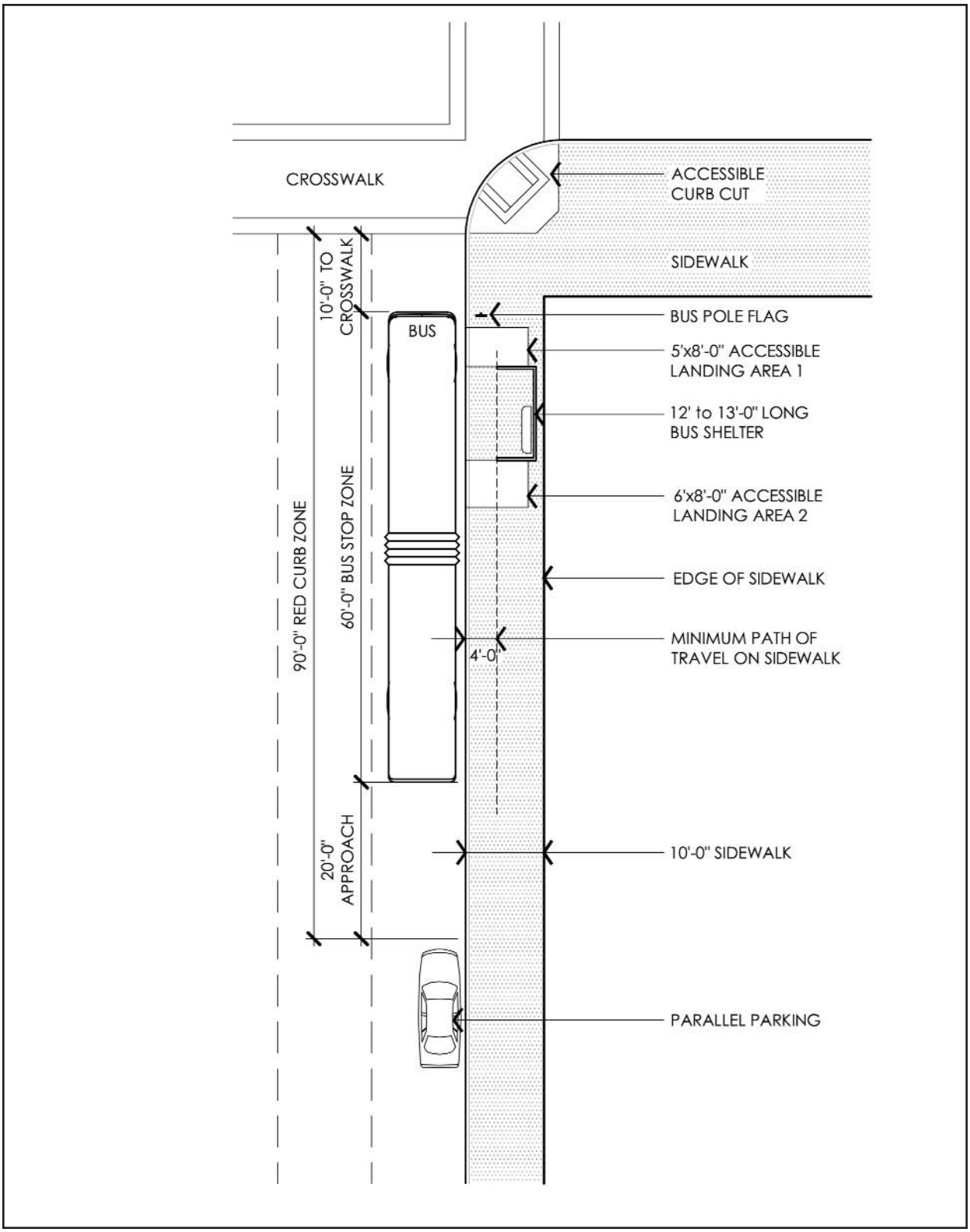


Figure 9: Near Side Bus Stop Template



must be kept clear of clutter.

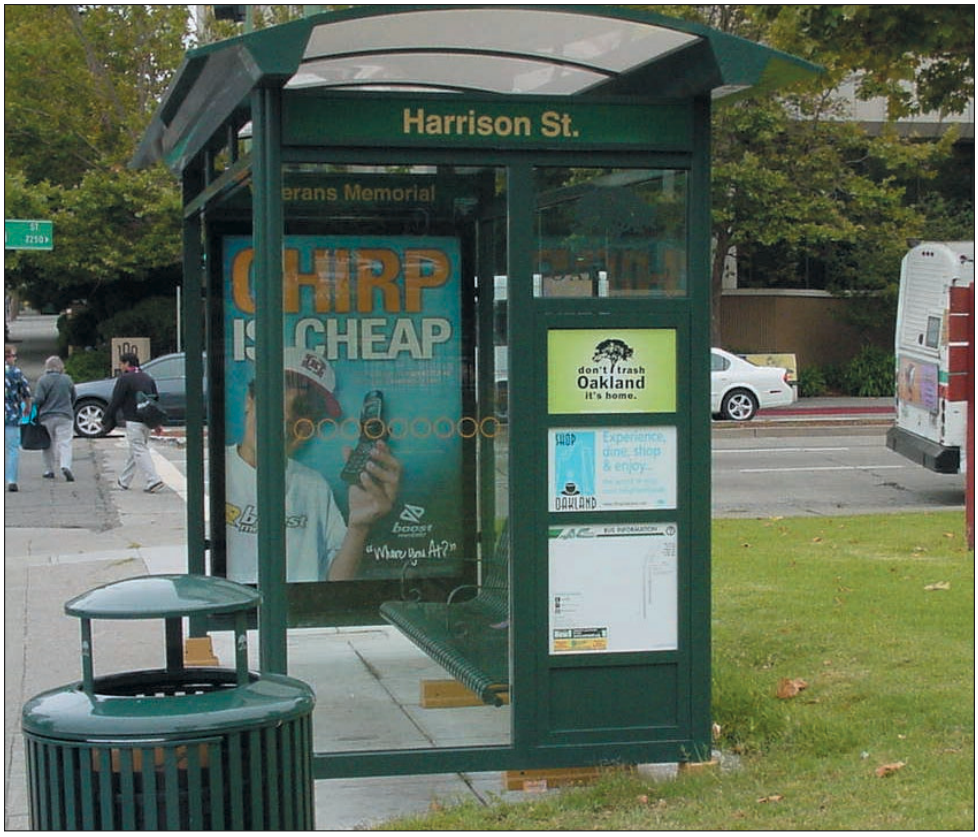
Middle zone: **The Passage Zone**. This is the next part of the sidewalk, the part used by pedestrians and wheelchairs to travel. This area should generally be kept clear with a minimum of a four to six-foot direct path be kept open as a path of travel for the disabled and others. At bus stops, bus shelters should be placed in this zone, with bus boarding and travel along the sidewalk in front of them. This placement of bus shelters meets legal requirements and maintains views of business behind.

