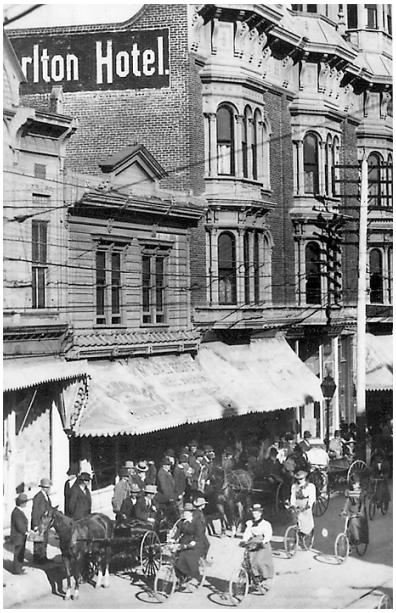

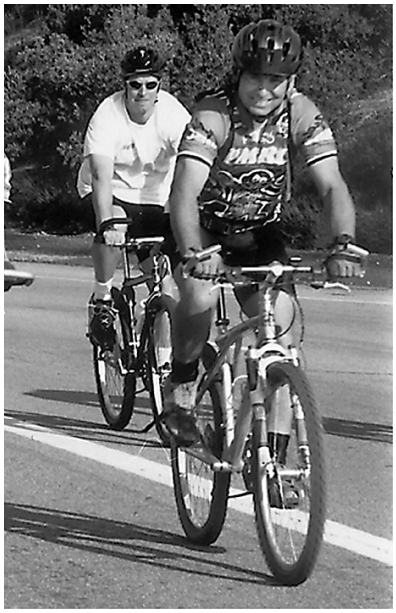

Century of Bikes

FINAL Bicycle Master Plan City of Pasadena

Adopted on November 6, 2000

Century of Bikes

Bicycle Master Plan C City of Pasadena

Adopted on November 6, 2000

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VI. COMPLIANCE WITH THE CALIFORNIA BIKEWAYS ACT

I. INTRODUCTION

A. GOALS

The Pasadena Bicycle Plan presents a guideline for the City to provide the safe and attractive environment needed to promote bicycling as a transportation mode.

By virtue of its early settlement, Pasadena is blessed with what is now known as traditional neighborhood design. Its streets were built for walking, bicycling, horse and buggies, and trolleys. As a result, they are human scale, with few streets of more than four lanes, and all of them lined with majestic trees. Pasadena has a good mix of housing, jobs, and commerce. This balance is reflected in how Pasadena residents work, shop, and play. Census data show that 42% of employed Pasadena residents work in Pasadena,[1] double and triple the equivalent portion in surrounding cities. Pasadena also serves as an employment, shopping, and entertainment destination for much of the surrounding area. Pasadena's central location, density, and commercial sector have made it the origin, destination and through route for many of the San Gabriel Valley's trips. These factors also mean that most trips beginning or ending in Pasadena are short in length.

The City has an ideal climate for bicycling: temperate, with few rainy days and moderate topography. It is home to a large and active population. All these factors lead to a tremendous potential for creating a community where bicycling is protected and encouraged, *i.e.* bicycle-friendly. Bicycle-friendly policies are part of a broader neighborhood-based transportation system that is also livable and walkable. This master plan is intended to provide guidance for achieving these goals.

The Mobility Element of the 1992 Pasadena General Plan called for developing a citywide bikeway system and increasing the use of bicycling and walking. This bicycle plan is intended to meet those requirements of the General Plan and to be consistent with it.

Other goals in the General Plan reinforce these two goals. A basic General Plan principle calls for making Pasadena a city "where people can circulate without cars." The Mobility Element says that its primary emphasis is allowing people to circulate without cars. It commits the City to focusing future planned transportation improvements on non-automobile-orientated projects, including the development of a citywide bikeway system.

Furthermore, the City has adopted a policy to make Pasadena "a place where bicycling and walking are encouraged and fostered, where all streets are bikeways, and where safety, education, and facilities are provided as an ongoing part of transportation and recreational planning and programs." The City Council has adopted a goal of five percent of all trips in the City to be made by bicycle by the year 2001.

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[1] US Department of Commerce, Bureau of the Census, 1990 Census of Population and Housing, Summary Tape File 3A, Los Angeles County.

This master plan expands upon the recommendations contained in the General Plan and provides guidance for meeting Pasadena's goal of becoming "bicycle friendly."

This new plan was written by two Pasadena bicyclists in consultation with City Public Works and Planning Department, members of the Mayor's Bicycle Task Force, the previous Bicycle Advisory Committee and the current Bicycle Task Force. Most of the major streets were measured for determining the rough feasibility of installing bicycle facilities; detailed engineering studies will be required for implementation.

Citizens were invited to provide input to the Draft Plan at a hearing of the Pasadena Transportation Advisory Committee. Thirty-five people spoke about the bicycle plan, with nearly unanimous support. In January 1999, the City Council adopted the plan in concept unanimously.

B. BICYCLING IN EARLY PASADENA

Pasadena's early development is intertwined with the bicycle—the "Golden Age" of bicycling occurred as Pasadena developed. Photographs of early street scenes always show bicycles. Pasadena's first streets were arranged for bicycles, pedestrians, and light rail trolleys.

Pasadena was very much part of a bicycling riding wave that swept the nation, with more bicycles than any city west of Chicago.

At the turn of the century, bicycling was big business with 15 bicycle shops in Pasadena. Edward Braley built the Bicycle Emporium on Raymond Avenue, but the only reminder left is the building's trim work showing bicycle wheels. The Mayor of Pasadena, Horace Dobbins, began work on what he called the Cycleway, to link Pasadena with Los Angeles. This elevated bicycle path provided grade separation and is now regarded as a precursor of the modern freeway. It allowed rapid, non-stop transportation, and was faster than the trolley car.

1898 Tournament of Roses Parade (Pasadena Historical Museum)

On January 1, 1900, the Tournament of Roses parade contained 350 flower-bedecked bicycles, including bicycle contingents from Pasadena's schools. The first purpose-built parade floats were built by hooking bicycles together and building a rose trellis and canopy around them. One popular float was

powered by local barber shop quartet, the Woodmen Quartet, who sang as they pedaled their float down Colorado Street. Afterwards the New Year's crowd went to the Tournament of Roses Bicycle Races at the track on Lincoln and Hammond, described as the best track in the nation. The Tournament of Roses attracted the best professional bicycle racers with lucrative prize money and the chance to ride in the temperate Southern California winter.[2]

Transportation quickly began to change the urban environment. The Wright brothers (bicycle mechanics) flew in 1903. Henry Ford (a former bicycle manufacturer) began mass production of the Model T in 1910. By 1915 many of Pasadena's bicycle shops had become 'cycle' (motorcycle) and 'auto-mobile' dealers.

The bicycle, walking, and the trolley all continued to provide a significant amount of transportation, but after World War II the car quickly became the dominant user of Pasadena's roads. As rail lines became highways, working horses and trolleys disappeared and use of bicycles for transportation dwindled.

Colorado Boulevard reflects these changes in the character of its storefronts. As it flows from west to east, the character and spirit changes from 19th to 20th century. As one travels eastward from Old Town Pasadena, pedestrian-oriented small stores and display windows become infrequent, while larger, slab-front stores and parking lots become more common.

Awareness of this development pattern gives Pasadena a unique opportunity to develop bike use while the City embraces alternatives to automobile-based transportation.

C. PRIOR BICYCLE PLANS

Bike use has evolved over time, and it is reflected in the city's prior bicycle plans. Pasadena's first effort to encourage bicycling (since the Golden Age of Bicycling) was the designation of the Kenneth Newell Bikeway along the Arroyo Seco. This popular route was assembled as a service project by the Kiwanas Club and named to honor Judge Kenneth Newell, who enjoyed and promoted bicycling.

The early 1970s heralded a rapid growth in bicycling. In response to community interest, in 1973 Pasadena assembled a City Bikeway Study Committee that prepared the report entitled "Pasadena Bicycle Transportation Program, Bikeway Development." They recommended that bikeways connect "residential, employment, shopping and school locations; into a network that can serve utilitarian trips, in addition to serving the need for recreation." They called for a primary or "backbone" bikeway system, consisting of "15 distinct corridors totaling approximately 45 miles in length." These corridors are shown in Table I-1.

[2] Pasadena Star-News, Jan 2, 1900.

Table I-1
Corridors Identified in the 1974 Plan

Corridor	Bikeway Facility Implemented
North-south	
Arroyo Boulevard	Both signed bike route and bike lanes
Lincoln and South Orange Grove	Lincoln has signed bike route but Orange Grove has no designation
Fair Oaks, Arroyo Parkway, or Marengo	Portions of Marengo have bike lanes
Lake	None
Allen	North Allen a signed bike route
Sierra Madre	Bike lanes
Sierra Madre Villa	A signed bike route
New York	None
East-west	
Washington	None
East Orange Grove	A portion has signed bike route
Maple/Corson	Bike lanes
Colorado	None
Del Mar	A signed bike route
California	None
Glenarm	Bike lanes

This "backbone" structure was remarkably prescient in identifying these corridors. In essence, these corridors represent all the major streets in Pasadena and provide the routes bicyclists would use to travel in Pasadena. However, at that time, the science of accommodating bicycle use on roadways and integrating them into a multi-modal transportation system was undeveloped. The report states that many approaches were "relatively new and untried." The report indicates that the statewide Bicycle Committee was still formulating recommendations. Due to the uncertainty of how to accommodate bicycles, the plan called for creating a network with a "combination of bike routes, bike lanes, and bike paths."

Although the plan did result in the designation of bike lanes on Sierra Madre, portions of Marengo, Maple/Corson, and Glenarm, many of the other corridors received only "bike route" designation and others were left untouched. Although the plan stressed a systematic approach, the resulting facilities lack continuity and consistency. They fail to form the called-for "backbone" to serve destinations, and serve to connect "residential, employment, shopping and schools" only poorly. In hindsight, the bike route designations, though popular in that era, were inadequate to accommodate and encourage bicycle use. The plan, though, did establish the need for a systematic network of bicycle facilities, but was unfortunately wrong with its forecast that "the bulk of bicycle trips in the foreseeable future will continue to be neighborhood riding by youths." Youth bicycling in Pasadena has plummeted.

In 1991, Pasadena took an historic step towards the creation of a bicycle-friendly system. This effort was led by the late Mayor Jess Hughston and was a pioneering effort in non-automobile transportation that drew national attention to Pasadena. Jess Hughston was named "America's Best Mayor" by Bicycling Magazine and Pasadena was described in the cover story. Mayor Hughston considered the bicycle planning efforts one of his greatest accomplishments.

The Mayor assembled a Bicycle Task Force to improve bicycling in Pasadena. The Bicycle Task Force wrote the "Plan to Make Pasadena Bicycle Friendly" that was adopted by the City Council. The Mayor also established the Arroyo Seco Recreation Zone, bicycle parking, and the Bicycle Advisory Committee. The Committee, which was started in 1991, provided monthly meetings between City staff and bicyclists to work together to improve the bicycling habitat in Pasadena.

Many of the Plan elements have been implemented and are responsible for Pasadena's leadership in promoting bicycling. The primary achievement of the Mayor's Bicycle Task Force was the creation of a bicycle-friendly policy, which solidified City policy and led to the General Plan's support for bicycling. It set goals for bicycle parking, which are continuing to be implemented. It also led to pavement patching standards.

The General Plan calls for a street network system that provides bicycle connections to transit-orientated development, commercial areas and transit stops.

The previous plans consistently called for a network of bicycle facilities, which the City has partially implemented. The City has been rewarded with both a reputation for bicycle-friendly streets and with more bicycling.

D. BICYCLING IN PASADENA TODAY

Bicyclists ride on all of the streets in Pasadena. Bicycle use varies however; different groups of bicycle users take different trips and have their own unique areas for bicycling. Most significantly, child bicyclists are almost conspicuous by their near absence in Pasadena outside of planned family outings.

Adult bicyclists can be found on every major street. They prefer mobility corridors such as Colorado Boulevard, Fair Oaks Avenue, and Lake Avenue. Many of these riders ride because it is cheap and accessible transportation, while others ride for pleasure, environmental reasons, or exercise. Sport and recreation bicyclists ride mostly on minor arterial streets. In Pasadena, prime areas include Linda Vista Avenue, Arroyo Boulevard, and the roads around the Rose Bowl (known as the Rose Bowl Loop). Indeed, recreational riders use an extensive network of aesthetically pleasing, bicycle-friendly streets that extend throughout the San Gabriel Valley. Moreover, they tend to travel during low-traffic times, such as Saturday and Sunday mornings.

Commuter bicycling is also important in Pasadena. According to the 1990 census, 1.3 percent of the residents rode bicycles to work. In 1990, total employment in Pasadena was 64,465, which equates to 839 bicycle riders. The Southern California Association of Governments estimates that there are now 90,000 jobs in Pasadena, which equates to 1,171 bicycle riders. In addition to these commuters, Pasadena is home to Caltech and several colleges. Although the number of students commuting to school has not been measured, it is likely significant.

Bike lanes can be found on some Pasadena streets. Eight percent of the 142 miles of collector and arterial roadways in Pasadena have bike lanes, as shown in Table I-2 and graphed on Figure 1: Existing Bikeways. Most of the bike lanes (Maple/Corson couplet, St. John, and Pasadena; i.e. 42% of the bike lane mileage) were installed as part of the Foothill Freeway

construction project in the early 1970s. Bike lanes on Sierra Madre Boulevard (28%) were also installed in the 1970s and later named to honor former Mayor Jess Hughston. Sierra Madre Boulevard is a former Red Car route, and hence had sufficient pavement width. Portions of Marengo Avenue, Raymond Avenue, and Arroyo Boulevard have bike lanes (30%). These were installed partially for traffic management.

Table I-2
Existing Bike Lanes

Street	From	To	Distance (miles)
East-West Streets			
Maple/Corson St.	Lincoln Ave.	Altadena Dr.	3.5
Glenarm St.	Arroyo Parkway	El Molino Ave.	0.5
North-South Streets			
Arroyo Blvd.	Holly St.	Seco St.	0.6
Arroyo Blvd.	Everts St.	Stanton St.	0.6
St. John Ave.	Lincoln Ave.	Del Mar Blvd.	0.6
Pasadena Ave.	Del Mar Blvd.	Lincoln Ave.	0.5
Raymond Ave.	Washington Blvd.	Orange Grove Blvd.	0.8
Marengo Ave.	Glenarm St.	Del Mar Blvd.	1.6
Sierra Madre Blvd.	Michillinda Ave.	San Pasqual St.	3.0
		Total	**11.7**

It should be noted that these bike lanes were created primarily due to ease of installation, and only secondarily for the desirability of these streets to form a citywide network of bicycle routes.

Although present records do not show how much funds were spent on implementing these bike lanes, they indicate that $111,470 was spent on bikeways improvements for the Rose Bowl Loop, with another $40,000 appropriated.

Figure 1: Existing Bikeways

In its ongoing program, Pasadena provides parking for approximately 1,000 bicycles. Bicycle racks are located throughout the city. Bicycle racks can be found at numerous bus stops, city-owned parking lots, churches, private office garages, churches, and local business and apartment buildings as shown in Figure 2: Existing & Proposed Bicycle Parking, Intermodal Links & Bicycle Amenities. Much of the bicycle parking funds were provided by an $180,000 ISTEA/Proposition C grant through the Los Angeles County Metropolitan Transportation Authority. City bicycle racks have been placed near bus stops along the bus routes shown in Table I-3.

Table I-3
Bicycle Links to Transit

Washington Boulevard	Orange Grove Boulevard
Foothill Boulevard	Walnut Street
Colorado Boulevard	Green Street
Del Mar Boulevard	California Boulevard
Sierra Madre Boulevard	Altadena Drive
Allen Avenue	Lake Avenue
Hill Avenue	Los Robles Avenue
Arroyo Parkway	Fair Oaks Avenue
Lincoln Avenue	Linda Vista Avenue

School children, parents, teachers, senior citizens, and the public in Pasadena are taught traffic rules through a two-year program that began in 1998. The program consists of 1,060 interactive school workshops reaching 25,000 students (K-12) each year, 62 school rodeos, 93 parent workshops, 93 teacher workshops, 36 senior citizen presentations, 36 community presentations, and 24 community rodeos. The program includes data collection and evaluation of its effect.

Figure 2: Bicycle Parking

II. DEVELOPING A PLAN FOR PASADENA

A. BICYCLISTS

In 1991 the City Council set a goal that five percent of all trips should be made by bicycle. This is a reasonable and achievable goal. As of the date of this plan, between one and two percent of all trips are made by bicycle. Experience with other cities, both locally and abroad, shows that an even greater portion of trips can be converted to bicycling. Numerous cities, many with notably inferior weather, exceed 10 percent bicycle use. Palo Alto, a city comparable to Pasadena in many ways, has 5.8 percent; Santa Cruz has 5.5 percent, Berkeley has 4.9 percent, and Santa Barbara has 3.2 percent. Davis has raised its use to 21.6 percent of *work* trips by installing bike lanes and other bicycle facilities. Many cities in the prosperous, developed countries of northern Europe, as shown in Table II-1, have achieved over 10 percent of all trips by bicycle. An analysis of the rising use of the bicycle in Germany determined that public policies enhancing the safety, speed and convenience of bicycling and making automobile use more difficult and expensive, enabled bicycle use to blossom.[3]

Table II-1
Modal Split Distribution for Urban Travel In Europe and North America[3]

Country (ranked by bicycle use)	Percent of Trips by Travel Mode (all trip purposes)				
	Bicycle	**Walking**	**Public Transport**	**Auto**	**Other**
Netherlands	**30**	18	5	45	2
Denmark	**20**	21	14	42	3
Germany (Western)	**12**	22	16	49	1
Switzerland	**10**	29	20	38	3
Sweden	**10**	39	11	36	4
Austria	**9**	31	13	39	8
Germany (Eastern)	**8**	29	14	48	1
England and Wales	**8**	12	14	62	4
France	**5**	30	12	47	6
Italy	**5**	28	16	42	9
Canada	**1**	10	14	74	1
U.S.A.	**1**	**9**	**3**	**84**	**3**

Pasadena's goal is consistent with national goals. In 1993, the Federal Highway Administration[4] set the goal of doubling the amount of walking and bicycling in the United States.

The enormous variation in bicycle use in the countries shown in Table II-1 illustrates that bicycle use is not a function of climate or wealth.[3] The countries blessed with double-digit bicycle travel

[3] Pucher J, Bicycling Boom in Germany: A Revival Engineered by Public Policy. *Transportation Quarterly*, **51:** (Fall 1997) 31-46.
[4] U.S. Department of Transportation, *National Bicycling and Walking Study*. FHWA-PD-94-023, Washington, DC: 1993.

have equally high automobile ownership rates. Automobile ownership rates in the countries with high bicycle use are among the highest in the world. Indeed, per capita car ownership in Germany essentially matches the United States, yet they rely much more on the bicycle. Moreover, their public transit systems are the most extensive and highest quality in the world. Climate isn't a factor—indeed ironically it seems as if the highest bicycle use occurs where the climate is the worst. European cities are more centralized; but even in the United States, 49% of all urban trips are 3 miles or less, 40% are 2 miles or less, and 28% are 1 mile or less.[5] These distances can be easily covered by bicycle. The main difference in bicycle use is the difference in how cities design and operate their streets.