Zone next to buildings--**Building Edge Zone**. Just as the Curbside Zone both buffers and makes the transition to the street, the Building Entry Zone makes the transition to buildings. Awnings and outdoor displays (if permitted) may be located here. On wide sidewalks, outdoor seating may be located here instead of or in addition to the Curbside zone. Bus stops generally do not make use of the Building Edge Zone, although in some cases it may be most appropriate to place a bus shelter here.

Streets Best Practice 6.4
Provide an ADA compliant bus boarding/alighting area of at least 8 feet by 5 feet

The first requirement is that the bus stop be physically accessible to all riders. Under the ADA

These newsracks in Oakland are around the corner from the main street, freeing up sidewalk space.



This bus shelter in Oakland provides a bench, map and schedule information, and a trash can.

Accessibility Guidelines (ADAAG) which implement the Americans with Disability Act, there must be a paved boarding/alighting area of at least eight feet by five feet for passengers. The area must be at least eight feet deep from the curb and five feet along the curb. This is a valuable safety rule for passengers generally. ADAAG also requires a minimum path of travel (sidewalk) clear of obstructions to and from this boarding area at least three feet wide. Many cities use four feet or even six feet as their standard.

It is important to note that AC Transit's older buses and our new "Van Hool" buses require different ADA boarding areas. The older buses have their wheelchair lifts at the front of the bus. They therefore require the eight foot by five foot area at the front of the bus stop, just behind the bus pole. Van Hools use a center ramp for disabled access and therefore need an ADA pad 16 feet back from the front of the bus or the bus pole. Since the same bus stop is likely to be served by various types of buses, each stop should provide ADA landing areas for both types of buses.

The proper siting of the ADA landing area is illustrated in Figures 8 and 9 (on pages 5-26 and 5-27), the Far Side and Near Side Stop Templates respectively.

Streets Best Practice 6.5
Provide bus shelters with appropriate amenities

A pleasant bus stop includes a bus shelter for protection from sun or rain. At a minimum there should be a bench to wait at. A fully equipped shelter will include places to sit, possibly leaning rails, a map of area AC buses and schedules for those buses. A tele-

phone that can at least make outgoing calls is still useful, because not all passengers carry cell phones (blocking incoming calls eliminates many of the crime-related uses of phones). Because of the cost of maintaining shelters, AC Transit's current policy is to work with advertising supported shelter providers who agree to maintain the shelters and meet minimum standards.

At each stop, bus shelters should be sited as close as possible to the bus stop flag, as shown in Figure 8 and Figure 9. Passengers will be able to board the bus most easily from there, and bus drivers will be best able to see them. AC Transit recommends that shelters be placed at the back of the sidewalk, which is generally preferable for pedestrian travel and for meeting ADA path of travel requirements. Often shelters at the back of sidewalks can be placed along blank walls.

However, in some cases it is necessary to modify the placement of the shelter. Shelters should not be placed where they block the sight line for a driveway or an intersection. Shelters should also not be placed directly in front of automatic teller machines (ATM), as this may create a real or perceived security problem. Within the guideline that the most important purpose of bus shelters is to serve bus passengers, shelter locations should be jointly determined by the city/jurisdiction controlling the sidewalk and AC Transit.

It is particularly important to provide amenities at heavily used bus stops. AC Transit has not adopted a formal set of standards for appropriate facilities and various types of stops. However, a set of standards was used to define appropriate levels of improvement along the San Pablo Corridor. Four levels of stop were defined based on ridership: A, C, D, and E. The most heavily use stops would receive the greatest improvement, while E stops with very limited use would only receive a bench.

APPENDIX 1

GLOSSARY OF TRANSIT AND LAND USE TERMS

Americans With Disability Act (ADA): A federal law mandating, among other provisions, that transit systems be accessible to people with disabilities and that comparable alternative service be provided for people unable to use fixed route service.

Arterials: Major roadways, other than freeways, designed to carry large volumes of traffic through and between cities. Arterials will normally be the widest streets in a community. They are sometimes also called *Major Streets*. Traffic on arterials is generally controlled by traffic signals, not stop signs. Every city and county in California must define its arterials as part of its roadway network in the Transportation Element of its General Plan. Some cities distinguish between Major Arterials and Minor Arterials. Examples of arterials include San Pablo Avenue, Hesperian and Fremont boulevards. AC Transit operates on many East Bay arterial streets and they are very important to bus operations.

Branches: Two bus routes operating along the same route for a substantial distance which then separate and travel different routes. Branches should be avoided when possible because they tend to provide poorer service, are difficult to manage, and can confuse passengers.

Bus Rapid Transit: An emerging form of high speed, high quality bus transit. Bus Rapid Transit (BRT) operates on separate rights of way such as dedicated lanes in a roadway or a separate busway. This allows the bus to be faster and more reliable. Bus Rapid Transit also spaces stops further apart, uses transit signal priority, generally uses low floor buses, and may collect fares under a proof of payment system. AC Transit is developing BRT for the International-Telegraph corridor; Los Angeles is among the other cities developing BRT, and Boston's Silver Line BRT is in operation.

Chicane: A traffic calming device which slows traffic by forcing it to divert from a straight path of travel. A chicane might channel a travel lane to the right and then back into the center of the roadway. Chicanes are often also built as chokers, narrowing the travel lane. They are also known as serpentines.

Choker: See *chicane*.

Class Pass: A program under which students at a college receive transit passes, paid for out of fees from every student. This program is in existence at dozens of American colleges and has proven very successful in increasing transit agency revenue and ridership. The University of California-Berkeley has a Class Pass program with AC Transit (see *Ecopass*).

Collectors: Secondary streets designed to bring traffic to arterials. Collectors, or collector streets, are generally designed for travel to or within a neighborhood but not for long distance travel. Collectors are generally not as wide as arterials but are generally larger than local streets. Collectors may be controlled by traffic signals and/or stop signs. Like arterials, cities define their collectors in the Transportation Element of a city's General Plan. AC Transit operates on some collectors.

Commuter rail: Longer distance rail transit systems designed to bring commuters to a central location. Commuter railroads generally have spread out stations (1-3 miles apart). Commuter rail service and ridership is concentrated in weekday peak hours, there may be limited or no service at other times. Commuter railroads typically run on ground level tracks with grade crossings. Examples of commuter railroads include Caltrain on the San Francisco Peninsula, ACE between Stockton and San Jose, and the Metrolink system in Los Angeles.

Comparison Retail: Stores offering major items, such as large appliances, that consumers purchase infrequently. They may wish to compare the price and quality of before purchasing. Some consumers may travel long distances to shop for comparison items such as furniture.

Convenience-Oriented Retail: Routine items such as groceries and sundries that consumers purchase repeatedly. Consumers generally wish to purchase these items at conveniently located stores and are generally less willing to travel long distances for them.

Crosstown Route: A shorter route that is designed to feed trunk routes and BART. In the AC Transit district crosstown routes usually operate in a primarily east-west direction. The 98th Avenue bus (Line 98) is an example of a crosstown route.

Deadhead: The time a bus is on the road but not in revenue service, usually traveling from its yard to its starting point, or from its ending point back to the yard. The term also refers to a bus that it is deadheading. Deadhead time produces cost to transit agencies, but no revenues and no service to passengers, so agencies seek to minimize deadhead time.

Ecopass: Similar to Classpass for employees. A payment is made by or on behalf all employees at a worksite, all of whom can then receive a transit pass. Occasionally used with residents, through bodies such as neighborhood organizations. In the United States, most widely used in San Jose and Denver.

Express Bus: A bus that operates a significant portion of its route with no stops, usually on a freeway. Most of AC Transit's Transbay buses to San Francisco are express buses because they operate largely on freeways and the Bay Bridge.

Farebox Recovery: The proportion of a transit system's operating costs that it recovers from fares (including passes, tickets, etc.). AC Transit's farebox recovery ratio varies somewhat year to year, but is generally between 20% and 25%. Virtually no North American transit agencies cover their full operating cost.

Fixed Route: Standard transit bus service is "fixed route," the bus always operates on a specific set of streets. The term fixed route is used to refer both to this type of service and the route that the bus operates on (see *flexible service* and *paratransit)*.

Flexible Service: Transit service which can deviate from a standard fixed route to take a passenger to a specific destination close to the route (e.g., their house). Flexible service is provided in low density, low ridership areas by a number of transit agencies

Floor Area Ratio (FAR): The mathematical ratio between the amount of built space on a site and the amount of land. For example, if a 10,000 square foot lot is covered completely, lot line to lot line, with a two story building, this would produce a 20,000 square foot building and an FAR of 2.0. Similarly, a four story building covering half the lot (5,000 square feet) would also have an FAR of 2.0. FAR is used to measure how intense a given building is, and is most commonly used for non-residential structures.

Free Right Turns: Right turn lanes before an intersection which allow vehicles turning right not to go through the intersection (also known as Slip Turns). Free right turns allow for faster vehicle movement and can reduce intersection congestion, but also often make it difficult for pedestrians to cross the street. Free left turns are rare, but are occasionally constructed at the intersection of two one way streets where the permitted turn is left.

General Plan: The comprehensive plan for a city's development, sometimes called the *Master Plan*. Under California law, each city and county must maintain a current General Plan that includes a land use, transportation, housing and other required elements. Cities may also add optional elements. The General Plan is a city's broadest statement of how it intends to structure its land use and transportation networks. General Plan land use provisions are usually consistent with the specific land use regulations found in Zoning Ordinances.

Greenfield: A location that is being developed for the first time, generally beyond the edge of previously developed areas, in contrast to infill development. It is also contrasted with "brownfield" development, which is redevelopment of previously contaminated locations. Classic suburban development occurs on greenfields.

Headway: The scheduled amount of time between buses on a route. A bus that is scheduled to run every 15 minutes is said to have a 15 minute headway.

Heavy Rail: High capacity rail transit systems designed to carry large numbers of passengers. Heavy rail systems typically are located above ground (elevateds) or below (subways) or in surface right-of-ways protected from cross traffic. Examples of heavy rail systems include BART, the Red Line subway in Los Angeles, and the New York City subway system. The "heavy" in heavy rail refers to a heavy degree of engineering, not necessarily the weight of train cars or other equipment (see *Light Rail* and *Commuter Rail*).

Infill: Development in an area that is already developed (although the specific site may not have been previous developed). Contrasts with greenfield development on land which has not been previously developed.

Intermodal: Involving two or more modes (types) of transit, e.g., bus and BART. Also used to refer to a site where a passenger transfers modes. BART often refers to the bus transit centers at BART stations as "intermodals." See *mode*.

Limited: Bus service that only stops at some of the stops along a route. Limited service is similar to Rapid service, but often stops more frequently and generally does not make use of transit signal priority. AC Transit operates several limiteds, but plans to convert these to Rapid service over time.

Light Rail: Rail transit that is less heavily engineered than heavy rail, and usually not fully grade-separated (i.e., above or below the ground). Examples of light rail lines include San Francisco's Muni Metro, the VTA rail lines in Santa Clara County and Sacramento's rail transit system. Light rail may operate in its own right of way or in the street. Light rail stations are typically one half-mile to one mile apart, depending on conditions. Sometimes called a "trolley."

Low Floor Bus: A bus with a lower floor than standard buses, allowing passengers to get on without climbing steps. People in wheelchairs can board the bus using a simple ramp rather than a wheelchair lift. The Van Hool buses used on AC Transit trunk lines are low floor buses.

Major Route: AC Transit's term for routes that are busier and more frequent than crosstown routes, but not as busy or frequent as trunk routes. Like AC Transit's trunk routes, major routes tend to be long north-south routes.

Mode: A type of transportation. Travel modes include automobile, bicycle, bus, ferry, rail, walking (pedestrian), and other modes. Many trips, especially transit trips, involve more than one mode—they are usually classified by the mode that covered the longest distance. (See also *intermodal* and *multimodal*).

Multimodal: Incorporating many types (modes) of transportation. The term multimodal may refer simply to the fact that multiples modes are present, such as on a roadway. It may also refer to planning or engineering that seeks to facilitate multiple modes of transportation, rather than just one.

Node: In land use, a focal point for development, where development is more intense than in the surrounding area. A transit station or major intersection could be a node of development.

Operating Cost: The cost of operating a bus or transit vehicle, including routine maintenance. Operating cost is distinguished from capital cost, the cost of buying or building vehicles, stations, and other fixed facilities. Operating cost is often expressed in terms of cost per revenue hour. Operating cost consists mostly of labor cost.

Owl Service: Late night bus service, typically in the hours between midnight and 5 a.m. Owl service, when it is operated at all, is on fewer routes than daytime and evening service. AC Transit operates owl service on selected trunk routes and will begin operating owl service to San Francisco during the hours BART does not operate.