In its 1993 National Walking and Bicycling Study,[6] the Federal Highway Administration examined the factors that encourage bicycle use. They found that climate, population, size, and density were insignificant factors and concluded that only two factors were significant: the strong presence of a university and whether more than 35 percent of the major streets had bike lanes. They concluded, "it seems fairly clear that cities with very few or zero miles of bike lanes are not generating much interest in bicycle commuting." Those cities above the threshold had ten times the bicycling as those cities below. The study also found bicycle use increased as the proportion of streets equipped with bike lanes increased beyond the 35 percent threshold.

Pasadena has five colleges and universities and a large number of college students, but Pasadena cannot truly be considered a "college town" such as Davis or Berkeley. Currently 8 percent of Pasadena's major streets have bike lanes and census data shows that 1.3 percent of commuting trips in Pasadena are made by bicycle.

Considering the Federal Highway Administration study, Pasadena can further encourage bicycling by completing its network of bicycle-friendly streets.

Evidence from other cities shows that the installation of bike lanes encourages bicycling. A recent article in ITE Journal attributed bicycle use of 15 times the national average in Eugene, Oregon to their high bikeway mileage count.[7] Surveys of bicycle riding in Santa Barbara[8] showed that all the nearly 50 percent growth in bicycling between 1973 and 1996 occurred on streets that received bike lanes in that period. Streets without bike lanes had the same amount of bicycle use as before, but those that received bike lanes consistently showed an increase.

Bike lanes reduce stress for bicyclists. Cyclists feel vulnerable to overtaking motorists, and, indeed, it is the most common cause of fatal car-bike collisions.[9] A bike lane forces a greater separation between the two. A separate bike path further separates motor vehicles and bicycles, but complicates intersections; while a bike path is required to be grade-separated like

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[5] U.S. Department of Transportation, *Nationwide Personal Transportation Survey*. Washington, DC: 1992.

[6] Goldsmith SA, Federal Highway Administration, National Walking and Bicycling Study, Reasons Why Bicycling And Walking Modes are and are not Being Used More Extensively as Travel Modes. 1993.

[7] West JE and Lowe A. Integration of Transportation and Land Use Planning through Residential Street Design. *ITE Journal*, August 1997, p. 48-51.

[8] Santa Barbara Bicycle Coalition, *Quick Release*, Bicyclist Numbers Increase in City of Santa Barbara, Nov. 1996.

[9] McCarthy M, Gilbert K, Cyclist Road Deaths In London, *Accident Analysis and Prevention*, 1996,**28:**275-279.

a freeway, but greatly increases its cost in urban areas. Without the separation, a bike path is more like a sidewalk. Although many bicyclists do not perceive it, studies have shown that sidewalk riding is more dangerous to the cyclist than street riding because of the crossing problems at intersections and driveways.[10,11]

Bike lanes, however, will not address the needs of all cyclists. Cyclists are diverse[12] and they have different motives for using bicycles. These differences affect their needs. Adult cyclists using their bicycles as transportation require the shortest, quickest route. While children use their bicycles for play and can behave unpredictably, sports and racing cyclists tend to form groups and travel fast. These differences make it impossible to design cycle routes that simultaneously satisfy all users.

Pasadena can learn from Germany's success in encouraging bicycling. Promotion of bicycle use was part of an urban policy to promote alternatives to automobile use. The most successful programs[3] in German cities started with providing a network of bicycle-friendly streets and also paths separated from both auto and pedestrian traffic. Muenster, for example, developed a backbone-based network, using their medieval city walls. From the backbone, 16 major bike routes radiate to outlying portions of the city. In addition, most residential streets can be safely used by bicyclists, due to traffic calming measures that give pedestrians and bicyclists the right-of-way and restrict speeds to 30 km/h (20 mph). Muenster has been rewarded with 32% of all trips by bicycle.

Other bicycle-friendly policies common in Germany include the following[3]:

- Streets that are one-way for cars but two-way for bicyclists.
- Reserved bus lanes that can be used by bicyclists, but not by autos.
- Street networks with deliberate dead ends and circuitous routing for cars but direct, fast routing for bikes (and pedestrians).
- Special bicycle streets that permit auto traffic but give bicyclists strict priority in right-of-way over the entire breadth of the street.
- Permission for bicyclists to make left and right turns where prohibited for autos.
- Special stop lines at intersections that allow bicyclists to pass waiting cars and proceed directly to the front, while cars must stop at a considerable distance from the intersection. Bicycles also get an advance green light, so they can clear the intersection before the cars start.
- Special traffic lights for bicyclists at most intersections, usually with priority signaling for bikes.
- Bike rental facilities at all train stations and many other transport nodes throughout the region.
- Integrated system of well-marked, color-coded bicycle routes for the city and the surrounding region, with detailed route maps widely available. Signs throughout the network indicate the direction, distance, and best bike route to key destinations.

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[10] Wachtel A, Lewiston D, Risk Factors For Bicycle-Motor Vehicle Collisions At Intersections. *ITE Journal*. Sept. 1994, 30-35.

[11] Aultman-Hall L, Hall FL, Ottawa-Carleton Commuter Cyclist On- and Off-road Incident Rates, *Accident Analysis and Prevention*, 1998 Jan; 30(1): 29-43.

[12] Boudewijn Bach and Norman Pressman, Climate-Sensitive Urban Space, Pulicatieburo, Delft, The Netherlands, 1992.

- Annual bicycling festivals that promote the environmental advantages of bicycling, display the latest bike models and accessories, and disseminate various other relevant information for bicyclists.
- Annual awards to firms that do the most to increase bicycling among their employees by providing showers, bike lockers, bikes to borrow, bike racks and a flexible dress code.
- A comprehensive system of bicycle parking facilities, especially in the city center and transit stations. Some bike racks have been sited in former auto parking lots and decommissioned car lanes, thus further removing roadway and parking capacity from cars.

Much bicycle use occurs on residential streets, away from the heavy traffic streets. These streets can be made more bicycle-friendly with traffic calming. Germany has been a leader in traffic calming.

> Since 1980, most cities have reduced speed limits to 30 km/hr (20 mph) and have further discouraged auto traffic by narrowing streets, increasing curves, setting up roadway bottlenecks, and installing speed bumps, ornamental posts (bollards), concrete planters, wider sidewalks, and bicycle lanes. These measures encourage bicycle use on residential streets. Moreover, in virtually all German cities, there is an extensive interlocking network of streets in the old town center and main shopping district that is completely off-limits to private cars. Most such zones enhance pedestrian and bicycle access to the very heart of the city while keeping cars at a distance, forcing them to park in fringe lots and garages.[3]

Another key component of German policy recognizes that parking is one of the most important necessities for auto use. German cities have restricted its availability and increased its cost. They have eliminated most free, non-metered on-street parking, except in residential districts where use is limited to residents through parking permit programs. On-street parking costs more near high demand locations, such as the central business districts. The revenue generated is used to help fund bicycle improvements.

The evidence shows that accommodating bicyclists in street design and operation results in a rapid growth in bicycling.

B. SAFETY

Safety is an essential element of a comprehensive plan to foster bicycling.

Nationally, around 800 bicyclists die annually. Essentially all of these deaths involve a motor vehicle collision. Indeed, it is rare for a bicyclist to die without a motor vehicle collision. More people die in lightning strikes than in bicycle-only crashes.

The significance of motor vehicle collisions for serious bicycle-related injuries is reflected in medical journal analysis. Almost all serious injuries involve a motor vehicle collision. In a study of 173 bicycle-related fatalities, all involved a motor vehicle collision.[13] In a study of emergency room treatments for bicycle-related injuries, over 85 percent resulted from motor vehicle collisions.[14] Addressing bicycle injuries requires addressing motor vehicle-bicycle collisions.

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[13] *Fife D et al.* Fatal Injuries to Bicyclists: The Experience of Dade County, Florida. *J of Trauma,* **23:**745-755.
[14] *Rivara FP et al.* Epidemiology of Bicycle Injuries and Risk Factors for Serious Injury. *Injury Prevention,* **3:**110-114, 1997.

Motor vehicle crashes cause two percent of all deaths in the US every year. They are the leading cause of death for all ages from 1 through 34 years.[15] Motor vehicle crashes are also the leading cause of premature death, taking 892 years per 100,000 population, far exceeding other leading causes such as homicide (386 years), heart attacks (336 years), and lung cancer (192 years).[15] Motor vehicle usage indirectly causes even more ill health by polluting the air and water, and discouraging physical activity.

Pasadena annually suffers a dozen fatal and over 1,000 injury motor vehicle collisions.[16] One-third of these fatalities or injuries are people struck by a motor vehicle (pedestrians or bicyclists). Typically, throughout California, pedestrians fatally injured outnumber bicyclists six to one.

The Federal Highway Administration in 1995 set a long-term goal of cutting the number of motor vehicle fatalities by 35 percent by 2005. The City could achieve the goal by improving the safety of street system.

1. Safe Communities

Pasadena ranks 14th among California cities for bicycle-related injuries. However, measuring the safety of bicycling by examining the number of injuries is misleading. Cities where more residents bicycle experience greater per capita injury rates.

Measurement of the number of people injured while bicycling is available from the California Highway Patrol. Data for the 15 cities with the highest rate of bicyclist injuries is presented in Table II-2.

Table II-2
Bicyclist Injuries

City	Population	Number	Rate per 100,000
1. Chico	44,200	86	195
2. Berkeley	104,200	184	177
3. Santa Barbara	87,300	141	162
4. Palo Alto	57,200	140	140
5. Newport Beach	68,200	79	116
6. Mountain View	69,800	74	106
7. Davis	49,400	46	93
8. Santa Monica	89,100	79	89
9. El Cajon	90,200	78	86
10. Woodland	41,200	35	85
11. Costa Mesa	100,200	82	82
12. Huntington Beach	185,300	133	72
13. Sacramento	383,800	271	71
14. Pasadena	**135,100**	**94**	**70**
15. Santa Rosa	120,900	81	67

[15] National Center for Health Statistics. *Health, US, 1995*. Hyattsville, MD: US Dept of Health and Human Services; 1996.
[16] California Highway Patrol, Annual Report of Fatal and Injury Motor Vehicle Traffic Accidents, 1993.

The cities with high per capita bicycle injury rates are bicycle-friendly and have high bicycle use. Most bicyclists would report that these cities are safer places to bicycle than the cities with low per capita bicycle injury rates. These cities have high per capita bicycle injury rates precisely because they have high per capita bicycle use. It is noteworthy that Davis, with far and away the highest proportion of trips made by bicycle, has an injury rate similar to cities with less bicycle use. This anomaly suggests that its investment in an extensive bike lane system (94% of arterial roads) has created a safer environment for bicyclists.

Without good bicycle use figures, it is unrealistic to compare Pasadena bicycle injury data to other cities. Such comparative use data is difficult to obtain and beyond the scope of this master plan. Nonetheless, it is desirable to increase the safety for bicycle users in Pasadena to protect residents and to encourage more to ride.

2. Improving Safety

For the prevention of traffic injuries, the most important measures are separation – of streams of traffic from each other and of vehicles from people – and control of speed. Limited separation has proved practical only on freeways, but the complete separation of large trucks from cars, bicycles and pedestrians on surface streets is unrealistic. The role of speed in accidents is incontrovertible; the issue for improving safety is controlling vehicle speed.

In general, experts on injury prevention recognize that environmental modifications have the greatest protective ability. Indeed, one medical journal paper[17] on this very topic starts with the sentence "in the debate about the relative merits of different preventive strategies in injury prevention, environmental changes, and legislation are often regarded as superior and more effective approaches to those involving health education." In other words, street design and operation are more important to bicycle safety than educating bicyclists to be safe.

a) Street Design and Operation

Street design and operation greatly impact bicyclist safety. Figure 3, Collision History, shows the location of motor vehicle versus bicycle injury collisions as recorded in police reports. Injuries are generally distributed, but concentrated along major corridors and near trip attractors (*e.g.*, Colorado Boulevard and Lake Avenue).

Bicyclists injured on residential streets are typically children. Epidemiological studies of child bicyclist injuries show that most occur mid-block on residential streets, essentially in front of their home. This pattern matches that found in studies of child pedestrian injuries. These injuries occur typically with children playing rather than going on a trip to a specific location.[18]

Separating children from motor vehicle traffic is impracticable on a residential street; hence speed control is necessary. Traffic-calming residential streets provides the best protection against childhood bicyclist injuries, and Pasadena is a nationally recognized leader in traffic calming efforts.

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[17] Towner EML, The Role of Health Education in Childhood Injury Prevention. *Injury Prev.* 1995;**1:**59-61.
[18] Agran PF, Winn DG. The Bicycle: A Developmental Toy Versus a Vehicle. *Pediatrics,* 1993; **91**:752-755.

Bicyclists injured on major streets are typically adults. Epidemiological studies[9] show that adult cyclists are fatally injured by motor vehicles overtaking (passing) on major roads and by motor vehicles turning, at both intersections and mid-block driveways. Both separation and speed control are necessary. Excessive motorist speed is a problem with overtaking-type collisions. This indicates that providing space for bicyclists and controlling motorist speeds are important to adult bicyclists.

Riding on the sidewalk is dangerous to bicyclists, as well as to pedestrians. A study of injuries in Palo Alto determined that riding on the sidewalk in the same direction as traffic, riding on the sidewalk in reverse direction, and riding in the street against traffic were all risk factors for injury to the bicyclist.[10] This finding shows that it is beneficial to encourage bicyclists to ride in the same direction as traffic in the street and not on the sidewalk. Bike lanes have been shown to encourage bicyclists to ride in the streets. Traffic counts showed that at sites with bike lanes, 73% of all bicyclists rode on the road with traffic. At sites without bike lanes, only 34% rode on the road with traffic. Without bike lanes, the study showed that sidewalk riding increased with roadway traffic and the number of traffic lanes on the street. [19]

[19] Santa Barbara Bicycle Coalition, Oregon Data on Sidewalks & Bikelanes. *Quick Release*, Jan 1998.

Figure 3: Collision History

The literature on bike lanes shows that cyclists are less likely to be injured on streets with bike lanes. A survey of bicyclists reported that "streets with bike lanes clearly have the lowest frequency of crashes." The researchers queried 1200 members of Washington bicycle clubs about their accidents. They found that the bicyclists averaged 8 accidents per million miles ridden on streets with bike lanes, versus 19 on minor streets, 23 on major streets, and 28 on bike paths.[20]

Evidence from Europe is reported in medical journals:

> "In Copenhagen, the provision of special bicycling lanes reduced the risk of bicycle accident per km by 50 percent between road junctions but there was no reduction of accidents at road junctions."[21]

> "Our study suggests that cycle lanes are safer than ordinary roads for cyclists. After the introduction of cycle lanes on certain routes in Oxford the number of road accidents remained the same despite double the number of road users."[22]

The separation of traffic streams provided by bike lanes is beneficial.

Intersections and mid-block turns of motorists are another significant danger for bicyclists. Although crashes involving left-turning vehicles do not occur as often as other major crash types, they are associated with high injury rates.

Protecting bicyclists from mid-block turns by motorists is best accomplished using access management. Raised medians physically prohibiting turns work substantially better than double yellow lines. Where medians are impossible to install, driveways can be designed to slow the movement of the motorists.

Right turn on red is another risk for bicyclists (as well as pedestrians). The Manual on Uniform Traffic Control Devices for Streets and Highways[23] provides guidelines for prohibiting right turn on red as follows:

1. Sight distance to vehicles approaching from the left (or right, if applicable) is inadequate.
2. The intersection area has geometry or operational characteristics that may result in unexpected conflicts.
3. There is an exclusive pedestrian phase.
4. Significant pedestrian conflicts are resulting from right-turn-on-red maneuvers.
5. More than three right turn on red accidents per year have been identified for the particular approach.
6. There is significant crossing activity by children, elderly, or handicapped people.

Where these or other conditions exist, especially near freeway ramps, it may be desirable to restrict right-turn-on-red.

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[20] League of American Bicyclists, *Bicycle USA*, Nov 1996. Study Shows Bike Lanes Safest for Cyclists.
[21] Lund MG, Wallen S. Bicycle Accidents, *ACTA Chir Scand Supplement*, **531:**1, 1986.
[22] Simpson AHRW, Unwin PS, Nelson IW, Head Injuries, Helmets, Cycle Lanes, and Cyclists, *Br Med J*, 1988, **296:**1161-1162.
[23] US Department of Transportation, Federal Highway Administration. *Manual on Uniform Traffic Control Devices for Streets and Highways*. Washington, D.C. 1988.

Slip lanes (or free right-turn lanes) are another challenge for bicyclists. Typically, the motorist using the lane is looking far back from the intersection, assumes cross traffic is moving at motorized traffic speed and fails to notice bicyclists (and pedestrians). As a result, these intersections are challenging for bicyclists. These could be rebuilt as conventional intersections, or as a temporary measure, they could be marked with a stop sign or re-configured so that the motorist exits at a greater angle (60°) to the receiving traffic lane to provide the motorist with a better view of oncoming traffic. Although this is contrary to the Green Book guidelines, they would increase safety for bicyclists and pedestrians.

b) Traffic Law Enforcement

Regulation of motorist behavior is important to bicyclists and pedestrians. Vehicle speed regulation is a primary concern. On arterial and collector streets the amount of roadway width required for comfortable bicycle use increases as speeds increase. A bicyclist typically feels comfortable with a curb lane width of 14 feet at 60 km/h (35 mph), but requires 15 feet at 75 km/h (45 mph).[24]

Traffic law enforcement is an important function of the City. Motor vehicle speeds are the most important factor for pedestrian and bicyclist safety. A motorist driving at 65 km/h (40 mph) needs 55 m (180 feet) to stop, compared to only 20 m (60 feet) from 30 km/h (20 mph). In addition, the likelihood of pedestrian (and presumably a bicyclist) being fatally injured increases from 5% at 35 km/h (20 mph) to 37% at 50 km/h (30 mph) and to 83% at 75 km/h (45 mph).[25]

Automated enforcement is a rapidly emerging cost-effective technology to regulate both red-light-running and speeding.[26] Experience with speed cameras has shown tremendous ability to reduce severe collisions. According to the British Medical Journal,[27] the number of deaths in the test corridor in London reduced threefold, from 68 to 20, and the number of serious injuries fell by over a quarter, from 813 to 596. Other experience matches the British experience. The Insurance Institute for Highway Safety[28] reported that speed cameras have reduced all injury crashes by 20 percent in Norway.

Red light running is a serious, but mostly neglected problem. A Federal Highway Administration survey found that 96 percent of Americans fear they will be hit by a red- light-runner when they enter an intersection. They also found one in three claim to personally know someone who has been injured or fatally injured in a red light running crash—similar to the percentage of people who know someone injured or fatally injured by a drunk driver. Red light cameras are in use in several California cities, including San Francisco, Santa Rosa, Oxnard, Beverly Hills, Culver

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[24] FHwA, Selecting Roadway Treatments to Accommodate Bicycle, FHWA-RD-92.073, Jan 1994.

[25] Mclean AJ, Anderson RWG, Farmer MJB, Lee BH, Brooks CG. Vehicle Travel Speeds and the Incidence of Fatal Pedestrian Collisions. Federal Office of Road Safety. CR 146. 1994.

[26] Turner S, Polk AE, Overview of Automated Enforcement in Transportation, *ITE Journal*, June 1998, 20.