Paratransit: Alternative transit service provided for persons who are physically unable to use fixed route service. Under the Americans with Disability Act, paratransit must generally provide service to the same destinations during the same hours as fixed route service. AC Transit participates in the East Bay Paratransit Consortium with BART to provide paratransit service in the East Bay.

Park and Ride: A location where auto drivers may park their cars and board transit. Park and rides are most commonly found at rail stations, but can also serve bus transit, such as at Richmond Parkway Transit Center or Ardenwood Park and Ride in Fremont.

Passengers per Revenue Hour: The number of passengers who board (get on) a bus in a Revenue Hour (see *Revenue Hour*).

Proof of Payment: A fare payment verification system under which passengers are spot checked as to whether they have proof they paid their fares. Proof could be a receipt, a transfer, or a pass. Passengers who do not have proof of payment are subject to a fine. Under proof of payment, passengers only stop at the front farebox if they are paying cash. This system allows passengers to board a transit vehicle through all doors, speeding up boarding. Proof of Payment is widely used on light rail systems, including San Francisco's Muni Metro and the Santa Clara VTA light rail lines.

Rapid Bus: Upgraded bus service generally similar to Bus Rapid Transit, without a dedicated right-of-way. Rapid buses use wider stop spacing, low floor buses, and signal priority to improve speed and reliability. AC Transit currently operates a Rapid bus on San Pablo Avenue, and will operate one on International Blvd. and Telegraph Ave. prior to the opening of the BRT. Los Angeles currently operates nine Rapid lines and plans to expand to over 20 Rapids.

Revenue Hour: An hour that a bus or transit vehicle is in service on its route, carrying passengers or available to carry passengers. During this time the bus is said to be in revenue service. Revenue hours are distinguished from deadhead time (time when the bus is traveling from the bus yard to the beginning of the line, or returning from the end of the line).

Right of Way: The physical area where a mode or modes of transportation operation. A road is a right of way, as is a railroad track or a busway reserved for buses.

Short Range Transit Plan (SRTP): The principal planning document for American transit agencies, required to receive Federal Transit Agency funding. The SRTP outlines an agency's policies, its current operations and finances, as well as its anticipated finances and major service changes for a 10 year period.

Slip Turns (see *Free Right Turns*)

Smart Growth: Either an overall growth pattern or a specific development. Smart growth is urban area growth which (1) occurs within existing developed areas, (2) is designed to minimize the amount of land consumed, and (3) is designed to maximize opportunities for travel by means other than driving alone. Smart growth seeks to create mixed use areas. Smart growth is usually thought of as higher density development, depending on context housing is likely to be in the form of townhouses or multi-family housing. Transit-oriented development is an important type of smart growth.

Span of Service: The hours of the day that a transit route operates, e.g., 6 a.m. to 10 p.m., sometimes described as hours of operation.

Specific Plan: A Specific Plan is a tool defined by California law for the implementation of the General Plan. It establishes a link between implementing policies of the general plan and the individual development proposals in a relatively small area of the city, such as Alameda's Northern Waterfront or Central Petaluma. Specific Plans must describe desired land uses and include implementation measures such as regulations, programs, public works projects, and financing measures necessary to achieve this.

Transbay Bus: Service operating across San Francisco Bay from the East Bay. These routes are designated with letters, rather than the route numbers used for buses within the East Bay. Most Transbay buses go to Transbay Terminal in Downtown San Francisco. AC Transit also operates Transbay Line M from Castro Valley to San Mateo and Line U from Fremont to Stanford.

Transit Center: An off-street site where passengers can catch multiple buses. At a minimum, transit centers include waiting platforms for passengers and loading bays for buses. Transit centers usually provide spaces for buses to "lay over" (wait) at the end of their routes. In the AC Transit district, transit centers are most commonly found at BART stations, but are also can be located at colleges (e.g., Contra Costa College) and shopping malls (e.g., Eastmont Town Center). BART refers to transit centers as "intermodals," because they facilitate transfers between modes (see *mode*s) such as bus-to-BART transfer.

Transit-Oriented Development: Development, most often housing but sometimes commercial development, sited in significant part to take advantage of transit service, such as a rail station or bus hub.

Transit Signal Priority: A method of operating traffic signals that under certain circumstances gives priority to the street buses are traveling on. A green light may be extended on the bus route's street; a red light may be shortened. This also benefits auto drivers on that street. Control of the signals is fully automated under rules agreed to by the city and the transit agency, bus operators cannot make lights change.

Trunk Route: A major route in AC Transit's system, operating over a longer distance, usually in a north-south direction with frequent service and a long span of service, sometimes 24 hours a day. Trunk routes carry a high proportion of AC Transit's passengers.The Line 82 International is an example of an AC Transit trunk route (see *Crosstown Route*)

Urban Design: The element of city planning that concerns how buildings and other structures and features are physically arranged in a city. Many cities have urban design guidelines which seek to make streets and neighborhoods attractive and pedestrian-friendly. These guidelines might regulate such matters as buildings' relationship to the sidewalk, location of building doors, stepbacks on upper stories of buildings, etc.

APPENDIX 2

Environmental Justice

Social Equity and Environmental Justice Policy from Short Range Transit Plan (SRTP)

Title VI of the Civil Rights Act of 1964 ensures that minority persons and communities are not discriminated against in the level and quality of service that is received. Additionally, Executive Order 12898 of the Civil Rights Act provides that Environmental Justice should be a part of the mission of every federal agency and federally funded program. As such, the AC Transit district has a responsibility to ensure that the level and quality of service that it provides is distributed without regard to race, color, national origin or disability. In turn, any policy that provides direction for the provision of service must ensure that its outcome does not discriminate based on color, race or national origin.

A productive and useful system maximizes the number of people using the service, though patronage may be concentrated in fewer areas than in a network that emphasizes coverage rather than productivity or need. Creating a productive and useful system is a key to ongoing financial stability. By carrying more people without running more service, AC Transit can increase its fare revenue as a percentage of operating cost.

Yet, there are also important social equity implications to this approach. The most productive parts of the system, those with the highest level of use and highest fare revenue, tend to be located in areas with higher population density and higher transit dependence.

The district has a commitment toward furthering the consideration of environmental justice issues, projects or programs that would place a disparate negative impact on a community based on income, race, color or national origin. In developing the service policies, service restructuring plans and service reduction plans, great care is taken to ensure that the district's low income and minority populations will not be discriminated against on any of these bases.

Over the past few years, the district has undertaken many steps to further its commitment to Environmental Justice principles. In November of 2000, the district hosted a forum on environmental justice in transportation for the San Francisco Bay area, that was the first such conference in the region. In 2002, the Board of Directors authorized Resolution 2033, which affirms the district's commitment to the civil rights and environmental justice principles and values ensured by the Civil Rights Act of 1964. This resolution assures that the needs of the people in the district are fully considered in decisions pertaining to service design, policy, and operations and that there is meaningful community involvement regarding these decisions.