[27] West R. The Effect of Speed Cameras on Injuries from Road Accidents, *BMJ* 1998; **316:5**-6.

[28] Insurance Institute for Highway Safety, Speed Cameras Reduce Crashes With Injuries in Norway. *Status Report*, 1998; **33:**6-7.

City, El Cajon, and Poway.[29] San Francisco halved the number of red light runners at camera-equipped intersections, and reduced the number of collisions by 10 percent.[29] Their Board of Supervisors voted in April to fund the expansion of the program to 34 cameras, and 100 "dummy" cameras at a cost of $323,000. Fairfax City, Virginia found that three cameras rotated between two intersections reduced the number of accidents at intersections with traffic lights from 43 in November 1996, before the cameras were installed, to 28 the same month the following year.[30] Fairfax City plans to install cameras at five more intersections. The Insurance Institute for Highway Safety[31] reported that red light violations in Oxnard dropped by 42 percent with the installation of nine cameras. Equally importantly, they reported that over 80 percent of the residents supported the cameras.

Evidence shows that only a few drivers cause most of the danger. Traffic law enforcement is important to control dangerous drivers. Studies of drivers who kill pedestrians[32,33] and of drivers involved in fatal collisions[34] show that these drivers are much more likely to have a history of multiple driving violations. Teenage drivers are another risk factor.[35]

c) Safety Training

Child bicyclist injuries tend to be concentrated into ages 6 to 12, which one injury researcher termed a "window of vulnerability." Children in this age range are at particular risk precisely because they are children—they lack the physical and cognitive development to cope with the complexity of traffic. The Centers for Disease Control summarized these developmental limits in a report on child pedestrian injuries.[36]

> The pedestrian skills of children are limited by at least five factors related to their physical attributes (*e.g.*, size and motor coordination) and developmental stage that impair their street-crossing skills until approximately age 12 years.
>
> First, young children may lack the physical ability to rapidly cross the street, and their short stature limits their visibility to drivers.
>
> Second, children are likely to choose the shortest rather than safest route across streets, often darting out at mid-block or entering the roadway between parked cars.
>
> Third, children normally disregard peripheral vision, have reduced attentiveness, localize sounds poorly, and lack sufficient impulse control.

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[29] Lewis, G. San Francisco Examiner, Red-light Cameras Lose Assembly Vote, April 24, 1998.
[30] Melillo W. Washington Post, Traffic Enforcement by Remote Camera Catching on in Area, March 16, 1998.
[31] Insurance Institute for Highway Safety, Red Light Cameras a Success in Oxnard, California. *Status Report*, 1997; **32:**7.
[32] Baker SP et al. Fatal Pedestrian Collisions; Driver Negligence. *Am J Public Health*, 1974; **64:**318-325.
[33] Lightstone AS et al. Relationship Between Driver's Record and Automobile Versus Child Pedestrian Collisions. *Injury Prevention*, 1997; **3:**262-266.
[34] Rajalin S. The Connection Between Risky Driving and Involvement in Fatal Accidents, *Accid Anal and Prev*, 1994; **26:**555-562.
[35] Pless IB et al. The Epidemiology of Road Accidents in Childhood, *Am J. Public Health*, 1987; **77:**358-60.
[36] Centers for Disease Control, "Childhood Pedestrian Deaths During Halloween — United States, 1975–1996," *MMWR, Morbidity and Mortality Weekly Report*, 46: (October 24, 1997), 987-990.

> Fourth, young children do not evaluate potential traffic threats effectively; they cannot anticipate driver behavior, have less acute sensory perception, and process sensory information more slowly than adults.
>
> Fifth, children may engage in "magical thinking" that leads them to believe, for example, that they are protected from vehicular harm within the confines of a painted crosswalk.

Yet, often society's injury control efforts focus on teaching them traffic safety, requiring skills beyond their mental and physical development.[37]

A review of child traffic safety instruction published in a medical journal reported that the literature was "replete" with examples of failed programs. They analyzed programs reported to be successful and determined that they were either unduplicated or internally inconsistent. They reported that training in real traffic situations was substantially better than training in a schoolyard or child-size traffic garden. They concluded that there is no curriculum that consistently produces correct behavior by children.[38]

A UCLA study of child pedestrian and bicyclist injuries in Long Beach concluded:

> "Educating children and their parents about traffic safety and safe play to produce changes in behavior and action is a complicated, costly, and long term approach. Although, in theory, a multidisciplinary, culturally sensitive (including language appropriate) educational program is attractive, few evaluations of educational programs have been encouraging."[39]

This lack of evidence of the benefits of child traffic safety education has led to an analysis of alternative approaches. One report[40] contrasted the cost effectiveness of child traffic safety education versus traffic calming. The researchers showed that the amount of money being spent on training children would quickly pay for installing traffic-calming throughout the city which, they felt, would halve the injuries to children. This approach was infinitely more cost effective, since they felt training programs would not reduce the number of injuries at all. Pasadena started traffic-calming its streets in the 1960s, and has done so on many of its residential streets.

C. DESIGN CONSIDERATIONS

Bicycles legally have the same rights and responsibilities as vehicles and can, and will, be ridden on all public roadways (except for limited-access freeways). The City of Pasadena General Plan Mobility Element states that "all streets are bikeways." Thus, all streets should be accessible by bicycle, with the appropriate bicycle facility.

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[37] Schieber, Richard A. and Nancy J. Thompson. "Development Risk Factors for Childhood Pedestrian Injuries." *Injury Prevention* 1996, 2: 228-236.

[38] Rivara FP. "Child Pedestrian Injuries in the United States," *American Journal of Diseases of Childhood*, 144: (June 1990): 692-696.

[39] Kraus JF et al, "Child Pedestrian and Bicyclist Injuries: Results of Community Surveillance and a Case-Control Study," *Injury Prevention*, 1996, 2:212-218.

[40] Roberts, Ian, Toni Ashton, Roger Dunn, and Trevor Lee-Joe. "Preventing Child Pedestrian Injury: Pedestrian Education or Traffic Calming?" *Australian Journal of Public Health*, 1994, 18: 209-212.

The General Plan says that Pasadena is in the process of improving its citywide bikeway system and making the City more "bicycle-friendly." Creating bicycle-friendly streets in Pasadena means designing and operating all streets with the needs of bicyclists considered. Specifically, "bicycle-friendly" means law-abiding motorists and accommodating bicycle riders in the street configuration, as shown in Table II-3.

Table II-3
Bicycle-Friendly Streets

Classification	Implementation
Mobility corridors	Bike lanes, shoulders, or wide curb lanes
Neighborhood streets with traffic signals	Bike lanes, shoulders, wide curb lanes, or bicycle boulevards
Neighborhood streets	Traffic-calming or bicycle boulevards

1. System Issues: Connectivity and Network Design

Bicyclists live geographically dispersed in relation to the destinations to which they intend to bicycle and these destinations vary by user group.

- Children ride to school, friends' homes, parks, and to a lesser degree, shopping areas.
- Adults ride to work, shops, and mass transit stations such as the Blue Line light rail.
- Recreation and sport riders ride in aesthetically attractive areas.

The most important consideration in providing bike lanes is to provide them on streets that people use. While it may be more feasible to install bike lanes on quiet back streets, such back streets fail to meet the needs of bicyclists for the following reasons:

- Most destinations of people traveling are located on major streets.
- Major streets form a barrier to travel. Freeways can only be crossed on a few streets, and major streets are difficult to cross without traffic control.
- Routes people use to get to their destinations are along major streets, and few people will use their bicycles if special route planning is required.
- Minor streets have more time-consuming obstructions, such as stop signs.
- Lastly, "quiet back streets" are typically already "bicycle-friendly."

Travel lines of potential bicyclists are, in fact, well represented by the motorized traffic flow on the streets. Not only do people on bicycles want to go to the same places as people in cars (within the constraints imposed by distance), but furthermore most travelers have a mental map of their community based on their experience as drivers. Bicyclists, like motorists, want the best and quickest route from one place to another.

Aesthetically attractive streets are also important for encouraging bicycling and walking. Research by the Dutch Railway showed that most people will accept a walking distance of up to a half mile, but will tolerate an increase in this distance of 50 percent if the trip is visually attractive, relatively safe and comfortable, with good surface and weather protection. Delays however, by long waits at intersections for a safe crossing, are perceived as 'lost' distance and the perception of 'lost' time is 60 percent greater than the reality. In Pasadena, blessed with a

Mediterranean climate, shade from trees or installed canopies will be important to encourage bicyclists (and pedestrians) to bicycle (and walk).

2. Regional Coordination

As the City makes improvements for bicyclist, it is important that it be aware of actions of adjacent jurisdictions.

South Pasadena has prepared a bicycle master plan calling for bike lanes on most major streets. Their plan calls for bike lanes on Fair Oaks, the major connector to Pasadena. Recreational bicyclists use Arroyo and Grand to access the Rose Bowl Loop.

To the south and east of Pasadena, the Los Angeles County Metropolitan Transportation Authority's San Gabriel Valley Bikeway Master Plan shows bike lanes on Colorado Blvd. through Arcadia and Monrovia (Monrovia already has bike lanes on Colorado Blvd.). It also shows bike lanes on Sierra Madre Blvd. through Sierra Madre. (Sierra Madre has prepared construction plans for these lanes, but has not yet striped the road.) The LACMTA plan also shows bike lanes on Sunset Blvd. up to California Blvd. It also shows bike lanes on San Marino Ave. through San Marino.

To the west of Pasadena, Glendale's General Plan Draft Circulation Element shows an extensive network of proposed bike lanes, including access to the Glendale Transit Center. Because Flint Ridge separates the two cities, only three potential bicycle routes are significant: Verdugo, Chevy Chase, and Colorado. Glendale shows proposed bike lanes on Verdugo and on Wilson (an east-west street, parallel to Colorado, which connects with Colorado Blvd. just east of the Glendale city limits). Bike lanes are not proposed for Chevy Chase due to inadequate width.

Altadena, to the north of Pasadena, lies within the jurisdiction of Los Angeles County, which reports no plans for bicycle-related improvements in the area. The County does plan to extend the Arroyo Seco Bicycle Path downstream from its current terminus in Ernest Debs Regional County Park to Avenue 33 at the Cypress Ave. pedestrian overpass.

The Metropolitan Transportation Authority's Central Area Bicycle Master Plan (April 1997) calls for bike lanes on the major roads west and south of Pasadena: York Blvd., San Pasq0ual Ave., and Huntington Drive.

Pasadena's efforts to improve conditions for people who bicycle is consistent with other regional plans. Southern California Association of Governments Regional Mobility Plan encourages bicycle commuting, as does the South Coast Air Quality Management District's Rule 2202, which also encourages ridesharing programs at work sites of 250 or more employees.

3. Facility Design

The following discussion of guidelines for facility design provides guidance for the City of Pasadena engineers and City Council. California Government Code §835.4(a) provides protection for the City for designs that were reasonable and carefully considered. Section 830.6

provides protection for plans or designs that have been approved by the legislative body or employee exercising discretionary authority. Accordingly, design of specific improvements for bicyclists using the streets of Pasadena will require their judgment.

Because much of the City developed before the age of the automobile, the city has some unique road conditions. Pasadena's historic tree-lined streets are eminently suited to carrying bicycles and motor vehicles. Modern road guidelines provide for pavement widths based on the adjoining land use and functional use of the road. Many streets in Pasadena were built prior to the development of these guidelines, and some streets have pavement widths too wide or with too many lanes for adjoining land and road use. These streets generally have enough room to install bike lanes with only minor impact to motorized traffic. Conversely, many streets have a restricted available pavement width for the functional use of the road.

The safe passage of bicyclists by motorists is a function of the width of the curb lane, or the combined width of the shoulder or bike lane and adjacent travel lane.[41] These conflicts can be illustrated by the effect of bicycle traffic on traffic lane capacity. The Highway Capacity Manual indicates that bicycle traffic reduces traffic lane capacity when the curb lane width is less than 14 feet.[42]

a) Shoulders and Bike Lanes

Marking shoulders or designating bike lanes have been shown to be beneficial for the safe passage of bicyclists by motorists. Not only is the motorist less likely to encroach into the adjacent lane when passing a bicyclist on facilities with shoulders or bike lanes, motorists have less variation in their lane placement and bicyclists ride further from the edge of the roadway. By riding further from the roadway edge, their sight distance is improved and they may be more visible to overtaking motorists and oncoming motorists (who may be turning left). Finally, being further from the roadway edge provides the bicyclist with slightly more time to react to drivers entering the street from a driveway or side street. The presence of the stripe separating bicyclists from motor vehicles results in fewer erratic maneuvers on the part of motorists and enhances comfort for all roadway users. Shoulders as narrow as one meter have been shown to provide sufficient space for motorists and bicyclists to safety interact.[43] Marking shoulders or designating bike lanes have also been shown to improve the level of service for bicyclists.[44]

In California, if a shoulder is designated by a city or county as a bike lane, its dimensions must meet the minimum requirements of the Caltrans Highway Design Manual, Chapter 1000:

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[41] Florida Department of Transportation, Safety Office, Florida Bicycle Facilities Planning and Design Manual, April 1996.

[42] National Research Council. Transportation Research Board, Highway Capacity Manual, Special Report; 209. 1985.

[43] University of North Carolina, Highway Safety Research Center, *Evaluation of Shared-use Facilities for Bicyclists and Motor Vehicles*, Prepared for Florida Dept. of Transportation. March 1996.

[44] Landis BW, Vattikut VR, Brannick MT. Real-Time Human Perceptions Toward a Bicycle Level of Service, *Transportation Research Record* 1578, 119-126.

Bikeway Planning and Design, Class II Bike Lane.[45] A shoulder that does not meet the minimum requirements for a Class II Bike Lane in Chapter 1000 may not be designated as a Bike Lane.[46]

These standards state that the minimum width for a Class II bike lane adjacent to curb or parking is 1.5 m, and wherever possible, that additional width (0.3 m to 0.6 m) is recommended when one or a combination of the following conditions exists:

- parking is substantial
- turnover of parked cars is high
- truck traffic is substantial

The minimum width for a Class II Bike Lane is 1.2 m when:

- no gutter [seam] exists; or
- adjacent to an uncurbed street shoulder

The Manual recommends that the width of the bike lanes be increased to 1.8 m to 2.4 m wherever possible.

To better provide for bicycles, whenever resurfacing streets where a bicyclist might ride near the gutter (*i.e.* where parking is restricted), paving from curb-to-curb eliminates the seam.

Where parking is allowed but a parking lane is not provided, the Manual requires that the combination Class II Bike Lane, intended for both motor vehicle parking and bicycle use, be 3.6 m wide. It notes that this type of lane is satisfactory where parking is not extensive and where turnover of parked cars is infrequent. However, it notes that if parking volume is substantial, turnover is high, truck traffic is substantial, or if vehicle speeds exceed 55 km/h, additional width is recommended.

b) Motor Vehicle Lanes

Attitudes toward street design are in a state of flux at present. *Engineering News-Record* covered[47] the controversy in a cover story. The AASHTO Green Book[48] provides design guidelines for new construction, but in the last year both the Federal Highway Administration[49] and the Institute of Transportation Engineers[50] have published guidelines stressing the importance of context in applying Green Book guidelines and using the flexibility available within them. The Federal Highway Administration published "Flexibility in Highway Design" specifically to remind traffic engineers of the flexibility available in the AASHTO design guidelines.

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[45] The Highway Design Manual is available at http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm
[46] California Streets and Highway Code, Section 891.
[47] Cho A. Taking Back Main Street. *Engineering News-Record*, Jan 12, 1998.
[48] AASHTO, *Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, Washington, DC, 1990.
[49] Department of Transportation, Federal Highway Administration, *Flexibility in Highway Design* Publication FHWA-PD-97-062. 1997.
[50] Institute of Transportation Engineers, Traditional Neighborhood Development, Street Design Guidelines, A Proposed Recommended Practice, June 1997.

The physical dimensions of automobiles and trucks limit lane widths for motorized travel. AASHTO provides standard vehicle dimensions, but ITE[50] provided the following table (Table II-4) specifically to remind designers "that the design values have some additional dimensional tolerance built-in, and this additional tolerance can become important where … street width differences of only a few feet are very important."

Table II-4
Vehicle Dimensions

			AASHTO Design Dimensions		Comparative Dimensions		
Vehicle	Symbol	height	width	length	width	length	
Pass	P	1.3 m	2.1 m	5.8 m'	1.8 m'	4.9 m	Full-size car
SU truck	SU	4.1 m	2.7 m	9.1 m'	2.1 m	6.6 m	UPS truck
SU bus	BUS	4.1m	2.7 m	12.2 m'	2.4 m	12.2 m	School bus

The Green Book provides lane widths built upon these vehicle dimensions. Chapter IV, *Cross Section Elements*, recognizes the need for flexibility in these cases:

> Although [motor vehicle] lane widths of 3.6 m are desirable on both rural and urban facilities, there are circumstances that necessitate the use of lanes less than 3.6 m wide. In urban areas where right-of-way and existing development become stringent controls, the use of 3.3 m lanes is acceptable. Three meter lanes are acceptable on low-speed [up to 65 km/h (40 mph)] facilities. Under unusual and severe constraints, 2.7 m lanes can be used in residential areas where traffic volumes are low.

The Policy provides further guidance in subsequent chapters. Chapter V, *Local Roads and Streets*, says the following:

> Street lanes for moving traffic preferably should be at least 10 feet wide. Where feasible, they should be 3.3 m wide, and in industrial areas they should be 3.6 m wide. Where available or attainable width of right-of-way imposes severe limitations, 2.7 m lanes can be used in residential areas, as can 3.3 m lanes in industrial areas. Added turning lanes where used at intersections should be at least 2.7 m wide, depending on the percentage of trucks.

Chapter VII, *Rural and Urban Arterials*, says the following:

> Lane widths may vary from 3.0 to 3.6 meters. The 3.0 m widths are used in highly restricted areas having little or no truck traffic. The 3.3 m lanes are used quite extensively for urban arterial street designs. The 3.6 m lane widths are most desirable and are generally used on all high speed, free flowing, principal arterials [freeways]. Under interrupted-flow operating conditions at low speeds up to 40 mph (65 km/h), narrower lane widths are normally adequate and have some advantages.

In summary, the desirable lane width for new construction in the Green Book depends on a multitude of design factors. Table II-5 provides a summary of these factors.

Table II-5
Summary of Design Guidelines for Street Widths

Design Consideration	**Narrower Lane Widths**	**Wider Lane Widths**
Truck Traffic	Little	Heavy
Operating Conditions	Interrupted Flow	Freeways
Speeds	Low, below 40 mph (65 km/h)	Above 40 mph (65 km/h)
Adjoining Land Use	Residential	Industrial
Right-of-Way Width	Restricted	Unrestricted

The Green Book also acknowledges the need for flexibility in lane width determination when designating bike lanes, calling for "special evaluation" for determining lane widths with bike lanes in the roadway.

These are guidelines for new construction. Guidelines for resurfacing, restoration, and rehabilitation (RRR) are considerably less stringent than new construction guidelines. The Transportation Research Board provided the following summary, as excerpted from Table A-1.[51]

Table III-6
Summary Comparison of Minimum Lane Width Guidelines for Urban Arterials

	AASHTO RRR Guidelines	FHWA RRR Proposed Standards	AASHTO Policy for New Construction
Through lanes	3.0 m	3.0 m	3.0 m, highly restricted conditions, low truck traffic 3.3 m "adequate" 3.6 m, "desirable," "generally used" on higher speed (≥ 40 mph, 65 km/h), free-flowing principal arterials.
Parking lanes	2.1 m	2.4 m	3.0 to 3.6 m (2.4 m acceptable if never used as a traffic lane).
Turning lanes DS ≤ 40 mph (65 km/h)	2.7 mt	3.0 m	3.0 m left-turn lanes, 3.3 m continuous two-way, left turn lanes.
Turning lanes DS > 40 mph (65 km/h)	3.0 m	3.0 m	3.0 m left-turn lanes, 3.3 m continuous two-way, left turn lanes.

Other guidelines expand upon this discussion of lane widths. Regarding principles of street design, the American Society of Civil Engineers[52] calls for selecting "the *minimum* width that will reasonably satisfy all realistic needs," and adds that "to design traffic and parking lanes as though the street were a 'microfreeway' is a highly questionable practice. Certainly the provision of two 3.3- or 3.6-meter clear traffic lanes is an open invitation to increased traffic speeds." (emphasis in original)

[51] National Research Council, Transportation Research Board, Designing Safer Roads, Practices for Resurfacing, Restoration and Rehabilitation, 1987.
[52] American Society of Civil Engineers, National Association of Home Builders, and ULI-the Urban Land Institute. *Residential Streets, Second Edition*. 1990.

Studies have shown that projects involving narrowing lanes (to less than 3.3 meter) nearly always reduce accident rates when the project is made to implement a strategy known to reduce accidents, but not when the purpose is to reduce traffic congestion by providing additional through traffic lanes.[53]

The City's General Plan Mobility Element has only two roadway classifications: Principal Mobility Corridor and Neighborhood Street. While the General Plan does not mention traffic level of services as a measure of transportation conditions, the Environmental Impact Report traffic analysis uses the level of service methodology to evaluate the traffic conditions on major corridors in the City. The General Plan set level E as the minimum acceptable threshold for traffic. Reducing traffic lane widths may have a quantifiable impact on the level of service of a roadway where a bike lane or shoulder is marked.

Cities that have installed bike lanes have used narrower (less than 3.3 m) lanes. Portland, Oregon, a leader in installing bicycle facilities, restricts lane widths to 3.3 meter and allows 3.0 meter wide lanes to be used.[54] Glendale's Circulation Element of its General Plan identifies six classes of city streets, all of which may be as narrow as 3.0 meter. Many streets in Pasadena have been striped at 3.6 meter (or even wider) and narrowing such lanes allows the creation of bike lanes.

c) Bike Paths

In California, new bike paths must meet the minimum requirements of the Caltrans Highway Design Manual, Chapter 1000: Bikeway Planning and Design, Class I Bike Path.[45,46] Additional information on design and operation of bike paths in contained in the AASHTO guide.[55]

The minimum width for a two-way off-street path is 2.4 m. The path should be wider, preferably 3.6 m or greater in areas with high use by bicyclists, pedestrians, and joggers. Wherever possible, bike path should be designed wider than the minimum width.

4. Determining Proposed Projects

There is no "cookbook" solution for creating "bicycle-friendly" streets. Depending on the pavement width, traffic volumes, and adjoining land use, different techniques will be required. These techniques fall into the following categories:

- Construct bike paths
- Create bike lanes
- Create bike lanes by narrowing vehicular lanes
- Create bike lanes by removing a vehicular lane

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[53] National Research Council, Transportation Research Board. *Effective Utilization of Street Width on Urban Arterials.* Report 330. August 1990.

[54] City of Portland Bicycle Master Plan, Design and Engineering Guidelines, Appendix A, www.trans.ci.portland.or.us, Accessed on 10/21/98.

[55] AASHTO, Guide for the Development of Bicycle Facilities, American Association of State Highway and Transportation Officials, 1999.

- Create bike lanes by removing a two-way turn lane
- Create bike lanes by removing parking
- Create bicycle boulevards
- Create share bus and bike lanes
- Widen curb lanes

a) Construct bike paths

An off-street path (also called an off-street trail or multi-use path) is a facility separated from motor vehicle traffic by an open space or barrier, either within the roadway right-of-way or within an independent right-of-way. Off-street paths are typically used by pedestrians, joggers, skaters, and bicyclists as two-way facilities. Off-street paths may be appropriate in corridors not well served by the street system (if there are few intersecting roadways), to create a "freeway" to improve service to bicyclists, to create short cuts that link urban destination and origin points along continuous greenbelts, such as rivers and abandoned rail corridors, and as elements of a community recreational trail plan.

Off-street paths can provide a good facility, particularly for novice riders, recreational trips, and cyclists of all skill levels preferring separation from traffic. Some of the advantageous practices in off-street path design include:

- Implementing frequent access points from the local road network; if access points are spaced too far apart, users will have to travel out of direction to enter or exit the path that will discourage use;
- Placing directional signs to direct users to and from the path;
- Building to a standard high enough to allow heavy maintenance equipment to use the path without causing it to deteriorate;
- Limiting the number of at-grade crossings with streets or driveways;
- Terminating the path where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street—poorly designed paths can put pedestrians and cyclists in a position where motor vehicle drivers do not expect them when the path joins the street system.
- Addressing potential security problems up front.

Off-street paths should not be placed directly adjacent to roadways. This creates a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic, which is contrary to the rules of the road. This can result in bicyclists going against traffic when either entering or exiting the path. This can also result in an unsafe situation where motorists entering or crossing the roadway do not notice bicyclists coming from their right, as they are not expecting vehicles coming from that direction. Even bicyclists coming from the left often go unnoticed, especially when sight distances are poor.

b) Create bike lanes

On some streets in the City, creating a bike lane is quite straightforward. Some roads are wide enough to add bike lanes without any adjustment other than painting bike lane stripes. These roads occur more frequently in the eastern portion of Pasadena.

c) Create bike lanes by narrowing vehicular lane widths

Other streets have sufficient curb-to-curb width, but the vehicular and parking lanes will have to be narrowed to find space for bike lanes. Many streets in Pasadena fall into this category. Wherever possible, mobility corridors should accommodate bicycle usages.

d) Create bike lanes by removing vehicle lanes

Many streets in Pasadena were built wide and striped for multiple lanes of traffic. However, with increasing volumes of traffic, it became apparent that road operation was incompatible with adjoining land use. De-emphasizing streets means removing travel lanes to reduce speeding and traffic volume. Designating a bike lane is consistent with this goal. Many of Pasadena's existing bike lanes were installed when a street was de-emphasized (*e.g.* Marengo between Glen Arm and Del Mar).

The General Plan Mobility Element calls for additional streets to be de-emphasized, including South Orange Grove, Washington, California, and Allen (south of freeway). Other streets have a low volume-to-capacity ratio. Wherever streets are de-emphasized, bicycle facilities (preferably Class II bike lanes) should be considered.

e) Create bike lanes by removing two-way turn lanes

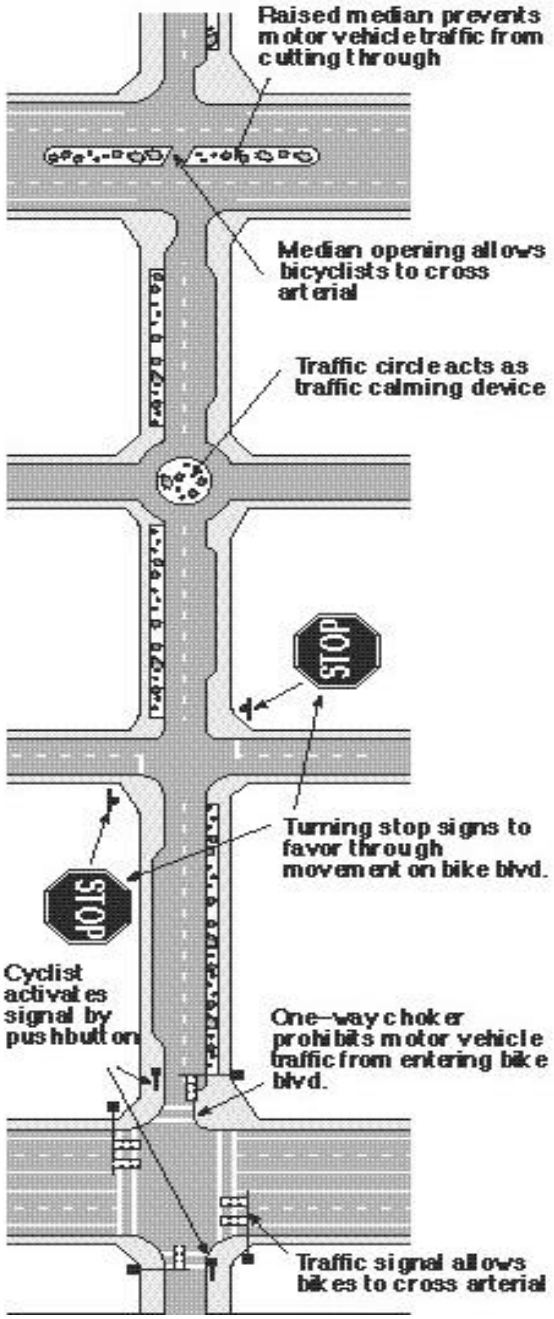
In some instances, Pasadena has de-emphasized streets by reducing the number of travel lanes, and creating a two-way turn lane instead of designating bike lanes. Wherever possible, future design should consider installing the bike lanes would improve the safety for bicyclists. In addition, a Federal Highway Administration report says two-way left-turn lanes do not afford a safe refuge for pedestrians.[49] Installing the two-way turn lane forces the traffic toward the curb and parked cars, where bicyclists ride. Installing bike lanes and moving the traffic toward the center of the street makes it easier for motorists to enter and exit driveways, eliminates overtaking conflicts with bicyclists, and gives pedestrians an area they can enter the street and be seen, prior to crossing.

f) Create bike lanes by removing parking

Removing parking from one or both sides of street is another possibility. Parking demand can be determined by adjacent land use, by available off-street parking or by conducting a parking study. Wherever possible, removing and restricting parking and adding bike lanes should be considered.

g) Create bicycle boulevards

A bicycle boulevard is a street with low traffic volumes where the through movement of bicycles is given priority over motor vehicle travel. A bicycle boulevard is created by modifying the operation of a local street to function as a through street for bicycles while maintaining local access for automobiles. Traffic calming devices are used to control traffic speeds and discourage through trips by automobiles. Traffic control is designed to limit conflicts between automobiles and bicycles and to give priority to through bicycle movement. Bicycle lanes are typically not needed on a bicycle boulevard.



A bicycle boulevard[54] can provide a good alternative to a bicycle lane if well publicized through maps and other appropriate outreach. They can be excellent attractors for new and inexperienced bicyclists, and provide a pleasant ride. Well-designed bicycle boulevards also provide room for emergency vehicles.

Bicycle Boulevards are used in several jurisdictions, including Palo Alto (Bryant Street), Sacramento (16th and H and O), Eugene (12th Avenue), Vancouver, BC (Adanac Bikeway and five others), and Arlington, VA (8th Street). Elements of a bicycle boulevard include the following:

- Selecting a street that provides a direct and continuous connection for bicyclists as opposed to a route that requires bicyclists to wind through neighborhoods. Bicycle boulevards work best on a street grid system.
- Turning stop signs towards intersecting traffic so bicyclists can ride without interruption.
- Placing motor vehicle traffic diverters at key intersections to stabilize motor vehicle volume. The diverters must be designed to allow

through bicycle movement. A full diverter must include a cut through wide enough (1.5 m clear) to accommodate a bicycle with trailer.

- Alternatively, placing traffic calming devices on the street to stabilize motor vehicle traffic speeds. These include traffic circles, speed humps, slow points, chicanes, etc. In some situations, both traffic diverters and traffic calming devices will be needed.
- Providing protection where the boulevard crosses higher volume arterial streets. This can be accomplished two ways:
  - With a signal.
  - With a median refuge. It is recommended that a median refuge be wide enough to allow a bicyclist, with trailer, to be protected (minimum 2.5 m, 3 m preferred). It is recommended that the design allow bicyclists to see the travel lanes they must cross.
- Placing directional signs to route bicyclists to key destinations, to guide bicyclists through difficult situations, and to alert motorists of the presence of bicyclists.

h) Create shared bus and bike lanes

Many cities create shared bus and bike lanes in an effort to expedite bus travel and to encourage bicycling.[56] Reserved bus lanes have been shown to encourage motorists to take a bus because of reduced travel time and more reliable service.[57] In addition, these lanes reduce the inherent conflicts between bus and bicycle travel by reducing the total traffic volume in the lane. The conflict arises because the bicycle, as slower traffic, is expected to ride to the right, but the bus must weave across the bicyclist's path to access the bus stop and weave back again to travel. Because buses frequently stop and start, the average speed of a city bus and a bicyclist are similar, resulting in the bicyclist passing the bus while it is stopped, and then the bus passing the bicyclist when it accelerates to full speed. This weaving occurs whether or not a bike-only lane exists. With a wide bus/bike lane and less traffic, this weaving occurs with less conflict.

San Francisco, Santa Cruz, and Portland, Oregon have bus and bicycle lanes. Vancouver, British Columbia has bus, bicycle and motorcycle lanes. These lanes improve conditions for both buses and bicycles. They improve the safety and comfort for bicyclists and also give bicyclists the confidence to ride further away from the edge of the road, encouraging safer bicycling techniques such as passing on the left, riding further away from parked cars (and associated "dooring"). They also increase bicyclists' visibility at intersections.

The Pasadena General Plan Mobility Element calls for designating bus lanes on Colorado and Lake.

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[56] DeRobertis MM, Rae R. Buses and Bicycles: Design Alternatives for Sharing the Road. *ITE Journal*, May 1998.
[57] Hamer M, On the Move, *New Scientist*, 15 August 1998.

i) Widen curb lanes

For higher volume and higher speed streets (above 40 km/h (25 mph) or 3000 ADT) where there is inadequate width to provide the required bicycle lanes, a wide outside lane may be provided that accommodates both bicyclists and motor vehicles. This could occur on retrofit projects where there are severe physical constraints and all other options have been pursued, such as removing parking or narrowing travel lanes to minimum acceptable widths.

A wide outside lane is typically 4.3 m wide. Usable width is normally measured from curb face to the center of the lane stripe, but adjustments need to be made for drainage grates, parking, and longitudinal ridges between pavement and gutter section. For widths of 4.6 m or greater, it is recommended that a bicycle lane be striped.

These are suitable for sport and recreational bicyclists on low traffic volume and low traffic speed streets; however, less sport-minded bicyclists will not ride with a wide curb lane except at the lowest traffic speeds and volumes unless a bike lane exists. This approach suffers from not providing a visible inducement to bicycling.

j) Shared roadway

There are no specific bicycle standards or treatment for low-volume, low-speed shared roadways; they are simply the roads as constructed. Shared roadways function well on roads such as local streets and minor collectors with speed limits of 40 km/h (25 mph) or traffic volumes of 3,000 ADT or less.

Many neighborhood streets function well as shared roadways if excessive traffic speeds and volumes are effectively reduced through traffic calming techniques, such as speed humps, round-abouts, etc.

III. THE PLAN FOR PASADENA

A. VISION STATEMENT

Pasadena is intertwined with the bicycle—the "Golden Age" of bicycling occurred during Pasadena's development. Early photographs of street scenes always show bicycles, intermixed with pedestrians, horses, and trolleys. Pasadena's first streets were arranged for these users. Pasadena was ahead of its time—this development pattern is now recognized as an essential element of a "livable community."

The Pasadena General Plan calls for creating "a city where people can get around without cars." This bicycle plan provides guidance for implementing that goal. Beyond that, this bicycle plan envisions that Pasadena should be a place where it is easier to ride a bicycle than to drive a car. Pasadena should be a place where bicyclists should be able to freely and safely circulate along all streets. At the bicyclist's destination, secure parking should be available and conspicuous, and it should be free.

Pasadena has a long history of encouraging bicycling. Continuing to encourage more bicycle riding in Pasadena provides many benefits by decreasing congestion while increasing mobility, and improving economics and health.

This plan accommodates existing bicyclists and encourages others to ride their bicycles. Evidence from other cities throughout America and the world shows that connecting people to their destinations with streets accommodating bicyclists encourages people to bicycle to their destinations.

The first step toward making a network to enable people to bicycle is to focus on their destinations. Most of Pasadena's major destinations are on Colorado Boulevard and Lake Avenue. People need to be able to bicycle along them as well as to them. These streets are the backbone of Pasadena.

With the construction of the Blue Line light rail, the train stations and the streets leading to them will become especially important for bicyclists.

Making these streets bicycle friendly, along with arterial streets at one-mile increments, creates the first step toward making a network to enable people to bicycle to their many destinations.

This plan identifies a network of bikeways that connect bicycle riders to their destinations.

However, bicyclists need more than just streets to accommodate them—they need safe streets to ride upon. Creating safe streets for everyone, not just bicyclists, is part of the vision.

This plan envisions a list of projects and programs to be added to the Transportation Improvement Plan, along with possible sources of supplemental funding to enable Pasadena to continue to implement this vision.

B. BICYCLE PLAN

1. City Streets

The major streets of Pasadena are presented with east-west streets first, presented from north to south; then north-south streets, presented from west to east. Appendix A contains scaled cross-sections for many of these streets, both existing, and with possible configurations for making them bicycle-friendly.

a) East-West Streets

Washington Boulevard

The General Plan designates this boulevard as a de-emphasized street, and the North Lake Specific Plan calls for de-emphasizing it east of Lake. Washington Blvd. serves mostly commercial land uses. It is 16.8 to 18.3 m (55 to 60 feet) wide, currently striped for four travel lanes. Parking is allowed along both sides. It is recommended that bike lanes be installed when this street is de-emphasized.

East Orange Grove Boulevard

The General Plan designates this boulevard as a principal mobility corridor from Lincoln to Rosemead. It has two separate personalities. West of Wilson, it is commercial, 16.8 to 18.3 m (55 to 60 feet) wide, currently striped for four travel lanes. Parking is allowed along both sides. In this section, there is insufficient room for adding bike lanes without removing a travel lane or parking.

East of Wilson, it is residential, 21.3 m (70 feet) wide, currently striped for four travel lanes, sometimes with a two-way turn lane, sometimes with left turn bays. Parking is allowed along both sides. In this section, sufficient room exists for adding bike lanes, except where parking coexists with the turn lane. In these cases, the parking and the turn lanes will need to be coordinated to restrict parking near the intersections for the length of the turn bay and to eliminate the two-way turn lane between intersection in the few areas where it exists.

Villa Street

Villa Street serves mostly residential land uses. It has two personalities. Its western portion is narrow with one travel lane in each direction. In some stretches, parking is allowed along only one side of the street. Its eastern portion is wider with sufficient room for installing bike lanes.

Maple and Corson Streets

Maple and Corson streets are one-way couplet streets, mostly residential, except west of Lake Avenue where they serve offices. Bike lanes were installed on these streets when they were converted to frontage streets concurrent with the construction of the Foothill Freeway. However, some portions of these designated bike lanes need to be upgraded to meet California state standards for a Class II Bikeway and should be re-configured. Adding bike lanes east of

Altadena Drive to Sierra Madre Blvd. would allow a connection with the bike lanes in that street.

Walnut Street

The General Plan designates this boulevard as a principal mobility corridor. It is a truck route and it serves a light industrial area.