To ensure that any future service policy would not discriminate against any one community, all of the existing service policies, both formal and informal, were reviewed during the Service Deployment Policies effort conducted in 2001. Additionally, when service reductions were being planned in 2003, environmental justice issues were again reviewed. In both of these efforts, social equity was not simply an after-thought, or a pass/fail screen that was used after service policy recommendations were made. Rather, environmental justice issues were among those first considered and addressed in developing how service would be deployed as part of both a financially constrained operating model, or if additional resources were available for a more robust operating scheme.

As part of the both the service policies process as well the service reduction process, the district's Board of Directors reviewed analyses that supported the commitment to social equity issues. Maps that depicted low income and/or autoless households (often a surrogate for poverty or disability) were compared to recommended routing or frequency changes to determine general and/or specific impacts to those populations. In most cases, recommended improvements to the network directly and positively impacted those neighborhoods with the highest concentrations of both low income and Calworks households. Service reductions primarily were considered in neighborhoods that had a low concentration of minority households.

The most productive corridors in AC Transit's system, those with the highest level of use and proportionately least reliance on external "subsidy," tend to be located in areas with higher population density and higher degree of transit dependence due to low income. Thus, service design policies that place a somewhat greater emphasis on productivity also have the effect of "rewarding" higher densities of urban development, and also have economically progressive impacts. Generally, the areas with lower productivity and a corresponding lower density do not have the concentrations of individuals who are either transit-dependent or chose to take transit. They are also areas that are not generally characterized by a high concentration of minority residents. These areas may be better served by other types of flexible services to provide a basic level of mobility.

However, the routes that are recommended here for significant operating and capital improvements transect areas of the district that currently have high proportions of low income and minority residents. As such, improving transit service in the urban core and on trunk lines as recommended by district policies contributes to social equity and environmental justice by improving the mobility of lower income residents.

APPENDIX 3

Design Guidelines for AC Transit Bus Transit Centers

ADOPTED BY THE AC TRANSIT BOARD OF DIRECTORS
MARCH 18, 1998

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INTRODUCTION

AC Transit has received federal funding to construct or upgrade several bus transit centers. Most of these facilities are located at activity centers such as BART stations, shopping centers or colleges. To assist the development of these transit center projects, AC Transit has developed design guidelines to provide consistency in the physical features among the transit centers. For the purposes of this discussion, a bus transit center is defined as an off-street facility where three or more bus lines connect, and where passengers can transfer between the bus routes of one or more operators, or between buses and other modes, such as rail.

The design guidelines contained in this document are supplemental to AC Transit's existing manuals titles "Guide for Including Public Transit in Land Use Planning" and "Transit Facilities Standards Manual." While the majority of information in these manuals is still correct, both manuals are currently being updated to reflect changes in industry standards, and to ensure compliance with the transportation facility accessibility guidelines of the Americans with Disabilities Act (ADA).

The ADA regulations provide minimum standards for the design of transit centers, as they are intended to insure accessibility for persons with disabilities. In some cases, however, the standards of the ADA do not allow for maximum movement within the facility. Thus, for some elements of the transit center design guidelines, it is indicated that, where space is available, efforts should be made to go beyond the minimum requirements of the ADA.

The design guidelines are intended to facilitate consumer use, and to aid planners, architects, engineers and other interested parties involved in the design of AC Transit's bus transit centers. AC Transit recognizes the importance of incorporating certain physical features, while addressing aesthetic and informational concerns in every transit center. These aesthetic qualities and siting of the physical features must be balanced with the need to establish a clear, obstruction-free path of travel.

These design guidelines are sorted into categories of primary guidelines, secondary guidelines, and informational items. Primary design guidelines are defined as physical features which AC Transit views as integral to the transit center. Primary features address operational, legal, and safety considerations, as well as aesthetics, to provide a consistent appearance among all AC Transit bus transit centers. Secondary design guidelines are features that are encouraged, but are flexible and negotiable depending upon cost, compatibility with the theme of the facility, and long term maintenance issues for the property owner. Informational items are not the focus of this document, but are noted as a topic for further research. These items would include signage and means of displaying passenger information.

Primary Design Guidelines

1. LOCATION OF BUS TRANSIT CENTERS

To the greatest extent feasible, bus transit centers shall be located as close as possible to the main entrance of the facility, whether the bus transit center is at a rail station, shopping center, or school. This provides the greatest ease for all passengers transferring between modes, while making full use of both the bus transit center and the facility.

2. MODAL MOVEMENT

a. Bus loading areas within the transit center shall be physically separated from auto travel lanes, especially when there is more than one bus island.
b. Pedestrian movement shall be facilitated through crosswalks and fencing (see Items 6c and 7).
c. Where possible, there shall be no more than two bus islands near the bus bays of the main bus loading area.
d. To the greatest extent possible, bus transit centers shall have only one-directional bus traffic.

3. SECURITY

a. Lighting: Safe, sufficient, and bright lighting shall be provided at bus transit centers around all bus bays and bus islands.
b. Landscaping: Landscaping shall be free of locations where someone can hide, and that create blind spots which obstruct the view of a bus driver or passenger.
c. Telephones: Where possible, there shall be at least one public telephone located at the bus transit center, and within sight of the bus transit area.

4. BUS SIGN POLE PLACEMENT

a. Bus Sign Pole to Curb/Sawtooth Bus Bay: As an orientation aid, the bus sign pole shall be located 18 inches to 24 inches from the curb of the sidewalk/bus island, or from the curb at the narrowest width of the sidewalk/bus island. The pole should align with approximate location of the front bumper of a

stopped bus.

b. Bus Sign Pole to Bus Shelter: To allow for wheelchair loading/unloading, perpendicular and parallel distance shall be maintained. The ADA minimums, specified below in subsections i and ii, should be exceeded where space permits.
   i. Perpendicular Distance: This distance is away from the curb. There shall be a minimum clear space of 54 to 60 inches between the curb and the base of the bus shelter/bench. This minimum clear space reflects the 18 to 24 inches required for bus stop pole placement and the minimum of 36 inches between the bus stop pole and the shelter/bus bench as required by the ADA.
   ii. Parallel Distance: This distance is along the length of the curb. There shall be a minimum clear space of 96 inches, as specified by the AC Transit "Transit Facilities Standards Manual" between the bus stop sign pole and the base of the bus shelter/bench.

5. TACTILE PATHWAYS TO ASSIST TRAVEL ALONG SAWTOOTH BUS BAYS AND SURROUNDING AREAS

a. Tactile Pathways: The varying width of the sidewalk/bus island along sawtooth bus bays makes it difficult for persons with visual impairments to maintain orientation. Tactile pathways (also referred to as "Induction Lines") shall be installed along the sidewalk/bus island of sawtooth bus bays. These pathways shall indicate the direction of travel, and serve as a linear guide along the length of the sidewalk/bus island. In addition, the pathway tile shall be readily distinguishable from the surrounding sidewalk.
b. Junction Points: To assist persons with visual impairments in reaching their bus stop or other destinations within the transit center, junction points "tiles" would be used to indicate the possible change in direction of travel. The texture of the junction point tile shall be different from that of the tactile pathway to signal to the user that a potential change in direction exists.
c. Type of Material: The tactile pathway shall be of a rigid material that will produce a hollow resonance when struck with a cane; such materials might include hard plastic porcelain, or fiberglass.
d. Installation: The tactile pathway surface shall be installed to resonate when it is struck by a cane. For some materials that might be used for the tactile pathway, this can be further enhanced by leaving a small gap between the tile and ground surface. This gap would create a very small air pocket which would enhance the hollow resonant quality.
e. Ground Surfaces: Sidewalk/bus island surfaces shall be of smooth concrete, while crosswalks on roadway surfaces shall be of a rough texture to provide tactile contrast between sidewalks and crosswalks.
f. Color Contrast: To assist those with low-level vision, contrasting colors shall be applied to tactile pathway materials and sidewalks, in keeping with ADA specifications. Pathway tiles should be bright in color, with yellow generally used for safety purposes. To the greatest extent possible, sidewalks/bus

islands shall contrast in color with the bus travel lanes. This contrast may be achieved by pigmented poured concrete and/or by painted curbs.

6. PATH OF TRAVEL

In order to assure that the path of travel is as accessible and functional as possible, access paths should be designed for unrestricted movement to the maximum extent feasible. In addition, to the greatest extent possible, the path of travel shall proceed in a straight line. Shelters, street furniture, and other amenities should be kept away from the clear path as much as possible.

Particular attention should be given to designing a path of travel that provides for a clearance between shelters/benches and bus stop poles to exceed the minimum width requirements specified by the ADA of 36 inches (915 mm.). In order to facilitate wheelchair boardings and alightings, adequate space needs to be allowed to cycle the lift and to allow for ingress and egress from the lift platform. The ADA minimum requirements for this space are 60 inches wide (as measured along curb or roadway edge) by 96 inches deep (as measured from the curb or roadway edge) for the wheelchair footprint and room to cycle the wheelchair lift.

7. SIDEWALKS AND BUS ISLANDS

a. Minimum Widths: The ADA requires the following widths for accessible routes and passing spaces. It should be noted that bus bay islands will provide an accessible route but may not be wide enough to provide passing space for two wheelchairs throughout the entire accessible route:
   i. Accessible Route: Consistent with the ADA requirements, the minimum clear width of an accessible route shall be 36 inches (915 mm.). (ibid.)
   ii. Passing Space: Per requirements of the ADA, if an accessible route has less than 60 inches (1525 mm.) clear width, then passing spaces for wheelchairs [of] at least 60 inches by 60 inches (1525 mm. by 1525 mm.) shall be located at reasonable intervals not to exceed 200 feet (61 m.).(ibid.)
   These guidelines recommend that passing areas on sidewalks shall be located at least every 50 to 60 feet, and closer if space permits.
b. Path of Travel: The sidewalk/bus island shall be kept free of obstructions to provide a clear path of travel as specified in Item 6 above.
c. Fences:
   i. A fence shall be placed opposite to the passenger loading side of the bus island if passenger loading

occurs only on one side of the bus island. This is intended to encourage the use of pedestrian crosswalks and to offer persons with visual impairments a way of differentiation between the loading and non-loading sides of the bus island.

ii. The fence, at a minimum, shall be made of chain link material, or of other transparent material in order to avoid having a solid wall which could create a hiding place for criminal activity. AC Transit encourages and will review other materials as proposed by the facility owner and designer.

8. CROSSWALKS

a. At a minimum, crosswalks shall be wide enough to accommodate one wheelchair. However, when space is available, crosswalks should be designed to allow two wheelchairs to pass.

b. To the greatest extent possible, crosswalks shall be perpendicular to curbs and traffic lanes.

c. Crosswalks shall be clearly marked, whether they are between the main bus bays and bus islands, or bus areas and parking areas.

d. Tactile Treatments: Crosswalks within the bus transit center shall have a centerline tactile surface treatment to assist visually impaired persons.

   i. The centerline guide tiles shall be of a hard material, and slightly raised. The centerline guide tiles shall be installed the length of the crosswalk (from curb to curb), and down the middle, parallel to the painted crosswalk lines. Four inches wide, rectangular, dome-shaped tiles, are preferred but other tile sizes will be considered depending on the type of tile and the location of the application.

   ii. The centerline guide tiles shall be of a different pattern from the tactile pathway (see Section 5 above)

   iii. The centerline guide tiles shall connect with tactile pathway tiles to provide an uninterrupted guide between sidewalks/bus islands, ramps and crosswalks.

   iv. Centerline guide tiles shall be mounted such that a small gap remains between the tile and ground surface, thus resonating when struck by a cane.

e. Bus bays shall be designed such that buses do not block crosswalks or traffic. Bus bays expected to be used for articulated buses shall be designed with enough space in the bay to accommodate the full size of the vehicle, to avoid obstruction of the crosswalk.

f. The sidewalk/bus island shall be grade separated from the roadway. To the greatest extent possible, the sidewalk/bus island shall have standard curb heights.

g. Crosswalk surfaces should be of a rough texture to provide tactile contrast between sidewalks and crosswalks.

9. BUS SHELTERS AT TRANSIT CENTERS

a. Bus shelters shall have the minimum dimensions as required by the ADA. The minimum requirement is a clear floor area of 30 inches by 48 inches entirely within the perimeter of the shelter.
b. There shall be at least one bus shelter for every two bus sign poles.
c. All bus shelters shall have benches.
d. All bus shelters at transit centers shall have lighting inside the shelter.
e. Bus shelters shall not have dark, tinted panes or screens that create an unsafe atmosphere or obstruct visibility from either inside or outside the shelter.
f. The inside of bus shelters must be visible from three sides.

10. TRASH RECEPTACLES

The placement of trash receptacles will depend on the specific characteristics and constraints of each site.
a. There shall be one receptacle for every two shelters at bus transit centers, provided that the number of trash receptacles do not block the sidewalk/bus island.
b. Trash receptacles shall not obstruct sidewalk/bus island access (see Items 6 and 7 above).
c. Relocation of the trash receptacles shall occur only with the written permission of AC Transit and the property owner.
d. The facility owner is responsible for emptying trash receptacles daily, and for their maintenance.