Colorado Boulevard

Colorado Boulevard serves commercial areas. As such, it is a popular destination for bicycle riders, and desirable as a bicycle route. Many of Pasadena's motor vehicle-versus-bicycle collisions occur on this street, indicating the high amount of bicycle usage. Colorado Blvd. serves as a regional bicycle route, connecting Pasadena to Glendale to the west, and to other towns in the San Gabriel Valley to the east. Monrovia has bike lanes on the boulevard.

Thirty years ago Colorado Boulevard was Route 66 and carried interregional traffic, but was superseded by the Foothill Freeway. Now it serves as access to the commercial areas along the street. The immediately parallel one-way couplet streets Union and Green serve as mobility corridors. Parking lots for the shops along Colorado Blvd. are accessed from these couplet streets.

Del Mar Boulevard

The General Plan designates this boulevard as a principal mobility corridor. It is a truck route and a bike route. It is four lanes, with parking on both sides, along its length. It serves the Blue Line station at Del Mar and Raymond.

California Boulevard

The General Plan designates this boulevard as a de-emphasized street. California Boulevard serves mostly high density residential. This boulevard will also serve the Blue Line Huntington Station at Fillmore Street. It also serves Caltech, and the Caltech-to-Fair Oaks BioTech corridor.

East of Lake Avenue, the road has been de-emphasized, reducing the number of lanes, possibly allowing room for bike lanes. Between Marengo and Lake, the roadway has four lanes, and the General Plan designates it to be de-emphasized, which would possibly allow room for bike lanes.

La Loma Road

La Loma Road serves residential land uses. It will serve as a corridor for San Rafael residents to access the Huntington Blue Line station at Fillmore.

Columbia Street

Columbia Street serves residential land uses. It will serve as a corridor for southwest Pasadena residents to access the Huntington Blue Line station at Fillmore. It connects to planned bike lanes in South Pasadena on Fair Oaks and Beacon Avenue, which connect to Meridian.

b) North-South Streets

Avenue 64

Avenue 64 serves residential land uses, although it is used as a short cut between the Foothill Freeway and the Pasadena Freeway. It has been de-emphasized with the addition of striped parking lanes and a center two-way turn lane. It is an important regional connector for bicyclists traveling to Los Angeles.

Linda Vista Avenue

Linda Vista serves residential land uses. This avenue is popular with both commuter cyclists and sport and recreation cyclists.

Arroyo Boulevard

Arroyo Boulevard serves residential land uses and is a signed bike route. Arroyo is popular with both commuting cyclists and sport and recreational cyclists. It is the Kenneth Newell Bikeway that runs from Los Angeles through South Pasadena and Pasadena to Altadena. The Kenneth Newell Bikeway is popular with recreational bicyclists. Arroyo's winding roads and shade tree canopy make it a pleasant bicycle ride. It draws bicyclists from considerable distances.

Portions of Arroyo Boulevard have bike lanes; in other locations the centerline has been placed asymmetrically, allowing more lane width in the uphill direction. (Narrower lane widths are more acceptable in the downhill direction because bicyclists can maintain speeds closer to motor vehicle speeds.) In the section between the Holly Street and Highway 134 bridges, Arroyo goes up a steep hill. Bicyclists go slowly up that hill, and although the roadway is posted 25 mph (40 km/h), motorists go faster up the hill. Danger to bicyclists could be reduced by moving the centerline off center, to allow more lane width (or a bike lane, if room is available) on the uphill direction. A bike lane in the downhill direction is less important since bicyclists can maintain higher speeds going downhill.

Arroyo Boulevard suffers from being used by motorists as a short cut route to the Rose Bowl even during non-event times. Indeed, two permanent signs at Orange Grove and California and another at California and Arroyo Boulevard direct Rose Bowl traffic to Arroyo Boulevard.

Lincoln Avenue

The General Plan designates this boulevard as a principal mobility corridor. Thirty years ago, Lincoln Avenue was State Highway 118 and carried interregional traffic, but was superseded by the Foothill Freeway. Now it serves as access to the commercial area along the street. Forest Avenue parallels much of Lincoln and is signed as a bicycle route.

South Orange Grove Boulevard

Orange Grove serves residential land uses although it is used as a short cut by through traffic between the Foothill Freeway and the Pasadena Freeway. The General Plan designates this boulevard as a de-emphasized street, and the West Gateway Specific Plan also calls for de-emphasis of Orange Grove.

St. John Avenue

St. John serves residential land uses although it is used as a short cut between the Foothill Freeway and the Pasadena Freeway. The General Plan calls for traffic mitigation control, particularly for noise along this avenue.

Pasadena Avenue

The General Plan calls for traffic mitigation control, particularly for noise along this avenue. North of Del Mar Blvd., the street has bike lanes.

Fair Oaks Avenue

The General Plan designates this boulevard as a principal mobility corridor. It is a designated truck route. South Pasadena plans to install bike lanes on most of the length of Fair Oaks in their city.

Marengo Avenue

The General Plan designates this avenue as a de-emphasized street both north of Orange Grove Blvd. and south of Del Mar Blvd. It has bike lanes south of Del Mar to Glenarm. Between Orange Grove Blvd. and Washington Blvd., the last block at each end has been signed for one-way travel out of the neighborhood.

The sections between Orange Grove and Del Mar and between Glenarm and Los Robles have a high need for bike lanes. Not only is the first section a gap between the bike-friendly portions south of Del Mar, but also it crosses the Foothill Freeway, a barrier to bicycle traffic. In addition, if Marengo were made bicycle-friendly for its entire length, it would provide Pasadena's first continuous north-south route, making a strong foundation for a network of bike-friendly streets. Furthermore, Marengo serves the Civic Center, Old Town Pasadena and Blair High School.

Los Robles Avenue

The General Plan designates this avenue as a principal mobility corridor north of Del Mar Blvd. and as a de-emphasized avenue south of Del Mar Blvd. South of Del Mar, it serves residential land uses and has been striped with parking lanes and a two-way turn lane.

El Molino Avenue

The General Plan designates the entire length of this avenue as a de-emphasized street. It is especially valuable to bicyclists since it is a relatively low traffic volume street that crosses the Foothill Freeway without on- and off-ramps.

At Washington Blvd. a semi-diverter has been installed to prevent southbound traffic.

Lake Avenue

The General Plan designates this boulevard as a principal mobility corridor. This avenue serves mostly commercial areas. North of the freeway, it is characterized by automobile-oriented businesses; and south of the freeway, it is pedestrian-oriented.

It serves a Blue Line station that will have no automobile parking. It is anticipated that passengers will walk, bike or be driven (kiss and ride) to the station. Accordingly, it is important that access to the station be made pedestrian- and bicycle-friendly.

The North Lake Specific Plan calls for a "move away from automobile-oriented uses." There are proposed street tables and street plazas, as well as a pedestrian and food garden district. The South Lake Specific Plan includes bike and pedestrian features and recommends serving the area with bicycle lanes.

Hill Avenue

The General Plan designates this boulevard as a principal mobility corridor south of the freeway and as a de-emphasized street north of the freeway. The section north of the freeway provides another opportunity to create a bicycle boulevard. In the section south of the freeway, parking is restricted during peak travel periods. It accesses Pasadena City College and Caltech.

Sierra Bonita

This street crosses the Foothill Freeway without on- and off-ramps and serves Pasadena City College.

Allen Avenue

The General Plan designates this boulevard as a principal mobility corridor north of the freeway and as a de-emphasized street south of the freeway. This avenue serves mostly residential areas.

It serves a Blue Line station, which will have no automobile parking. It is anticipated that passengers will walk, bike or be driven (kiss and ride) to the station. Accordingly, it is important that access to the station be made pedestrian- and bicycle-friendly.

North of the Freeway, the pavement width is wide enough to allow adding bicycle lanes. South of the Freeway, it is possible to add bike lanes with limiting parking to only one side of the street as is done on El Molino. Overnight parking is prohibited on this street.

Craig Avenue

This street crosses the Foothill Freeway without on- and off-ramps. Because of this factor, it is valuable to bicyclists.

Altadena Drive

The General Plan designates this boulevard as a principal mobility corridor. A portion is already designated as a bike route.

Sierra Madre Boulevard

The General Plan designates this boulevard as a principal mobility corridor north of the freeway. The entire length has bike lanes, from Sierra Madre to San Marino.

San Gabriel Boulevard

The General Plan designates this boulevard as a principal mobility corridor.

New York Drive/Woodbury Drive

This route is popular with bicyclists. Both of these streets are situated on the border with Los Angeles County, and will require coordination with the County.

Sierra Madre Villa

The General Plan designates this boulevard as a principal mobility corridor north of the freeway. It serves the Blue Line station at Sierra Madre Villa.

Halstead Avenue

Serves the Blue Line station at Sierra Madre Villa. The East Pasadena Specific Plan calls for creating a bicycle and pedestrian mall along these streets.

Rosemead Boulevard

The General Plan designates this boulevard as a principal mobility corridor.

2. Rose Bowl Environs

Bicycle plans normally view bikes as transportation; but the fun and fitness components should not be overlooked. Recreational riders are more likely to make the transition to using their bike for shopping and commuting. Terrain and weather keep recreational cycling a strong force in the Pasadena area. The most central feature in Pasadena for recreation is the Rose Bowl Loop as shown in Figure 4: Rose Bowl Loop. The Loop is located in an area known as the Middle Arroyo and consists of Rosemont Avenue, Seco Street, West Drive, and Washington Boulevard. These streets form a 3.1-mile-long loop around the Rose Bowl Stadium, Brookside Golf Course, and their adjacent parking lots. It is next to Brookside Park, the Aquatic Center, baseball diamonds, and tennis courts. With many trees and grassy areas, it is a scenic and pleasant location for a bicycle ride. The 1932 Olympics bicycle track events and 1947 National

Bicycling Road Race Championships were held there. During the 1984 Los Angeles Olympics many national teams trained there.

The General Plan calls for the Rose Bowl area to be considered first and foremost a "recreation area." Many additional recreational uses have developed in the last decade. The perimeter roads area has evolved from literally a dumping ground to a popular walking, roller skating, running, and bicycling loop. At the request of the Bicycle Advisory Committee in 1991, several traffic-related changes on the Loop were made. Much of the success of the Loop stems from re-arranging the stop signs on the perimeter roads to allow non-stop clockwise circulation. That change, Phase One of the three phase

Figure 4: Rose Bowl Loop

program outlined in the *Plan to Make Pasadena Bicycle Friendly*, reduced conflict between Loop users and other traffic in the area. Use of the Loop has blossomed in recent years, undoubtedly aided by these changes. It is recommended that further improvements be made.

a) Develop Sense of Community

Foremost, the City needs to build a sense of community among the Loop users. It is recommended that signs identifying the Loop as a recreation area be installed on all roads approaching the Loop, as recommended in the 1991 *Plan to Make Pasadena Bicycle-Friendly*. It is recommended that resources available for users such as water fountains, rest rooms, and telephones, be mapped and clearly identified. It is recommended that a kiosk for Loop users be installed at the existing rest rooms and proposed Bike Stations. In addition to the map of resources, it is recommended that the kiosks display courtesy guidelines for users as shown in Table III-1. It is recommended that the kiosks include a bulletin board to facilitate *ad hoc* communication among Loop users.

Table III-1
Courtesy Guidelines

Courtesy Code	Bicyclists	Dogs
• Obey all signs and regulations • Show courtesy for other users • Exercise caution in congested areas • Ride, walk, skate, or run in a consistent and predictable manner • Don't block the path of others, they may have difficulty passing	• Maintain a safe speed • Note that bicyclists are subject to the Vehicle Code	• The law requires owners to leash and clean up after their dogs

b) Improve Access

The City recently added bike lanes on Arroyo Boulevard help improve access for bicyclists and help to set a tone for the area. Rosemont Avenue between the Loop and Orange Grove Boulevard is a high-need route for Loop users. It is one of two gateways connecting the Rose Bowl to Old Town Pasadena and to many residents of Pasadena. It is relatively narrow and motorists using it as a shortcut travel at high speed. Because of the uphill grade, bicyclists however, travel much more slowly. Moving the centerline to provide more space for the uphill direction potentially would ease conflicts between motorists and bicyclists. Another option might be creating a bike lane only on the uphill side if there is room for only one bike lane.

c) Reduce Conflicts with Other Users

Improvements for the Loop consist of reducing conflicts between Loop users and others using the roads. Conflicts for bicyclists (and to a lesser degree other loop users) stem from two concerns: overtaking and turns across the Loop.

Overtaking

Motor vehicle speeds all too often are incompatible with Loop users. Posted speed limits are too high considering the large number of pedestrians and bicyclists using the Loop. West Drive is posted 40 mph (65 km/h) and Rosemont is posted 35 mph (60 km/h). A letter to the Star-News (Dec 12, 1997) noted the inappropriateness of these speeds:

> Everywhere in the city, the speed limit ranges from 25 mph (where pedestrians are present) to 35 mph. On West Drive, however, where mothers push their strollers in the street, the speed limit is 40 mph.

Given the large volume of users and their diversity, it is recommended that the speed limit be set at 25 mph (40 km/h). Note that the California Vehicle Code allows a lower speed limit to be set near parks.

> 22357.1. Notwithstanding Section 22357, a local authority may, by ordinance or resolution, set a prima facie speed limit of 25 miles per hour on any street, other than a state highway, adjacent to any children's playground in a public park but only during particular hours or days when children are expected to use the facilities. The 25-mile per hour speed limit shall be effective when signs giving notice of the speed limit are posted.

The Plan to Make Pasadena Bicycle Friendly called for three phases to improve the area. One of the Phase Two improvement called for making the Loop roads one-way. This idea could be implemented gradually. At first, the restrictions could be imposed during peak recreational use times on the Loop, such as evening hours from 4:00 to 7:00 p.m. Then, depending upon an evaluation, the hours could be extended. Alternatively, the one-way restriction could be placed first on the west side of the Loop, minimizing impact to people driving to the golf course.

Turns Across the Loop

By definition, Loop users circulate around the Loop. They encounter conflicts when other park users enter or exit parking lots inside the Loop. During non-event times, essentially three user communities park within the Loop: golfers, park users (*e.g.* soccer players), and Loop users (*e.g.*, walkers, runners, roller skaters, and bicyclists). Reducing the demand for parking within the Loop would reduce these conflicts.

A particular concern centers on Lot K, which is located at the southwest corner of the Loop. It is popular with Loop users. Approximately three-quarters of the ingress and egress are through the south driveway. Often this driveway is congested by traffic exiting the driveway and attempting to turn east (over double yellow lines). Because the bridge immediately east blocks sight lines and because of the large number of Loop users, this particular turn is difficult to execute. Additionally, exiting vehicles sometimes block entering traffic in a relatively narrow section of the roadway, blocking all traffic on the Loop.

d) Provide Bicycle Parking At Large Public Gatherings

The General Plan calls for bicycle parking at large public gatherings:

> 4.2.D At public events where large crowds gather—for instance, sports events, concerts, and conventions—promoters should be required to provide Class 1 bike parking facilities at numerically adequate levels.

Secure, ad hoc parking can be easily provided. Experience in other jurisdictions provides insight. At the Stanford University stadium in Palo Alto, the stadium operator ropes off corrals in visible locations near stadium entrances. Bicycle riders lock their bikes within the corral and the stadium guards the bicycle during the event. According to John Ciccarelli with Stanford University Transportation Program, as many as 1,200 bikes have been watched during an event. The stadium pays a fee $100 to $500 (depending on the number of corrals) to a nonprofit bicycle advocacy organization, Silicon Valley Bicycle Coalition. (A bicycle advocacy group has a vested interest in promoting bicycle use and therefore maximizing the use of the bicycle parking.) It is recommended that the Rose Bowl Operating Company develop a similar relationship and bicycle parking corral concept for every large event. It is recommended that they also promote the availability of the secure bicycle parking with every appropriate opportunity.

The Rose Bowl currently has bicycle-parking lockers that are unused. Bicycle lockers are more appropriate for daily use, as opposed to the greater volume *ad hoc* use needed during events.

3. Horace Dobbins Cycleway

The California Cycleway Company was incorporated on August 23, 1897, by the visionary (and Pasadena Mayor), Horace Dobbins, to develop an elevated wooden bicycle toll way from the Green Hotel to downtown Los Angeles. Early investors included the following: Henry Markam (Governor of California), Professor Thaddeus Lowe (balloonist and aviation pioneer) and E. R. Braley (of Pasadena's Braley Bicycle Emporium). On January 1, 1900, the first section was opened to the public and 600 cyclists made the ride.

Rail magnate Henry Huntington, worried that the Cycleway would compete with his new Red Cars, moved to block Dobbins' acquisition of the last key quarter-mile reach into downtown Los Angeles; but it remained for the invention of the motor-car, to deliver the Cycleway's final death-blow. In 1917 Dobbins sold the right-of-way, which later became the Pasadena Freeway.

Currently, a Pasadena to Los Angeles bikeway is in the Regional Transportation Improvement Program. $2.1 million is dedicated to the construction of an elevated bike-bridge over the Los Angeles River, as well as an interchange with the Los Angeles River Bikeway, under

construction now. An additional $1.5 million is earmarked for the on-grade portions. South Pasadena and Caltrans have both voiced support for the project.

4. Kenneth Newell Bikeway

The Kenneth Newell Bikeway, running from Los Angeles to Altadena along the rim of the Arroyo Seco, is popular with recreational bicyclists. It was assembled as a service project by the Kiwanas Club and named to honor Judge Kenneth Newell, who enjoyed and promoted bicycling.

As has already been discussed, portions of Kenneth Newell Bikeway have bike lanes; in other locations, the centerline has been placed asymmetrically, allowing more lane width in the uphill direction. (Narrower lane widths are more acceptable in the downhill direction because bicyclists can maintain speeds closer to motor vehicle speeds.) In the section between the Holly Street and Highway 134 bridges, Arroyo goes up a steep hill. Bicyclists go slowly up that hill, and although the roadway is posted 25 mph (40 km/h), motorists go faster. Moving the centerline off center, which would allow a bike lane on the uphill direction, could reduce the danger to bicyclists. (A bike lane in the downhill direction is less important since bicyclists can maintain higher speeds going downhill.)

The Kenneth Newell Bikeway suffers from being used by motorists as a route to the Rose Bowl, even during non-event times. Indeed, two permanent signs at Orange Grove and California and another at California and Arroyo Boulevard direct Rose Bowl traffic to Arroyo Boulevard. It is recommended that these signs be removed to discourage use of this route during non-event times.

Arroyo Boulevard could be converted to a Bicycle Boulevard by constructing a movable semi-diverter at the intersection with Arroyo Drive (just south of the Highway 134 overpass). During non-event times, southbound motorized traffic from the Rose Bowl would be diverted up Arroyo Drive to Orange Grove, though bicycle traffic would be allowed to pass. Likewise, northbound motorized traffic would also be diverted up Arroyo Drive to Orange Grove. During event times, the diverters could be removed to maximize traffic to and from the Rose Bowl.

5. Traffic Signals

In Pasadena, approximately half of the signals are pre-timed and half are vehicle or pedestrian actuated. Vehicles are detected with wires buried in the pavement, usually in the shape of a circle or diamond. The loop detects the presence of ferrous metal in a vehicle. However, these embedded vehicle detectors sometimes may not be able to detect the presence of motorcycles and bicycles.