11. AC TRANSIT IDENTITY

a. Identity – Bus transit centers should be easily identifiable regardless of their location (BART station, mall, or park-and-ride lot). Users of the facility should be able to easily locate the bus transit area through the use of logos and color schemes that represent the transit operator. Since AC Transit is the sponsor of these transit centers, it is important that its logo and colors are used consistently at every AC Transit bus transit center.
b. Logo – The AC Transit logo shall be prominent in the overall design of the bus transit center. The location and size of the logo must be approved by AC Transit. The logo shall be prominently placed on bus shelters and canopies; AC Transit will consider other locations.
c. At bus transit centers that are served by several transit operators, the logos and colors of the other bus transit operators will also be displayed.

Secondary Design Guidelines

As previously stated, secondary design guidelines are features that are encouraged, but are flexible and negotiable depending upon cost, compatibility with the theme of the facility, and long term maintenance issues for AC Transit and the property owner. Secondary design guidelines pertain only to physical features of bus transit centers.

1. AC TRANSIT COLORS

The use of AC Transit's corporate colors (white, dark green and black) should be used in the bus transit center, including on AC Transit bus shelters.

2. WINDSCREENS

AC Transit recommends that windscreens be placed in each bus shelter. In areas with high rates of vandalism, foundations may be placed in bus shelters for future installation of wind screens, but the wind screens need not be installed initially. The installation of windscreens shall be decided jointly by AC Transit and the facility owner, recognizing concerns regarding future maintenance.

3. TELEPHONES

Where it is possible to exceed the requirement described in Item 3c, public telephones should be located in (or next to) bus shelters so that passengers waiting for their bus do not need to leave the bus stop to use the telephone.

INFORMATIONAL ITEMS

The primary and secondary design guidelines are directed at physical features of the AC Transit bus transit centers. When these guidelines were developed the community at large expressed concern regarding signage and other informational items. Many of the concerns were extensions of the issues raised through the "Collective Forum on Accessing Buses at BART Stations" (dated March 4, 1997). Though this section on informational items cannot include all of those issues, key features that emerged from discussions with the community are summarized. The identified desirable features from the Collective Forum relating to informational items are described in the following sections.

1. DISPLAY CASE

A display case of information should be located inside and outside the facility. The case should contain:

a. location of the bus transit area;
b. bus bays with each route;
c. route maps;
d. schedule information; and
e. services surrounding the bus transit center, such as intermodal connections, shopping centers, schools, recreation areas, and medical facilities.

2. UPDATED STOP INFORMATION

Appropriate, current route maps and schedule information for bus lines that stop at the bus bay should be provided at each bus stop pole or shelter.

3. INFORMATION IN ALTERNATIVE FORMATS

Where possible, transit information should be in alternative formats, such as in Large Print, Braille, Spanish or Chinese.

APPENDIX 4

RESOURCES

BIBLIOGRAPHY

The following materials provide further information on transit-oriented development, pedestrian-oriented design, and multimodal street planning. AC Transit does not necessarily endorse the entire contents of any of these works, but they do provide useful information. Most materials are also available on the web unless otherwise noted.

San Francisco Bay Area Rapid Transit District, **BART Station Access Guidelines** (2003). BART's policies and guidelines concerning how various transportation modes should access BART stations.

San Francisco Bay Area Rapid Transit District, **BART's Transit-Oriented Development Guidelines** (2003). BART's overview of how Bay Area communities can and have created transit-oriented development around BART stations.

Metropolitan Transportation Commission, **Bay Area Transportation: State of the System 2003** (2003). This overview factbook on Bay Area transportation focuses mostly on highways, but does include some basic data on transit in the region.

Santa Clara Valley Transportation Authority, **Community Design and Transportation: A Manual of Best Practices for Integrating Transportation and Land Uses** (2003). An extremely detailed manual covering issues similar to Designing With Transit for Santa Clara County. Not on the web.

Community Design and Architecture, **East 14th Street South Area Development Strategy: A Land Use, Urban Design and Street Improvements Plan** (City of San Leandro, 2003). A multi-faceted strategy for upgrading a commercial strip and improving its transit- and pedestrian-orientation.

Kay Fitzpatrick et al, **An Evaluation of Bus Bulbs on Transit, Traffic and Pedestrian Operations** (Transit Cooperative Research Program Web Document 19, 2000). A technical report on bus bulbs that concludes that bus bulbs actually improved traffic flow when they were installed.

Smart Growth Network, **Getting to Smart Growth: 100 Policies for Implementation** (2002). Outlines principles and practical actions in number of areas for achieving smart growth, with examples from numerous cities nationwide.

Texas Transportation Institute, **Guidelines for the Location and Design of Bus Stops** (Transit Cooperative Research Board, TCRP Report 19, 1996). A key reference on a crucial topic.

Transportation and Land Use Coalition, **Housing Shortage/Parking Surplus: Silicon Valley's opportunity to address housing needs and transportation problems with innovative parking policies** (2002). Analyzes Silicon Valley communities' parking requirements and concludes that they are hindering much needed production of housing.

Jeffrey Tumlin and Adam Millard-Ball, **How to Make Transit-Oriented Development Work** (Planning Magazine, May 2003). The authors discuss how to make projects genuinely transit-oriented rather than simply transit-adjacent, including the need to manage and reduce parking.

City of Milpitas, **Milpitas Midtown Specific Plan** (2002). An award-winning plan for developing an underutilized section of Milpitas into a pedestrian-friendly, transit-oriented district.

Hank Dittmar and Gloria Ohland editors, **The New Transit Town: Best Practices in Transit-Oriented Development** (Island Press: 2003). A collection of up to the minute articles on TOD issues and case studies by leading researchers and consultants in the field. Not on the web.

Anastasia Loukiaitou-Sideris and Robin Liggett, **On Bus Stop Crime** (Access Magazine 16, 2000). Summarizes a major federal study on the determinants of bus stop crime within a neighborhood. The study shows the importance of locating bus stops where there is pedestrian activity and "eyes on the street."

City of Oakland, **Pedestrian Master Plan** (2002). Oakland's plan for improving pedestrian life in Oakland is part of the city's General Plan. It is currently one of the few pedestrian plans in the country, though a number of Bay Area communities are now planning to prepare Pedestrian Plans.

City of Portland, **Portland Pedestrian Master Plan** (1998). The first and still a leading example of pedestrian plans. Portland has also developed pedestrian design guidelines.