6. Street Maintenance for Bicycling

While implementing bicycle facilities is important, keeping them in good condition is equally important. When a bicycle lane becomes filled with glass and other debris, for example,

bicyclists are forced into motor vehicle lanes. Poor bikeway maintenance can contribute to accidents and deter potential bicyclists unwilling to risk flat tires and skidding in city streets.

An important fact for maintenance personnel to know is that a bicyclist is riding on two narrow, high-pressure tires. What may appear to be an adequate roadway surface for automobiles (with four wide, low-pressure tires) can be treacherous for bicyclists.

At the locations shown in Table III-2, signs direct bicycles onto the sidewalk. The Green Book states "sidewalks are generally not acceptable for bicycling." A second set of signs advises bicyclists to watch for turning vehicles. It is recommended that both of these signs be removed and replaced, where these signs are located at the beginning of a right turn lane, with sign R4-4 ("Begin Right Turn Lane; Yield To Bikes").

Table III-2
Sign Locations

Street	Cross Street
Maple St.	Fair Oaks Ave.
Maple St.	Marengo Ave.
Maple St.	Lake Ave.
Corson St.	Fair Oaks Ave.
Corson St.	Marengo Ave.
Corson St.	Lake Ave.
Corson St.	Altadena Dr.
St. John Ave.	Del Mar Blvd.

7. Bicycle Parking

Every bicycle trip has two basic components: the route selected by the cyclist and the "end-of-trip" facilities available at the destination. These end-of-trip facilities include parking for the bicycle, showers and changing space for commuters. If the end-of-trip facilities do not meet users' needs, other means of transportation will be substituted. In a nationwide Harris Poll conducted in 1991, 42 percent of the respondents said that they had ridden a bicycle in the past year. Of this group, almost half said that they would sometimes commute to work by bicycle, or commute more often, if there were showers, lockers, and secure bicycle storage at work. Clearly, the availability of convenient, secure bicycle parking is a critical factor in an individual's decision whether or not to use a bicycle for transportation. Good, secure bicycle parking offers these benefits:

- it inexpensively and efficiently increases parking capacity;
- it serves those who use bicycles as a mode of transportation; and
- it encourages bicycle use.

Cyclists' needs for bicycle parking range from simply a convenient piece of street furniture to storage in a bicycle locker that affords weather, theft and vandalism protection, gear storage space, and 24-hour personal access. Where a cyclist's need lies on this spectrum is determined by several factors:

- Type of trip being made: whether or not the bicycle will be left unattended all day or just for a few minutes.
- Weather conditions: covered bicycle parking is apt to be of greater importance during the wetter months.
- Value of the bicycle: the more a cyclist has invested in a bicycle, the more concern she or he will show for theft protection. Most new bicycles cost $400 and often considerably more.

- Security of area: determined by the cyclist's perception of how prone a given area is to bicycle theft.

This is fairly subjective, and probably predicated to a degree on an individual's experiences with bicycle theft. A final need for some potential commuting cyclists is for showers, lockers and changing rooms at trip destinations. For those cyclists needing to dress more formally, travel longer distances or cycle during wet or hot weather, the ability to shower and change clothing can be as critical as bicycle storage.

Common terms describing end-of-trip facilities are defined below.

SHORT-TERM PARKING Bicycle parking is meant to accommodate visitors, customers, messengers and others expected to depart within two hours and requires an approved standard rack, appropriate location and placement, and sometimes, weather protection.

LONG-TERM PARKING Bicycle parking is meant to accommodate employees, students, residents, commuters and others expected to park more than two hours. This parking is to be provided in a secure, weather-protected manner and location. Long-term parking typically will be a bicycle locker, a bicycle station, a locked room with standard racks and access limited to bicyclists only, or standard racks in a monitored location.

STANDARD RACK A non-enclosed rack that is designed to reasonably protect the wheels from accidental damage and allow use of a high security, U-shaped lock to secure the frame and one wheel.

SECURE As invulnerable as possible to theft, depending on an appropriate combination of parking type, location, and access.

PLENTIFUL Enough short- and long-term bicycle parking spaces to exceed peak demand.

EASILY ACCESSIBLE Indoor bicycle parking must be on a floor that has an outdoor entrance open for use and a floor location that does not require stairs to access the space; exceptions may be made for parking on upper stories with elevator access within multi-story buildings. Directional signs should be used to locate bicycle parking areas when they are not visible from the street.

ADJACENT TO DESTINATIONS Short-term bicycle parking should be located no farther from the main entrance than the closest auto parking, and within 50 feet of a main entrance to the building. Close proximity to a main entrance is desirable for long-term parking but is not required.

COVERED Means having sufficient shelter to protect the parked bicycle from the elements, particularly rain.

SHOWER AND LOCKER FACILITIES Any facility providing showers, changing space, and permanent clothes storage lockers sufficient to the needs of bicycle commuting employees.

Pasadena has bicycle lockers installed at the Rose Bowl and in city-owned parking lots near Old Town. However, these lockers are installed in out-of-the-way locations without any identification or contact information. In the Old Town lots, parking lot attendants were unaware

of their existence when asked. It is recommended that the City post signs on these lockers identifying them as bicycle parking lockers and provide a phone number for potential users to call to obtain information and a key. The lockers should be moved close to the entrances to increase their visibility and convenience. If they cannot be moved, directional signs should be used to locate them.

The City of Anaheim and Caltrans have adopted the following policy for use of bicycle lockers. The use of the lockers is free of charge, but the lockers must be used. To obtain a key to a locker, the user calls the number posted on the locker, and the agency sends a contract for its use. The user agrees to the contract and returns it with a key deposit. The agency then sends the key. After a short time period and periodically thereafter, the agency slips a postcard into the locker and the user is expected to return the postcard within a reasonable amount of time. (A reasonable length of time depends on the competition for locker use.) Upon return of the key, the agency refunds the deposit. Such a policy would be consistent with the General Plan, which calls for bicycle parking to be free.

Bicycle racks in historic areas could be of suitable design and possibly be custom-designed as public art as well as racks. The City of Los Angeles has installed "art-racks" at the Museum of Contemporary Art, Pershing Square, Grand Central Market, and other locations.

As indicated in the Bicycling in Pasadena Today section, Pasadena has installed rail racks at many locations. Bicyclists highly regard this design; it is simple, safe and inexpensive. In some locations, where these racks have suffered from vandalism, it is recommended that larger-diameter (2¼ -inch-diameter), thicker-wall (Schedule 40) tubing and larger, thicker footplates be used to harden them. It is recommended they be firmly anchored with rawls spikes and coated with PVC for better durability.

Locations for these racks were proposed by the City's Bicycle Advisory Committee. The Committee visited and provided locations for every City parking garage and library, and wrote general location and installation guidelines. Many racks were installed on public right-of-ways, mostly on the sidewalk. In the older parts of the City, this approach works well, however in the newer parts, parking lots often separate the sidewalk from front entrances. In these locations businesses should be encouraged to place additional bicycle parking immediately adjacent to store and business entrances.

Bike racks should be located as close as possible to building entrances, preferably within twenty-five feet. Other criteria include maintaining adequate sidewalk clearance, locating racks outside of bus stop and vehicle loading zones, and away from fire hydrant and newspaper boxes.

To achieve a greater bicycle-transit link, two types of transit facilities need bicycle parking: light rail stations and park-and-ride lots. The General Plan calls for bicycle parking at major bus, rail, and park-and-ride facilities. As of September 1998, the only permanent park-and-ride lot in Pasadena, the Caltrans lot located at the intersection of the Foothill Freeway and Sierra Madre Blvd., is equipped with bicycle lockers. The City has committed to equipping every planned

Blue Line station with bicycle lockers, racks, showers, and clothing lockers. Some will have also have bicycle rental.

Currently, the City provides its employees who commute via bicycle with showers and lockers in the first floor of City Hall. The City is undergoing planning for renovation of Paseo Colorado, a shopping mall in downtown along Colorado Boulevard. As part of this renovation, the City plans to install a bike station in the new mall with public bicycle lockers, racks, showers, rest rooms, clothing lockers, as well as bicycle rental.

8. Bicycling Programs for Youths

The 1974 Bicycle Plan says, "perhaps the bulk of bicycle trips in the foreseeable future will continue to be neighborhood riding by youth." Contrary to this prediction, bicycle use by children has declined dramatically. This loss is not unique to Pasadena. An international study of children's transportation showed that youth in the United States, Australia, and Canada rarely use bicycles, but youth in Sweden do.[58] However, this decline in youth bicycle use has occurred in one generation. Almost everyone reading this master plan remembers bicycling as a child.

One program worthy of emulation is the Center for Appropriate Technology in Eugene, Oregon. They use bicycle maintenance to teach not only tool skills, but also principles of physics and geometry as they relate to frame design. Each student completely restores a bicycle. Bicycles impounded by the Pasadena Police Department could be used for such a program.

The Center also has a bicycle rack construction program, where young people make high quality tubular bicycle racks. The youths are involved at all levels, from site analysis to installation.

Students also provide valet bicycle parking for spectators at events. This parking program provides a service to event-goers who want to guarantee the security of their bicycles, and provides these youths an opportunity to work together as a team in a public and professional setting.

The 1991 *Plan to Make Pasadena Bicycle Friendly* called for creating a youth racing program.

> The Recreation Department, working in cooperation with bicycle clubs, schools, and community organizations, should help establish a youth racing program with training and competition in road and track racing.

This youth racing program could provide a healthy, low-cost recreational outlet for Pasadena's young people along the lines of the Little League or AYSO model, while increasing their bicycle proficiency and safety.

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[58] *Roberts, Ian, John Carlin, Catherine Bennett, Erik Bergstrom, Bernard Guyer, Terry Nolan, Robyn. Norton, I. Barry Pless, Ravi Rao, and Mark Stevenson. "An International Study of the Exposure of Children to Traffic."* Injury Prevention *3 (June 1997): 89-93.*

IV. IMPLEMENTING THE PLAN

A. PRIORITIES

Pasadena's General Plan states, "The street network must provide bicycle connections to transit-orientated development, commercial areas, and transit stops." Following this plan, the streets proposed in the bikeway network were selected because they:

- Connect cyclists to desired destinations, such as employment centers, commercial districts, transit stations, institutions, and recreational destinations;
- Provide continuity with the interregional plans, thus providing connections with bikeways in neighboring cities.
- Provide the most direct and convenient routes possible;
- Provide a parallel bikeway approximately every half-mile.

Higher priorities were given to bikeways serving major destinations and transit stations, and providing a parallel bikeway approximately every mile. Second priority was given to bikeways completing a half-mile grid.

Priorities are presented in Table IV-1 and shown in Figure 5: Bikeways Network Implementation Plan.

Table IV-1
Bike Lane Projects

Street	Length	Character	Comment
FIRST PRIORITY			
East-West Streets			
Colorado Blvd.	6.3	Mobility	Many destinations, possible bus/bike lane
North-South Streets			
Marengo		De-emphasis	
City limits to Washington	0.8		
Washington to Orange Grove	0.7		Make bicycle boulevard
Orange Grove to Del Mar	1.2		Crosses Freeway
Del Mar to Glenarm	0.9		Existing
Glenarm to Los Robles	0.7		Blair High School
Lake Ave.	2.6	Mobility	Many destinations. Serves Blue Line station
Allen			Serves Blue Line station
North of Freeway	1.2	Mobility	
South of Freeway	1.0	De-emphasis	
Sierra Madre Villa Dr.	1.9	Mobility	Serves Blue Line Station
Halstead	0.5		Serves Blue Line Station

SECOND PRIORITY			
East-West Streets			
Washington Blvd.	3.3	De-emphasis	
East Orange Grove Blvd.	4.4	Mobility	
Del Mar Blvd.	4.8	Mobility	Serves Blue Line station
California Blvd.	3.7	De-emphasis	Serves Blue Line station
La Loma	1.3	De-emphasis	
Columbia	0.4		
North-South Streets			
Avenue 64	1.1	De-emphasis	
Linda Vista	2.9	De-emphasis	
South Orange Grove	2.3	De-emphasis	
St. John Street Lincoln to Del Mar California to Bellefontaine	 Existing 0.3		
Pasadena Avenue Lincoln to Del Mar Del Mar to Columbia	 Existing 1.1		
Lincoln Ave.	2.1	Mobility	
Los Robles Ave. North of Del Mar South of Del Mar	 2.7 1.4	 Mobility De-emphasis	
El Molino Ave. North of Orange Grove Orange Grove to Del Mar South of Del Mar	 1.4 1.2 1.5	 De-emphasis De-emphasis De-emphasis	 Make bicycle boulevard
Wilson Ave.		De-emphasis	Make bicycle boulevard Serves Caltech
Hill Ave. North of Freeway South of Freeway	 1.6 1.1	 De-emphasis Mobility	 Serves City College
Craig Ave.	1.5	De-emphasis	
Altadena Dr.	1.8	Mobility	
New York Dr.	1.2	Mobility	
Rosemead Boulevard	0.9	Mobility	
THIRD PRIORITY			
East-West Streets			
Mountain	3.7		
Villa St. West of Hill St. East of Hill St.	 1.6 1.9		 Narrow
Walnut St.	3.5		
North-South Streets			
Arroyo Blvd.	4.2		Portions have bike lanes
Fair Oaks	3.8	Mobility	
Oak Knoll	1.4		
San Gabriel Boulevard	1.1	Mobility	

B. SCHEDULES FOR IMPLEMENTATION

Phase 1	Cost
· Re-paint existing bike lanes throughout City. (11.7 miles)	66,000
· Remove and replace signs at locations in Table III-2	2,000
· Review traffic light synchronization policy to eliminate excessive speed	0
· Initiate pedestrian and bicyclist promotion and safe driving campaign.	100,000
· Convert Marengo and El Molino (Washington to Orange Grove) to bicycle boulevards	20,000
· Add bike lanes on Colorado Boulevard (6.3 miles)	38,000
· Add bike lanes on Marengo between Orange Grove and Del Mar (1.2 miles)	7,000
· Add bike lanes on Allen Avenue to Blue Line station (1.7 miles)	10,000
· Add bike lanes on Orange Grove between Wilson and Sierra Madre Villa (2.7 miles)	16,000
· Add bike lanes on Lake Avenue (2.6 miles)	20,000
· Provide bicycle parking at Rose Bowl events	20,000
· Begin conversion of traffic signal detectors to bicycle- and pedestrian-friendly forms (*e.g.* video)	50,000
· Prepare feasibility study on Horace Dobbins Cycleway	50,000
· Rose Bowl improvements, move centerline and add crosswalks and stop signs	25,000
· Install bicycle parking lockers and racks	10,000
· Install bike racks on ARTS buses	10,000
Total for Phase 1	444,000
Phase 2	
· Add bike lanes on North Lake Avenue to Blue Line station (2.2 miles)	13,000
· Add bike lanes on California Blvd. between Marengo and Lake (0.8 miles)	5,000
· Add bike lanes on California Blvd. between Lake and east City limits (1.3 miles)	8,000
· Add bike lanes on Avenue 64 (1.4 miles)	9,000
· Add bike lanes on South Orange Grove between Lincoln and Columbia (1.8 miles)	11,000
· Add bike lanes on New York (1.3 miles)	8,000
· Continue promotion and safety campaign.	200,000
Total for Phase 2	254,000
Phase 3	
· Add bike lanes on Halstead to Blue Line station (0.4 miles)	2,000
· Add bike lanes on Washington (4.7 miles)	25,000
· Add bike lanes on Lincoln (2.2 miles)	13,000
· Add bike lanes on Hill between Topeka and California (2.4 miles)	13,000
· Add bike lanes on Los Robles between Del Mar and south City limit (1.5 miles)	9,000
· Add bike lanes on El Molino between Del Mar and south City limit (1.6 miles)	10,000
· Continue promotion and safety campaign.	200,000
Total for Phase 3	272,000

C. SAFETY PROGRAMS

Safety program should be aimed at altering the behavior of motorists. It should stress to motorists that motor vehicles are the leading cause of death and disability for children, and that children are especially vulnerable to traffic and are incapable of watching out for adults. Portland, Oregon promoted a comprehensive "For Kids Sake, Slow Down" campaign that used billboards, bus benches, and bumper stickers to assure that the message was widely viewed. An appropriately modified version of their brochure "Good Neighbor Traffic Tips!" is

attached. Such a brochure could be developed for Pasadena, and delivered with Water and Power bills or in the *In Focus* newsletter delivered to every household.

GOOD NEIGHBOR TRAFFIC TIPS!

Pasadena is one of the most livable cities in the world. We each have a responsibility to keep it that way.

In every neighborhood, traffic is a big concern. Drivers who speed, cut through neighborhoods or don't share the road with pedestrian and cyclists make Pasadena less livable for all of us. Here are some Good Neighbor Traffic Tips:

- **Slow Down**

Vehicle collisions are the leading killer and crippler of young Californians. It's illegal *and* unsafe to exceed the posted speed limit. Don't do it. The life you save may be someone's child.

- **Stay on major streets.**

Residential streets are designed for local use. Cutting through neighborhoods may seem like a time-saver—but it's *not.* Don't turn neighborhoods into raceways. Stay on major streets.

- **Share the road.**

Bicyclists and pedestrians have as much right to the right-of-way as motorized vehicles. Share the road.

- **Link your trips.**

Not only are there more vehicles on the road, each vehicle is being driven more miles. Buck the trend. Combine several errands into one trip.

- **Curb your car**

Walk, bike or bus. The best way to keep Pasadena safe for pedestrians, bicyclists and transit users is to become one yourself. Curb your car. It's an easy way to help Pasadena's environment.

D. HOW TO FUND THE VISION

1. Incorporate into Transportation Improvement Program

Pasadena lacks a specific bicycling program. Opportunities ought to be sought to create one and that a specific portion of Pasadena's transportation budget be devoted to bicycle facilities. The City Council has established a goal of five percent of all trips to be made by bicycle; and using more of the total transportation funding for this purpose seems reasonable. The General Plan supports such spending priorities, specifying "the focus of future planned transportation improvements in the City is on non-auto-oriented projects."

2. Supplemental Funds

Additional potential funding sources for bicycle projects is wide and varied. Most programs can be classified as federal, state, regional, local, and private. Bike projects are often funded through LACMTA. However there are many other sources available, including environmental, recreational, and health grants. Mitigation funding from major government and private projects could also provide funds. Private, foundation and corporate funding should also be pursued.

a) Federal Funding

The Transportation Equity Act for the 21st Century, known as TEA 21, has greatly increased the amount of funding available to bicycle, pedestrian and inter-modal projects. Federal Transportation funding is prioritized and approved by Regional Planning Organizations as lead agencies, such as the LACMTA. These funds are distributed to projects in the Regional Transportation Plan. Unlike other transportation projects that require an 11.5% local match, for bicycle projects the federal share is 80%, with a 20% local, regional, or state match. That percentage may change (under TEA 21) to 88.5% to make the local match consistent with other transportation modes. A new provision calls for a 95% share for "providing bicycle access to mass transit." In some instances, transportation enhancements may allow 100% funding, without local matching funds.

These funding programs, while familiar to transportation planners, quickly become an alphabet soup of acronyms (STP, CMAQ, TEA, etc.) to non-planners. This is a brief summary of some of those programs, which may provide funding for the City (as well as regional) bicycle projects.

Congestion Management and Air Quality (CMAQ)

In the new TEA 21, CMAQ funding was increased by 50 percent. Because bicycle transportation is the most cost-effective way to reduce air-pollution, CMAQ funds are available and may help fund bicycle programs. Non-profits are now allowed to directly administer projects, in partnership with a public entity.

Intelligent Transportation System Integration Program

TEA 21 calls for technology-based, non-motorized research projects to "enhance alternative transportation" be included in the Intelligent Transportation System Integration Program.

Transportation Enhancements (TE) Program

There are several possibilities to fund neighborhood projects under the new transportation bill. One of the more popular programs is called the Transportation Enhancements Program (which is 10% of the state's Surface Transportation Program allocation). Nationwide this totals $3.7 billion over the next six years.

The TEA 21 conference committee has settled upon a couple of items that may be of interest. Traffic calming measures are now an eligible activity for safety projects. Under the Hazard Elimination Program, bicycle and pedestrian safety projects are eligible and should be considered as projects.

Under the TE program, there are several categories of eligibility for funding projects such as sidewalk reconstruction, landscaping and streetscape improvements, benches, streetlights, pedestrian access studies, pedestrian malls, signage, pedestrian bridges and walkways and improved access at curbs.

A new category has been added under the TE program, "provision of safety and educational activities for pedestrians and bicyclists." The Transportation Enhancements Program also includes the innovative financing provisions that would allow non-profit organizations to sponsor projects.

b) State Funding

Environmental Enhancement and Mitigation Program

The Environmental Enhancement and Mitigation Program (EEM) is administered by the Resources Agency of California, which then makes recommendations to the California Transportation Commission. Grants are generally limited to $500,000; however the Resources Agency may encourage and recommend awards exceeding that $500,000 guideline. These funds can be used to mitigate existing transportation projects as well as to provide urban forestry, recreational, and park projects. Local agencies and non-profits may apply for and receive grants. Local matching funds are not required, but are given weight in evaluation of the proposals. In-kind/volunteer services are not given formal credit, but are looked upon favorably.

Petroleum Violation Escrow Account (PEVA)

The Petroleum Violation Escrow Account was set up to fund projects that save energy. Bicycle transportation projects are eligible.

Caltrans Bicycle Lane Account

The bicycle lane account has been increased and will continue to increase for the next few years. Bicycle advocates are working to increase this budget to one percent of the total Caltrans budget.

Department of Health Services

Department of Health Services realizes that much of the mortality and morbidity of Californians is due to lack of physical activity. They are now investigating ways to make people more active. They recognize making cities more walkable and bikeable are the best way to increase activity. Although specific funding programs are not available currently, contact should be established to position the City for when such funding becomes available.

c) Local Funds

Huntington Memorial Hospital is the regional trauma center for the San Fernando and San Gabriel valleys. It is required to devote a portion of its trauma income to injury prevention

efforts. Opportunities ought to be sought with the hospital for funding programs such as public outreach efforts.

E. PUBLIC RELATIONS AND OUTREACH

The key to developing a successful public relations and outreach program is a consistent, widely distributed, and persistent message. The goal should be to change consciousness, for example, signs indicating that Pasadena is bicycle-friendly should be placed wherever appropriate, such as on bike racks and bike lane signs in the city. The city transportation department letterhead should ideally incorporate the slogan from the General Plan: "PASADENA, A CITY WHERE PEOPLE CAN GET AROUND WITHOUT A CAR." Pasadena's monthly newsletter *In Focus* could have features that work toward achieving that goal, with articles about bicycling, walking and riding the bus and train.

Advocacy programs should be developed, such as promoting a car-free day each week.

Rose Bowl and other special community events should promote walking, biking, and busing. Clear ridesharing goals for each event should be established and progress toward reducing the number of vehicles, and more importantly, reducing the number of vehicles per attendee, should be tracked and publicized.

Figure 5: Bikeways Network Implementation Plan

V. ANTICIPATED RESULTS

Aggressive promotion of bicycling should provide many benefits to Pasadena residents.

A. DECREASE CONGESTION

It is recognized that congestion or "gridlock" is a serious urban problem. Traffic congestion has plagued the transportation system from the time the automobile first became commonplace. Cars are large, and consume a lot of space to operate and store. A bicycle rider uses one-tenth as much space as a car user, greatly increasing the carrying capacity of the road. Each car replaced with a bicycle ameliorates congestion.

The Mobility Element of the General Plan calls for reducing the number of vehicular trips. Part of achieving the multi-modal, traffic-calmed, environmentally friendly transportation system is making the paradigm shift from expanding automobility to expanding alternatives.

Historically, efforts to solve traffic congestion have focused on *supply*, by improving traffic flow or building more roads. Recent analysis shows that the demand for vehicular trips is "elastic" and as roads are built, new trips and longer trips expand to fill the new road space.[59] Caltrans acknowledges this phenomenon, officially saying, "we can't build our way out of congestion." The same elasticity, but in the opposite direction, has also been shown. As roads are restricted or closed, trips and trip lengths decrease.[60,61] In the past, traffic volume was viewed as "liquid," which meant that decreasing traffic on one road would cause traffic to increase on another. Current understanding views traffic volume as a "gas," that expands and contracts to fill available road space.

Furthermore, the degree of elasticity has been shown to vary with the availability of alternatives.[62] As options for travel improve, in number, service, frequency, reliability, and safety, people will use alternatives to serve their needs.

B. IMPROVE ENVIRONMENT

In Southern California, the environmental consequences of motorized transportation are widely understood and visible. Over two-thirds of the air pollution in the air basin comes from transportation. Despite ever more stringent controls on tailpipe emissions, increasing use of motor vehicles has kept air quality at hazardous concentrations.

In addition to air pollution, motor vehicles are also significant contributors to water pollution (due to airborne nitrogen emissions being deposited in water bodies and due to direct leakage of oil products) and global climate change. Encouraging bicycling addresses all of these issues.

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[59] *Hansen M. Do New Highways Generate Traffic?* Access, University of California Transportation Center, *1995; 7:16-22*.

[60] *Hamer M. Roadblocks Ahead*. New Scientist *24 January 1998*.

[61] *Traffic Impacts of Highway Capacity Reduction*, ITE Journal, *July 1998, 14*.

[62] *Nijkamp, P. and G. Pepping. 1998. Meta-Analysis for Explaining the Variance in Public Transport Demand Elasticities in Europe*. Journal of Transportation and Statistics *1:1*

C. IMPROVE ECONOMICS

A recent World Bank report[63] showed that increasing car use increased the economic activity of a region, but only up to a point. Southern California was shown to be past the point of diminishing returns. In Southern California, in the average household, transportation is the second greatest expense. It used to be food. If a Pasadena household can avoid purchasing a second car by having the Blue Line available to travel to downtown Los Angeles and by having bikeable and walkable streets, that money is then available for spending in Pasadena.

In addition, since Southern California no longer has any automobile manufacturing facilities, and half of the fuel consumed in the United States is imported, much of the money spent on purchasing and operating automobiles leaves the regional economy. And this is not just a regional concern. Thirty percent of the[64] United State's trade deficit is due to imported oil, and a further fifteen- percent is due to imported vehicles.[63] Bicycling provides a means to reduce the cost of transportation and to keep the economic activity of the region circulating within the region.

D. IMPROVE HEALTH

Physical activity is part of a healthy life, but such activity has decreased as transportation has become more mechanized and sedentary leisure activities have replaced active ones. Studies[65] have shown that physically active people live longer than sedentary people do.

The British Medical Association[66] summarized the health benefits of bicycling:

> The health benefits of bicycling are well documented. Regular physical exercise delays postmenopausal osteoporosis and lowers cardiac morbidity and mortality — perhaps by reducing body fat and blood pressure and increasing the ratio of high density to low density lipoproteins. It may also improve mental health and all cause mortality. As a form of aerobic exercise bicycling is ideal; it makes use of the large limb muscles without putting strain on the joints. The energy requirement of bicycling 6.5 km each way to work at a speed of about 20 km/h are equivalent to those of 10 minutes' of wrestling, over half an hour's squash, 50 minutes' tennis singles, an hour's skating, a brisk 4 km walk, or 24 holes of golf. Studies have shown that civil servants who bicycled regularly experienced half the expected number of coronary events, and lifelong bicyclists over the age of 75 had a 10-fold reduction in the incidence of ischaemic heart disease.

The British Medical Association[66] recommends "more bicycling lanes, an integrated system of bicycling paths, priority for bicyclists and pedestrians over motorists, traffic restraint, and better access for bicycles on trains."

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[63] *Kenworthy J, Laube F, Newman P, Barter P.* Indicators of Transport Efficiency in 37 Global Cities. *Washington, DC: The World Bank, 1997.*

[64]

[65] *Paffenbarger RS et al. Physical Activity, All-Cause Mortality and Longevity.* N Engl J Med *1986:**314:**605-13.*

[66] *Godlee F. On Your Bikes: Doctors Should be Setting an Example.* Brit Med J, *1992,**304:**588-9.*

E. PROMOTE FITNESS

The fitness of the American public has declined dramatically in recent years. Poor physical fitness is the second leading cause of premature death[67]—nearly 14 percent of all deaths. Only tobacco, which claims 19 percent of all deaths, exceeds it as a cause of death. Obesity has increased at record levels over the past decade, up from 26% of adults in 1980 to 34% today. Over 58 million American adults—one third of the population—are overweight or obese. Former Surgeon General, C. Everett Koop,[68] terms the increasing obesity as a "crisis." At the same time, childhood obesity rates have been rising steadily over the last three decades, with 22% of children ages 6 to 17 now overweight. By the most stringent definition, more than half of U.S. women and men age 20 and older are considered overweight.[69]

In the United States, the Institute of Medicine says overweight people are costing citizens more than $70 billion annually in both direct health care costs and indirect ones such as lost productivity.[69]

The prevalence of obesity has increased in the past decade, yet daily energy intake and fat consumption have actually been reduced during this time period.[70] The obesity is due to reduced daily physical activity, as leisure activities are more sedentary and transportation becomes more mechanized.

Reversing these disturbing trends is an important reason to make Pasadena more bikeable and walkable. The Centers for Disease Control recommend[71] that community programs be developed to promote physical activity among children and adolescents. Encouraging bicycling as transportation and recreation provides a positive life-long activity well suited to Pasadena residents of all ages.

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[67] *McGinnis JM, Foego WH. Actual Causes of Death in the United States.* JAMA *1993;* ***270:****2207-2212.*

[68] *Koop CE. The Link Between Obesity and Disease.* Wall St. J. *11 March 1998.*

[69] *Wickelgren I. Obesity: How Big a Problem?* Science, *29 May 1998;* ***280:****1364-1366.*

[70] *Anderson RE et al. Relationship of Physical Activity and Television Watching with Body Weight and Level of Fatness Among Children,* JAMA *1998;* ***279:****938-942.*

[71] *Centers for Disease Control and Prevention. Guidelines for School and Community Programs to Promote Lifelong Physical Activity Among Young People.* MMWR Morb Mortal Wkly Rep. *1997; 46 (No. RR-6): 1-36.*

VI. COMPLIANCE WITH THE CALIFORNIA BIKEWAYS ACT

A. ESTIMATE OF NUMBER OF BICYCLE COMMUTERS AND FUTURE PROJECTIONS

The 1990 US Census counted 64,465 total workers in Pasadena. Of these, 839 bicycled to work, or 1.3%. This is the latest official count of the number of bicycle commuters. The Southern California Association of Governments estimates that there are now 90,000 jobs in Pasadena. If the same 1.3% of these bicycled to work, this would bring the number to 1,171. In addition to these commuters, Pasadena is home to the California Institute of Technology and several colleges. The number of students bicycle commuting to school and higher education not been calculated, but is likely significant.

The City Council has adopted a goal of increasing bicycle commuting to 5% of all commuters by the year 2001. The Comprehensive General Plan of the City highlights this goal. The Plan sets forth of the primary visions of the future of Pasadena as one "...where people can circulate without cars." The Plan also states a policy of making Pasadena a place "...where bicycle and walking are encouraged and where all streets are bikeways."

B. LAND USE MAP

A map with descriptions of existing and proposed land use and settlement patterns is included on page A-34 of the Appendices.

C. BIKEWAYS NETWORK MAPS

A map of the existing and proposed bikeways is included Figures 1 and 5. A description of the proposed bikeways is included in Chapter IV and on pages A-1 through A-33 of the Century of Bikes Plan.

D. END-OF-TRIP BICYCLE PARKING MAP

A map of the existing and proposed bicycle parking is included Figures 2. The map shows where the City's standard bicycle racks have been placed. They are located along retail corridors, near libraries, parks, schools and colleges and other locations of known use. Bicycle lockers are also shown at the Rose Bowl, at public parking structures on Holly Street and at One Colorado, and at City Hall. The racks the City has been using are convenient for cyclists to lock to but are not strong and require significant maintenance. It is recommended that the City adopt the Schedule 40 2 1/4-inch pipe with rawls spikes and PVC coating as the standard rack for better durability.

E. BICYCLE PARKING FOR INTERMODAL CONNECTIONS MAP

A map of the existing and proposed bicycle parking is included Figures 2. Only one park-and-ride lot exists in Pasadena. It is located at the intersection of Foothill Boulevard and the 210

Freeway. The park-and-ride lot has bicycle lockers and racks. City bicycle racks have been placed near bus stops along the following bus routes:

Allen Avenue	Hill Avenue
Altadena Drive	Lake Avenue
Arroyo Parkway	Lincoln Avenue
California Boulevard	Linda Vista Avenue
Colorado Boulevard	Los Robles Avenue
Del Mar Boulevard	Orange Grove Boulevard
Fair Oaks Avenue	Sierra Madre Boulevard
Foothill Boulevard	Walnut Street
Green Street	Washington Boulevard

F. BICYCLE AMENITIES MAP

A map of the existing and proposed bicycle parking is included Figures 2. Currently the City has restrooms, showers and lockers for bicycle commuters in the first floor of City Hall. They are available for City employees to use. The City is undergoing plans for renovation of Pasadena Plaza, a shopping mall in downtown along Colorado Boulevard. As part of this renovation, the City plans to put a bike station in the new mall with public bicycle lockers, racks, showers, restrooms, clothing lockers as well as bicycle rental.

The planned Blue Line light rail line stations will all have bicycle lockers, racks, showers and clothing lockers. Some will also have bicycle rental.

G. BICYCLE SAFETY & EDUCATION PROGRAMS

The City of Pasadena contracts with Safe Moves to provide bicycle and pedestrian safety education to school children, parents, teachers, senior citizens, and the general public. It is a two-year program beginning in 1998 and ending in 2000. The program exists of 1,060 interactive school workshops reaching 25,000 students (K-12) each year, 62 school rodeos, 93 parent workshops, 93 teacher workshops, 36 senior citizen presentations, 36 community presentations and 24 community rodeos.

The City of Pasadena contracts with Safe Moves to provide bicycle and pedestrian safety education to school children, parents, teachers, senior citizens, and the general public. It is a two-year program beginning in 1998 and ending in 2000. The program exists of 1,060 interactive school workshops reaching 25,000 students (K-12) each year, 62 school rodeos, 93 parent workshops, 93 teacher workshops, 36 senior citizen presentations, 36 community presentations and 24 community rodeos.
The contract also includes data collection and evaluation to monitor the improvements on safety. It is too early to present the results of the program. However, it sets a goal of reducing the number of children aged 1 through 17 injured or killed on bicycles by 20%. It also sets a goal of raising the rate of bicycle helmet use by children aged 1 through 17 from 31% to 71%.

Pre-program statistics for the year 1996 are shown in the table below.

Bicycle Accident Data by Age Group in 1996

Age in Years	Killed	Injured
1-14	0	21
15-17	0	6
18-24	0	13
25-43	0	35
44-54	0	7
55+	1	5

H. CITIZEN AND COMMUNITY IMPUT

Citizens were invited to provide input to the Draft Plan at a hearing of the Transportation Advisory Commission on January 9, 1999. The hearing was well publicized. Approximately 55 people attended and 35 spoke about the Draft Plan. Another public hearing was held on January 25, 1999 of the City Council.

I. COORDINATION OF BICYCLE AND OTHER TRANSPORTATION PLANS

This Century of Bikes Plan has been coordinated with, and is consistent with both local and regional transportation and air quality plans. The Century of Bikes Plan is consistent with the City's Mobility Element in that it encourages bicycling for utilitarian purposes.

The Century of Bikes Plan is consistent with the San Gabriel Valley Bicycle Plan in including regional routes, such as Sierra Madre Boulevard and San Pasqual Street on the Plan. It also links up with routes planned by neighboring cities such as Avenue 64 connecting with bike routes in Los Angeles.

The Century of Bikes Plan is consistent with the Southern California Association of Governments Regional Mobility Plan (RMP) by encouraging bicycle commuting. The RMP is the delegated transportation plan for air mobility and air quality goals for the region and incorporates the Los Angeles County's bike plans.

The Century of Bikes Plan is also consistent with the South Coast Air Quality Management District's Rule 2202 that encourages ridesharing programs at work sites of 250 or more employees. The Plan services employers citywide and will assist them in complying.

J. PROJECT PRIORITIES

A description of the projects proposed in the Plan can be found in Section IV. A listing of their priorities is on pages IV-1 and IV-2. The bicycle routes are also mapped showing their priority on the Figure 5: Bikeways Network Implementation Plan.

K. PAST EXPENDITURES FOR BICYCLE FACILITIES

In the past Pasadena has spent bicycle funds on bikeways, bicycle parking and signage. Specifically, the City has used Transportation Development Act Article 3 funds in the past for bike lanes on Maple St., Corson St., Sierra Madre Blvd., Raymond Ave. and Marengo Ave. It also spent funds on Class III signage on streets such as Altadena Dr., Orange Grove Blvd., Wilson Ave., Sierra Bonita Ave. and Del Mar Blvd. Present records do not show how much was spent on these.

Records from 1996 show that $111,470 was spent on bikeways in the Rose Bowl area with another $40,000 appropriated.

In 1993, Pasadena received $180,000 of Intermodal Surface Transportation Efficiency Act and Proposition C funds from the Los Angeles County Metropolitan Transportation Authority for bicycle racks and lockers. This is how much of the bicycle parking in Pasadena has been funded.

The Century of Bikes Plan estimates the cost of projects in the Plan on page IV-3.

Appendix A

APPENDIX A

Street Cross-Sections

The cross-sections on the following pages describe many of the streets in Pasadena. These cross-sections depict the existing lane configurations. The "existing" cross-sections were chosen to be representative of the identified reach of roadway. In many circumstances however, it is impossible to select a representative section due to many changes in lane configuration, pavement width, parking restrictions, or other factors.

The cross-sections with bike lanes or other adjustments are intended to illustrate possible options for accommodating bicycles and do not represent specific recommendations. A detailed engineering study will be required to determine actual roadway cross-section configuration. Most of the cross-sections are measured mid-block and the configuration will be different at intersections. At intersections, turning lanes are typically added and parking is restricted.