Transportation and Land Use Coalition, **Revolutionizing Bay Area Transit ... On a Budget: Creating A State of the Art Rapid Bus Network** (2003). Major transit advocacy group's report on the value of Bus Rapid Transit to Bay Area transit.

Regional Livability Footprint Project, **Smart Growth Strategy Final Report** (Association of Bay Area Governments, 2003). The final report of a major regional project to develop regional and county-level smart growth strategies for each of the nine Bay Area counties. The outcome is now being used as a smart growth "vision" in other regional processes. Contra Costa County has spun off the county-based Shaping Our Future process.

California Department of Transportation, **Statewide Transit-Oriented Development Study** (2002). Caltrans sponsored a major statewide study on what makes transit-oriented development successful and how well TOD met transportation goals as well creating a detailed database on numerous TOD projects from Sacramento to San Diego.

Transit Cooperative Research Program, **Transit Capacity and Quality of Service Manual** (RCRP Report 100, 2003). A comprehensive and detailed manual of service and facility standards for bus, rail, and other forms of transit, in addition to pedestrian access to transit.

City of Berkeley, **Transportation Element of the General Plan** (2001). A General Plan Transportation Element with policies strongly oriented to transit, walking, and bicycling.

Urban Land Institute, **Transforming Suburban Business Districts** (2001). A lavishly illustrated book about how and why to transform suburban business districts into pedestrian- and transit-friendly places. Not on the web.

Project for Public Spaces, **Transit-Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities** (Transit Cooperative Research Program, TCRP Report 33, 1998). Discusses policies for an examples of developing transit-friendly streets, covering issues that are in Chapter 5 of Designing With Transit.

Robert Cervero, **The Transit Metropolis: A Global Inquiry** (Island Press, 1998). An international review of how modern cities have been built around transit by a leading scholar in the field. Not on the web.

Dena Belzer and Gerald Autler, **Transit-Oriented Development: Moving from Rhetoric to Reality** (Brookings Institution Center on Urban and Metropolitan Policy, 2002). A policy paper analyzing why there has not been more transit-oriented development and why it has not always achieved its goals.

WEBSITES

There are a number of websites that have helpful information, particularly on transportation and land use planning issues. Government agency websites generally include at least the agendas for their governing body meetings, some also include reports to those governing bodies. Website information is as of August, 2004. AC Transit does not necessarily endorse the content of these websites.

AC Transit (www.actransit.org): Maps of and schedules for AC Transit routes are available here, as well as information about the status of AC Transit projects, like Bus Rapid Transit.

Access Magazine (www.uctc.net/access/access.asp): Access is published by the University of California Transportation Center and is available for free downloading. Its often iconoclastic articles seek to connect transportation and social issues and often discuss the Bay Area.

Alameda County Congestion Management Agency (www.accma.ca.gov): The Congestion Management Agency (CMA) carries out the requirements of the state's Congestion Management Law and does transportation planning, funding and implementation in Alameda County. The site presents traffic data and data on the "SMART Corridors" Project which includes the San Pablo Avenue Rapid.

Association of Bay Area Governments (www.abag.ca.gov): ABAG is the Council of Governments for the Bay Area, representing Bay Area cities and counties. The planning section of the ABAG website contains information on region-wide smart growth efforts.

American Public Transportation Association (www.apta.com): APTA is the industry organization for American public transit agencies. The APTA website provides access to extensive transit statistics and news about current developments in public transportation.

Bay Area Alliance for Sustainable Communities (www.bayareaalliance.org): The Bay Area Alliance describes itself as a "multisector stakeholder coalition" working for sustainable regional development. The Alliance has developed (and the website includes) the Compact for a Sustainable Bay Area, a regional platform for sustainable development endorsed by AC Transit and numerous other governmental and non-profit groups.

Bay Area Council (www.bayareacouncil.org): The Bay Area Council is a business-sponsored regional public policy organization which advocates for expanded transportation infrastructure, such as the Water Transit Initiative, and increased housing development in the Bay Area.

Bay Area Rapid Transit District (www.bart.gov): BART's website provides information such as timetables for BART passengers and information about BART plans and projects.

Center for Transit-Oriented Development (www.reconnectingamerica.org/html/TOD/index.htm): The Center for Transit-Oriented Development is a new national research, planning, and advocacy organization. It seeks to better understand the successes and shortcomings of transit-oriented development and formulate strategies to make TOD more common, "bring it to scale."

Contra Costa Transportation Authority (www.ccta.net):CCTA acts as congestion management agency, a growth management oversight agency, and manager of the 1/2c transportation sales tax in Contra Costa County. The CCTA website includes detailed land use data and projections for Contra Costa County and the county's recently adopted Bicycle/Pedestrian Plan.

Institute for Transportation Engineering (www.ite.org): ITE is the professional organization for traffic engineers and related fields. Much of its website is for members only but the public can access information on traffic calming, intersection safety, roadway design, and other areas.

Metropolitan Transportation Commission (www.mtc.ca.gov): MTC is the "Metropolitan Planning Organization" for the Bay Area. Federal transportation dollars for the Bay Area flow through MTC. The MTC site has extensive information about Bay Area transportation planning, including information about the Transportation for Livable Communities (TLC) grant program and other MTC smart growth efforts. The site has also Bay Area Census data.

National Center for Bicycling and Walking (www.bikewalk.org): The website includes information on how to make communities more bicycle and pedestrian-friendly and evaluations of state transportation department efforts thus far.

Planetizen (www.planetizen.com): Planetizen is the on-line national "newspaper" of city planning. The site includes articles from newspapers around the country, essays written for Planetizen, listings of upcoming conferences, and links to highly rated city planning websites.

Shaping Our Future (www.shapingourfuture.org): Shaping Our Future is a countywide cooperative planning and visioning process involving all of the cities and the county in Contra Costa County. The Shaping Our Future vision has been endorsed in principle by most cities in Contra Costa County. The site has not been updated since 2003, but contains background information.

Smart Growth America (www.smartgrowthamerica.com): Smart Growth America is a national coalition supporting smart growth and opposing sprawl. The website includes a number of articles and reports on this topic, including a report comparing the level of sprawl in various American metropolitan areas.

Transit 511.org (www.transitinfo.org): Transit511.org is a one-stop website with information about the routes and schedules of every Bay Area transit agency, big or small (including AC Transit). The trip planner on the site can tell you the best transit routes for traveling between most points in the Bay Area.

Transit Cooperative Research Program (www.tcrponline.org): The transit industry's leading research organization on questions such as bus stop location. Virtually all reports are available for free downloading, but some are very large.

Transportation and Land Use Coalition (www.transcoalition.org): TALC is a regional advocacy and research group supporting smart growth and improved public transit. A number of reports on regional transit are available on their website.