WASHINGTON BOULEVARD

at Fair Oaks Avenue

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19.5	11.5	10	19

With bike lanes (with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	6	11	12	11	6	7

at Marengo Avenue

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19	11	11	19

With bike lanes (with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	6	11	12	11	6	7

at Catalina Avenue

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
17.5	10	10	17.5

With bike lanes (with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	5	10.5	10	10.5	5	7

at Hill Avenue

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
17.5	10	10	17.5

With bike lanes (with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	5	10.5	10	10.5	5	7

at Sinaloa

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19	11	11	19

With bike lanes (with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	6	11	12	11	6	7

at Woodlyn

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
20	12.5	12.5	19.5

Alternative: With bike lanes (Version with planned de-emphasis):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
8	6	11	14.5	11	6	8

Alternative: With bike lanes (Version without de-emphasis):

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	5	10	10	10	10	5	7

EAST ORANGE GROVE BLVD.
at Gamble House

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19	11	11	19

Alternative: Bicycle-friendly (adjust lane widths):

Travel/Parking	Travel	Travel	Travel/Parking
20	10	10	20

Alternative: Add bike lanes (restrict parking to one side):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	10	11	11	10	5

at Foothill Freeway bridge

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
22	10	11	21

With bike lanes:

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	5	10	10	10	10	5	7

at Manzanita
also at Garfield and Madison

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19	11	11	19

Bicycle-friendly (adjust lane widths)

Travel/Parking	Travel	Travel	Travel/Parking
20	10	10	20

Add bike lanes (restrict parking to one side):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	10	11	11	10	5

at Mentor

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
18	10	10	18

Add bike lanes (restrict parking to one side):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	10	10	10	10	4

between Wilson and Catalina

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
16	12	10	17

Bicycle-friendly (adjust lane widths):

Travel/Parking	Travel	Travel	Travel/Parking
18	10	10	17

between Linda Rosa and Palo Verdi (typical east of Wilson)

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
23	12	12	23

With bike lanes:

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	6	11	11	11	11	6	7

between Carmelo and Martello

Existing:

Travel/Parking	Travel	Turn	Travel	Travel/Parking
19	11	10	11	19

With bike lanes (remove 2-way turn lane between intersections and remove parking where turn lane needed near intersections):

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	6	11	11	11	11	6	7

between Sierra Madre and Altadena

Existing:

Travel/Parking	Travel	Turn	Travel	Travel/Parking
22	11	11	11	22

With bike lanes:

Parking	Bike	Travel	Travel	Turn	Travel	Travel	Bike	Parking
7	5	11	10.5	10	10.5	11	5	7

Orange Grove at Canyon Wash

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
19	11	10.5	19

Alternative: With bike lanes (reduce number of travel lanes):

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	6	11	11.5	11	6	7

Alternative: Add bike lanes (restrict parking to one side):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	10	10	10.5	10	5

VILLA STREET

at Summit

Existing (no change):

Travel	Travel/Parking
14	20

at Garfield

Existing (no change):

Travel	Travel/Parking
14	20

at El Molino and at Michigan

Existing:

Travel/Parking	Travel/Parking
20	20

With bike lanes (parking on one side):

Bike	Travel	Travel	Bike	Parking
5.5	11	11	5.5	7

at Sinaloa

Existing:

Travel/Parking	Travel/Parking
24	24

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	6	11	11	6	7

at Carmelo

Existing:

Travel/Parking	Travel/Parking
24	24

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	6	11	11	6	7

COLORADO BOULEVARD
at Avenue 64

Existing:

W Bound	W Bound	E Bound/Parking
10	10	20

With bike lanes (and remove one west bound lane):

Bike	Travel	Travel	Bike	Parking
5.5	11	11	5.5	7

Colorado St. Bridge

Existing:

Travel	Travel
15	15

With bike lanes:

Bike	Travel	Travel	Bike
5	10	10	5

at Orange Grove

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
20	12	12	20

With bike lanes:

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	5	10	10	10	10	5	7

at Raymond (typical through Old Town)

Existing:

Parking	Travel	Travel	Travel	Travel	Parking
7	12	12	12	12	7

Bicycle-friendly (widen outside lane):

Parking	Travel	Travel	Travel	Travel	Parking
7	14	10	10	14	7

at Grand Oaks (mid-block)

Existing:

Parking/Travel	Travel	Median (paint)	Travel	Parking/Travel
20	10	10	10	20

With bike lanes:

Parking	Bike	Travel	Travel	Med.	Travel	Travel	Bike	Parking
7	5	10	10	6	10	10	5	7

at Grand Oaks (at intersection)

Existing:

Turn	Travel	Travel	Turn Lane	Travel	Travel
9	10	10	10	10	20

With bike lanes (add bike lanes):

Turn	Travel	Travel	Turn Lane	Travel	Travel	Bike
9	10	10	10	10	15	5

at Virginia (typical east of Sierra Madre Blvd.)

Existing:

Parking/Travel	Travel	Median	Travel	Parking/Travel
20	13	8	13	20

With bike lanes:

Parking	Bikes	Travel	Travel	Median	Travel	Travel	Bikes	Parking
7	5	11	10	8	10	11	5	7

at Halstead

Existing:

Parking/Travel	Travel	Turn Lane	Travel	Parking/Travel
20	12	10	12	20

With bike lanes:

Parking	Bike	Travel	Travel	Turn Lane	Travel	Travel	Bike	Parking
7	5	10	10	10	10	10	5	7

CALIFORNIA

South Orange Grove to St. John

Existing:

Parking/Travel	2-wayTurn	Parking/Travel
19.5	11	20

With bike lanes (eliminate two-way turn lane):

Parking	Bike	Travel	Travel	Bike	Parking.
8	6	11.5	11	6	8

St. John to Pasadena Ave.

Existing:

Travel	Travel	Turn	Travel	Travel
10	10	10	10	10

With bike lanes (eliminate one west bound lane):

Bike	Travel	Travel	Turn	Travel	Bike
5	10	10	10	10	5

at Edmondson Alley

Existing:

Travel	Travel	Turn	Travel	Travel
10	10	11	10	10

at Marengo Ave.

Existing:

Travel	Travel	Travel	Travel
14.5	10.5	10.5	14.5

With bike lanes:

Bike	Travel	Travel	Travel	Travel	Bike
5	10	10	10	10	5

at Madison

Existing:

Travel	Turn	Travel	Travel
15	10	10	15

With bike lanes:

Bike	Travel	Travel	Travel	Travel	Bike
5	10	10	10	10	5

west of Lake

Existing:

Right turn	E Bound	Left turn	W Bound	W Bound
10	10	9	10	10.5

With bike lanes (remove one west bound lane between Lake and Hudson)

Right turn	Bike	E Bound	Left turn	W Bound	Bike
10	5	10	9.5	10	5

east of Lake

Existing:

Parking	Travel	Turn	Travel	Parking
10	15	10	11.5	8

With bike lanes:

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	5	10.5	10	10	5	7

at Hill (Pasadena)

Existing:

Parking	Travel	Turn	Travel	Parking
8	12.5	10	12	8.5

Alternative (remove turn lane):

Parking	Bike	Travel	Travel	Bike	Parking
8	6	11.5	11.5	6	8

Alternative (parking on one side only):

Bike	Travel	Turn	Travel	Bike	Parking
6	11.5	10	11.5	6	8

at Sierra Vista Avenue (San Marino)

Existing:

Parking	Travel	Travel	Parking
8	12	12	8

at San Gabriel (Pasadena)

Existing:

Parking	Travel	Turn	Travel	Parking
8	13	14	13	8

With bike lanes:

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	5	11	10	11	5	7

at Caroll Way (Pasadena)

Existing:

Striped	Travel	Turn	Travel	Striped
8	14	13.5	14	8

With bike lanes:

Parking	Bike	Travel	Turn	Travel	Bike	Parking
7	5.5	11	10.5	11	5.5	7

COLUMBIA ST. between Orange Grove Blvd. and Fair Oaks Ave.

Existing:

Parking/Travel	Parking/Travel
25	25

With bike lanes (install painted median):

Parking	Bike	Travel	Md.	Travel	Bike	Parking
7	5	11	4	11	5	7

AVENUE 64
Colorado Blvd. to Melrose

Existing:

Travel	Travel
25	25

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
8	6	11	11	6	8

south of Melrose

Existing:

Striped	Travel	Turn	Travel	Striped
8	12	10	12	8

With bike lanes (replace two way turn lane with bike lanes):

Parking	Bike	Travel	Travel	Bike	Parking
8	6	11	11	6	8

SOUTH ORANGE GROVE BLVD.
(Time-restricted parking)

Existing:

Parking/Travel	Travel	Travel	Parking/Travel
14	10.5	10	14

With bike lanes (de-emphasize and eliminate parking on one side):

Parking	Bike	Travel	Turn	Travel	Bike
7	5	10.75	10	10.75	5

ST. JOHN
at Congress

Existing:

Parking/Travel	Travel
18.5	13.5

With bike lanes:

Parking	Bike	Travel	Travel
7	5	10	10

PASADENA AVENUE
at Colorado Boulevard, typical from Del Mar Blvd. to Corson St.

Existing:

N Bound	N Bound	Bike	Parking
12	10	5	7

FAIR OAKS

at Claremont

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
20	11.5	11.5	19

Bicycle-friendly (widen curb lane):

Travel/Parking	Travel	Travel	Travel/Parking
21	10	10	21

at Painter

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
15	11	11	13

Bicycle-friendly (widen curb lane):

Travel/Parking	Travel	Travel	Travel/Parking
15	10	10	15

at Villa

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
14	11	11	14

Bicycle-friendly (widen curb lane):

S Bound	S Bound	N Bound	N Bound
15	10	10	15

at Parsons

Existing:

S Bound	S Bound	S Bound	Turn	N Bound	N Bound	Parking
12	11	11.5	10	15	13.5	7

With bike lanes:

Bike	S Bound	S Bound	S Bound	Turn	N Bound	N Bound	Bike	Parking
5	10	10	10	10	11	11	5	7

at Colorado

Existing:

Travel	Travel	Travel	Travel
12.5	10	10	12.5

at Dayton

Existing:

Parking	Travel	Travel	Parking
20	11	11	20

Bicycle-friendly (widen outside lane):

Parking	Travel	Travel	Travel	Travel	Parking
7	14	10	10	14	7

RAYMOND AVE.
at Painter

Existing:

Travel/Parking	Turn	Travel/Parking
18	14	18

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
8	6	11	11	6	8

MARENGO AVE. Typical from Washington Blvd. to East Orange Grove Blvd. parking on west side only

Existing:

Travel/Parking	Travel
18	12

Proposed (move centerline):

Travel/Parking	Travel
19	11

So. of East Orange Grove

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
17	13	11	19

Alternative: Bicycle-friendly (widen curb lane):

Travel/Parking	Travel	Travel	Travel/Parking
20	10	10	20

Alternative: With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	10.5	11	11	10.5	5

LOS ROBLES
at Penn

Existing:

Travel/Parking	Travel/Parking
24	24

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	6	11	11	6	7

at Prescott
4 lanes with restricted rush-hour parking.

Existing:

Travel/Parking	Travel	N Bound	N Bound/Parking
14	11	11	14

Bicycle-friendly (widen curb lane):

Travel/Parking	Travel	Travel	Travel/Parking
15	10	10	15

at Mountain

Existing:

Travel	Travel	Turn	Travel	Travel
10	10	10	10	10

at Parke St.

Existing:

Travel	Travel	Travel	Travel
14	11	11	14

at Villa
no parking

Existing:

S Bound	S Bound	N Bound	N Bound
16	18	11	15

With bike lanes:

Bike	Travel	Travel	Travel	Travel	Bike
6	12	12	12	12	6

at freeway bridge

Existing:

S Bound	S Bound	Turn	Med.	Turn	N Bound	N Bound
22	10	11	5	11	10	22

at Doubletree Hotel

Existing:

Parking	Travel	Travel	Two way turn	Travel	Travel	Parking
7	14.5	10	10	10	12.5	7

With bike lanes (remove two-way left turn lane):

Parking	Bikes	Travel	Travel	Travel	Travel	Bike	Parking
7	5	12	11	12	12	5	7

Los Robles at Cordova
intersection (South side)

Existing:

Travel	Travel	Turn	Travel	Travel
17	10	10	10	12

With bike lanes (remove turn lane):

Parking	Bike	Travel	Travel	Travel	Travel	Bike
7	5	11	10	10	11	5

Los Robles between Del Mar and Cordova

Existing:

Travel	Travel	Travel	Travel
13.5	10	11	14

Los Robles north of Del Mar

Existing:

Travel	Travel	Travel	Travel
18.5	10	10	9

Los Robles south of Del Mar

Existing:

Parking	Travel	Turn	Travel	Parking
8.5	10	10	11.5	8

With bike lanes (replace 2-way turn lane with bike lane):

Parking	Bike	Travel	Travel	Bike	Parking
8	5.5	10.5	10.5	5.5	8

Los Robles north of California

Existing:

Parking	Travel	Two-way turn	Travel	Parking
8	11	10.5	11.5	8

With bike lanes (replace 2-way turn lane with bike lanes):

Parking	Bike	Travel	Travel	Bike	Parking
8	6	10.5	10.5	6	8

Los Robles at Alpine

Existing:

Parking	Travel	2-way Turn	Travel	Parking
8	11.5	11	12	7.5

With bike lanes (replace two-way turn lane with bike lanes):

Parking	Bike	Travel	Travel	Bike	Parking
8	6	11	11.5	6	7.5

Los Robles at Allendale

Existing:

Travel	Turn	Travel
20	11	20

With bike lanes (replace two-way turn lane with bike lanes):

Parking	Bike	Travel	Travel	Bike	Parking
7	6	12	12	6	8

EL MOLINO
at Highland
parking on west only

Existing:

Travel	Travel/Parking
12	18

Move centerline:

Travel	Travel/Parking
11	19

at Ladera
parking on west only

Existing:

Travel	Travel/Parking
12	18

Move centerline:

Travel	Travel/Parking
11	19

NORTH LAKE
at Rio Grande

Existing:

Travel/Parking	Travel	Turn	Travel	Travel/Parking
18.5	10	10	10	18

south of Washington
Raised median

Existing:

Parking	Travel	Travel	Median	Travel	Travel	Parking
7	12	11.5	8	12	11.5	7

Bicycle-friendly (widen curb lane):

Parking	Travel	Travel	Median	Travel	Travel	Parking
7	13.5	10	8	10	13.5	7

at Bell

Existing:

Travel/Parking	Travel	2-way Turn	Travel	Travel/Parking
21	12	10	12.5	21

With bike lanes (add bike lane):

Parking	Bike	Travel	Travel	2-way Turn	Travel	Travel	Bike	Parking
7	5	10.5	10.5	10	10.5	10.5	5	7

at Villa

Existing:

Parking	Travel	Travel	2-way Turn	Travel	Travel	Parking
7	14	12	10	12	14	7

With bike lanes (add bike lane):

Parking	Bike	Travel	Travel	2-way Turn	Travel	Travel	Bike	Parking
7	5	10.5	10.5	10	10.5	10.5	5	7

at Locust

Existing:

Travel	Travel	Travel	Travel	Median	Travel	Travel	Travel
145	10	10	10	10	10	10	11

at Union

Existing:

Travel	Travel	Travel	2-way Turn	Travel	Travel	Travel
12	10	11	10	11	10	12

OAK KNOLL

at Old Mill

Existing:

Parking	Travel	Travel	Parking
8	14	16	8

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	5	11	11	5	7

at Ridge

Existing:

Parking	Travel	Turn	Travel	Parking
8	12	10	12.5	8

With bike lanes (remove turn lane):

Parking	Bike	Travel	Travel	Bike	Parking
8	5	12	12	5.5	8

at Cornell

Existing:

Parking/Travel	Turn	Parking/Travel
20	10	20

With bike lanes (remove turn lane):

Parking	Bike	Travel	Travel	Bike	Parking
8	5	12	12	5	8

HILL AVE.
at Atchinson St.

Existing:

Travel/Parking	Travel/Parking
19	19

With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Bike
7	5	11	11	5

North of Washington

Existing:

Travel/Parking	Travel/Parking
21	21

With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Bike
8	6	11	11	6

at Asbury

Existing:

Parking	Travel	Travel	Parking
8	14	14	8

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	5	10	10	5	7

north of Loma Vista, typical to Washington Blvd.

Existing:

Parking	Travel	Travel	Parking
8	13.25	13.25	8

Bicycle-friendly:

Parking	Travel	Travel	Parking
7	14.25	14.25	7

With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Bike
8	6	11	11	6.5

at Orange Grove

Existing:

Parking	Travel	Turn	Travel	Parking
8	10	10	11	8

With bike lanes (remove turn lane):

Parking	Bike	Travel	Travel	Bike	Parking
7	6	10.5	10.5	6	7

With bike lanes (parking on one side):

Parking	Bike	Travel	Turn	Travel	Bike
7	5	10	10	10	5

north of California Blvd.
(typical to Del Mar Blvd.)

Existing:

Parking/Travel	Parking/Travel
24	24

With bike lanes:

Parking	Bike	Travel	Travel	Bike	Parking
7	6	11	11	6	7

ALLEN ST.
at Brigden, Loma Vista, Monte Vista

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
21	11	11	21

With bike lanes:

Parking	Bike	Travel	Travel	Travel	Travel	Bike	Parking
7	5	10	10	10	10	5	7

at Wagner

Existing:

Travel/Parking	Travel	M.	Turn	Travel	Travel/Parking
20	15	3.5	11	11	20

With bike lanes:

Parking	Bike	Travel	Travel	M.	Turn	Travel	Travel	Bike	Parking
7	6	11	11	3.5	10	10	10	5	7

at Locust

Existing:

Travel/Parking	Travel	Turn	Travel	Travel/Parking
28	10	10	10	22

With bike lanes:

Parking	Bike	Travel	Travel	Turn	Travel	Travel	Bike	Parking
7	5	11	11	12	11	11	5	7

Between Colorado and Walnut
parking restricted at rush hours.

Existing:

Travel/Parking	Travel	Travel	Travel/Parking
10	10	10	10

With bike lanes (restrict parking):

Bike	Travel	Turn	Travel	Bike
5	10	10	10	5

With bike lanes (parking on one side only):

Parking	Bike	Travel	Travel	Bike
8	6	10	10	6

north of Keystone

Existing:

Travel/Parking	Travel/Parking
19	19

With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Bike
7	5	10.5	10.5	5

south of Keystone

Existing:

Travel/Parking	Travel/Parking
20	22

With bike lanes (parking on one side):

Parking	Bike	S. Bound	N. Bound	Bike
8	6	11	11	6

at Oakdale
2 hr parking 9 am-4pm on southbound
no parking 8am-4pm on northbound

Existing:

Travel/Parking	Travel/Parking
18	18

at Homet

Existing:

Travel/Parking	Travel/Parking
19	19

With bike lanes (parking on one side):

Parking	Bike	Travel	Travel	Bike
7	5	10.5	10.5	5

SIERRA MADRE VILLA AVENUE
at Electronic Drive
2 travel lanes with rush hour restricted parking, Bike Route

Existing (no change):

Travel/Parking	Travel	Travel	Travel/Parking
18	10	10	18

at Primavera Street
76 feet, with 4 travel lanes with turn lane, rush hour restricted parking
Bike Route

Existing:

Travel/Parking	Travel	Turn	Travel	Travel/Parking
21	12	10	12	21

With bike lanes

Parking	Bike	Travel	Travel	Turn	Travel	Travel	Bike	Parking
7	6	10	10	10	10	10	6	7

North/South Streets

HALSTEAD STREET
Halstead at Electronic Drive
2 travel lanes with parking both sides

Existing:

Parking/Travel	Parking/Travel
28	28

With bike lanes:

Parking	Bike	Travel	Median	Travel	Bike	Parking
7	5	11	10	11	5	7